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SE2.3.7 Case Study: Sustainable Intermodal Transport Services on the Atlantic Arc

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1. Summary

The purpose of the study is to devise a unified approach to establishing sustainable intermodal transport services, using case-studies along the Atlantic Arc as a back-drop.

Within the Atlantic Arc, Ireland is taken as a special case because of its geographical and historical isolation from Mainland Europe. Using the concept of 'normalised trade', which is taken to be the expected trade flows between a state and its proximate states based on relative GDPs, it is found that trade flows between Ireland and France and the Iberian states are considerably less than what might be considered to be 'normal'. This study examines the trade potential available between these countries and the influence this may have on the setting up of new services.

The study examines the factors necessary to establish an intermodal network solution for the benefit of all participants in intermodal transport. This involves a detailed analysis of the legal, commercial and operational capabilities required to ensure the effective operation of a network. The study also considers the financial support strategies available for setting up new services. The Appendices that are attached outline the Top-20 Imports & Exports between Ireland and France & Spain, as well as investigating three potential services along the Atlantic Arc.

Target Stakeholders

- Shipping companies and logistics operators
- Port and terminal management and stevedoring companies;
- Customers of port services, e.g. ship operators, haulage operators, forwarders and shipping agencies;
- European, state and international authorities and agencies responsible for the implementation of transport and trade policies.
- Local port communities including importing/exporting firms.

Approach

The study has the following general structure, with reference to the chapter numbers in the study:

2. *Trade Potentials between States:* The trade potentials between Ireland, France and the Iberian States are examined. The historical implications of trade flows are outlined together with an explanation of the normalised trade flows between Ireland and the UK and Ireland and France & Iberian States. From this analysis it is apparent that unitised trades between Ireland and France & Spain have the potential of being increased by a factor of approximately three. Irish exports to Spain are on a downwards spiral. Arresting this deterioration in unitised trade will require a concerted effort on the part of the two affected states, Spain and Ireland.



3. *Strategies to Achieve Sustainable Intermodal Services.* The fourth pillar of sustainable intermodal services, Strategic Network Alliances, is considered to be little understood and its importance is generally underestimated. For this reason, most of Chapter 3 is assigned to this topic. The advantages of an Intermodal Network structure are deemed to be:
 - It avoids the unsustainable risks of Integrated Intermodal Operations,
 - It avoids the lack of reliability that is a characteristic of Independently Functioning Operations,
 - High levels of efficiency can be achieved through coordinated management of the independent operational functions;
 - Risks are distributed amongst participating operators;
 - The system is open to new operational entrants;
 - It is a system that is particularly applicable to the large range of intermodal operations that service Europe's regional ports.
4. *The Analysis of Possible new services along the Atlantic Arc* investigates how these services may be established or strengthened. Three possible combinations of routes are analysed in detail.
5. *Funding supports for Motorways of the Seas* looks at the various supports available for the establishment of new services along the Atlantic Arc. This section also examines requirements under the Ecobonus initiative.

Appendices are attached that outline the Top-20 Imports/Exports between Ireland and France & Spain. Also, the sample services along the Atlantic Arc are presented in some detail.

References

Key projects

'Promotional Platform for Short Sea Shipping & Intermodality (PROPS)

'Sustainable Knowledge Platform for the European Maritime and Logistics Industry (SKEMA)'

'Effective Operations in Ports (EFFORTS)'

'Tools and Routines to Assist Ports & Improve Shipping (TRAPIST)

Maritime Navigation and Information Services (MarNIS)

Motorways of the Sea European Style (MOSES)

Feasibility of New RoRo/RoPax Services between Ireland and Continental Europe (NECL in conjunction with Marine Institute of Ireland).

Key web sites

<http://www.props-sss.eu/>

<http://www.skematransport.eu/>

www.efforts-project.org

<http://www.necl.ie/trapist/index.htm>

<http://www.marnis.org/home.asp>

http://ec.europa.eu/transport/infrastructure/index_en.htm

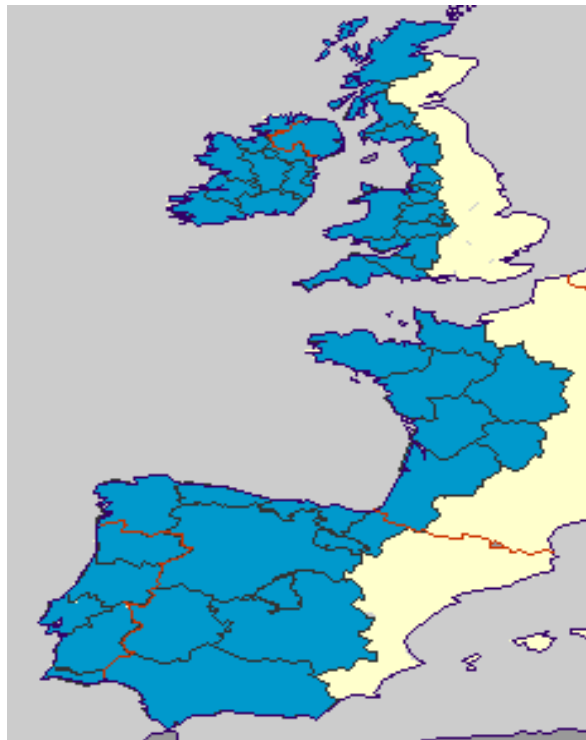
www.necl.ie/



2. Trade Potentials between selected states along the Atlantic Arc

2.1 Introduction

The Atlantic Arc is taken to encompass Ireland, Britain, France, Spain, Portugal and the Benelux states of Belgium, Luxembourg and the Netherlands. The transport connections and trade flows between the Atlantic Arc states are for the most part very good, with some aberrations in the case of Ireland because of its close historic ties with Britain. This study, therefore, places special emphasis on maritime services linking Ireland with other Atlantic Arc states, especially with France and the Iberian Peninsula.



2.2 Historic Background

A milestone in the history of Ireland was the Act of Union with England that came into force in January 1801. This resulted in Ireland being governed directly from London. The Act of Union was in response to the rebellious spirit in Ireland that took its cue from the French Revolution, which had a profound effect on the liberation movement in Europe. France had made three attempts to send troops to Ireland to support the Irish rebels, but each failed for a variety of reasons.

Following the Act of Union there was a period of prosperity in Ireland due to the need for food, horses and men in England, which was engaged in an extended war with France. However, following the termination of the Napoleonic wars, the Irish economy went into free-fall and entered a prolonged period of want and deprivation that reached its nadir in the Great Famine of the 1840's. Through death and mass emigration the population fell by 1.4 million people in ten years and continued to fall throughout the remainder of the century. Commemoration stones in different regions, such as that marking the mass grave of 8,000 to 10,000 famine victims in Skibbereen, West Cork, are constant reminders of these terrible times.

