SPSD II

BASES OF A GROWTH OF INTERMODAL TRANSPORT IN BELGIUM: THE SEARCH OF "MISSING LINKS"

J. MARCHAL, C. MACHARIS, A. VERBEKE

GENERAL ISSUES
AGRO-FOOD
ENERGY
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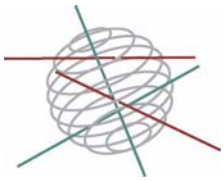
PART 1
SUSTAINABLE PRODUCTION AND CONSUMPTION PATTERNS

SCIENTIFIC SUPPORT PLAN FOR A SUSTAINABLE DEVELOPMENT POLICY
(SPSD II)



Part 1 :
Sustainable production and consumption modes

FINAL REPORT

BASES OF A GROWTH OF INTERMODAL TRANSPORT IN BELGIUM: THE SEARCH OF "MISSING LINKS"

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Executive summary

The project "Bases of a growth of intermodal transport in Belgium: the search of "missing links" " is a coherent task package carried out by two transport research centers, one working within the university of Liege (Ulg) and the other working within the Vrije Universiteit Brussel (VUB). The two research centers constituted a common team in order to work together on a certain number of topics concerning transportation in general. This research project is based on existing research projects, which have been carried out by the two research centers in the recent past.
These previously conducted research projects all led to the conclusion that practitioners as well as public decision-makers should concentrate on specific elements to stimulate a better growth of the intermodal transport in Belgium.

The team has identified four elements which constitute real "missing links", not sufficiently taken into account by the public policy and the administrators of intermodal transport. These four elements are:

1. A follow-up tool for intermodal transport prices;
2. An analysis of the most critical value added services that should be supplied by intermodal terminal operators;
3. A series of directives to optimize the packaging of goods, in order to stimulate intermodal transport;
4. An instrument that enables the follow-up of "modal scan" analysis.

These elements are analysed and each of them constitute an entire module of this report.

I A follow-up tool for intermodal transport prices

In the Belgian market, it is not easy for potential users to know where and how the global cost of an intermodal transport can be obtained. As a consequence, the objective of this first part is to calculate the price of an intermodal transport in Belgium for a number of relevant corridors. This objective is reached in two steps.

First, a general methodology for the calculation of a price for an intermodal transport is presented. Second, the methodology is applied to a number of Belgian intermodal corridors. Two intermodal scenarios are defined: the rail intermodal scenario and the river intermodal scenario. The prices calculated for the two scenarios are compared to the price for the overall road solution. This comparison shows that on specific corridors the intermodal solution is cheaper than the unimodal road solution, on the other corridors the price is equal for the two transport solutions. These results are surprising, considering that it is generally perceived that intermodal transport is more expensive than unimodal road transport. All the results are presented in the tables hereafter.

I.1 Comparison of intermodal rail and road price

Four corridors were analysed for the intermodal rail scenario.

Corridor	Intermodal price(€)		Road price(€)
	20' container	40' container	
Renory - Anvers	222,3€	268,46€	260€
Mouscron - Anvers	266,76€	335,14€	285€
Athus - Anvers	312,34€	403,51€	400€
Zeebrugge - Anvers	183,34€	220€	200€

I.2 Comparison of intermodal river and road prices

Three corridors were analysed.

Corridor	Intermodal river price (€)		Road price
	For one TEU	For one FEU	
Avelgem - Antwerp	250 €	280 €	240 €
Vilvoorde - Antwerp	199 €	228 €	100 €
Liège - Antwerp	250 €	260 €	260 €

I.3 Sensitivity analysis

This module ends with a sensitivity analysis. This analysis is carried out by means of a dedicated intermodal river price calculation model. The rate of filling and the loading scheme (rate of 20'/40' loaded) are analysed. One of the interesting conclusions is that the intermodal prices could still be lower than they are at present, under the conditions that operators increase frequencies of their forwardings and that they can control the pre and post haulage transport price and the price of terminal operations.

With regard to the increase of the frequencies in particular, the intermodal operators assure that they can guarantee higher frequencies if they have much larger volumes to transport. Among the possible solutions to reach this massification of flows, the team analyzed the effect that the addition of the value added services to the transport chain could have (which constitutes the second part of this study), with a focus on groupage services (the third part of this study).

I.4. Some considerations on the external costs of transport

This first module, devoted to the calculation of the price of intermodal transport in Belgium, only takes the internal costs into account. To make an assessment of the real costs of transport and allow a more realistic comparison between intermodal and unimodal road transport, an analysis of the external costs of both alternatives is provided in annex 8. This analysis shows that while affecting the generalised costs of both alternatives, the difference between the price of intermodal transport and the price of unimodal road transport would be reduced considerably and intermodal transport could even become less expensive than unimodal road transport.

II Value added services

The second module of this study treats the analysis of the contribution of value added services to intermodal transport in Belgium. This part shows that value added services bring strategic, organisational and financial advantages to the companies using those services.

On the other hand, the companies identify the following limits and difficulties with regard to the integration of value added services in their logistic schemes: the control of the entire logistic chain, the coordination of flows (goods, information, financial); selection of subcontractors and the transition to a real partnership; the risk of overcost; human resources problems; quality control; returns to the customer and the image of the company; the loss of confidentiality of information.

A categorisation of value added services is executed. These categories can be cited, the list being unlimited: transport operations and auxiliaries of transport, reception of the transport means, drivers and other workers, storage, stevedoring and processing of goods and finishing production operations; commercial and IT operations, operation for the international trade, etc.

Furthermore, the situation of value added services in Belgian intermodal transport is analysed. An inventory of the services offered by Belgian railway and river intermodal platforms is carried out. The analysis of the situation of the Belgian terminals shows that these offer a variety of interesting value added services such as the repair, the cleaning and the maintenance of containers, the storage of dangerous goods, the organization of pre and post haulage, customs clearance, etc.

However, it has to be mentioned that, except the service of storage of dangerous goods, of storage and the inventory control, almost all the services offered are services oriented towards containers, whereas no services oriented towards the goods strictly speaking were found. This is the case in particular for the cleaning, repair and inspection of the containers. Taking into account the fact that the container belongs to the maritime shipping lines, these services are more interesting for the large shipping lines, which own the containers, and not the owners of the goods that are inside the containers.

The intermodal platforms should consider to offer more services related to the goods than those related to the loading unit. The groupage of goods, labelling, packing, bagging, etc, are services that possess more potential to stimulate the customers to use the intermodal solution than the services related to the loading unit, which do not have a direct impact on the activities of the customers. In any case, the introduction of these services must be done on request of the users, as it would be a mistake for a terminal to invest in expensive infra- and suprastructure to offer additional services without customer demand.

The principal conclusion of this part is that value added services can shift additional freight to intermodal transport but their introduction into the transport chain depends on the way the intermodal operators present the potential services and their value to the users. The users must be convinced of the interest they have in using value added services. "Groupage", which is an interesting value added service, is analyzed more in detail in the third module of this report.

III Third module : The introduction of "groupage" in Belgian intermodal transport

At present, most intermodal transport terminal operators in Belgium are engaged in the "bundling" of containers, in order to fill trains or inland navigation vessels in an efficient way. Notwithstanding the wide adoption of "bundling", "groupage" services are not yet provided systematically, i.e., the collection of small freight flows to fill the load units themselves. However, such groupage services are in many cases provided in other E.U. countries, where terminal operators view such services as an important source of value added. This module analyses the reasons for the lack of groupage activities in Belgium. A survey was conducted among 17 terminal operators, 47 shipping agents and 50 shipping forwarders in Belgium. This survey allowed the identification of the main barriers hampering the introduction of groupage, as well as the perceived advantages, that could lead to its introduction in the near future.

The main obstacles hampering the adoption of groupage are the difficulty for the terminal operators to remain neutral vis-à-vis all terminal users. From a financial perspective, groupage usually cannot be offered by small agents or operators. From an organisational point of view, groupage requires careful and integrated logistical planning, especially when intermodal transport is considered. Another obstacle is the labour intensive nature of the activity as the groupage and de-groupage of goods is a labour-intensive activity.

However, terminal operators could benefit from the groupage activity, namely if they were to provide this service themselves. As a matter of fact, groupage opens a new market for intermodal transport. The main benefit is that groupage results in a lower overall cost of the main transport mode due to lower unit costs. This also means that adoption of groupage may reduce the barriers to a modal shift towards intermodal transport.
However, in order to make the service on the terminal profitable, shippers and forwarders should be persuaded to outsource groupage to the terminal operators.

Further research to evaluate the market potential of these services for the various Belgian terminal operators is thus required. More specifically, the calculation of the costs and the benefits for the clients and the terminal operators should be analysed carefully.

IV Fourth module : Modal scan analysis

The last module of this report deals with the analysis of logistic strategies of 10 Belgian firms working in various fields of activity. The analysis is done by means of the modal scan tool, which was set-up for this purpose. The Belgian modal scan tool builds further upon a modal scan methodology that was set up by Dutch researchers.

IV.1. Position of the problem

The first module of this report, which was devoted to the tool for the calculation of the intermodal prices, showed that intermodality could in certain cases be more economic than the unimodal road transport. The second and third modules showed that the integration of a number of specific value added services in the intermodal transport chain could lead the users

to use this transport mode more frequently. Unfortunately, these two modules also showed that without a voluntary attitude of the customers, the integration of added value services will never be able to deliver the anticipated results. As a consequence, it is very interesting to collect the opinion of the principal actors of the logistic chain, namely the companies which produce the goods. This is achieved by means of a modal scan of companies.

