RECORDIT and capacity utilization

- REAL COST REDUCTION OF DOOR-TO-DOOR INTERMODAL TRANSPORT

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Background

The recent White Paper of the EC on the revision of the Common Transport Policy [1] devotes a special attention to intermodal freight transport services. In its section: "*Linking up the modes of transport"*, the White Paper advocates a number of technical, economic and organisational innovations that directly aim at increasing the attractiveness of intermodal solutions. On the other hand, and no less importantly, many other measures and actions proposed by the White Paper, although they do not target intermodal freight transport as such, are immediately relevant to the general objective of promoting intermodality. Specifically: the revitalisation of European railways (through radical increases in efficiency and the eventual establishment of a dedicated freight network), the introduction of an adequate system of transport infrastructure charging, the generalised improvement of the quality of transport services, are all fundamental prerequisites to achieve a higher degree of competitiveness in the intermodal freight sector.

Objectives

The **ultimate objective** of RECORDIT is to improve the competitiveness of intermodal transport in Europe - notably through the reduction of cost and price barriers that currently appear to hinder its development - while respecting the principle of sustainable mobility. It is in fact generally agreed that promoting intermodal transport solutions will generate direct benefits in terms of:

- ⇨ a reduction of the negative environmental impacts, as well as of health and accident risks associated to the transport activity

- ⇨ an increase in the quality of life (less congestion, reduced barriers to the use of space) and, in general, better working conditions and safety of those involved in the transport of goods.

The main challenge is to identify ways and means to achieve such goals through a market transformation process based on the actual increase of intermodal attractiveness, i.e. primarily through: i) the reduction of the real costs associated with intermodal transport services, and ii) the internalisation of externalities that are currently not reflected in market prices.

[1] European Commission, 2001

RECORDIT therefore concentrates on the issue of real cost calculation, where those include both internal and external elements. Internal costs are those directly faced by the user of intermodal transport services, therefore covering all cost items for which the shippers (or/and the consignees) ultimately pay. External costs correspond to those cost items that are currently borne by the community at large, and notably include damages to the environment and health, as well as time losses resulting from congestion and affecting other transport users or citizens in general.

The **immediate objectives** of RECORDIT are to:

- ⇨ define and validate a methodology for the calculation of the real costs of intermodal freight transport
- ⇨ compare real costs to charges and taxes currently paid
- ⇨ assess current imbalances and market distortions
- ⇨ recommend policy and business actions allowing to drastically reduce intermodal costs thus increasing the attractiveness of intermodal transport options.

The comparison of real costs with current prices (charges and taxes) faced by the users of intermodal transport services contributes to identifying the most appropriate policies apt to redress current inefficiencies of the market. On the other hand, the comparison of intermodal costs with the corresponding all-road costs allows an assessment of the existence and the extent of undue competitive advantages as a result of insufficient internalisation of external costs.

Ultimately, RECORDIT aims at promoting intermodal transport by helping formulate the appropriate mix of: i) public policies to redress current market distortions, and ii) private initiatives focusing on the reduction of friction and other internal costs.

RECORDIT addresses those policy needs in a comprehensive way. It is based on the recognition that, in Europe, the current intermodal market is characterised and constrained by an insufficient knowledge of the mechanisms of cost and price formation. Increasing the transparency of those mechanisms will stimulate fair competition, and, as a result, raise efficiency levels and improve the quality of service, while contributing to increase the sustainability of the transport sector, social welfare and quality of life.

The RECORDIT contribution is twofold: on the one hand, it identifies priority areas where intermodal costs could be reduced through a better organisation of services and a more effective and systematic use of efficient technologies; on the other, it supports the pricing reform currently in preparation, whereby users are expected to pay for the full costs arising from the production of the transport services, through the incorporation in prices of the so-called negative externalities generated by those services (environmental damages, congestion costs, accident risks, etc.). An equitable pricing system will in turn allow to redress current market distortions, particularly across modes.

Overall approach.

