ITS-IT Marco Polo Project – WP 3

Best Practice Guide

December 2008

Carlo Vaghi, Gruppo CLAS, Italy
Giuseppe Siciliano, Gruppo CLAS, Italy

Summary

1. Introduction

1.1. The need for best practices

Basic in the purpose of defining a training module on intermodal transport is the collection of Best practices in the organisation of the intermodal transport. We consider as “intermodal” every transport implying a modal shift of standard loading units as swap bodies, semi-trailers or containers, without manipulation of goods in loading units. The BP can concern national or international freight flows.

The idea is to show the wide possibilities offered by intermodal transport. As far as possible, the Best Practices enlight the partnership developed between all of these organisations:

- transport operators (all modes)
- shippers
- terminal operators
- any national bodies involved in environmental or intermodal issues,

in the creation of a suitable intermodal alternative on a selected route.

The Best Practice charts, attached to the present guide in Annex, focus on the way the transport operations are designed and dealt with, including technical commercial issues, environmental aspects, lessons learnt..

The aim of the present document is to create a guide of Best Practices, i.e. a collection of business cases of freight modal shift from road to alternative modes of transport (rail, inland waterways, short-sea-shipping or combination of them) which constitute inspiring experiences for potential intermodal transport users all around Europe.

2. Methodological aspects

The first step of the analysis is the preliminary selection of cases and companies that would suit the role of “best practice taker”, then it is the partner’s responsibility to gather data and describe the modal shift case in the most effective way.

The data collection has been realised by means of a questionnaire, which complies with two major guidelines:

- The output of the best practice description has to fit at the utmost with the 2-page “best practice chart” format;
- The description of the case has to be enough exhaustive for making an environmental comparison with the all-road solution, which is one of the main goal of the project.. The aim is to calculate the emission – in terms of CO_2 –, the number of equivalent heavy vehicles and the fuel consumption avoided thanks to the adoption of the combined transport instead of an all-road solution. Information such as the type of vehicle, the loading unit capacity, the route length, the empty trip factor and the frequency are necessary to perform a reliable environmental assessment of the modal shift.

1.2. Identification of the transport chain

The first section of the best practice chart aims at describing the best practice in its main features. As an assumption, the **identity** of the "best practice taker" should be revealed: for the company, being in the list of "best practice takers" determines a positive impact in terms of image, as proven by "Viacombi" experience. Photos of the company's facilities and/or the company logo can be used in order to illustrate the best practice.

The company is asked to give answers referred to the specific route/connection selected as "best practice".

One of the aims of this section is to identify the role of the company within the transport chain. Of course the most part of best practices should be brought by "decision makers", i.e. by companies (usually shippers, big forwarders/MTOs[1] and shipping lines) which can decide the use of intermodal solutions, purchasing related transport and logistics services from operators.

The name of customers and suppliers may be unspecified, when the company approached has no right to reveal names. At least the roles of other actors involved in the transport chain should be specified, in order to show how many actors should be involved in the creation of a "best practice" experience.

The distance of each leg along the door-to-door (from shipper to consignee) intermodal chain is a very relevant element, since the calculation of distances involved is very important for performing the assessment of environmental aspects.

Indeed it may be possible that the company is not willing/authorised to reveal the name of terminals used in a specific connection. In other cases, the company has stressed its role of decision maker by listing a number of possible (competitor) terminals among which it makes a choice, contract by contract on the same door-to-door route.

The transport volume on the route is also relevant for the assessment of environmental aspects. Where available, the transport volume has been expressed in ILU/trip and ILU/year. ILU (Intermodal Loading Unit) refers here to containers, swap bodies and semitrailers.

The charts also give a description, where suitable, of the equipment needed along the whole intermodal chain, such as:

- Crane (gantries or reach stackers) availability at terminals
- Fork lifts at shipper's / consignee's
- Specific equipment for specific goods (e.g. perishable, dangerous)
- (and of course) the type of intermodal loading unit

The ownership of the equipment is important in order to show to potential users the necessary investment needed, and/or the opportunity to find along the transport chain actors providing the necessary input, without need for huge investments.

The description of the goods transported (as specific as the company can reveal) is a powerful tool for showing the range (often wider than expected) of commodities suitable for intermodal.