The main objectives of the modal scan are:

- To realise a modal shift from road towards the alternative transport modes, primarily rail and inland waterway;
- To identify the bottlenecks in multimodal transport;
- To stimulate the logistics managers of the companies to systematically think of multimodal transport as a credible alternative in their logistics strategy, in other words, not to choose systematically the road alternative;
- To inform the companies on the multimodal transport possibilities, which are at their disposal;
- To convince the logistics managers to really use the multimodal alternative.

The modal scan analysis is carried out using the following scheme:

1 Knowledge of the company

Information collected:

- Description of the activities: finished products, annual reports, …;
- Number of employees;
- Turnover (for 2002);
- Principal markets;
- Other.

2 Profile of the logistic organization

- Importance of the logistics system (number of employees assigned to the logistics tasks);
- Indication on the level of incoming and outgoing flows: quantities (in tons, number of trucks, number of containers, pallets, etc.);
- Modal split of incoming and outgoing flows (in general);
- Part of the transport cost in the total cost of the product;
- Other.

3 Experience with multimodal and intermodal transport

- Motivation of the choice of the currently used transport mode(s);
- Attention paid by management to alternative transport modes;
- The company experience with transport modes other than the road mode;
- Other.

4 Attitude towards the modal shift project

- Is the project recognized and supported?
- What are the conditions posed by the company to take part in the modal scan?
- Etc.

IV.2. Scanned companies and selection criteria

Five companies were selected in Wallonia and five other companies in Brussels and in Flanders. Two important parameters were used for the selection of the companies. Those parameters are:

- The importance of incoming and/or outgoing flows and
- The non-use of the intermodal transport mode by the company.

The presentation of the results of the modal scan is made anonymously in accordance with the request of the analysed companies. A calculation of the price of intermodal transport of certain flows is carried out. The calculated intermodal prices are compared with the road prices. From this calculation, it is derived that on specific corridors, the companies can make some profit by using intermodal transport, while on other corridors, the intermodal price is higher than the road transport price which cannot lead the companies to change their logistics strategies.

More generally, the modal scan revealed some interesting elements, which can constitute a potential for an effective modal transfer between the unimodal road mode and the intermodal mode when they are taken in account. The elements with a positive influence are:

- an awakening of the companies of production of the current and future difficulties related to the road transport mode,
- the voluntary attitude of the companies towards the integration of intermodal transport in their logistics scheme,
- the existence of a real potential which can be shifted to the intermodal mode.

Unfortunately, the study also revealed some bottlenecks which hamper an effective modal shift. These bottlenecks are mainly related to the quality of intermodal transport: price, reliability, frequency, and availability. Some policy initiatives and measures are suggested to solve a certain number of these difficulties: intervention of the public authorities, regrouping of the intermodal operators in order to better ensure the promotion of intermodal transport, creation of a website devoted to intermodal transport, bringing some large companies towards intermodality (retailers and wholesalers, car industry...). The table on the following page summarizes all these bottlenecks and the suggested solutions.

Outline of the bottlenecks in the Belgian intermodal transport

	Bottleneck	Solution suggested	Official authority	Shippers	Intermodal operators
1	Difficulties for the clients to find the intermodal price	Creation of a website devoted to intermodal transport	- Subsidise the creation of the website. - Promote the website	Consult the website	Provide the data (standard prices)
2	High cost of the pre and post haulage	Regrouping of the intermodal actors in order to be able to negotiate lower prices with the road operators	/	/	Negociate the pre and post haulage transport price with the road operators
3	The lack of the groupage service on the intermodal platform	Negotiate with the companies specialised in groupage and the shippers in order to attract them towards intermodal transport	Finance a complementary study to evaluate the potential of transfer (cost-benefit analysis + conditions of feasibility of this transfer)	/	Establish contacts with the specialised companies of the groupage and the shippers
4	Disastrous former intermodal experiments (high prices, weak frequency and lack of reliability)	Price: see point 2 Frequency: see point 3 (the frequency can be increased only if there are sufficient flows) Reliability: see point 10 (to add the tracking and tracing service)	- Subsidise the intermodal transport; Deal with a percentage of the costs as it is the case in some other countries (e.g. France and Germany). - To prohibit the carriage of goods by road between Saturday 22h and Sunday 22h (*as described in the European Commission proposal approved by the European Parliament in July 2002*), except if the operator can prove that the road transport is part of an intermodal transport chain.		- To attract more customers (see point 3), - To increase the frequency - To negotiate the price of pre and post routing with the road conveyors
5	Shippers unawareness of the intermodal possibilities	Creation of a website devoted to intermodal transport	- Subsidise the creation of the website. - Promote the website	Show interest in the alternative transport modes	- Promote intermodal transport - Meet the managers of the large companies located in a given radius (of a specified terminal)
6	Administrative slownesses	Accelerate the administrative formalities (e.g. the granting of the licence to build...)	Give priority to the treatment of requests for infrastructure works relating to intermodal transport	/	/
7	Empty trip = high cost	Use the website		Consult the web site	

		www.teleroute.be	/		/
8	Infrastructural bottlenecks	- Maintenance of the water ways (dredging) - Facilitate the access to rail for the companies located along the railroad.	Financing of a part of infrastructure works	Financing of the other parts of infrastructure works	/
9	Lack of value added services	Introduction of services of stevedoring and warehousing of goods and postponed production	Financing of a complementary study to evaluate the potential of transfer (cost-benefit analysis+ conditions of feasibility of this transfer)	Consider the subcontracting of certain logistic activities	Meet with the shippers, the maritime lines and the companies specialised in grouping
10	Incompatibility between the intermodality and some new production concepts (like the JIT concept)	Introduce specific value added services (e.g. stock management, tracking and tracing...)	/	Reorganize the logistic scheme of the company. The new scheme should take account of the duration of intermodal transport	Insert a tracking and tracing service so that the shipper (the firm) can intervene in the event of non-observance of the deadlines.

MODULE I INTERMODAL TRANSPORT PRICES

CHAPTER I

GENERAL ASPECTS OF INTERMODAL TRANSPORT

I.1. Introduction

The project « Bases of a growth of intermodal transport in Belgium: the search of 'missing links' » is a coherent set of research tasks carried out by two research teams: one from the Liège University and the other from the Vrije Universiteit Brussel (VUB). The common Brussels-Liège research team is today the main group carrying out research in the field of intermodal transport in Belgium. The current research project is based on several research projects conducted by both research centres in the (recent) past.

This former research led to the conclusion that both practicians as well as policymakers have to focus on specific elements in order to foster a better growth of intermodal transport in Belgium.

The team identified four elements that are the real « missing links », i.e. those elements that are not adequately taken into account in public policy or by intermodal transport managers. These are:

1. A follow-up tool for intermodal transport pricing;
2. An analysis of the most critical added value services that have to be provided by intermodal terminals operators;
3. A set of guidelines to optimize the packaging of goods in order to stimulate intermodal transport
4. A follow-up tool for "modal scan" analysis.

These four elements should be considered as the bases for a new policy, aiming at an approach of intermodal transport that will make it possible for the government to focus on the "missing links" of its overall transport policy. More specifically, this would lead to the development of a more attractive, transparent and cooperative environment for the various actors on the transport market rather than trying to develop an important global intermodal master plan. Such a plan might appear as attractive on paper but the efficient implementation of it would be quite difficult to realize.

The philosophy of the project is that a real transfer of unimodal road transport towards intermodal transport will only be feasible if the economic actors of both supply and demand chains can carry out specific actions by themselves or if they can identify new opportunities at micro-level thanks to which modal transfer would generate gains for companies.

The research team (VUB – Ulg) has identified the elements that should be further studied. Two of these elements are related to the demand, i.e.:

- The lack of modal integration exercises, which hamper the development of the image of intermodal transport as a valid alternative for unimodal road transport.
- The lack of transparency of intermodal transport prices

On the supply side, two main questions are to be addressed:

- The added value services needed to create an attractive logistics service offer to conventional users of road transport;

- The problem of small volumes groupage. Until today, the lack of groupage prevented many small and medium size companies to use the intermodal alternative.

Therefore, this report contains four chapters, each of them dealing with one of the missing links.

I.2. General methodology

This project consists of a detailed analysis of the four elements that are the missing links that would foster the growth of intermodal transport in Belgium. Each of these four elements make up a different module that is examined on the basis of four components:

1. International academic research on the topic;
2. Results of former research projects carried out by the research team;
3. Current (or lack of) efforts by different professional organisations and public agencies on the topic in Belgium as well as in other countries of the European Union
4. Consistency with the objectives of transport policies carried out by the national and regional government bodies in Belgium

The research methodology used by the team implies an in-depth approach and is complementary to more conventional approaches usually adopted by the academic research teams (for instance the proposals for the introduction of "road pricing", the funding of intermodal infrastructure, the PACT European programme, etc.).

CHAPTER II

METHODOLOGY FOR THE CALCULATION OF INTERMODAL PRICES

II.1. Definition of intermodal transport

In the field of transport of goods, intermodal transport is generally defined as the coordinated handling of goods in a continuous flow, from their point of origin to their destination, successively using different modes of transport.

II.2. Factors that influence the modal option

There are different factors that determine the use of one specific mode of transport instead of another, but for shippers, the dimensions of service (quality, speed and reliability) and price are most likely the ones that will influence the modal choice. In a free market situation, the success of the intermodal chain will therefore depend on its capability to adapt itself to the needs of the transport users and, in this respect, the existence of efficient modal interfaces is essential to the concept of "seamless transportation", i.e. the presence of a transport chain for which the transition from one mode to another will cause no delay nor any additional cost.