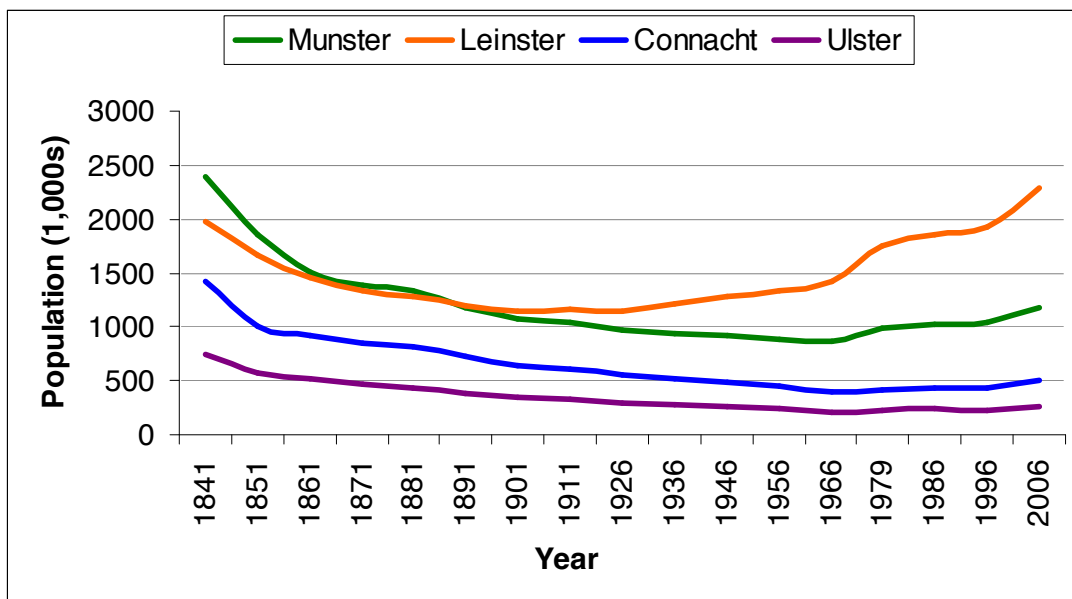


The decline in population affected the provinces differently. Munster had the largest population of the four Irish provinces in the 1840's, with 2.4 million people. Leinster was second with 2 million people, while Connacht had 1.4 million and Ulster (those counties that are now part of the Republic) had 0.7 million.

Irish Provinces and Counties



Population changes in the Irish provinces



The populations of Leinster and Munster bottomed out in 1926 and 1961 respectively and the populations of the other two provinces reached their lowest points in the early 1970's.



Proximity and trade with Great Britain favours the East Coast of Ireland (Leinster), especially during the period when the majority of Ireland’s trade was either with Britain or was streamed through Britain. Trade between Britain and Ireland will always be important for the two states, but a new situation is in the offing where trade with France and the Iberian states has the potential of reaching more normal proportions.

2.3 Trade Potentials between Ireland, France & the Iberian States

There is significant trade and shipping potential between Ireland, France and the Iberian states for several reasons:

2.3.1 Historic isolation of Ireland from France, Spain & Portugal:

Direct trade with France and the Iberian states was effectively curtailed during the period of Ireland’s union with Britain. The watch towers that are positioned around the Irish coast were established to warn of possible incursions from these states, rather than welcoming them as neighbouring trading partners. The most notable trade that was not via Britain was smuggled goods into remote South and West coast bays and harbours. The inertia of this period of isolation is carried forward to present times.

2.3.2 Significant climatic and industrial differences between Ireland, France, Spain & Portugal

There are significant climatic and industrial differences between Ireland, France and Spain that make interregional trade opportunities quite varied and attractive. This is illustrated by the top-four unitised goods that are transported between Ireland and the other states. For imports into Ireland, fruit & vegetables feature strongly from states that receive considerably more sun than Ireland; also, non-metallic mineral manufactured goods, such as tiles, and steel products for which Ireland has no manufacturing facilities.

On the other hand, Ireland is notoriously wet and has profuse growth of grass. Hence, meat, beef and dairy produce feature strongly in its exports, as do fish and pharmaceutical products.

Ireland	France	Portugal	Spain
Imports	Cereals & cereal preparations	Non-metallic mineral manufact.	Non-metallic mineral manufact.
	Iron & steel	Manufactures of metals	Vegetables & fruit
	Vegetables & fruit	Vegetables & fruit	Road vehicles
	Plastics in primary forms	Cork & wood manufactures	Crude fertilisers & minerals
Exports	Meat & meat preparations	Sugar, sugar preparation & honey	Meat & meat preparations
	Essential oils, perfume materials	Meat & meat preparations	Medical & pharmaceutical product
	Dairy products & birds’ eggs	Metalliferous ores & metal scrap	Metalliferous ores & metal scrap
	Fish, crustaceans, molluscs	Medical & pharmaceutical products	Fish, crustaceans, molluscs

2.3.3 Normalised Trade Flows between Ireland & its Proximate States

Normalised Trades can be described as the trade flows that may be expected between a reference state and its proximate states on the basis of the GDPs of the proximate states and the total trade flows from



the reference state. The normalised trades can be used to estimate trade potentials and potential trade gaps. It is useful to determine normalised trades in terms of –

- a. The values of unitised cargo flows between a reference state (Ireland) and each of its proximate trading states (Belgium / Luxemburg, the Netherlands, France, Spain, Portugal and the United Kingdom);
- b. The associated numbers of unitised cargoes, both RoRo & LoLo.

The annualised values and numbers of unitised cargoes, computed on the basis of relative GDPs, as well as the multipliers that would be required to bridge the trade gaps, are as follows:

2007 - Value of Unitised trades (€) into & out of Ireland

Trading States	GDP (€M)	Actual Import Values (€k)	Actual Export Values (€k)	Normalised Import Values (€k)	Normalised Export Values (€k)	Import Multiplier to Bridge Trade Gap	Export Multiplier to Bridge Trade Gap
Belgium/Lux.	371,328	1,043,310	11,299,840	1,271,811	2,189,059	1.22	0.19
Netherlands	567,066	2,289,744	3,261,180	1,942,221	3,342,977	0.85	1.03
France	1,894,646	2,194,327	4,861,818	6,489,229	11,169,350	2.96	2.30
Spain	1,050,595	931,333	2,952,390	3,598,325	6,193,486	3.86	2.10
Portugal	163,179	135,921	370,859	558,894	961,976	4.11	2.59
UK	2,044,133	14,267,074	13,161,369	7,001,228	12,050,608	0.49	0.92

2007 – Number of Loaded TEUs (RoRo & LoLo) into & out of Ireland

Trading States	GDP (€M)	Imports Loaded TEUs	Exports Loaded TEUs	Normalised Imports Loaded TEUs	Normalised Exports Loaded TEUs	Imports Multiplier to Bridge Trade Gap	Exports Multiplier to Bridge Trade Gap
Belgium/Lux.	371,328	45,632	23,428	45,004	31,131	0.99	1.33
Netherlands	567,066	77,183	57,198	68,727	47,541	0.89	0.83
France	1,894,646	55,046	55,435	229,625	158,842	4.17	2.87
Spain	1,050,595	48,442	21,024	127,329	88,079	2.63	4.19
Portugal	163,179	21,060	4,985	19,777	13,680	0.94	2.74
UK	2,044,133	490,841	348,577	247,743	171,374	0.50	0.49



2.3.4 Points of Note in the Normalised Tables:

The Normalised Tables can be most easily interpreted from the columns 'Multipliers to Bridge Trade Gaps' i.e.

If a multiplier is 1 or nearly 1, then the Actual and Normalised values are nearly the same.

If a multiplier is considerable greater than 1, then the current Actual Value or number of TEUs has the potential of being greatly increased.

Similarly, if a multiplier is much less than 1, then the current Actual value or number of TEUs is much greater than normal, usually for identifiable reasons.

The following are some of the key points arising from an inspection of the tables:

1. For Belgium / Luxemburg and the Netherlands, the values and numbers of unitised cargoes are nearly normal, which coincides with the excellent transport services between Ireland and these states. There are direct LoLo services from Dublin, Waterford and Cork and approximately 350,000 trucks/ year connect Ireland via the British Land Bridge with mainly northern European destinations.
2. For France, unitised trades with Ireland, both in value and numbers could be increased by a factor of approximately three for them to approach normal.
3. Similarly for Spain, unitised trades with Ireland could be increased by a factor of approximately three.
4. Ireland's imports and exports with Britain are for the most part twice normal. The exception is the value of Ireland's exports with Britain, which are about normal. The reasons for this are the traditional close relationship between the east coast of Ireland and Britain, and a prevailing practice in Ireland of purchasing goods from other states via British traders, paying a surcharge in the process and contributing to the notoriously high price of goods in Ireland.
5. The Export Multiplier for the values of unitised exports from Ireland to Belgium / Luxemburg is as low as 0.19. This is because of high value chemical / pharmaceutical exports from Ireland to Belgium for further processing / distribution throughout Europe.
6. In relative terms, the number of units imported into Ireland from Portugal is unusually high. This is because of a strong trade in 'Mineral Manufactured Goods', such as, tiles, pottery, decorative stone.