Shedding light on the cost and price formation mechanisms requires, as a starting point, the availability of an agreed set of rules to consistently assess the wide variety of cost factors involved. The first task of RECORDIT has therefore been to establish a full-fledged, original accounting framework for intermodal freight transport, where both internal costs (those faced by the various operators for the production of the service), and external costs (those currently borne by society at large) are described. The approach is based on a highly detailed representation of the sequence of activities that are carried out for the production of the door-to-door transport services (load and unload, transhipments and marshalling, pre and post haulage, main haulage by road, rail, inland waterways or short-sea-shipping). Each such activity involves one or more operator (shippers and consignees, modal hauliers, terminal operators, forwarders, integrators). RECORDIT has reviewed this entire process at the maximum possible disaggregation level, and mapped all cost factors associated to each step, resulting in over 800 individual cost items, all of which are described in the RECORDIT accounting framework, together with their units of measure and the methods to appraise the corresponding values. For what concerns externalities, RECORDIT has adopted the damage cost approach, based on the Impact Pathway methodology, which starts from the technical characteristics of the activity (technology and type of vehicle, load factor, corridor length), then calculates the so-called "burdens" associated to the activity (i.e. emissions of pollutants, emissions of noise, frequency of accidents), then models the physical impact of these burdens on human health, crops, materials, etc., and finally estimates the monetary value of these damages (through market values when available, as for e.g. crops and materials, or through Willingness-To-Pay values otherwise). This process - which, as described, is strictly bottom-up - has been originally devised and experimented in the ExternE project, and has since been used and validated in several other projects and case studies (e.g. QUITS, UNITE); although uncertainties still remain, it is generally considered to be accurate.

RECORDIT has then proceeded to the calculation of the entire range of costs for three trans-European, door-to-door corridors (corresponding to a cumulated length of over 9000 km, across 16 European countries, including both Member and Accession States). This has allowed a testing of the effectiveness of the accounting framework and, more importantly, to evaluate the actual costs along these major corridors. Both the intermodal solutions and their all-road, competing alternatives are analysed. The result is a database of costs, internal and external, which, although limited to the three RECORDIT routes, provides basic, fundamental insights at the European level as a whole.

Based on this extensive data set, and on the assessment of taxes and charges currently paid, RECORDIT has then carried out systematic comparisons of costs: across corridors, between intermodal and all-road options, between real costs and prices paid, and between external costs and taxes and charges.

This has in turn allowed the identification of those cost items (cost drivers) that play a major role in determining the performance of intermodal services, thereby leading to recommendations on priority actions to reduce those costs. In parallel, the pricing relevance of results has been analysed, through the appraisal of the potential impacts of internalisation.

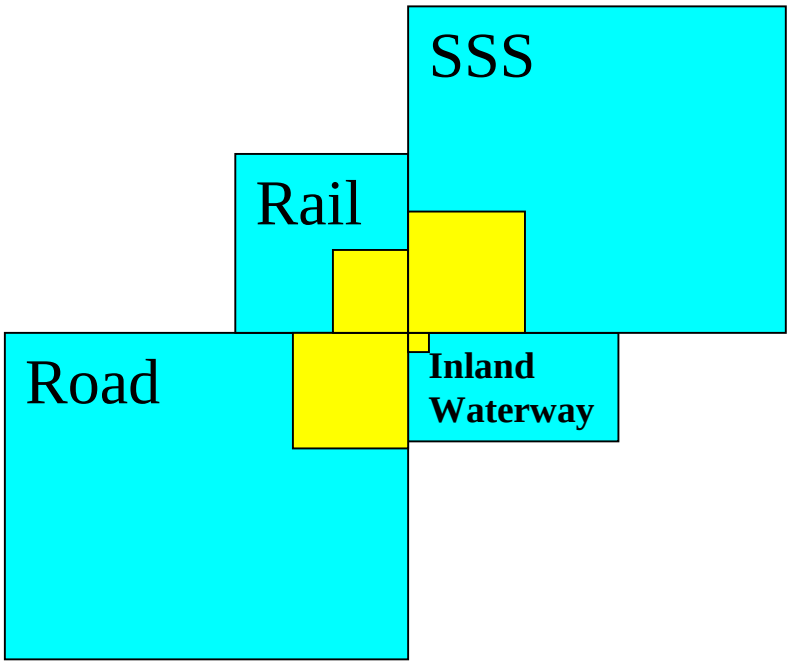
The RECORDIT playing field: assessing the European intermodal market.