1.2.1. Alternative all road solution

The section concerns the description of the "alternative" all-road solution, i.e. the road transport solution which was used before the strategic choice of intermodal on the route, or the corresponding route theoretically covered by a truck.

[1] Multimodal Transport Operators.

The section has two aims: describing the main technical features of the all-road solution, including information on the number (%) of empty return trips (since it is one of the most effective factors towards modal shift); the distance, from shipper to consignee, is to be calculated "desk" if not directly available at the company's).

The second aim is to investigate the preferences of the shippers in terms of factors of the modal choice. A "traditional" list of possible quality factors of intermodal is presented, deriving from the review of several past EC projects (e.g. SPIN, LOGIQ, IQ) for sure. The "cost" factor is not included in the list, since the cost comparison is dealt with in a following section of the questionnaire.

1.2.2. Technical aspects

The section is rather heterogeneous, and comprises all questions needed for describing the best practice in its technical and organisational features.

After having specified the starting date, the company is asked to say, at a glance, what has been the real trigger of the modal shift operation. We are not dealing here with "modal shift factors", which have been specified in the last section, but with the "origin" of the modal shift.

The section is also aimed at showing innovative aspects of intermodal transport, i.e. the availability of "quality services", such as tracking & tracing, innovative storage practices, innovative practices for tha aggregation of transport demand, or other features that may attract potential users of intermodal.

The punctuality issue is also analysed here, as a relevant quality factor affecting in particular rail-road transport. The comparison between the real delay and the delay usually allowed in the specific business sector would show the suitableness of intermodal, and/or the punctuality rate (i.e. the high quality) reached by non-road transport on a specific route or for a specific customer.

The company is also asked to reveal whether it has agreed for a compensation scheme in case of delays caused by the operator/supplier. Whilst "quality agreements" are widely diffused in road transport (and provide for a market segmentation between customers), only recently are they spreading in rail freight and short-sea-shipping business. Intermodal is assumed to be a "quality product" for rail freight operators. At least an answer "yes/no" would be sufficient for assessing the diffusion of quality agreements among best practices surveyed, i.e. for showing to potential users if their possible transport contracts would be covered by specific quality clauses.

1.2.3. Economic aspects

As expectable the present section is the most sensitive, with the highest possibility of failures in gathering data. Anyway the economic component is necessary in this analysis since it is possible to demonstrate, by simple figures, where, when and under which conditions intermodal can be cheaper than road transport.

<u>Since it is not the aim of ITS-IT to reveal confidential data of any industry, no monetary figure is presented in the best practice charts unless the company gives explicit permission.</u> The cases reported in the project presentation, anyway, usually show the cost comparison in terms of percentage (i.e. assuming =100 the cost of the all-road solution); this kind of display also requires the permission of the company.

Cost figures are preferably expressed in terms of €/ILU. Figures in terms of €/tonne would work only if expressed as a comparison with all road, but in this latter case the information given may be biased, since the cost comparison may be different for complete unit (truck) loads.

A collection of costs per segment of the intermodal chain is also sought after. If the company is able and willing to provide us with such costs, this information is very useful. Above all, a relevant piece of information comes from the notion whether empty trips are necessary or not: in fact, costs are to be calculated by the company taking into account (both for intermodal and for all-road solution) the necessity of empty trips vis à vis the opportunity of achieving full return trips for ILUs involved in the connection.

This section also addresses investment costs and other organisational changes having economic impact on the company's budget. The cost/opportunity related to the increase/decrease of storage areas and increase/decrease of time costs is of course difficult to calculate in monetary figures.

The section ends with a section on public support. This important issue is addressed in this section with particular regard to *financial* support, whilst other forms of public support (organisational, communication, studies, round tables, etc.) are addressed further on.

1.3. Environmental aspects

The final aim of environmental impact assessment of modal shift best practices is to calculate the CO2 emission (tonne/year) saved, the number of trips (equivalent heavy vehicles) and the fuel consumption (litres/year) avoided thanks to the adoption of intermodal instead of all-road solution. This calculation will be made benefiting from ADEME methodology developed in Viacombi, with some significant simplifications, in order to minimise the amount of data needed from the companies.