Most stakeholders should change their attitude in order to favour a better cooperation and collaboration among them all; such a change is vital to ensure the success of intermodal transport. In this respect, the development of intermodal transport is a challenge for partnership work and for the establishment of coordination between the various actors in the transport chain.

However, the collaboration between the various intermodal transport stakeholders raises another very important question; it concerns the real possibilities of combining the societal objectives such as road safety, conservation of road heritage or the mitigation of environmental impact, taking into account financial or commercial imperatives such as the reduction of transport times, minimum direct costs, just-in-time delivery and the reduction of inventories and costs associated to that process.

This study does not aim at showing that intermodality is "the solution" to all problems in today's transport chain. The study is rather aiming at proving that due to the adoption of various appropriate measures and due to the collaboration between all actors involved (practicians as well as Belgian public authorities), it is possible to foster a better growth of intermodal transport that takes into account both the interests of shippers and the sustainable development of society.

II.3. Models for the calculation of transport costs

II.3.1. General overview of transport costs

The total transport cost includes various items, which can be classified into different categories, i.e.:

- Transport "strictu sensu": all the costs due to the movement of one vehicle between its point of origin and its point of destination.

- Inventory value: costs generated by the storage of the goods for a certain length of time. This item includes real costs such as insurance premiums, interests and the opportunity cost (the transported goods represent a certain amount of inactive money that could be otherwise used).
- Handling, packaging, storage: costs due to the handling of goods, apart from transport itself. This refers to activities such as packaging, storing, loading and unloading.
- Indirect costs: costs that result from support activities to transport (administrative services …). Such costs are not easy to identify for a specific trip.

II.3.1. Mathematical models

According to literature, there are different models used for expressing transport costs. They can be classified into four broad categories:

On the basis of the following generic system:

Q : Quantity transported
CT : Total cost of transport
F_t : Average cost for one ton transported
S : Distance in km
T_s : Average cost (or marginal cost) per unit of distance travelled
F_t/tkm : Average cost per ton and per km
X : Average cost per convoy

- **Formula (a) : $CT=Q*F_t$**

Transport costs depend on the quantity transported, taking into account an average cost per transported unit, without considering the distance travelled.

However, this distance is sometimes implicitly taken into account in the definition of cost per transported unit. This cost formula is often used when transport is subcontracted by the company (contract).

- **Formula (b) : $CT=S*T_s$**

Transport costs depend on the distance travelled, taking into account an average or marginal cost per distance unit, without considering the quantities transported.

- **Formula (c) : $CT=S*Q*F_t/km$**

Transport costs depend on the distance travelled and the quantities transported, taking into account an average per unit of distance and unit of weight, for instance ton/kilometer.

- **Formula (d) : CT=X**

Transport costs are based on an average cost per convoy, without taking into account the distance travelled. This kind of formula is often used in case of routing problems for which the distances between the different places are supposedly known.

II.3.2. Practical models

Several studies on intermodal transport in general and more specifically, on the assessment of intermodal transport price, can be found in specialized literature. Among these studies, it is worthwile mentioning: Prognos, a study by A. Richey, Pets, Schutz der Erdatmospäre (German commission survey), the study by M Fonger, Pact, Impulse, Promotiq, Logiq, IQ, Recordit. A summary of these studies can be found in annexes 1 and 4.

Moreover, the members of the common VUB-ULg team have, on several occasions, been authors or co-authors of studies on transport costs. These studies have also been used as a reference for the present project. Several data are originating from these studies among which, without giving an exhaustive list, the following ones:

- Comparison of transport costs Wilrijk-Milan, a study carried out by the VUB ;
- The role of railways in the promotion of combined transport, carried out by Anast-ULg.

II.3. Comparison and model selection

The analysis of the points mentioned above allows us to present the following comments concerning the calculation models of intermodal transport costs:

a) Mathematical models

The above-mentioned mathematic models calculate transport cost on the basis of the quantity transported and the distance travelled, using simple formulas. Unfortunately, such models have two major disadvantages:

- The calculations more often than not only deal with the transport element as such. In these models, it is indeed difficult to include the element related to the stop in transhipment terminals. These models are therefore difficult to apply in the case of intermodal transport;
- These models refer to a cost per load unit and distance travelled, information that is only available after observing, over a long period of time, the data concerning transport for a specific region and corridor.

The mathematical model will therefore not be used in the present study because of the above-mentioned disadvantages.

b) Practical models

Alongside the models based on a mathematical system, there are other practical models that have been developed within the framework of national and European studies that calculate the cost of transport thanks to the analysis of a well-defined transport route. These practical models allow us to determine the prices for intermodal transport thanks to the various prices applied by the actors of the transport chain. There are three very specific important elements in these models: the definition of the corridor to be analysed, the loading unit concerned and the kind of goods as well as the packaging used.

The major disadvantage here is caused by the problems arising from data collection among the actors of the intermodal chain as well as the validation of such data. However, this methodology has been chosen for our study, as the objective of this work is to determine a practical method to calculate the price of intermodal transport. More specifically, a model that would allow a shipper to calculate the price it will cost to transport goods between well-defined origin and destination points. As a consequence, it is obvious that these practical methods are more appropriate to try to solve this kind of problem as compared to the mathematical models.

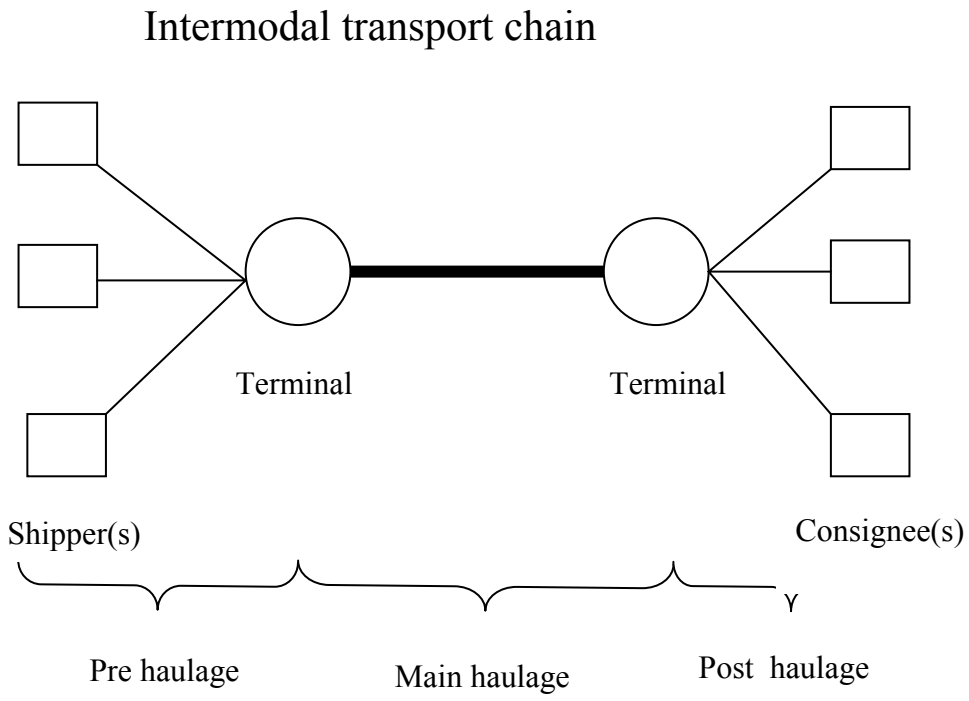
We will therefore calculate the intermodal price for the transport of a container between a point of origin and a point of destination in Belgium. The corridors to be analyzed and the loading unit are clearly determined. The kind of goods, as well as the packaging used, are two parameters that are implicitly taken into account. In fact, the objective is to transport all kind of goods in containers.

CHAPTER III

INTERMODAL TRANSPORT PRICES IN BELGIUM

III.1. Actors in an intermodal transport chain

There are several actors who successively intervene in the intermodal transport chain for the movements of goods between two points. The intermodal chain can be presented as follows:



The above figure highlights various budget items, which form the cost of the whole intermodal chain. These costs concern:

- The shipper or the consignee
- The pre and post haulage road transport
- The costs of the terminal, which in Belgium can be:
  - Either a river terminal,
  - Either a railway terminal,
  - Or a shunting yard.
- The main transport

III.2. Global structure of intermodal transport cost

The practical calculation of the intermodal price requires that we know all the real cost elements at the level of each actor of the intermodal transport chain. Such elements are presented in the table in Annex 2. In this table, the sign "X" placed in front of an item means that the cost is paid for by the player involved. The costs grid is presented in such a way that it is as general as possible in order to allow anyone to use it to assess his/ her transport costs in an effective and efficient way. However, it might happen that, according to the situation, some of these elements are not essential because they have already been included in another cost item. A double counting should be avoided in order to avoid a false image of the final result.

III.3. How does the intermodal transport chain work in Belgium?

In general terms, the intermodal transport chain in Belgium includes the following main actors:

- A shipper (or a consignee);
- A road haulier for the pre or post haulage of the container towards/from the transhipment point (for an export operation) or the final customer (in the case of an import operation);
- A terminal operator for the transit of the containers transported that will deal with handling operations and, if need be, the intermediate storage;
- A main carrier.

At the very beginning of the chain we find the shipper. Between him and the first transhipment post (which can be a river terminal, a railway terminal or a shunting yard) there is the road pre haulage. The second step concerns the unloading operations at the first transhipment post.