What is the size of the market for Intermodal freight transport, and what are the important characteristics of that market? Data for the EU from various sources (Eurostat, 1999) provides a partial answer. Referring to unitised traffic 53.7 M tkm were moved by rail in 1996. The main operators in this market are UIRR companies (share approximately 60%) and ICF which with its Associates has a share of approximately 30% Small independent companies such as CNC receive a small share (~10%). Detailed statistics are not available on the mix of swapbodies and containers but the latter represent the major proportion of tonnes moved. In addition UIRR members are responsible for the movement of semi-trailers and accompanied transport, which account for 30% of consignments.

In the case of inland waterways the figure for unitised movements in 1996 was 4.7 M tkm representing only 4% of the mode's activity. The hinterland traffic of the ports of Rotterdam (the Rhine corridor) and Antwerp together with feeder traffic between these two ports is reported to account for over 90% of the containers moved on inland waterways of the EU.

With short sea shipping (intra EU) the unitised traffic was 140.7 M tkm which is a 13% share of the total short sea shipping movement. Dominated by container movements it includes both feeder traffic and trade between EU members.

Figure 1: The relative size of the market for intermodal transport



If the market of interest to intermodal transport is defined as the market for unitised traffic, then this market includes all containers and swapbodies moved – not just those destined for a railhead or seaport. Statistics are not generally available on the proportion of road movement that takes place using load units. The figure for the UK is 6% of tonnes moved by road (HMSO, 2001). Other countries in Europe make greater use of containers and swapbodies and therefore the figure for the EU can be expected to be over 10% giving a figure of at least 150 M tkm. The figure draws together these various statistics to show the size of the market for unitised consignments. With the inclusion of road movements this can be seen as the market for intermodal transport. It is possible to go further and say that the potential market is even larger – intermodal transport could persuade (with perhaps a more attractive price/quality package) consignors to unitise more of the goods that they move, leading to an expansion of the market and a transfer from road.

The corridors

One of the main objectives of RECORDIT was to examine the internal and external costs of intermodal transport and its competitor – the All-road solution. Within Europe there is a wide range of intermodal routes. The area of interest includes not only the countries of the EU but also those of the pre-accession states. Intermodal transport covers not only rail but also inland waterways, short sea shipping and even air (though the last is not examined in this study). In order to capture this variety throughout intermodal services in Europe, and at the same time draw certain general conclusions about the costs of intermodal transport, three corridors were chosen. These three corridors cover 16 different countries and, to some extent, the three main modes that contribute to intermodal transport. The three corridors comprise

1. Genova to Manchester
2. Athens/Patras to Gothenberg
3. Barcelona to Warsaw

Each of these corridors is defined in terms of the beginning and end of the intermodal points on a route. The cost analysis is carried out for a door-to-door movement between an origin and a destination in the vicinity of these locations. The three intermodal routes in the corridors therefore require pre-haul from the origin (except Genova) and post-haul to a destination. In the first corridor for instance the post-haul is from Manchester to Preston (a distance of 50km) and in the second there is a pre-haul from Athens to Patras (a distance of 210km). Each corridor is served by an intermodal route and an All-road route.

The Trimodal Chain between Genova, Basel, Rotterdam and Manchester

This is defined as trimodal due to the use of three modes (four including road).