2.3.5 Top-20 Imports & Exports between Ireland and France & Spain

The Top-20 unitised Imports & Exports between Ireland and its proximate states were obtained from macro-economic data relating to Ireland's trade and port data. The Top-20 tables account for approximately 90% of unitised imports and exports. They therefore provide an excellent insight into the cargoes that would need to be targeted by a direct service linking Ireland, France and Spain. Refer to Appendix 1, where the Top-20 tables of Imports and Exports between Ireland and France & Spain are shown.



2.3.6 General Findings relating to Trade Potentials

1. The historical and geographical contexts have considerable bearing on Ireland's disproportionate focus on Great Britain and Ireland's relative neglect of France and Spain for its unitised trades. This is borne out by a comparison of the actual and normalised unitised trade flows between Ireland and its proximate states, which are Britain, France, Belgium/ Luxemburg, the Netherlands, Spain and Portugal. This shows that unitised trades with the Benelux states are more-or-less normal and trades with Great Britain are twice normal, while unitised trades with France, Spain and Portugal are approximately one third of normal.
2. An examination of the Top-20 Irish unitised imports and exports with France and Spain for 2007 provides some interesting insights into these trades:
 - a. In each case the Top-20 unitised imports or exports account for approximately 90% of the total unitised trades, so they are quite representative.
 - b. When the Top-20's for 2007 are compared with those of 2004 and 2008, it is found that the cargo configurations are quite stable; that is, there are no significant swings in the SITC configurations of the cargoes being shipped.
 - c. In 2007, the numbers of units in the Top-20's imported to Ireland from France and exported to France from Ireland were nearly the same (49 kTEUs and 52 kTEUs respectively). This relatively close balance in the trades reduces the overall cost of maritime transport between the two states. In addition, in 2008, in the middle of a deep recession in Ireland, these figures did not alter much.
 - d. For Spain, the situation is considerably different: the number of units imported into Ireland from Spain in the Top-20s list was 46 kTEUs in 2007 and is increasing, which is quite a healthy situation.
 - e. In sharp contrast, the number of exported units from Ireland to Spain in the Top-20s list was 19 kTEUs in 2007 and has been decreasing since 2004. The low number of exports from Ireland, the imbalance in trade that it causes and its downwards trend in volumes, all combine to pose a significant problem.
 - f. An examination of the cargo types in the Top-20 imports and exports between Ireland and Spain is revealing. Only one of the imports into Ireland from Spain is food stuff – vegetables & fruit (SITC 5). Most of the others are durable goods of medium, low or very low value; only one could be deemed to be medium / high value, and it too is durable. It is evident that there are a lot of such cargoes available in Spain that can be shipped to Ireland.



- g. Exports from Ireland to Spain is the problem area and it highlights a fundamental problem that exists in relation to unitised trade between Ireland and Spain. Irish exports to Spain can be classified as follows:

Cargo Classification of Exports from Ireland to Spain	TEUs	No. of Top-20s in the Classification
High value or very high value goods	11,442	9
Food stuffs	6,180	5
Low value / very low value goods	3,422	4
Medium value, durable goods	1,156	2

The key to understanding the composition of this table is in the low number of medium value durable goods that are in the table; they account for only 4.6% of the total export volumes. For Ireland's exports to France there are 8 of the Top-20's in that classification, accounting for 21% of the total Top-20 unitised volumes.

Medium valued durable goods are underrepresented in the exports to Spain because of the poor choice of transport services that are available: LoLo services from Dublin that are an adjunct of services from Britain, and long-haul trucking via the British Land Bridge, which is very costly. The response for the goods in the different classifications is as follows:

- The high or very high value goods are trucked to Spain, because the cost is bearable.
- Food stuffs have no choice but to use long-haul trucking. Meats and dairy produce are subject to world prices, which are very low at present. Agriculture is like a juggernaut; it can only keep producing in the short-to-medium term regardless of the cost, but the volumes to Spain are falling because of the high cost of trucking. It should be noted that the potential for dairy produce & meats from Ireland is high because of its mild, moist climate which is comparable to that of New Zealand.
- Fish are caught in Irish waters by Spanish fishing boats and landed in Ireland. The trucking costs to Spain are considerably less than fishing boats having to return to Spain to land their fish. However, fishing is being curtailed to conserve fish stocks and it is expected that volumes will continue to fall.
- The low value, durable goods are transported by low cost shipping.

That leaves the medium valued durable goods without a suitable transport solution, and hence they are notably underrepresented. It also means that the volumes of food stuffs and high / very high valued goods are considerably less than might be expected.

This can be further illustrated by a direct comparison of Irish unitised exports in the Top-20 lists to France and to Spain.



Comparison of trends in Irish unitised exports to France and to Spain:

	2004	2007	2008
Top-20 unitised Irish Exports to France (TEUs)	48,530	52,152	50,601
Percentage change relative to 2004		7.5	4.3
Top-20 unitised Irish Exports to Spain (TEUs)	24,969	19,292	15,504
Percentage change relative to 2004		-22.7	-37.9

2.4 Summary of Chapter 2

Geography, history and relative GDPs – all have a bearing on the volume of unitised cargo flows between a state and its proximate states. It is helpful to use these factors to obtain an indication of what constitutes ‘normal’ cargo flows between trading states and, accordingly to identify endemic trade gaps. In this regard, it is apparent that unitised trades between Ireland and France & Spain have the potential of being increased by a factor of approximately three.

Unitised cargo volumes between Ireland and France are nearly balanced in the each direction, leading to competitive maritime services between the two states. In contrast, unitised volumes between Ireland and Spain are out of balance, with Irish exports to Spain on a downwards spiral. This development has arisen in the first instance from inadequate transport services for the full range of Irish exports to Spain. It has recently been exasperated by a severe recession following a self-inflicted property bubble in Ireland. It will be difficult to arrest this downwards trend, as it is not within the compass of a single transport operator to significantly influence the market. It will require a concerted effort on the part of the two affected states, Spain and Ireland, in addition to activating the financial supports that are made available by the European Commission, to establish efficient maritime links and to realise the potential three-fold increase in unitised trades between the two states.



3. Strategies to Achieve Sustainable Intermodal Services

3.1 Introduction

The European Coordination Action project 'PROPS' identified four pillars of sustainable intermodal services:

1. Market Knowledge,
2. Optimal Service Design,
3. Operational Efficiency,
4. Formulation of Strategic Network Alliances,

Chapter 3 deals briefly with Market Knowledge as an essential sub-element of Strategic Marketing. It then examines at some length Strategic Network Alliances, which are particularly important for distributed services along the Atlantic Arc. Chapter 4 is devoted to Optimal Service Design.

3.2 Strategic Marketing to Secure Unitised Cargoes for New Services

The elements of strategic marketing are presented as a number of sequential steps, whereas in practice much of the work on the various tasks can be carried out in parallel.

1. **Determination of the Top-20 unitised cargoes between each two trading states or regions.**

The Top-20s can be specified in TEUs, because LoLo, RoRo & trucked cargoes and services need to be examined as potential clients and competitors respectively. The estimated Top-20 unitised cargoes between Ireland and France & Spain are given, as an example, in Appendix 1.