The main transport operation will be carried out either by train or by inland waterway. Therefore, the research team does not take into account coastal short sea shipping nor piggyback traffic. Such a haulage operation would only be interesting for intermodal transport between Belgium and overseas countries, which is out of the reach of the present study. The goods (in this case the container) then arrive at the seaport (Antwerp or Rotterdam), which represents the end of the analyzed intermodal chain. It is important to stress that the calculated price does not include the price of the operations at the maritime terminal. The handling cost is the same for a container arriving at the maritime terminal, either by train, vessel or truck. As a consequence, the parameter "cost of operations carried out at the maritime terminal" is not an element that will make a difference in the price of transport between intermodal or all-road solutions.

The process described above refers to an export operation. For an import operation, everything stays the same, the chain only being inverted in that case.

Using the description of the intermodal transport chain, we can define several items which constitute the total price of intermodal transport in Belgium:

- Pre/post haulage (price of road haulier),
- Transhipment (price for the handling of a container in a terminal),
- The main transport operation (carried out by barge or by train).

III.4. Definition of intermodal scenarios and collection of data

Using the description of the intermodal transport chain in Belgium, we can define two scenarios. The main difference between these scenarios is the fact that the main transport operation will be done either by rail (the rail intermodal scenario) or by inland waterway (the intermodal river scenario).

The collection of data among the various stakeholders (transport experts as well as professional transport organisations) involved in both scenarios was done by way of interviews.

It should be noted that it was not possible to obtain all the cost elements for each of the intermodal transport chains identified in Belgium, as most actors invoked professional confidentiality. Therefore, the research team was not able to calculate the intermodal price for all intermodal corridors in Belgium. Nevertheless, the intermodal prices have been calculated using the privileged relations of trust established between the research team and some Belgian intermodal operators, as well as many other specialists (road hauliers, bankers, etc). During the process, the research team obtained interesting data that allowed to calculate the intermodal price on three corridors, i.e. Liège-Antwerp, Avelgem-Antwerp and Vilvoorde-Antwerp for the river intermodal scenario.

Concerning the rail intermodal scenario, using the data provided by the Belgian railway operator IFB (a subsidiary of the national railway company), the research team was able to calculate the intermodal prices for the following corridors: Antwerp – Zeebrugge (110 km), Antwerp – Mouscron (190 km), Antwerp – Renory (125 km), Antwerp – Bressoux (125 km) and Antwerp – Athus (325 km).

III.5. Practical calculation of intermodal prices

III.5.1. General formula for intermodal prices

As the intermodal transport price in Belgium is the total sum of three cost items as explained above, it is calculated on the basis of the following formula:

$$TI = TR+TT+TP$$

In which:

TI : Price of intermodal transport

TR : Price of pre/post haulage road transport

TT : Price of terminal handling operations

TP : Price of main haulage transport

III.5.2. Price of pre/post haulage (TR)

Considering the disparity between the information received from different sources, the research team thought it useful to exploit all data in order to define a price that can be considered as the one commonly applied in Belgium. The conversations with various road transport experts resulted in a price between 100 and 150 euros for the pre/post haulage road operation of a container in an area of 40 kilometres around a river or rail terminal. As a consequence, it can be considered that the average price for road transport of a container in a maximum area of 40 km around a terminal in Belgium would be of an average of 125 €. However, it was decided to use the amount of 100 euros as a basis for the calculation of

pre/post haulage road operation in an area of 40 km, because the research team wanted to define a price that would be favourable to intermodal transport as compared to road transport. It is indeed very likely to envisage pre/post haulage road prices of some 100 euros if the intermodal operators can form a group and negotiate such a price with road hauliers.

III.5.3. Price of terminal handling operations (TT)

a) Rail terminal

Generally speaking, we can consider that the simple handling of a container in a terminal managed by IFB costs around 30 euros, "simple handling" meaning here the placement of a container on a wagon, the unloading of the container in the storage area, the picking-up of the container from that same area and its loading onto a truck for its transport to the customer (who is the owner of the goods).

b) River terminal

The price for handling operations at a river terminal amounts to 50 euros (2 X 25 euros) according to the information provided by terminal operators.

III.6. Price for the intermodal rail scenario

III.6.1. Introduction

It is important to note from the outset that there exists no global price system for rail transport of containers in Belgium. Usually, for a specific railway track or corridor, each transport operation requires to calculate the cost in order to determine the price for the container. In fact, as experience shows, the calculation is done only once and the price is defined once and for all for the railway corridor concerned.

Table III.1. indicates the prices per TEU (twenty foot equivalent unit) for some of the rail corridors regularly used by IFB.

Train Zeebrugge – Muizen :				
Price (*)	3000		price per TEU	37,04
Capacity	81 TEU			
Train Antwerp – Muizen				
Price (*)	3000		price per TEU	37,04
Capacity	81 TEU			
Train Mouscron – Muizen				
Price (*)	3000		price per TEU	37,04
Capacity	81 TEU			
Train Athus – Muizen				
Price (*)	5000		price per TEU	61,73
Capacity	81 TEU			

Table III.1 : Price of rail transport[1]

[1] Source : Commercial service of Inter Ferry Vessels (IFB).

III.6.2. Organisation model of rail transport

The transport of containers is organized following the « hub and spoke » model represented here:

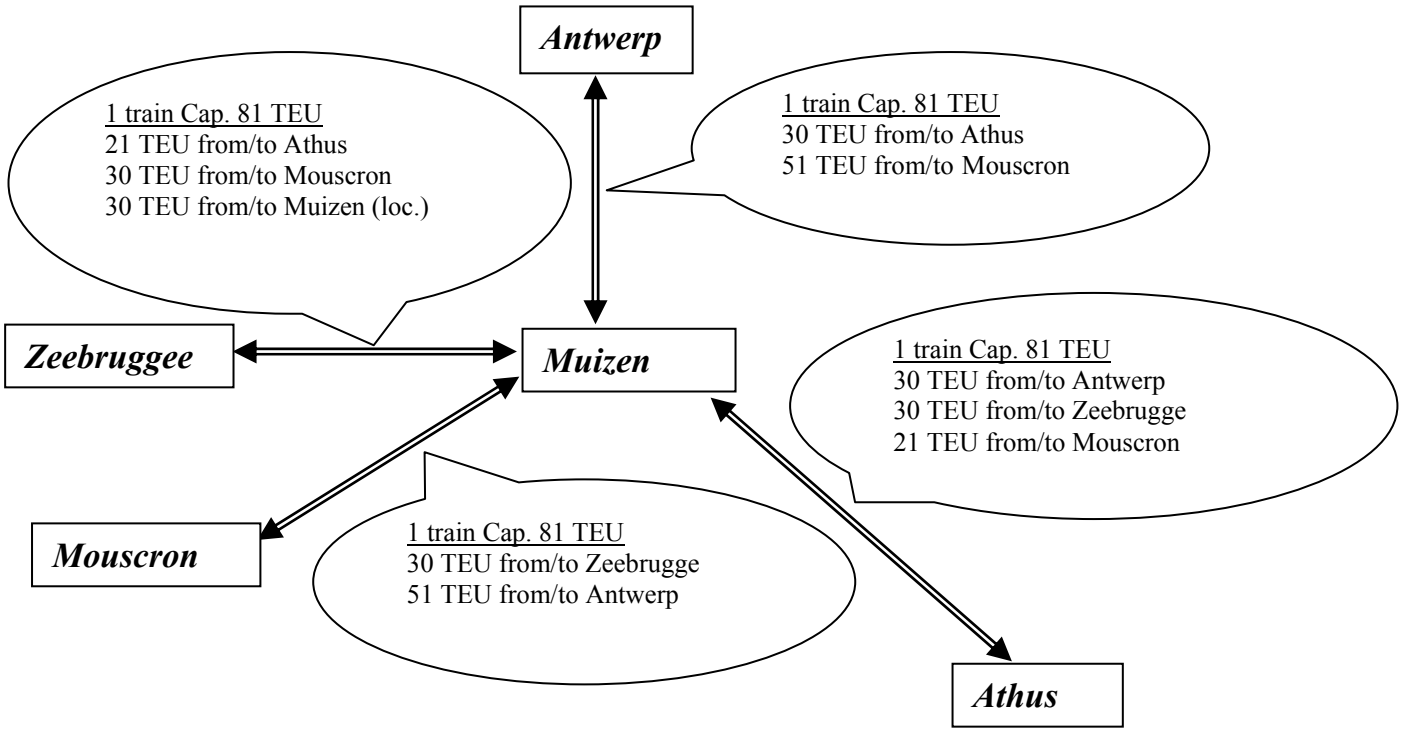


Figure III.1 : Example of ''Hub and Spoke'' organisation model

The main feature of this organisation model is that the containers with different destinations are collected at the various rail terminals (end of the spokes), after which they are sent to a central terminal (hub) where the convoys are reconstituted on the basis of the various final destinations (spokes) of the containers.

III.6.3. Calculation hypothesis

Considering that in 95% of the cases, rail transport is a one-way operation because most containers are import containers, we limited ourselves to the one-way transport price. In some cases, the shipping line, owner of the container, charges an additional cost of 30% for the empty return trip of the container. However, in most cases, the company will always find return freights through the import customer, to assure that the return trip of the container is paid for by the export customer. In this study, we consider that there is always an export customer and that the price calculation can therefore be limited to the one-way model. In the following paragraphs the price for rail intermodal transport is calculated for the following rail corridors:

1 Antwerp - Zeebrugge
2 Antwerp - Athus
3 Antwerp - Mouscron
4 Antwerp - Bressoux
5 Antwerp – Renory

Our calculations are based on the following hypotheses:

- Import scenario;
- Transport is in one direction only or "one-way";
- Existence of an export customer;
- Loading factor of 65%;
- Handling price per container: 30 euros;
- Road transport price for pre/post haulage: 100 euros.