The origin of the consignment is Genova Voltri harbour. The intermodal route starts with a rail itinerary connecting the harbour and Basel. This is followed by a transfer (by road) to an inland waterway terminal providing access to the Rhine corridor linking Basel and Rotterdam (via Koblenz, Koln, Dusseldorf, Emmerich and Nijmengen). At Rotterdam there is a transfer to a Short Sea Shipping service, which carries the consignment to Felixstowe harbour. In the UK the rail route goes from Felixstowe to Manchester Trafford Park, via London. The final leg to Preston is by road.

The All-road route starts with a segment between Genova and Basel via Milano (E62), Como (E35), Gothard tunnel and Luzern (E35). The road segment between Basel and Rotterdam involves Walldorf (E35), Hockenheim (E50), Eindhoven (E25) and Gedersmalsen (A2). Following use of a RoRo service across the Channel from Rotterdam to Felixstowe the road route is via the A14 and M6 to Manchester.

The overall length of the road route is 1912km, which is considerably shorter than the intermodal route of 2134km. About half this extra distance can be explained by the extra length required by rail in the UK.

Figure 2:Genova to Manchester (Preston) – Intermodal solution

The freight freeway Athens – Patras – Brindisi –Munich – Hamburg – Gothenburg

The intermodal route starts with a road leg from Athens to Patras. This is followed by a short sea shipping leg (RoRo) to Brindisi. The rail segments are then Brindisi – Milano

Milano – Brenner Pass – Kuffstein – Munchen Riem. In Germany, Denmark and Sweden: the route goes to Hamburg/Billwerder – Taulov – The Great Belt Bridge – The Oresund Bridge – Malmo – Gothenburg. The final leg from Gothenberg is then by road.

The road segment follows the same route from Athens to Patras. Following the ferry crossing the route from Brindisi involves Bari, Rimini (E55), Bologna, Verona, Brenner pass, Innsbruck (E45), Dreieck Inntal and Munich (E52). In Germany the route is to Hamburg (E45), Puttgarden (E47) followed by ferryboat (20 km), Rodby – Helsingor (E47/E 55), another ferryboat (4 km), Helsingborg and finally Gothenberg (E20). All the road segments of the route between Munich and Helsingborg are high quality motorways (except for urban road close to the harbour of Helsingborg).

The length at 3599km of the road route is considerably less than the intermodal route of 4128km, though there are charges on the road for access in both Italy and Austria as well as the three ferry boat crossings.

Figure 3: Athens to Gothenburg – Road and ferry route.

The door-to-door Barcelona – Lyon- Torino- Trieste – Lijbliana – Budapest – Warsaw

Following a pre-haul by road to Barcelona the intermodal route follows a rail itinerary connecting the Spanish (165 km), French (845 km) and Italian territories (110 km) defined as: Barcelona - Cerberes – Bezieres – Nimes – Montpelllier – Avignon – Lyon – Amberieu – Chambery – Torino. This requires an axle change at the French – Spanish border, restrictions on the swapbody gauge in Modane (C30) and the necessity of using two or three locomotives on the Alpine slopes. The Southern route, which passes through Ventimiglia is not endowed with sufficient capacity and infrastructure characteristics to

support heavy traffic, and is dedicated to passenger trains. All rail freight on the corridor from Barcelona to Torino therefore goes via the Rhone Valley and through the Alps. The rail itinerary connecting the Italian, Hungarian and Polish territories starts in Torino and runs through Verona – Budapest – Kosice – Plavec/Muszyna and Warsaw.

The All-road route is different to the intermodal, the road segment follows a southerly route through Marseille -Ventimiglia – Savona and then to Torino which avoids the Alps' crossing. The road segment between Torino and is a high quality toll motorway. From Trieste to Ljubljana is the E70; followed by a motorway to Budapest (E57) and by E77 from Budapest to Warsaw, with a final delivery leg on local roads.

The overall length of the road route is 2735km, which is considerably shorter than the intermodal route of 3270km.

Figure 4: Intermodal Route Barcelona to Warsaw - All-road Solution.