The ADEME approach is based on the following elements:

1) Distances. The distance data concerns both the intermodal solution and the all-road one. In the former case it includes (together with the main haulage length) the pre- and post-haulages; depending on the case, such distances have to be computed once or twice in order to take into account the possible return trip of the haulier. In the latter case the total all-road distance has to be corrected with the share of empty return trips: it is assumed that such share increases the total distance according to the formula: *total distance = door-to-door distance * (1 + ERT*$_{\%}$*)*, where ERT$_{\%}$ is the percentage of empty return trips. For all chains or services involving rail and IWW, since (as shown in the following tables) different emission factors correspond to different countries, the distances have been split between countries according to the route.

2) Tonnage. The gross tonnage is considered, since this can vary a lot depending on the ILU that is used (e.g. container vs swap body). For the all-road solution, the same total tonnage as intermodal as been considered (and also the same unit tonnage, referred to single ILUs).

3) CO_2 emission factors, which correspond to the quantity of CO_2 emitted to carry a ton of freight for one kilometre (gCO_3 / ton*km), or the quantity of CO_2 emitted per litre of fuel. Such factors are based on average values for each mode of transport.

Emission factors of rail transport per country (Source: Ademe)

Country	kg CO_2 / ton*km
France	0.026
Germany	0.032
Austria	0.013
Belgium	0.019
Denmark	0.038

Spain	0.035
Finland	0.020
Italy	0.029
Luxembourg	0.025
Norway	0.008
Netherlands	0.030
United Kingdom	0.041
Sweden	0.004
Switzerland	0.004

For countries not included in the list, an average of the above values has been considered as a proxy.

Emission factors of IWW transport of containers for major basins (Source: Ademe)

Basin	g CO_2 / ton*km
Seine	30.1
Rhone	29.4
North	42.9
Rhein	36.2
Moselle	37.8
Inter-basin	38.1

Finally, the emission factor of SSS is equal to 38.84 g CO_3 / ton*km *(source: Ademe)*.

Thus, the categories of data needed for the calculation are the ones listed in the following table, which also lists the hypotheses assumed when it was not possible to obtain direct data from the concerned actors.

Data	Hypothesis if no direct data available
Type of vehicle (road)	Euro 3 truck and semi-trailer (40 tonnes)
Capacity of the loading unit	*(always declared by the concerned actor)*
Length of the route	Calculation via web routers
Empty trip factor	An average of the same data from similar best practices
Frequency of transport relations	*(always declared by the concerned actor)*

The assessment will result in the following figures:

- Emission avoided (tonnes of CO2/year)
- % of emission avoided compared to the road scenario

- Number of equivalent heavy vehicles avoided (trucks/year)
- Fuel consumption avoided (litre/year)

The most relevant data to be gathered (if available at the company's) concerning means of transport used in intermodal main haulage is the capacity of the means of transport, since standard unit emission rates of trains (diesel and electric), barges and ships would be assumed. As an additional information, occasional needs for double traction or diesel traction of rail main haulage of rail-road intermodal solutions may be investigated.

3. Best practices

Though the collection of the best practices and the categorisation of the information followed at first a geographical criterion, the presentation of the results turns out to be more efficient if clusterised according to the type of supply chain involved. In other words, the following sections describe firstly the best practices concerning the **services of transport** (collected from the operator's point of view) and secondly those concerning the **transport chain** (collected from the shipper's or forwarders' – the decision makers – point of view).

As an introduction it is worth underlining that such best practices involve:

- door-to-door transport chains covering 20+ countries in Europe
- actors from a large variety of sectors of activity
- every mode (excluding air transport) that comprises the use of intermodal loading units
- a majority of cases where the container is the preferred ILU, followed by swap bodies
- solutions for the improvement of the efficiency of transport from the very short range (50 km) to the long range (1500+ km)
- a widespread reduction of emissions as a major social consequence of the investigated projects.

The main differences between the results of the data collection in the operators' case vs. the shippers' case are that:

→ in the former case the collection of information has an obvious lack in what is to be defined as "the factors of modal choice", since these information can only be given by shippers. This notwithstanding, the opinions of transport operators concerning quality factors of the different transport solutions are relevant per se.

→ in the latter case there is sometimes a lack of detailed, first-hand information covering the characteristics of the transport (road or intermodal solution), being it the exact route or distance or the timetable. Where possible, this gap has been filled in by researching via direct (by telephone calls or interviews with operators) or indirect (via online or in-house databases) enquiries the missing data.