2. **Segmentation of the Top-20 unitised cargoes** between each state / region into cargo types that have identifiable characteristics for a maritime service. The most immediate forms of segmentation, although not exclusively so, include:

- The ranking in the Top-20 list, with the highest ranking commodities naturally attracting the greatest attention.
- Food stuffs, which normally require fast, reliable deliveries (regardless of their value), as delivery times are critical, with a missed deadline resulting in a day's lost sales or even rejection of the cargo.
- High or very high value goods, which require reliable, secure, monitored deliveries, with price not necessarily being a determining consideration.
- Medium value, durable goods often purchased for stock, for which hassle-free deliveries and price are important considerations.
- Low value, durable goods for which delivery price is everything.



The above points are illustrated in the Top-20 lists in Appendix 1, in which Rank, description of goods (based on their SITC classification), estimated number of TEUs in each classification and the estimated value per TEU are given for both imports and exports between designated states.

3. **Identification of manufacturing companies** within the inner and outer hinterlands of designated exporting ports i.e. the names of the companies, their locations, nature of their businesses and an indication of their size – to facilitate their categorisation into market segments that are relevant to intermodal transport and to provide them with service offerings that meet their logistics requirements.
4. **Determination of pricing / discount strategy.** A pricing algorithm can be prepared based on the relevant Unit Price / Ship Utilisation graph and taking into account cargo volumes of clients, early or regular bookings, the degree of priority required and the availability of back-cargoes. This also determines the discounts to freight forwarders, to hauliers and to large & small shippers, as well as the priority premiums / discounts that may apply.
5. **Preparation of a full market offering** i.e. schedule, features of the service (such as reliability of services, D2D delivery times, support services that are provided), differential prices / discount rates for freight forwarders, hauliers and shippers / receivers.
6. **Field testing the market offering** to assess and modify if necessary the proposed offering; to estimate ship utilisations during the start-up phase, in the medium term and in the steady-state situation.
7. **Preparation and implementation of a full marketing plan**, based on the competitive advantages that the service would have for its target market segments.

3.3 Strategic Alliances to achieve sustainable Network Solutions in Intermodal Transport

Establishing a new intermodal service involves a large number of participants with varying degrees of responsibility, with corresponding rights and obligations. Historically, reliance on the importing/ exporting proficiency of a small number of clients was sufficient to ensure the viability of a particular service. In constrained financial times, however, an approach that distributes the risks & benefits between a wide range of participants in a network configuration is a more effective strategy.

There are many forms of strategic alliance that can contribute to a successful network. A strategic alliance is a formal relationship between a number of organisations to pursue agreed goals or to realise a specified business opportunity whilst the organisations retain their independence. A joint venture, in which firms create a legally independent company, is the most formal type of strategic alliance. In the more usual and



less formal type of alliance, the participating firms enter a contractual relationship to share some of their resources and capabilities in order to achieve competitive advantage in their shared business goals.

Strategic alliances amongst haulage companies and intermodal transport operations are discussed in the sections that follow.

3.3.1 Strategic Alliances amongst Haulage Companies

At least three different types of transport alliances or networks amongst **haulage companies** exist, namely –

Loosely Organised Networks, which are common amongst independent road transport operators, but are also widely used elsewhere in the transport industry. Some of their features are:

- Ad-hoc transport tasks and issues are dispersed through the network, which effectively adds capacity and capability to individual participants;
- There are little-or-no initial investments required of the participants;
- Because entry to the alliance is easy, a network can be beset with ‘easy-riders’ i.e. participants that avail of opportunity when it is presented to them, but contribute little themselves;
- There is little incentive to introduce innovative features in a Loosely Organised Network because of the lack of commitment amongst participants.

In brief, in a Loosely Organised Network there is no formal management, little risk and little associated profit.

Co-operative networks, which are similar to Loosely Organised Networks except that they are more formally structured and are supported by IT systems. Their features include:

- Work routines can be supported by the use of IT;
- For individual participants there is better capacity utilisation through the deployment of free capacity and through more efficient use of colleagues’ capacity;
- Participants must invest in the IT overhead & supports and in their own IT capabilities;
- As with loosely organised networks, membership saturation and a lack of trust can limit the number of affiliated members.

Formalised networks, in which the marketing, administration, logistics, pricing, billing and development are carried out by the principal participating company in the network. Such networks have many features:

- There is a high level of coordination in marketing, administration and capacity utilisation;
- There is a capability to achieve wide geographical coverage;
- Earnings can be greater than the average for cooperative networks as a whole, because of greater than average administrative & coordination efficiencies;
- Establishment and operating costs can be high;



- Membership saturation can limit expansion of the network.

Many SME hauliers are part of the networks of larger transport operators. The advantage to them is that they can concentrate on their core competencies while achieving regular employment as well as significant discounts on fuel and vehicle purchases.

The key advantage to the principal transport operator is that it secures the commitment of independently functioning hauliers without being liable for their operating and capital costs.

3.3.2 Strategic Alliances in Intermodal Transport

Strategic Alliances in short sea shipping (SSS) are generally associated with intermodal transport. In this regard intermodal transport can be deemed to involve the transportation of freight in a container or vehicle, using multiple modes of transport such as truck, ship and rail, without any handling of the freight itself when changing modes. There are four forms of intermodal transport that can be considered:

Ferry Operations and Road Haulage: Ferry operations generally minimise the shipping distances, so that the principal emphasis is on trucking, with ship sailings scheduled to accommodate the trucking demand for sea crossings. The ferry operations are generally independent of the road haulage and aim to minimise disruption to its functioning.

Integrated Intermodal Operations with ships operating over medium to long distances and with central management having control over the shipping, trucking functions and terminal operations through ownership, leasing or contracting. They can achieve a high level of efficiency; they make best use of waterborne transport, whether using RoRo or LoLo, and achieve efficient coordination of an intermodal service. The principal issue associated with integrated control over ships, terminals and trucks is the operational and financial risk to which the controlling organisation is exposed from loan funding and contingent liabilities associated with a fully integrated operation. The risks can be borne in a growth market, but in a recessionary market the financial burden can be crippling.

Independently Functioning Intermodal Operations: independent functioning of ships, terminals and trucks distributes the risks amongst the different functionaries, hence facilitating relatively easy entry & exit of ship and truck operators into the network. The system is open to new entrants, it is flexible and price sensitive. It is particularly suited to interregional services, connecting the large network of common-user terminals in Europe's regions with each other and with hub ports. Associated with this flexibility there are, however, many difficulties:

- The different operational elements in an intermodal network can move out of synchronisation very easily, thus incurring costs that have to be absorbed by clients;
- The system requires a considerable amount of buffer capacity for it to function,
- Under-performance or modifications to a schedule for short-term advantage can have serious repercussions elsewhere in a network,



- Marketing of an intermodal service is difficult, if not impossible except through the good offices of freight forwarders and logistics service providers.

Intermodal Network Solution: An effective Network Solution is similar, in many respects, to a Formalised Network in road haulage, in that the principal participant in the network, normally the ship operator, carries out the central marketing, administration, logistics, pricing, billing and development of the network. It avoids the significant risks associated with an Integrated Intermodal Operation and the lack of coherence & reliability of an Independently Functioning service. At the same time it retains the positive features of both i.e.

- achievement of a high level of efficiency through coordinated management of the intermodal services;
- distribution of risk amongst participating operators;
- a system that is open to new operational entrants;
- a system that is particularly applicable to the large range of intermodal services that are prevalent in Europe.

3.3.3 Specifications for a Sustainable Intermodal Network

The following are the specifications for an intermodal network, as given in the European project PROPS¹:

- a. The operational characteristics of the strategic alliance that is proposed should be clearly defined.
- b. A written agreement between participants is necessary. The content of the agreement should accommodate the requirements of the participants and be legally robust.
- c. There should be agreed objectives, such as:
 - o Provide improved services for clients,
 - o Achieve an agreed market share of specified hinterland markets, with the realisation of associated benefits to the participants,
 - o Improve the competitiveness of a networked service,
 - o Extend the geographical range of a service into new markets.
- d. The alliance should be structured so that it is durable with a long time horizon.
- e. Any joint investments or shared costs should be clearly stated and agreed in advance.
- f. Shared risks should be estimated and agreed in advance.
- g. The expected benefits of the alliance to the individual participants should be quantified and compared to those of the status quo.