III.6.4. Railway price for the line Zeebrugge – Antwerp

a) Tarif per TEU[2]

With a length of 110 km, the rail corridor Zeebrugge – Antwerp is the one with the highest frequency among all the lines exploited by IFB.

The basis for the calculation is a convoy formed by a locomotive and 30 wagons, which is the one most often used on this line. The traction cost equals 200 euros per trip while the renting of a 3 TEU wagon equals 20 euros per trip. The convoys have thirty 3 TEU wagons, total capacity therefore being equal to 90 TEU. Each wagon transports a 20'container and a 40' container. The total cost for renting the convoy thus equals 2600 euros, or a cost of 28.89 euros per TEU per trip or a cost of 86.67 euros per wagon per trip. As a wagon is loaded up to 40% with 20' containers and up to 60% with 40', the cost for a 20' equals 40% of 86.67 euros, i.e. 34.67 euros, and the cost for a 40' equals 60% of 86.67 euros, i.e. 52 euros.

It should be noted that these costs are estimated on the basis of a loading factor of 100%, with all containers well loaded (~15 tons for a 20' and 24 tons for a 40'). In fact, the real loading factor is between 65 and 70%. With a loading factor of 65%, the costs would equal 53.34 euros for a 20' and 80 euros for a 40'.

b) Global rail price

For a 20' container, the rail transport cost is calculated as follows:

53.34 + 30 = 83.34 euros.

The rail intermodal price on the corridor Zeebrugge – Antwerp is obtained by adding to this price the cost of pre/post haulage road transport, i.e. 100 euros. The rail intermodal price will therefore equal 183.34 euros.

For a 40' container, the price equals 120 euros for rail transport and 220 euros for intermodal transport.

III.6.5. Antwerp – Athus

The diagram of figure 1 shows that transport between Athus and Antwerp is based on the following steps:

1 Transport Antwerp – Muizen,

2 Transport Muizen – Athus.

As Muizen is not really a « physical destination » for the goods but only the 'hub' or a shunting yard where containers are not unloaded onto trucks, the calculation is as follows:

[2] TEU = twenty foot equivalent unit

a) Theoretical calculation

The price Antwerp – Athus is equal to the one of Antwerp – Muizen (i.e. 37.04 euros/TEU) added with the price Muizen – Athus (i.e. 61.73 euros/TEU). The transport for a 20' container is therefore calculated as follows:

98.77 euros + 30 euros (handling) = 128.77 euros. This is the price for a 100% loading factor. In reality, the loading factor applied is between 65 and 70 %. It is therefore considered that 30 to 35% of the capacity is not used.

Taking into account this capacity utilization rate, the calculation for the Antwerp – Athus corridor is as follows:

- Antwerp – Muizen (30 TEU foreseen for Athus) = (3000/81)*30 = 1111.10 euros
- Muizen – Athus (30 TEU from Antwerp) = (5000/81)*30 = 1851.85 euros

The total price for Antwerp – Athus equals 1111.10 + 1851.85 = 2962.95 euros using a 100% loading factor. For a 65% loading factor, the price is calculated as follows:

2962.95 / 65% = 4558.4 euros, or a price per TEU of 4558.4 / 30 = 151.95 euros and 181.95 euros (if we include the handling operations). In theory, the transport of a 20' container will cost 181.95 and the transport of a 40', 363.9 euros.

b) Pratical calculation

The calculation of the price applied by the railway operator is based on the fact that a wagon of 3 TEU capacity is generally loaded with one 20' container and one 40' container, which implies that a 20' will cover 40% of the costs and a 40' will cover 60% of the costs. With a total price for the renting of a wagon of 3 TEU capacity equal to 3*151.95 = 455.85 euros, the price for the transport of a 20' is 40% of the total price, i.e.: 40%*455.85 = 182.34 euros.

With the addition of 30 euros for handling operations, the total price for one-way transport of a 20' is: 182.34 + 30 = 212.34 euros.

The same elements give us a total price of 303.51 euros for the one-way rail transport of a 40' container.

The intermodal price on this corridor is of 312.34 euros for a 20' container and of 403.51 euros for a 40'.

III.6.6. Antwerp – Mouscron

The calculations show the following results:

For a 20' container:

Railway price : 166.76 euros (including handling operations)
Intermodal price : 266.76 euros

For a 40' container:

Railway price : 235.14 euros (including handling operations)
Intermodal price : 335.14 euros

III.6.7. Renory – Antwerp

The price for renting a wagon of 3 TEU capacity is equal 150 euros on this corridor. Considering once again a loading factor of 65%, the calculations show the following results:

For a 20'container:

Railway price : 122.3 euros (including handling operations)
Intermodal price : 222.3 euros

For a 40' container:

Railway price : 168.46 euros (including handling operations)
Intermodal price : 268.46 euros

III.6.8. Comparison of road and railway prices

Corridor	Price (€)		Road Price (€)
	20' Container	40' Container	
Renory – Antwerp	222,3	268,46	260
Mouscron – Antwerp	266,76	335,14	285
Athus – Antwerp	312,34	403,51	400
Zeebrugge – Antwerp	183,34	220	200

Table III.2: Comparison of road and railway prices

Table III.2 shows that the railway price is less expensive than the price of unimodal road transport for a 20' container. On the other hand, the price for the 40' container is more expensive. Moreover, figure III.2 on the next page shows that the influence of pre/post haulage road as well as that of handling operations on the intermodal price decreases with the increase of the distance between the railway terminal and the port of Antwerp. This decrease is much more important in the case of 40' containers as compared to 20' containers.

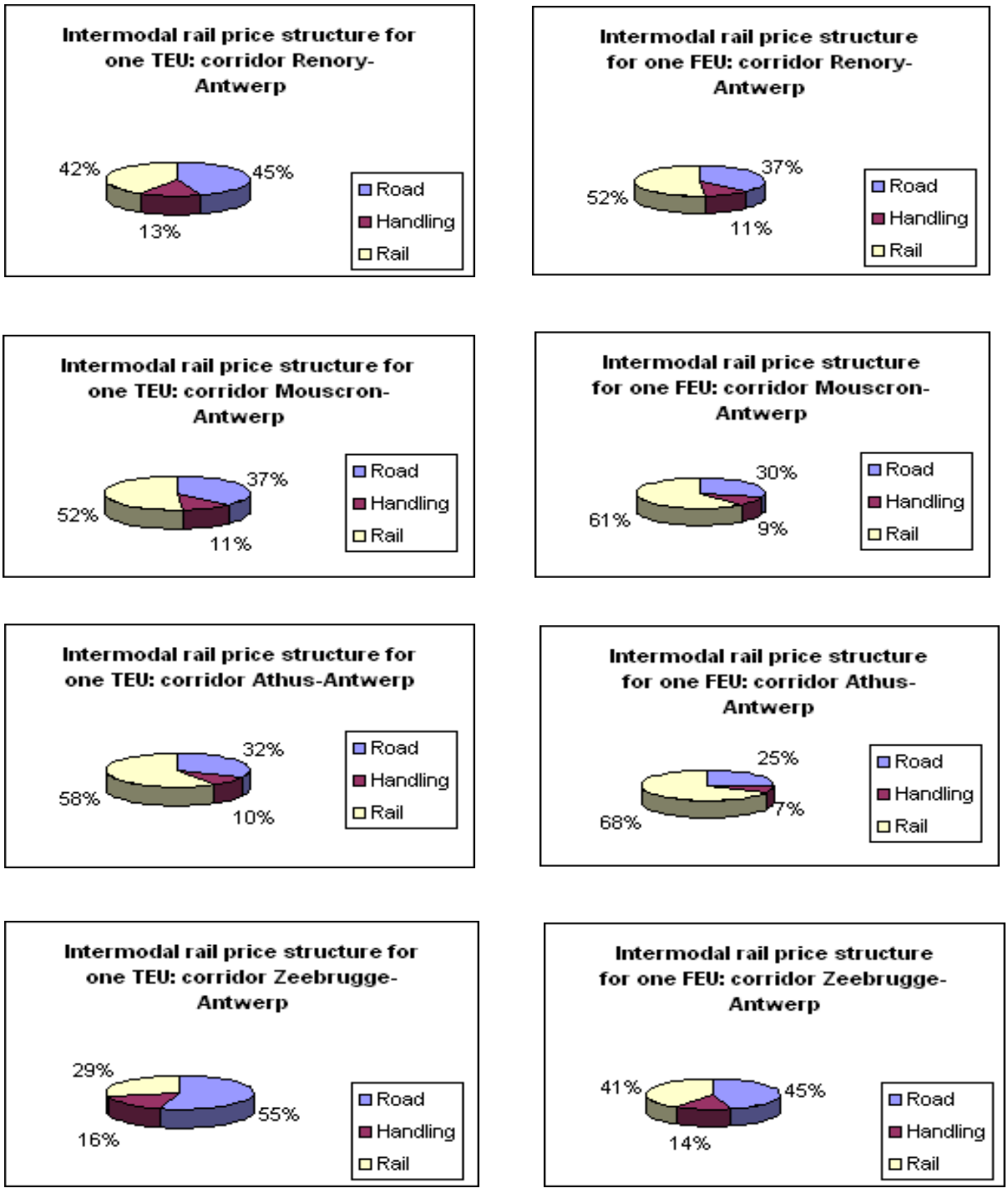


Figure III.2: Structure for the railway transport price in Belgium

III.7. Price for the river intermodal scenario

III.7.1. Calculation hypothesis

The calculations for the price of river intermodal transport are based on the following hypotheses:

- Containers are transported on a complete round trip;
- The outward trip is with loaded containers, the return trip with empty ones;
- The price for handling operations at the river terminal equals 50 euros for the whole transport process;
- The customer (shipper or final consignee) is located within a radius of 40 km from the river terminal;
- The pre/post haulage road price equals 100 euros.