3.1. Best practices: the services

An organised list of the **9** best practises collected from transport operators is presented below.

Operator or forwarder	Countries involved	Type of intermodality	Type of ILU	Type of goods	Range *Short : <100 km* *Middle : 100-1000 km* *Long : >1000 km*
Bohemiakombi	Czech-Germany	Road-rail	-	Chemicals, foods, raw material, hard goods	Middle
BoxXpress.de	Germany	Rail-road	Container	Various	Middle
BoxXpress.hu	Germany-Austria-Hungary	Rail-road	Container	Various	Long
GYŐR - GÖNYŰ KIKÖTŐ	Belgium-Germany-Austria-Hungary-Serbia-Romania	IWW-road	-	Bulk commodities (grain)	Long
Kusters Transport	Belgium	IWW-road	Container	Various containerised goods	Middle
MÁV Kombiterminál	Hungary-Austria	Rail-road	-	Various goods	Middle
Pegasus	Italy-Austria-Germany	Road-rail-road	Container	Various	Middle
Polzug	Germany-Poland	Road-rail-road	Container	Various	Middle
Transfennica	Spain - Belgium	Road-IWW-road	RoRo	Palletised goods	Long

As concerns the modes of transport we therefore have gathered :

- **6** «service» best practices focused on **rail**
- **3** «service» best practices focused on **IWW**

A big input on IWW comes from Benelux, where barge transport is the most widely represented in the intermodal chain.

A further detail on the collection of best practices comes from the analysis of the **loading units** involved in the different cases:

→ **5** “service” best practices involve **containers**

→ **1** “service” best practice involve the **RoRo** system

→ other three involve various type of ILU’s

3.2. Best practices: the transport chains

An organised list of the **24** best practises collected from shippers/manufacturers/forwarders is presented below.

Shipper	Countries involved	Type of intermodality	Type of ILU	Type of goods	Range *Short : <100 km* *Middle : 100-1000 km* *Long : >1000 km*
Acciona (Shipper's name undisclosed)	Spain-Morocco	Road-SSS-rail-road	Container	Fruit	Long
Agro Handel	North range to Black Sea	Road-IWW-road	-	Agricultural	Long
Ambrogio	Italy - Switzerland - Germany - Belgium	Road-rail-road	Swap bodies	Dry non-refrigerated, chemical, waste, furniture/paper /cardboard	Long
Atlas Copco	Belgium	Road-IWW	Container	High value goods for machine and aviation industry	Short
Baxter	Belgium	IWW-road	Container	Pharmaceutical	Middle
Construrail (Shipper's name undisclosed)	Spain - Italy	Road-rail-SSS-road	Container	Construction materials	Long
Corman	Belgium	IWW-road	Container	Dairy products	Middle
Corus	Belgium-Germany	IWW-road	-	Steel products	Middle
Decathlon	France	Road-rail-road	Swap bodies	Sport items	Middle
DHL Freight	Italy-Switzerland-Germany-Belgium-England	Road-rail-SSS-road	Container	General cargo	Long
Ewals Cargo Care	Belgium	Road-rail-road	Container	Rice, agrobulk	Short
Biard Somadem	France	Road-rail-road	Swap bodies	Removal	Middle
Grimaldi (Shipper's name undisclosed)	Spain - Italy	Road-SSS-road	Container	Various	Long
Kombisztar/Philips	Hungary-Croatia-Slovenia	Rail-road	Container	Components, furniture, facet marble slabs, cold tiler substances, chemicals	Middle
OKD	CzechRep-Germany	Road-rail	-	Foundry coke	Long

Mepavex Logistics	Belgium	IWW-road	Container	Food	Short
Metrans	Czech/Slovakia-Germany	Road-rail	Container	Various	Middle
Les Rapides Bleus	France	Road-rail-road	Swap bodies	Office equipment	Middle
Renault	France - Spain	Road-rail-road	Swap bodies	Engines	Long
Soufflet	France	Road-IWW	Container	Cereals	Middle
Tang Freres	France	IWW-road	Container	Food	Middle
Trans Italia	Italy - Spain	Road-SSS-road	RoRo	Household appliances, Pulp, Glass, various materials	Long
Volvic	France	Road-IWW	Containers	Water	Middle
Whirlpool Europe	Italy - Switzerland - Germany - Denmark – Sweden	Road-rail-road	Swap bodies	Household appliances	Long

As concerns the modes of transport we therefore have gathered :

- **9** «chain» best practices focused on **IWW**
- **9** «chain» best practices focused on **rail**
- **3** "chain" best practices focused on both **rail and SSS**
- **3** "chain" best practices focused on **SSS**

A big input on IWW comes from Benelux, where barge transport is the most widely represented in the intermodal chain.