The special characteristics of a network design may be examined under the three broad headings of **Legal, Commercial** and **Operational** requirements to achieve a successful implementation. In addition, the reciprocal rights, obligations and expected benefits of each participant should be clearly specified to ensure maximum benefit to participants.

¹ PROPS Deliverable 1.2: 'Business Networking and Short Sea Shipping' January '09



3.3.4 Legal characteristics of a Network solution

Exercise of due diligence and considerations of legal constraints are necessary for investigation of each permutation of the network strategy. The legal structures that affect the operation of the network comprise contractual obligations, regulatory issues, and insurance-related requirements. These closely affect the commercial and operational functioning of the network.

- The formulation of contractual relationships between partners in the network is the foundation for the efficient operation of the system. These agreements, established between the participant shareholders, are crucial to the efficient operation of the entire transport chain and ensure a reliable and stable co-dependent situation.
- Compliance with regulations in respect of customs, veterinary issues, security, immigration, environmental and safety concerns affect the participants in the network. Potential infringements of European competition law and State Aid principles may also need to be addressed.
- Insurance clauses must be comprehensive to encapsulate the rights and corresponding obligations of each participant in the network.

3.3.5 Commercial Characteristics of a Network solution

The commercial characteristics include the Marketing and Transactional functions of the network. Both can be considered from the perspectives of the ship operators, hauliers, terminals, ports and, in particular, from the perspective of the network management.

Marketing functions of a Networked Intermodal Service:

A great strength of a network solution is the centralised management of common marketing functions, combined with localised marketing by network participants. All but the last of the following bullet-points relate to central marketing functions.

- Quantifying the potential unitised cargoes in the hinterlands and forelands of the trading states of the proposed intermodal service;
- Segmentation of the unitised cargoes into accessible and meaningful categories;
- Targeting the unitised cargo segments for which the proposed service would have a distinct advantage over competitive services;
- Preparation of a comprehensive pricing algorithm and strategy that will take into account clients' cargo volumes, early or regular bookings, degree of priority required, availability of back-haul cargoes – for both accompanied and unaccompanied RoRo cargoes;
- Preparation of a market offering, including schedules, features of the service, differential prices / discount rates and service times for D2D deliveries – for freight forwarders, hauliers and shippers / receivers.
- Preparation and implementation of a marketing / promotional plan that will include active participation of members of the intermodal network in their own regions i.e. hauliers, freight forwarders, terminals and ports.



Transactional function of a Networked Intermodal Service:

The transactional function represents the cutting edge of the marketing programme and is supported by a comprehensive IT system. It is underpinned by the pricing algorithm, enabling prices and bookings to be issued by network participants in any location for any D2D delivery within the network. It facilitates billing and client payments to be managed centrally, as well as payments to network participants.

3.3.6 Operational Characteristics of a Network Solution

The special characteristics of a Network Solution include the management of the network, its IT systems and operational innovations.

Management functions of a Networked Intermodal Service

- Implementation of policies and strategies that are agreed by network participants;
- Setting performance standards and quality assurance guidelines, in consultation with network participants;
- Tracking of unitised cargoes throughout the network, with automatic reporting and information access to clients;
- Achieving optimal utilisation of trailers and containers so as to minimise their out-of-use costs;
- Gathering and managing data to ensure regulatory compliance, adherence to performance and quality standards and to augment market knowledge;
- Assessing and availing of support funding, including TEN-T, Marco Polo and Eco Bonus funding;
- Facilitating entry of acceptable new entrants to the network and exiting of those that choose to leave.

IT functions of a Networked Intermodal Service

- Supporting communications throughout the network, ensuring that required real-time and historic information and data are streamed between -
 - The network and Administrations,
 - The network and clients,
 - The network participants and management,
- Supporting the network pricing, bookings, billings and payments model so that all participants in the network are engaged with these functions;
- Supporting the tracking of cargoes throughout the network, with automatic reporting and access to information for clients;
- Supporting optimal utilisation of transport resources throughout the network;
- Supporting the collection and management of data for regulatory compliance, for adherence to performance and quality standards and to augment market knowledge;



Innovative functions of a Networked Intermodal Service

A networked intermodal service is an innovation in itself; it also provides opportunity for devising and implementing further innovations, such as:

- Selectively linking two or more networked services together in order to extend the range and scope of services that may be provided;
- Providing maritime safety training and certification for drivers to change their status on board ship from passengers to supernumeraries, reducing the passenger classification of RoRo ships that are required and, hence, the operating costs.
- Deploying the 'pony-express' concept, whereby trucking ranges can be increased within the limits set by the constraints of the Working Times Directive.

3.4 Summary of Chapter 3

It is self-evident that three of the four pillars of sustainable intermodal services – Market Knowledge, Service Design and Operational Efficiency – are necessary features of successful intermodal services. The fourth, Strategic Network Alliances, is little understood and its importance is generally underestimated. For this reason, most of Chapter 3 is assigned to this topic, after first providing an overview on Strategic Marketing.

Strategic Network Alliances are an everyday feature amongst haulage companies. Three types of haulage networks are identified: Loosely Organised Networks, Cooperative Networks and Formalised Networks in which the marketing, administration, logistics, pricing, billing and development are carried out by the principal participating company in the network.

Intermodal Transport Services are understandably more complicated than haulage operations. The three standard types are:

- Ferry Operations & Road Haulage, which minimise shipping distances and have a principal focus on trucking;
- Integrated Intermodal Operations, with central management having control over shipping, trucking and terminals through ownership, leasing or contracting;
- Independently Functioning Intermodal Operations, that is, independent functioning of ships, terminals and trucks, with risks distributed amongst the functionaries.

An Intermodal Network is a fourth option. It is not simple. It requires a high level of managerial skill to operate. It is technologically sophisticated and intrinsically innovative. Its advantages are:

- It avoids the unsustainable risks of Integrated Intermodal Operations,
- It avoids the lack of reliability that is a characteristic of Independently Functioning Operations,
- High levels of efficiency can be achieved through coordinated management of the independent operational functions;
- Risks are distributed amongst participating operators;
- The system is open to new operational entrants;
- It is a system that is particularly applicable to the large range of intermodal operations that service Europe's regional ports.



4. Analysis of Possible Services along the Atlantic Arc

The purpose of this section is to investigate how services may be established or strengthened along the Atlantic Arc. The services / linkages that are considered as examples are:

- 4.1 Cork – Brest – Gijon and return by the same route.
- 4.2 Rosslare to / from Cherbourg.
- 4.3 Tangier – Algeciras – Vigo – Cherbourg & return by the same route.

4.1 A RoRo service linking Cork – Brest – Gijon (Return)

This service is proposed as a possibility for bridging the maritime service gaps that exist between Ireland and Spain and, to a lesser extent, between Ireland and France. The challenge is to design a service that links Ireland, France and Spain and that is competitive with long-haul road transport for the targeted markets.

A map of the proposed service is given on the following page.

Details of the service are given in Appendix 2, Section 1. A summary of the service outputs is as follows:

	Cork		Brest		Gijon	
	Q2Q Price (€)	Q2Q Times (hrs)	Q2Q Price (€)	Q2Q Times (hrs)	Q2Q Price (€)	Q2Q Times (hrs)
Cork			€965	19.8	€1,682	41.3
Brest	€965	19.8			€1,028	21.6
Gijon	€1,682	41.3	€1,028	21.6		

Two round trips per week can be achieved, with an average ship speed of 20.5 knots.