The calculations of this section were made possible thanks to the cooperation of intermodal operators based in the regions of Avelgem, Vilvoorde and Liège.

III.7.2. Avelgem – Antwerp corridor

a) Price for a 20' container

Outward trip loaded: 100 euros
Return trip empty: 50 euros
Round trip and handling: 100+50=150
Pre/post haulage road transport: 100 euros
Intermodal price: 100+50+100= 250 euros.

b) Price for a 40' container

Outward trip loaded: 100 euros
Return trip empty: 80 euros
Round trip and handling: 100+80=180euros
Pre/post haulage road transport: 100 euros
Intermodal price: 180+100= 280 euros.

c) Road transport for the containers between Avelgem and Antwerp

Unimodal road transport price for a 20' or 40' container between Antwerp and Avelgem: 240 euros.

III.7.3. Vilvoorde – Antwerp corridor (50 km)

a) Price for a 20' container

Round trip + handling: 99 euros
Intermodal price: 99+100= 199 euros

b) Price for a 40' container

Round trip + handling: 128 euros
Intermodal transport: 128+100= 228 euros

c) Road transport for the containers between Vilvoorde and Antwerp

Unimodal road transport price for a 20' or 40' container between Antwerp and Vilvoorde: 110 euros.

III.7.4. Liège – Antwerp corridor

a) Price for a 20' container

Round trip + handling: 150 euros
Intermodal price: 150 + 100 = 250 euros

b) Price for a 40' container

Round trip + handling: 160 euros
Intermodal transport: 160 + 100 = 260 euros

c) Road transport for the containers

Unimodal road transport price for a 20' or 40' container between Antwerp and Vilvoorde: 260 euros.

III.7.5. Comparison of river intermodal and all-road prices

a) Avelgem-Antwerp corridor

As we could not obtain data on railway transport for containers between the cities of Avelgem and Vilvoorde and the Port of Antwerp, the comparison is limited to the prices between road and river options.

Scenario	**Price for one TEU**	**Price for one FEU**
River	250 €	280 €
All-road	240 €	240 €

Tableau III.3: Comparison of containers transport for the Avelgem-Antwerp corridor

b) Vilvoorde-Antwerp corridor

Scenario	**Price for one TEU**	**Price for one FEU**
River	199 €	228 €
All-road	100€	100 €

Tableau III.4: Comparison of containers transport for the Vilvoorde-Antwerp corridor

c) Liège-Antwerp corridor

Scenario	**Price for one TEU**	**Price for one FEU**
Rail	224 €	240 €
River	250 €	260 €
All-road	260 €	260 €

Tableau III.5: Comparison of containers transport for the Liège-Antwerp corridor

III.7.6. Structure of the river intermodal transport price

The structure of the intermodal transport price as presented in figure III.3 shows that there is an important influence of road transport prices and handling operations on the global price of intermodal transport for the corridors covered by this study. This influence is even more explicit when the river terminal is situated closer to the port of Antwerp. Both pre/post haulage road transport and handling operations have a very negative impact on the price of intermodal transport.

In order to try and mitigate these effects, derived from the use of road and the handling operations for intermodal traffic, it is desirable that intermodal operators integrate all transport operations from the shipper to the seaport terminal. By doing so, they will be able to control both the pre/post haulage transport and handling operations prices.

A stronger cooperation between the various actors of the intermodal chain is also to be favoured. This will allow for a sound development of intermodality since the various stakeholders will not act as competitors any more but rather as partners, each of them taking into account the others' interests.

The creation of a dedicated association for the development of intermodal transport in Belgium, that would gather together all the actors intervening in intermodal transport, is to be promoted. This association would be responsible for the identification and analysis of all the problems that slow down the growth of intermodal transport and would also identify and try efficient solutions to solve them.

Furthermore, this association would also aim at maintaining contacts with the shippers, in order to inform them about any kind of progress in the field of intermodal transport (increase of the number of services from the main seaports – Antwerp, Rotterdam – reduction of prices, etc.) and continue to collect their opinion on the attractiveness of intermodal transport.

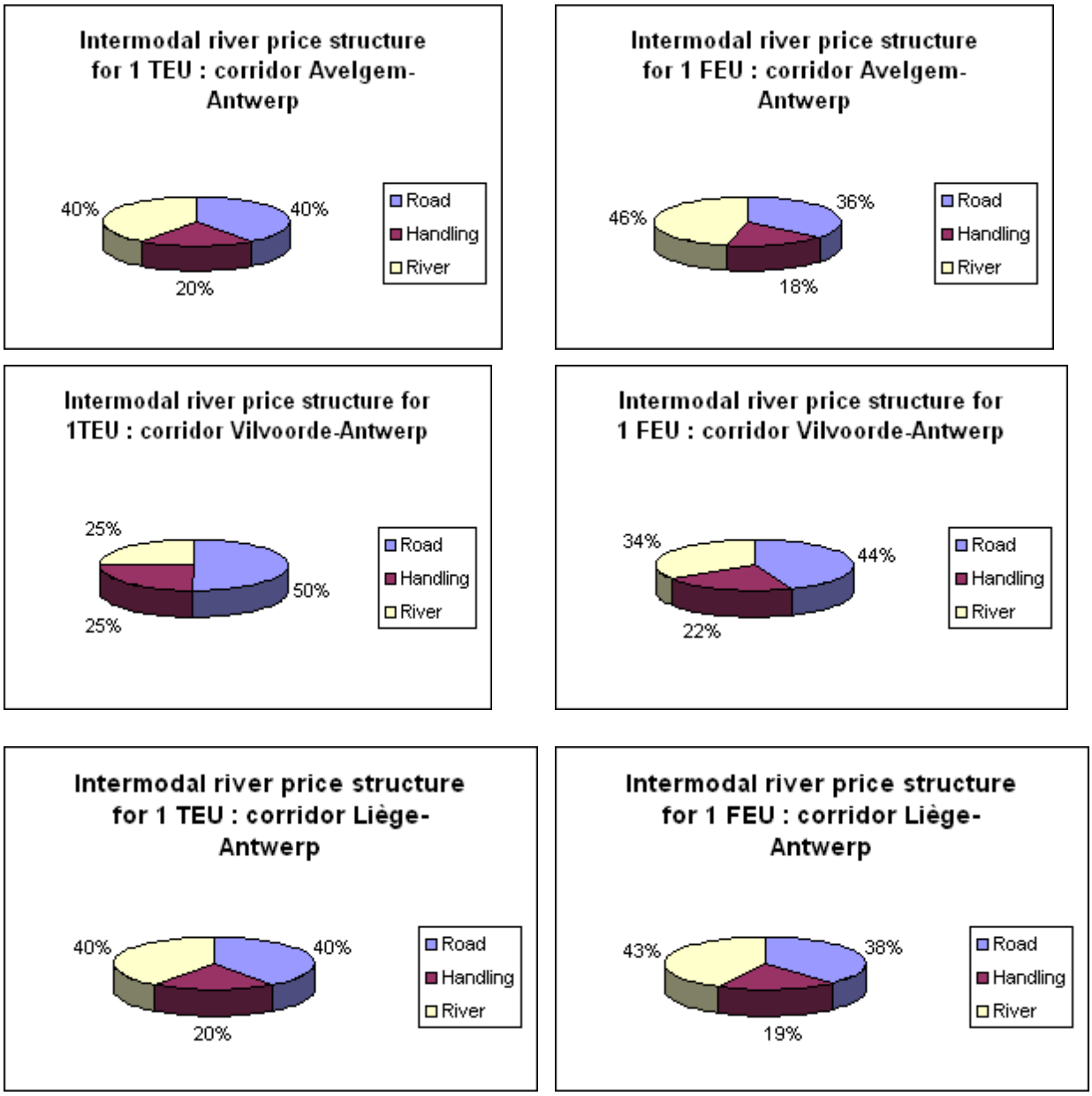


Figure III.3: Structure of river intermodal transport price

CHAPTER IV

SENSITIVITY OF INTERMODAL TRANSPORT IN BELGIUM

IV.1. Introduction

In chapter III, we have defined the price of intermodal transport for containers in Belgium in the case of river and rail intermodal scenarios. These calculations were based on the information collected among the actors involved in such scenarios. The present chapter deals with the analysis of the sensitivity of intermodal prices in Belgium in the case of the river scenario. As a matter of fact, the interviews with the river transport stakeholders confirmed that there are some parameters that strongly influence the price of river transport for containers. These parameters essentially concern the quantity of 20' and 40' containers loaded per trip, the number of trips per week and the loading factor of the vessel.

IV.2. Analysis procedure

In order to be able to analyze the influence of a specific parameter, a calculation model for the transport price in the case of river intermodal transport has been designed (see Annex 3). In this model, prices for the handling operations and the pre/post haulage road transport are constant and respectively amount to 50 and 100 euros.