A further detail on the collection of best practices comes from the analysis of the **loading units** involved in the different cases; since IWW is the most used mode, the container stands out as the most common ILU:

→ **15** "chain" best practices involve **containers**

→ **5** "chain" best practices involve **swap bodies** (mainly they are the ones focusing on rail)

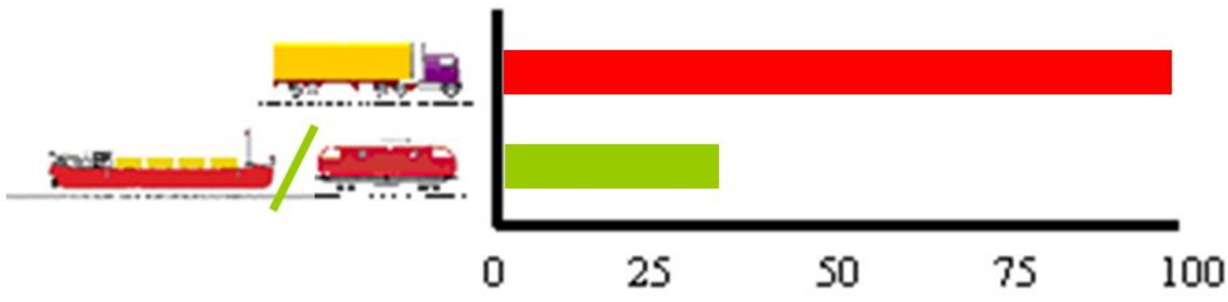
→ **1** "chain" best practice involve the **RoRo** system

→ other three involve various type of ILU's

4. Conclusions: lessons learnt

The result that represents the main goal of this activity is the investigation of the **environmental effects of the best practices**, namely the reduction of CO_2 emissions that combined transport determines with respect to the all-road solution.

For each best practice, an average of 9000 t_{eq} of CO_2 per year is saved, corresponding to a reduction of 68% of the total emissions that road vehicles would take to do the same transports.



The following table presents in detail the environmental consequences for the best practices whose data allowed such calculation.

Country	Best practice name	CO2 saved (Teq/year)	CO2 saved (% on allroad)	Road Vehicles avoided (year)	Fuel saved (Ltr/year)
BEL	Atlas Copco	166	38%	4.760	62.357
BEL	Baxter	260	58%	1.146	97.592
BEL	Corman	83	59%	196	31.124
BEL	Ewals Cargo Care	239	62%	2.250	89.952
CZE	OKD Doprava	2.093	52%	2.600	786.356
ESP	Acciona Rail	261	26%	400	97.925
ESP	Conte-Rail	443	44%	300	166.394
ESP	Grimaldi Spain	768	47%	900	288.615
ESP	Transfennica	464	13%	1.500	174.379
FRA	Décathlon-TAB	770	61%	930	290.000
FRA	Biard Somadem	420	83%	322	160.000
FRA	Le Rapides Bleu	385	70%	676	185.000
FRA	Soufflet/SNTC	70	15%	512	26.200
FRA	Tang Freres	82	35%	500	30.725
FRA	Transfesa/Renault	22.315	65%	11.000	8.380.000
FRA	Volvic	378	16%	2.350	141.900
GER	BoxXpress.de	29.149	65%	47.760	10.951.132
GER	BoxXpress.hu	101.591	79%	55.974	38.166.980
GER	Pegasus	4.826	61%	10.400	1.812.928
GER	Polzug	28.317	74%	31.134	10.638.517
ITA	Ambrogio	6.162	30%	409	125.253
ITA	TransItalia	22.848	37%	295	90.435
ITA	Whirlpool Europe	3.359	85%	295	90.435
NED	Corus	285	19%	2.240	107.026
NED	Mepavex	266	77%	1.299	99.793

Also, an average 7000 road vehicles are avoided yearly as a result of these best practices, and 2,9 million litres of fuel are saved.
It is worth underlining that :

- According to the selected panel, best practices based on the shift from road to SSS are those that accounts for the higher reduction of CO_2 emissions, followed by IWW and rail. This is due to the specificity of selected cases;
- The best practices describing "services" and involving forwarders through long haul routes (such as the German cases) show higher (absolute) values of emission reduction. This mainly because here not only the cargo shifted from road to intermodal by one shipper, but the entire cargo of a train/ship/barge, or the multi-client volume managed by a forwarder on the same relation, is accounted.