The Schedule for the service, with four ports of call per round trip, can be designed around berth availabilities and the need to meet the requirements of the principal clients for whom specific arrival days and times are important. Repetition of the schedule can be achieved on a weekly basis, but does require some variation in ship's speed between ports, as well as an elective delay at one of the ports. The most notable features of the service are competitive prices vis-à-vis long-haul road transport and relatively short, reliable delivery times, both of which are achieved with an average ship utilisation of 40% (ship capacity is 155 trailers). The following are sample details of this average ship utilisation:

Stage of Voyage	Trailers / yr @ 40% av. Ship Utilisation	Approx. % of total trailers pre yr. between the trading states
Southbound: Ireland – France	4,429	3.3%
Southbound: Ireland – Spain	1,771	4.1%
Southbound: France – Spain	4,429	0.2%
Northbound: Spain – France	3,100	0.1%
Northbound: Spain – Ireland	3,100	3.2%
Northbound: France – Ireland	3,100	2.5%

RoRo Service linking Cork, Brest and Gijon



Calling to ports in three states alleviates much of the uncertainty with regard to ship utilisations, especially on the southbound leg. Nevertheless, a strong marketing effort would be required to achieve break-even ship utilisation, which is approximately 30%. This incorporates a 20% discount on long-haul road transport. On that basis, the service would be economical if 40% average utilisation were achieved, as the major portion of the revenues associated with utilisations greater than 30% would contribute to gross profit.

A prerequisite for a successful service would be an efficient network management structure that would –

- Implement an effective marketing programme in the three participating states,
- Reassure shippers with dependably reliable services,
- Achieve sustainable low prices for shippers, consistent with stable profit margins for network participants,
- Effectively extend the range and scope of the network through stable linkages with complementary services and networks,
- Provide all support services that are normally associated with large integrated transport operations.



4.2 A RoRo service linking Rosslare – Cherbourg (Return)

Details of this service are given in Appendix 2, Section 2. A map of the proposed service is given on the following page.

The following is a summary of the service outputs:

	Rosslare		Cherbourg	
	Q2Q Price (€)	Q2Q Times (hrs)	Q2Q Price (€)	Q2Q Times (hrs)
Rosslare			1,050	23.94
Cherbourg	1,050	23.94		

Three round trips per week can be comfortably achieved at an average ship's speed of 18.4 knots. This includes a reserve voyage time of 8%, which allows for bad weather or any port delays. A fixed schedule can be organised around berth availabilities and the needs of clients, with some variation for summer and winter sailings.

The Q2Q prices are based on an average ship utilisation of 40%, which is conservative. The prices are comparable to the cost of getting a ferry between Ireland and Britain, trucking across Britain to Portsmouth and getting a ferry to Cherbourg. The shipping service has the distinct advantage of Truck Drivers arriving in Cherbourg refreshed, with a clear tachograph; whereas driving across Britain would require a full break before delivering a trailer.

Cargo availabilities are reasonably good, with more-or-less balanced unitised trades between France and Ireland. There are three services connecting Rosslare with NW France, so that Rosslare is becoming an important focus in Ireland for France. The range of services and the competition between them is likely to stimulate trade between the two states and help bridge the trade gap that currently exists.

RoRo Service linking Rosslare and Cherbourg.

Unaccompanied RoRo linking Tangier, Algeciras, Vigo and Cherbourg



4.3 A RoRo service linking Tangier – Algeciras – Vigo – Cherbourg (Return)

Details of this service are given in Appendix 2, Section 3. The following is a summary of the service outputs:

	Tangier		Algeciras		Vigo		Cherbourg	
	Q2Q* Price (€)	Q2Q Time (hrs)	Q2Q Price (€)	Q2Q Time (hrs)	Q2Q Price (€)	Q2Q Time (hrs)	Q2Q Price (€)	Q2Q Time (hrs)
Tangier			473	7.2	1,160	41.6	2,206	80.5
Algericas	473	7.2			999	34.3	2,045	73.3
Vigo	1,160	41.6	999	34.3			1,358	39
Cherbourg	2,206	80.5	2,045	73.3	1,358	39		

*Q2Q – Quay-to-Quay



The average ship's speed for the Tangier – Algeciras – Vigo – Cherbourg service would be about 19.5 knots. The schedule depends on client requirements and berth availabilities. A repeatable weekly round-trip service can be achieved using variable speeds between ports, together with delays at selected ports. The delays and variable speeds would be necessary to keep to the schedule and to offset late evening / early morning arrivals at some ports.

The logic of the service is strong. It commences with a connection from Tangier in Morocco, which has a dynamic, growing economy. The second port-of-call is Algeciras, Spain's largest port and a distribution centre for the east coast of Spain to Valencia and Barcelona and, subsequently, to Southern France. The proposed service would provide a much-needed connection up the west coast of Portugal to Vigo, the third port-of-call, which services Northern Portugal and North West Spain, with a combined population of about eight million people. From Vigo, the connection is to Cherbourg, the fourth port-of-call, which acts as a distribution point for France, Belgium, the Netherlands and Germany by land or by sea. Cherbourg has excellent maritime connections to Ireland via Rosslare, as well as a well-used connection to the British market via Portsmouth. All-in-all, the service would provide an ambitious maritime network along the Atlantic Arc, connecting North Africa, Southern Europe, Western Europe and North-western Europe in one integrated service

The key to the service's success is in establishing an intermodal network within the Tangier – Cherbourg service and forming strong bonds with associated networks, such as services between Cherbourg & Ireland and Cherbourg & Britain. The features of the network are:

- Cooperative preparation of the market offering, including schedules, D2D differential prices / discount rates and delivery times;
- Incorporating the data into a pricing algorithm and a dynamic electronic schedule that will underpin the electronic bookings, billings and payments and that will be implemented throughout the network;
- Cooperative preparation of a marketing / promotional plan that will empower local network participants and that will provide them with central support in a distributed marketing programme;
- Implementing an interoperable IT system that will:
 - support communications throughout the Tangier – Cherbourg network and with collaborating networks;
 - support the network's pricing, billing and payment model;
 - support management of the network, including tracking & reporting on cargoes, achieving optimal utilisation of transport resources, the collection & management of data for quality control, for the accumulation of market knowledge and for regulatory requirements.



4.4 Summary of Chapter 4

The Atlantic Arc extends in a N/S direction from Northern Scotland to Morocco ($60^{\circ}\text{N} - 35^{\circ}\text{N}$) and in an E/W direction from the Netherlands to Ireland ($5^{\circ}\text{E} - 10^{\circ}\text{W}$). It includes eight states and the proposed intermodal services are, for the most part, interregional. In general, the sailing distances are relatively long and the three services that are examined compare well in unit cost / unit price with long-haul trucking and are only marginally worse in delivery times because of working time restrictions on truck drivers.

The principal risks that the services face are:

- a. Under-utilisation of the ship resources,
- b. Reduced reliability of services due to calling to three or more states,
- c. Weathering start-up difficulties, due to a reluctance on the part of shippers to use services before they are well established.

Using an Intermodal Network configuration will alleviate these risks, but will not remove them altogether.

The combination of central and local marketing by the network management and network participants respectively should improve ship utilisations above what might be expected with only central management of a service.

Similarly, reliability of services along the network can be expected to be good-to-excellent with central controls and local commitment, and with rewards to each and all dependent on consistent reliability of networked services.

Weathering start-up difficulties is a difficulty that all new services face. An imaginative marketing programme would help, but ultimately funding supports, such as those described in Chapter 5, may be necessary to offset the financial risks of a slow take-up of a new service.



5. Funding Supports for Motorways of the Sea Projects

Motorways of the Sea (MoS) projects are one of the main European transport policy initiatives. They are designed to move long-distance transport off roads and onto seaborne transport in an effort to fight growing congestion and greenhouse gas emissions in Europe.