Generally speaking, the model takes into account the features of the vessel (dimensions, propellers …), the cost for the staff and many other parameters such as described in Annex 3. In order to calculate the price of intermodal transport, and considering the price strategies adopted by the intermodal operators, the research team considered 50% of the river transport price as the profit margin for a transport operation.

IV.3. Validation of the model

Before applying the model within the framework of this sensitivity study, it had to be tried out in order to validate it. This was achieved by using the expertise of some Belgian river operators. Using the real data they provided us, we calculated the price of intermodal transport, by applying the model, and the model results were compared with their own calculations. The results were considered as satisfactory and therefore, the model could be validated. Prior to this, the operators also validated the data that were collected by the research team among various sources including the ship owners, waterways managers, financial experts, etc.

IV.4. Case studies

The model developed was applied to the case of river transport and was based on two different kinds of vessels: one of 1350 tons and another of 2000 tons. These two categories of vessels are indeed well-suited for container river transport. Several sub-cases have been tested. The influence of parameters such as the dimension of the transport unit, the loading factor and the loading programmes are analyzed. The results of the calculations are included in tables IV.1 and IV.2 hereafter.

1350 ton vessel: LF = 100%

Condition of the vessel	*Exploitation system*	*River cost per TEU*	*Intermodal price*
Second-hand	Owned	41.40	212.10
	Rented	60.07	240.11
New	Owned	51.84	227.76

2000 ton vessel

Condition of the vessel	*Exploitation system*	*River cost per TEU*	*Intermodal price*
Second-hand	Owned	36.39	204.58
	Rented	51.08	226.62
New	Owned	45.99	218.99

Tableau IV.1 : Comparison of transport prices. Loading Factor (LF)=100%

Case 2 Loading factor: 75%

1350 ton vessel

Condition of the vessel	*Exploitation system*	*River cost per TEU*	*Intermodal price*
Second-hand	Owned	55.20	232.80
	Rented	80.1	270.15
New	Owned	69.12	253.68

2000 ton vessel

Condition of the vessel	*Exploitation system*	*River cost per TEU*	*Intermodal price*
Second-hand	Owned	48.52	222.77
	Rented	68.11	252.17
New	Owned	61.32	241.99

Table IV.2 : Comparison of transport prices. Loading factor (LF)=75%

IV.5. A few lessons

The analysis of the cases allowed to learn a few interesting lessons. All things being equal for other aspects, the price of river intermodal transport decreases with the increase of the capacity of the transport unit. Tables IV.1 and IV.2 show that prices are lower for the 2000 tons as compared to the 1350 tons.

As far as the loading factor (or the using rate) is concerned, figure IV.1 shows that the cost of river transport decreases when the using rate of the vessel increases. This favours the increase of the quantities transported by the vessel units. One of the measures that would allow to reach such an increase would be to use low tonnage units that would be loaded on three levels. Unfortunately, this solution is not possible yet because of the limited draft of the bridges in the Belgian waterway system.

For the comparison between loaded 20'/40' containers, figure IV.2 shows that it is more interesting to transport only 20' containers, for which the intermodal price per container is lower, i.e. 266.71 euros. Unfortunately, such an option is to be discarded since it would imply that vessels as a whole would be assigned to the transport of 40' containers, with the highest price per container, i.e. 383.42 euros per container.

Figure IV.1 : Influence of loading factor on river and intermodal prices

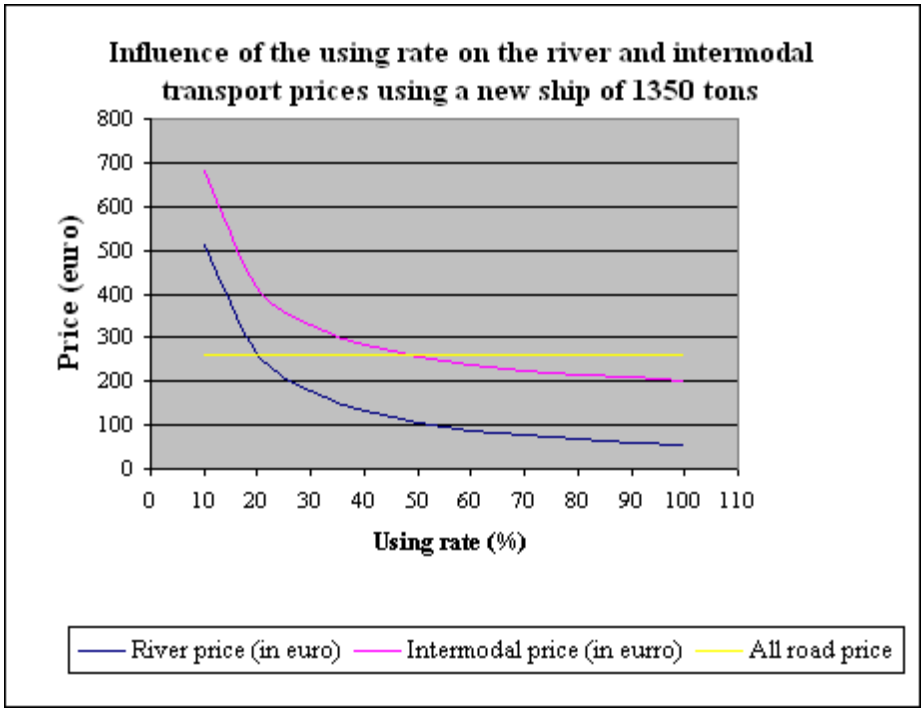
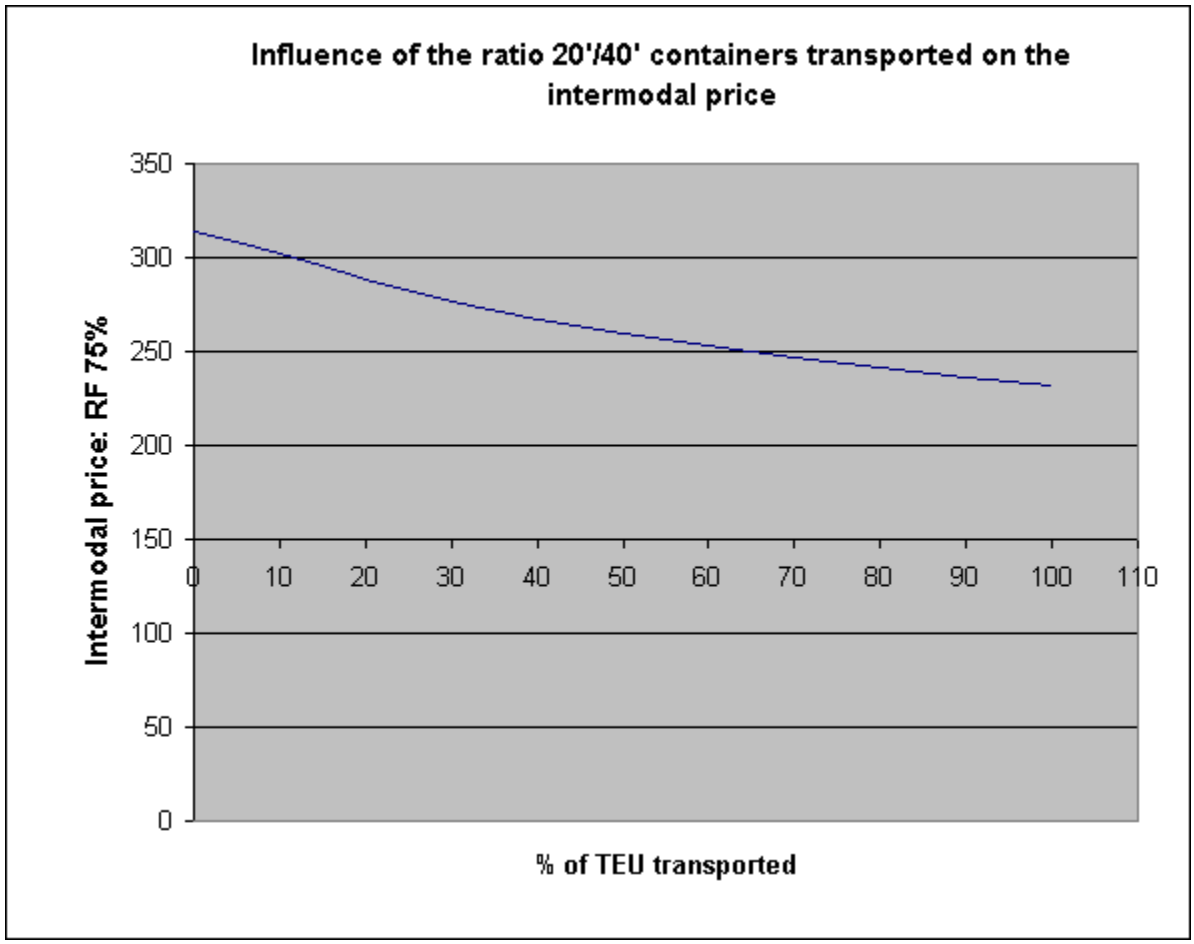


Figure IV.2 : Influence of the ratio between 20'/40' containers transported on intermodal price .



IV.6. Conclusion

The intermodal prices calculated in this section of the study show that it is possible to improve the competitivity of intermodal transport as compared to unimodal road transport. One of the policy measures to do so is through the creation of a real intermodal pool in Belgium that would gather all the intermodal actors. The objective of such an intermodal pool will be to defend intermodal transport through its promotion among shippers and other potential customers and through the negotiation with road hauliers of more interesting pre and post haulage road transport prices.