As concerns the other **advantages of the intermodal solutions**, the following aspects have to be highlighted:

→ Reduction of direct transport costs, which is generally always much lower than the all-road transport cost, and the major factor of convenience of the intermodal solution
→ Reduction of road congestion, and consequent improvement of:

- the productivity rate of the equipment, and a capacity increase on other routes
- waiting times at terminals
- total travel times

→ Sustainable investments to cope with further growth
→ Reduction of travel times for maritime legs in the West Mediterranean area, which are remarkably shorter than inland ones ("arc effect")
→ Better punctuality rates,(especially on certain routes such as Alpine crossings)
→ Acceptable degrees of flexibility
→ Higher safety and high frequency of quality controls (especially in the case of swap bodies)
→ Lesser risk of problems caused by bad weather

The final paragraphs illustrate the **lessons learnt** from the analysis. The remarks that will follow are intended to answer questions such as:

- what are the key factors for the success of such operations?
- what are the main problems that hinder the implementation of intermodal solutions?
- what is the foreseeable evolution of such solutions?

Basically, intermodal transport is used because it is economically convenient compared to the all-road solution. The shorter the pre- and post-hauls, the more convenient intermodal transport is ; therefore, it also enables the forwarder to depreciate transhipment fixed cost.
In certain supply chains the economic factor is largely predominant compared to other factors, such as lead-time or delays. The economical advantage, though, is not sufficient; a fundamental key to success is the structured and coordinated approach to the organisation of the intermodal transport operations. In other words, the modal shift has been realised if operations were implemented in a professional and a well-considered way, thanks to effective agreements between shippers, forwarders and intermodal operators.
Also communication is important: a large media coverage helps achieve a benefit in terms of potential customers at the launch of the operations.

By contrast, the mis-knowledge of the system and of its means is one of a number of factors to be overcome in order to increase the efficiency of intermodal operations.

A major one, underlined by operators, is the need of a higher number of shippers (customers) using the same service, that would enable intermodal operators to achieve higher transport volumes, higher frequencies, a wider mix of goods transported, and less unbalanced flows.
As far as IWW is concerned, also congestion at terminals and at the canal locks is seen as an obstacle (especially in ports where passenger ships have the priority). Ports infrastructures, moreover, do not enable fast handling operations and are sometimes limited as for the size of barges that can be served.
In the case of SSS, infrastructural problems are also present and connections between maritime and railway links should be improved.
The high percentages of empty containers is sometimes a relevant problem. In theory, an import container could be reloaded after unloading at the production plant. In reality however this is not feasible. The shipping lines differ for import and export and the containers are owned by these shipping lines. Therefore, containers mostly have to be returned to an empty container depot. The same is true for export containers, which mostly have to be picked up empty in the port area prior to loading. Hence every container still involves two transports of which one is empty.
Similarly, the availability of swap bodies is a problem that needs to be solved. Linked to the flexibility advantage given by the use of swap bodies, an agreement with intermodal operators is in some cases potentially feasible, which would overcome problems of availability due to overbooking, by leaving a certain amount of swap bodies at the disposal of the shipper.

For the future, all actors expect a growth of the intermodal transport in terms of volumes, frequencies, and quality. The promotion of multimodal transport, together with the increasing road congestion and the growing awareness of environmental issues will certainly attract more volumes. The liberalisation of the rail cargo transport sector is a decisive factor to allow the successful development of this kind of operations The more volumes that are attracted, the more (cost-)efficient the terminal can operate and the more connections to the terminals can be offered.
The success itself of these best practices, which in some cases were "pilot projects", will largely influence the future use of these models: other parties become interested in the solution if an experiment, especially if led by a big company, turns out to be successful and cost-efficient.

Annex: Best Practice Charts