The EU provides financial support to maritime service providers for the start-up of MoS projects and for

- (a) investment in the infrastructure needed through the TEN-T and
- (b) Maritime services through Marco Polo.

EU funding provides leverage for projects that might not otherwise proceed on the basis of private sector investment.

The following table provides an overview of the EU funding and State Aid guidelines affecting MoS actions. This is an adapted extract from the first annual report (September 2008) of the European Coordinator for Motorways of the Sea, Luis Valente de Oliveira.

	Marco Polo II 2007-2013	TEN-T Maritime funding 2007-2013
Fundable	Maritime services	Investment in infrastructure
Aid intensity	35%	10% ²
Aid duration	5 years	6 years
Commission Budget	450 m€ ³	310 m€ ⁴

5.1 Marco Polo

This is the European Union's funding programme for projects that shift freight transport from road to sea, rail or waterways. Marco Polo's aim is to encourage public and private investment in maritime services and key technologies in the energy and transport sectors in the interests of a true internal market and greater competitiveness.

² Priority projects in the field of transport allow a maximum of 20 % of the eligible cost, or a maximum of 30 % of the eligible cost for cross-border sections, provided that the Member States concerned have given the Commission all necessary guarantees regarding the financial viability of the project and the timetable for carrying it out. For transport projects other than priority projects: a maximum of 10 % of the eligible cost is allowable

³ The Marco Polo II budget is spread out over yearly calls.

⁴ The funding for TEN-T projects under MoS is spread out over yearly calls for proposals. The budget is divided in the following manner: 2007 – 20 m€, 2008 – 30 m€, 2009 – 85 m€, 2010 – 100 m, 2011 – 50 m€, 2012 – 25 m€



The Marco Polo II programme runs from 2007-13 and has a budget of €450 million. Marco Polo funding can provide grant aid for start-up costs associated with operation of services, normally to a maximum of 35%, during the initial years of a new service.

Funding is available for the following actions in furtherance of the Marco Polo policy objectives:

1. Modal Shift
2. Catalyst actions
3. Motorways of the Sea actions
4. Traffic avoidance
5. Common learning actions

For a project to be eligible, the promoting companies must come from at least two EU member states, the project must quantify the total amount of tonne-kilometres of cargo that will be transferred from road, and the proposed project must not distort competition. The European Commission's Calls-for-Tenders are made on an annual basis.

5.2 Trans European Network TEN-T

The Trans-European Transport Network (TEN-T) programme is established under the EC Treaty in Articles 154-156. This programme dedicates financial support towards the realisation of important transport infrastructure projects – promoting the wider European objective of competitiveness and job creation together with social and economic cohesion.

Community financial aid takes the form of grants for works, studies or studies with physical interventions. Grants are allocated to works and also to studies, including feasibility studies, comprehensive technical and environmental studies and costly geological explorations, thus helping to overcome early stage project difficulties.

The maximum amount of Community aid available as defined in the TEN-T Regulation is as follows:

1. Studies: 50 % of the eligible cost, irrespective of the project of common interest concerned;
2. Works:

Priority projects in the field of transport allow

- a maximum of 20 % of the eligible cost, or
- a maximum of 30 % of the eligible cost for cross-border sections, provided that the Member States concerned have given the Commission all necessary guarantees regarding the financial viability of the project and the timetable for carrying it out.

5.3 Ecobonus

Ecobonus is an initiative which provides economic reimbursement for hauliers that use sea transport as part of their journey. This is an initiative from the Italian Government which has backing from the



Commission as an acceptable form of State Aid. According to the European Coordinator for Motorways of the Sea, Luis Valente de Oliveira, this system has significant merits and should be considered as a best practice example that could be integrated by other Member States.

Every maritime connection, identified along Italian costs, except for Sardinia, can avail of the Ecobonus scheme. For connections already in operation, the subsidy for hauliers may be up to 20% of the cost of the connection. For the creation of new connections, the contribution may be up to 30% of the relevant costs. The contribution value is calculated on the difference between the external costs generated by road transport and those of maritime transport on each identified connection.

To ensure efficient operation of the system, rigorous conditions are imposed on enterprises seeking to obtain the benefit of the Ecobonus. In particular, a minimum number of 80 trips per year on the same connection must be guaranteed. Where conditions are not met by the beneficiaries of the system, payment of bonuses may be curtailed or reclaimed by the government.

5.4 Summary of Chapter 5

The establishment of a new service requires an immense investment with a corresponding level of risk. In light of the challenges posed and in furtherance of the Commission's stated policy objective of creating adequate maritime and intermodal infrastructure to avoid congestion and emissions, support funding is available.

Financial support is provided for the start-up of MoS projects and for investment in infrastructure and maritime services under TEN-T and Marco Polo respectively. Applications for financial aid must be submitted to the Commission through the intermediary of the Member State concerned or by the applicant organisation with the agreement of the Member State.

Ecobonus is an innovative example of a rebate system that does not seek to pit hauliers against shipping service providers. Instead, hauliers are rewarded for utilising sea transport for part of their journey rather than imposing penalties on them for using roads. This initiative may be further utilised if it were implemented across Europe under the Commission's influence.



Appendix 1: Top-20 Imports & Exports between Ireland and France & Spain

Top-20 Imports into Ireland from France (2007)						
Rank	SITC Code	SITC Description	IMPORTS			
			Est TEUs	% of Total TEUs	Value €000	Value/ TEU (€)
1	4	Cereals & cereal preparations	5,542	10.07	14,134	2,551
2	67	Iron & steel	5,398	9.81	45,751	8,476
3	5	Vegetables & fruit	5,374	9.76	61,033	11,357
4	57	Plastics in primary forms	4,416	8.02	54,933	12,440
5	6	Sugar, sugar preparation & honey	4,207	7.64	32,845	7,807
6	78	Road vehicles	3,745	6.80	323,694	86,423
7	11	Beverages	3,532	6.42	113,235	32,060
8	56	Fertilisers	3,313	6.02	7,205	2,175
9	64	Paper, paperboard	2,454	4.46	32,606	13,285
10	66	Non-metallic mineral manufactures	1,768	3.21	18,673	10,563
11	69	Manufactures of metals	1,311	2.38	31,295	23,864
12	55	Essential oils, perfume materials	1,050	1.91	77,732	74,019
13	1	Meat & meat preparations	1,021	1.86	27,533	26,956
14	74	General industrial machinery	973	1.77	79,572	81,816
15	33	Petroleum, petroleum products	899	1.63	2,653	2,952
16	68	Non-ferrous metals	884	1.61	44,034	49,814
17	2	Dairy products & birds' eggs	808	1.47	13,982	17,311
18	72	Machinery, specialised	792	1.44	52,634	66,454
19	59	Chemical materials & products	771	1.40	29,266	37,935
20	53	Dyeing, tanning & colouring	748	1.36	13,421	17,950
		Totals	49,006	89	1,076,230	



Top-20 Exports from Ireland to France (2007)

Rank	SITC Code	SITC Description	EXPORTS			
			Est TEUs	% of Total TEUs	Value €000	Value/ TEU (€)
1	1	Meat & meat preparations	12,663	22.84	328,619	25,951
2	55	Essential oils, perfume; toilet & cleansing	11,134	20.08	394,570	35,439
3	2	Dairy products & birds' eggs	4,239	7.65	90,777	21,416
4	3	Fish, crustaceans, molluscs, preparations	3,559	6.42	88,784	24,949
5	63	Cork & wood manufactures, not furniture	3,361	6.06	17,657	5,254
6	89	Miscellaneous manufactured articles	3,226	5.82	301,065	93,321
7	75	Office & data processing machines	1,979	3.57	1,409,717	712,174
8	25	Pulp & waste paper	1,765	3.18	1,153	653
9	59	Chemical materials & products	1,364	2.46	256,548	188,030
10	74	General industrial machinery & equipment	1,321	2.38	174,746	132,302
11	54	Medical & pharmaceutical products	1,247	2.25	665,601	533,698
12	11	Beverages	986	1.78	40,869	41,445
13	28	Metalliferous ores & metal scrap	953	1.72	1,347	1,414
14	72	Machinery, specialised	895	1.61	33,227	37,140
15	21	Hides, skins & furskins, raw	853	1.54	8,120	9,524
16	57	Plastics in primary forms	581	1.05	14,543	25,048
17	58	Plastics in non-primary forms	560	1.01	48,086	85,877
18	32	Coal, coke & briquettes	523	0.94	267	510
19	71	Power generating machinery	519	0.94	23,405	45,098
20	6	Sugar, sugar preparation & honey	426	0.77	16,114	37,846
Totals			52,152	94%	3,915,215	