From corridor case studies to the assessment of the European intermodal market as a whole

In choosing the RECORDIT corridors, great care was taken to identify routes that would prove representative of the overall European market of intermodal transport services, thereby adequately lending themselves to a possible generalisation process.

Clearly, both the sheer length and the geographical and modal variety of the selected corridors reflect this objective, with corridors that cumulatively extend over 16 countries, more than 9000 km of routes, and all transport modes (with the exception of air).

One should however be cautious in attempting direct extrapolations from the corridor results, for a variety of reasons:

- ⇨ RECORDIT deals with door-to-door transport solutions. The market situation is however such that, on any of the RECORDIT corridors, the current door-to-door transport demand (i.e. loading units being moved all the way from Patras to Gothenburg, etc.) is in fact very limited. While the selected routes are theoretically sound - as they allow for a wide coverage of modes and contexts - the results (in terms e.g. of unit door-to-door costs) are not immediately market-relevant

- ⇨ also (as extensively illustrated in further sections of this report), variability has been found very high across corridors and segments thereof: estimated costs (both internal and external) vary considerably from one corridor to another, and approaches based on the adoption of average values do not therefore seem reasonable in a generalisation perspective

- ⇨ moreover, uncertainties affecting individual cost values can be very high, owing in particular to: i) the difficulty in obtaining high quality bottom-up data, ii) the difficulty in establishing common sets of assumptions across countries and corridors, and iii) the intrinsic uncertainty associated to valuation methodologies.

On the other hand, several steps have been taken to - at least partially - offset these limitations:

- ⇨ while door-to-door traffic is indeed scarce on the full length of the RECORDIT corridors, intermodal services are offered and active on most sub-segments therein. This allows to assess shorter, market-relevant corridors as an immediate by-product of the full corridor analysis

- ⇨ RECORDIT has established a comprehensive database with all the values of the individual cost items assessed along the corridors and sub-corridors. Ultimately, this wealth of highly disaggregated data (several hundreds of individual cost items) provides an extensive and (to a large degree) statistically significant sample of elementary observations, which lends an acceptable level of credibility to further quantitative analyses carried out in a generalisation perspective

To conclude, the data sample from the three RECORDIT corridors, although subject to the limitations above, can indeed be used as a solid basis for transferability and generalisation purposes.

Corridor results.

Total internal costs for the movement of a "Class A container" (including taxes and charges) are summarised in the table below:

Corridor	Intermodal			All-road		
	€/movement	Length (km)	€/km	€/movement	Length (km)	€/km
Genova-Manchester	2315	2134	1.08	2836	1912	1.48
Patras-Gothenburg	3970	4128	0.96	4894	3599	1.36
Barcelona-Warsaw	3350	3270	1.02	3448	2735	1.26

The intermodal option is consistently cheaper than the all-road alternative, despite being longer. Its competitiveness is however severely undermined by the poor performance of intermodal transport in terms of trip duration, which is between 70% (Patras-Gothenburg) and 400% (Genova-Manchester) longer than for all-road.
A similar comparison for marginal external costs confirms the better performance of intermodal transport.

Capacity utilization

An important element in assessing different transport solutions including their economic and environmental competitiveness, is connected to the ability of using the different modalities in an efficient way.

Among those aspects which have been investigated in a number of projects, and have also benn a key question in the RECORDIT project, is the way the capacity of different modes are being used.

A key issue is the way in which a given capacity is being utilized, taking as well the technical as the more organisational aspects into consideration. The lack of utilization is rather often based on a lack of cooperation either within the transport chain itself, or between the transport chain on one hand, and the shippers or the production chain on the other. These lacks of interaction often lead to a suboptimization of the chain

A better utilization of a given capacity is therefore not so much a question of how to improve the technical solutions , but much more a question of improving the logistical aspects of the operation. Such an improvement could be trigged by illustrating the economic and environmental effects of a better capacity utilization, and a number of ways of how to come around to this.