Top-20 Imports into Ireland from Spain (2007)

Rank	SITC Code	SITC Description	IMPORTS			
			Est TEUs	% of Total TEUs	Value €000	Value/ TEU €
1	66	Non-metallic mineral manufactures	15,559	32.12	68,252	4,387
2	5	Vegetables & fruit	7,453	15.38	74,586	10,008
3	78	Road vehicles	4,748	9.80	313,484	66,018
4	27	Crude fertilisers & minerals	3,135	6.47	2,335	745
5	63	Cork & wood manufactures (not furniture)	2,868	5.92	16,742	5,837
6	56	Fertilisers	2,808	5.80	5,319	1,894
7	6	Sugar, sugar preparation & honey	1,750	3.61	8,336	4,763
8	67	Iron & steel	1,643	3.39	19,027	11,578
9	64	Paper, paperboard & articles thereof	1,204	2.48	14,892	12,373
10	69	Manufactures of metals	762	1.57	18,947	24,878
11	79	Other transport equipment	629	1.30	15,981	25,405
12	57	Plastics in primary forms	529	1.09	8,562	16,200
13	62	Rubber manufactures	524	1.08	14,181	27,061
14	89	Miscellaneous manufactured articles	489	1.01	21,546	44,039
15	74	General industrial machinery & equipment	481	0.99	25,789	53,669
16	8	Feeding stuff for animals	479	0.99	686	1,432
17	77	Electrical machinery, apparatus & appliances	395	0.82	24,573	62,222
18	9	Miscellaneous edible products & preparations	381	0.79	4,358	11,429
19	55	Essential oils, perfume materials; toilet preps	273	0.56	19,649	72,062
20	42	Fixed vegetable fats & oils	262	0.54	7,682	29,324
		Totals	46,371	96	684,927	



Top-20 Exports from Ireland to Spain (2007)

Rank	SITC Code	SITC Description	EXPORTS			
			Est TEUs	% of Total TEUs	Value €000	Value/ TEU €
1	1	Meat & meat preparations	2,192	10.43	82,636	37,698
2	54	Medical & pharmaceutical products	1,904	9.06	558,942	293,610
3	28	Metalliferous ores & metal scrap	1,765	8.39	4,969.95	2,817
4	3	Fish, crustaceans, molluscs	1,693	8.05	63,676	37,620
5	0	Live animals	1,402	6.67	25,868.7	18,457
6	59	Chemical materials & products	1,320	6.28	275,304	208,575
7	55	Essential oils, perfumes, toilet & cleansing	1,229	5.85	494,745	402,604
8	64	Paper, paperboard	1,159	5.52	1,417	1,222
9	2	Dairy products & birds' eggs	1,120	5.33	26,864	23,986
10	11	Beverages	867	4.12	54,867	63,277
11	69	Manufactures of metals	820	3.90	41,262	50,312
12	27	Crude fertilisers & minerals	748	3.56	14,545	19,433
13	75	Office & data processing machines	623	2.96	456,859	733,824
14	74	Industrial machinery & equipment	524	2.49	58,160	110,995
15	89	Miscellaneous manufactured articles	490	2.33	130,744	266,597
16	26	Textile fibres & their wastes	408	1.94	3,697	9,070
17	9	Miscellaneous edible products	308	1.46	39,440	128,196
18	66	Non-metallic mineral manufactures	291	1.38	2,618	9,005
19	57	Plastics in primary forms	224	1.07	6,361	28,369
20	63	Cork & wood manufactures (not furniture)	207	0.98	1,223	5,914
		Totals	19,292	92	2,344,199	



Appendix 2: Sample Services along the Atlantic Arc

Section 1: Cork - Brest – Gijon (Return)

Inputs	
Ship	
Ship Name	MoS RoRo
Ship Average Service Speed (knots)	20.5
Reserve Steaming Allowance (%)	8%
Ship Capacity (Trailers)	155
Average Ship Utilisation (%)	40
Fuel Consumption at sea (tonnes /day)	72
Fuel Consumption in Port (tonnes /day)	0.5
Daily Charter Rate	€20,000
Cargo	
Port charge per Trailer	€130
Round Trips per week	2
Fuel	
Fuel used at Sea	LS 180
Fuel Used in Port	MDO
Price of Fuel (LS180) €/tonne	€306
Price of Fuel (MDO) €/tonne	€383

Q2Q Price per Trailer			
	Cork	Brest	Gijon
Cork		€965	€1,682
Brest	€965		€1,028
Gijon	€1,682	€1,028	

Q2Q Times (hrs)			
	Cork	Brest	Gijon
Cork		19.77	41.34
Brest	19.77		21.57
Gijon	41.34	21.57	



Section 2: Rosslare – Cherbourg (Return)

Inputs	
Ship	
Ship Name	MoS RoRo
Ship Average Service Speed (knots)	18.4
Reserve Steaming Allowance (%)	8%
Ship Capacity (Trailers)	155
Average Ship Utilisation %	40
Fuel Consumption at sea (tonnes/day)	52
Fuel Consumption in Port (tonnes/day)	0.50
Daily Charter Rate	€20,000
Cargo	
Port charge per Trailer	€130
Round trips per week	3
Factor used to convert TEUs to trailers	0.44
Fuel	
Fuel used at Sea	LS 180
Fuel Used in Port	MDO
Price of Fuel (LS180) €/Tonne	€306
Price of Fuel (MDO) €/Tonne	€383

Q2Q Price per Trailer		
	Rosslare	Cherbourg
Rosslare		€1,050
Cherbourg	€1,050	

Times (hrs)		
	Rosslare	Cherbourg
Rosslare		23.94
Cherbourg	23.94	



Section 3: Tangier – Algeciras – Vigo – Cherbourg (Return)

Inputs	
Ship	
Ship Name	Tor Corona
Ship Average Service Speed (knots)	19.5
Reserve Steaming Allowance (%)	8%
Ship Capacity (Trailers)	230
Average Ship Utilisation (%)	40
Fuel Consumption at sea (tonnes/day)	75
Fuel Consumption in Port (tonnes/day)	0.5
Daily Charter Rate (€/ day)	€22,000
Cargo	
Port charge per Trailer	€130
Round trips per week	1
Factor used to convert TEUs to trailers	0.44
Fuel	
Fuel used at Sea	LS 180
Fuel Used in Port	MDO
Price of Fuel (LS180) (€/Tonne)	€306
Price of Fuel (MDO) (€/Tonne)	€383

Q2Q Price per Trailer				
	Tangier	Algeciras	Vigo	Cherbourg
Tangier		€473	€1,160	€2,206
Algeciras	€473		€999	€2,045
Vigo	€1,160	€999		€1,358
Cherbourg	€2,206	€2,045	€1,358	

Q2Q Voyage Times (hrs)				
	Tangier	Algeciras	Vigo	Cherbourg
Tangier		7.24	41.56	80.53
Algeciras	7.24		34.32	73.30
Vigo	41.56	34.32		38.97
Cherbourg	80.53	73.30	38.97	