On the other hand, the research team believes that the development of intermodal transport largely depends on its capacity to persuade potential customers that it can offer a real alternative to road transport, and that it takes into account their production imperatives: respect of schedules, acceptable frequency, reliability, etc.

The fact that this transport mode shows growth figures on the corridors we analyzed shows that an increasing number of shippers believe in this transport model. The control of costs should therefore have a positive impact on the development of intermodal transport.

References module I

1 Journal ''Le Lloyd'', édition du 7/juin/2002, page 2.

2 Analyse du coût d'exploitation des navires sur les voies d'eau intérieures : rapport du Groupe de Travail n°11 du Comité Technique Permanent I de l'Association Internationale Permanente des Congrès de Navigation. 1991.

3 Patrick COUDIJZER : Calcul du coût de transport par voie d'eau intérieure, mémoire de fin d'études, Université de Liège, 1993.

4 Bart A. M. JOURQUIN : Un outil d'analyse économique des transports de marchandises sur des réseaux multi-modaux et multi-produits : LE RESEAU VIRTUEL, concept, méthodes et applications ; Thèse de doctorat, 1996.

5 Rafael SANCHEZ : L'intermodalité au Québec : entre le mythe et la réalité. Article paru dans la révue : Routes et Transports, vol. 25, N°4, Hiver 1995-1996.

6 Michel MARQUIS : Deux nouveaux systèmes intermodaux pour le transport de marchandises à courte et moyenne distances au Québec. Article paru dans la révue : Routes et Transports, vol. 25, N°4, Hiver 1995-1996.

7 RECORDIT : Real Cost Reduction of door-to-door intermodal transport. European study on the calculation of the intermodal transport cost. February 2002.

8 Policy options for intermodal freight transportation, transportation research board, Washington D.C., 1998.

9 Shifting cargo to Inland Waterways, final report, by Anast Liège, EBD Duisburg and ÖIR Vienna. April 1998.

10 Shifting cargo to Inland Waterways First interim report. December 1996

11 J. MARCHAL : Analyse du matériel de navigation, des infrastructures de transport et de leur adéquation à la demande de transport, recherche réalisée pour le compte du Ministère de l'Equipement et des Transports, novembre 1995.

12 Anast, service du professeur Marchal : Le transport par voies navigables et son développement durable : Analyse du marché - Possibilités de transfert de marchandises ». Rapport de recherche, juin 1998.

13 Anast, service du professeur Marchal : Le transport par voies navigables et son développement durable : Analyse stratégique du marché - Questionnaires et interviews de marchandises ». Rapport de recherche , juin 1999.

14 J. Marchal, S. Rodriguez : Etude d'un plan d'actions à mettre en œuvre dans le secteur du transport par voies navigables. Etude réalisée pour le compte du ministère belge des travaux publics, juin 1993.

15 C. Gulan : Etude des problèmes posés par le transport fluvial pour le développement des exportations au Cameroun. Novembre 1987.

16 Z.Zhang, J. Marchal : Multi-modal Freight Transport with Intensive Utilization of Inland Waterways Transport mode. Research report. Juin 2000.

17 J. Marchal, F. Nzengu, C. Coolen : Rapport relatif au développement d'un outil de modélisation du calcul du coût global du transport fluvial, étude réalisée pour le compte du ministère wallon de l'équipement et des transports, décembre 2000.

18 CPDT – LEPUR : Optimisation des grandes infrastructures : Tome III : Transport fluvial et intermodalité. Rapport final, septembre 2000.

19 CPDT-Rapport final – Thème 2 : Gestion de la mobilité et de la multimodalité. Tome 2 : Le transport ferroviaire. Etude réalisée par LEPUR pour le Ministère de la Région Wallonne. Septembre 2001.

20 Sarah Vanderstraeten : De structurele beschrijving van transportkosten : Mémoire de fin d'études. 2002

21 Harilaos Psaraftis, Evimar working group WG 4.2 : Door-to-door intermodal technologies, final report. November 2002.

22 Policy options for intermodal freight transportation : Transportation Research Board special report 252. National academy press. Washington D.C. 1998.

23 City logitics. Network modelling and intelligent transport systems. Elsevier science Ltd.

24 A. M. Newman and C. A. Yano : Scheduling Direct and indirect trains and containers in an intermodal setting. Papers published in the Transportation Science Journal, pp 256-270, vol. 34, Number 3. August 2000.

25 W.-J. Van Schijndel, J. Dinwoodie : Congestion and multimodal transport : a survey of cargo transport operators in the Netherlands, in the Transport policy journal, pp231-241 vol.7 N° 4. October 2000.

MODULE II ADDED VALUE SERVICES

CHAPTER I

INTRODUCTION

Freight transport by road increases in relative and absolute importance in the European Union as demonstrated by the European Commission White Paper "The European Transport Policy for 2010 : Time to decide". Because of the problems arising from this increase in road freight transport, in particular road congestion, pollution, accidents, etc., the European Commission adopted in its freight transport policy the objective to promote an efficient door-to-door transport of goods, by using at least two different transport modes, within the framework of an integrated transport chain. In order to achieve this objective, intermodal transport is an important stake for the Commission.

The European Union in general and each country of the Union in particular seek ways and means to ensure a more environmental-friendly distribution of goods and to solve the challenges arising from the increase of goods movement. For these reasons, many countries of the Union are currently studying the conditions that will allow an efficient intermodal transport development both at national and international levels, with the aim of creating a modal transfer from road to the waterways and the railways.

Such a modal transfer is only possible if these transport modes (water and rail) have some additional advantages for the users as compared to the road. One of these advantages would be through the enrichment of the goods during their trip. One of the means to obtain such enrichment is to perform operations on the goods between the moment they leave the shipper and the moment they are delivered to the final consignee. The best place to do this is with no doubt the transhipment place, which can be a maritime port, a river or rail terminal or any other multimodal platform.

Indeed, during the breaking of bulk at the moment of transhipment, it is possible to perform operations on the goods in different ways. For instance, it is possible repackage the product, to label it, to present it under the form of packets, pallets, etc. The integration of these operations or 'added value services' in the intermodal transport chain is therefore an idea to be further explored in order to create a modal transfer from road to rail and water.

CHAPTER II

ADDED VALUE AND INTERMODAL TRANSPORT

II.1. Definition of added value

The concept of 'added value', although quite often used, is still rather vague. According to its definition, it refers to the value given to the product as compared to the basic service offered by the competitors for the lowest price. This added value is created when a shipper or logistic operator does something more than just transport the goods from point A to point B. Transport as such could be qualified as a basic service in order to derive a competitive advantage. Providers offer services to the industrial world and can integrate themselves in the global chain flow. In this chain, they ensure the reduction of costs for the customer (directly – i.e. the price of the service – or indirectly – i.e. organisational advantages for instance) and, furthermore, the increase of the value of the final product, which makes it possible to absorb the supplementary cost that is usually associated with the additional service that leads to the added value.

II.2. Breaking of bulk and added value

The breaking of bulk in the transport chain of goods, i.e. the moment when loading or unloading operations take place, is increasingly associated with the creation of added value. As a matter of fact, this breaking point in the transport chain is usually the synonym of a cost in terms of time or handling operations. As a result, this moment can offer the opportunity to a company to intervene, in order to enrich the product, by processing the goods, and to give value to the breaking of bulk.

The creation of an added value cannot be considered as something spontaneous. It usually is the result of the desire to meet new needs expressed by the customers on the market. These customers demand a constant renewal of products (hence a shorter life cycle) and a customization of production. To respond to this demand, companies usually tend to apply the concept of "delayed identification of products", i.e. to postpone as much as possible the production and customization of products. This leads to the decomposition of products in basic elements and sub-elements that tally with the customization features. Furthermore, this implies a total reorganisation of the production-transport-distribution chain for the companies and it demands a new organization of the processes of goods flow transmission. In other words, there is an evolution from induced flows (upstream pushing flow toward downstream according to the previsions, without any particular demand expressed by the customer) to drawn flows (the flow of products is triggered by the firm demand expressed by a customer).

Moreover, it is important to know that the behaviour and the needs of shippers evolve. In an unstable and competitive environment, it is important that transport companies try to have a better knowledge of the shippers' needs, about the nature of their organisation and their transport and logistics policies, in order to adapt themselves. As a consequence, it is therefore the carrier who will have to adapt to the production strategy of his customer and not the opposite. As a result, it is appropriate to suggest in the logistic chain of transport only those services that are expressed as wishes by the customer (who is a potential user of the service), instead of offering the customer services that do not meet his needs. Therefore, a good knowledge of the customers' needs is essential in order to avoid investments that might well be difficult to make profitable afterwards.

II.3. Subcontracting logistics

At present, many companies entrust external logistics partners with the transport of their production. Subcontracting logistics operations to specialized providers offers many advantages to companies. These advantages can be classified into three categories.

a) Strategic advantages

The outsourcing of transport in the logistic chain allows the company to:

- Focus on its specialization as a company *(core business*) ;
- Adapt itself to the shortening of products life cycles (flexibility in the application of the concept of delayed identification of products) ;
- Obtain competence advantages from the provider.

b) Organisational advantages

- Focus the flows on logistic excellence items (control of distribution channels by the provider) ;
- Use the space normally occupied by logistics activities for production activities ;
- Transfer part of the staff to the provider.

c) Financial advantages

- Reduce the global logistic cost ;
- Benefit from scale economies derived from the provider who consolidates the flows ;
- Transform fixed costs into variable costs ;
- Limit the investments (warehouses, transport equipment, etc.) and associated risks ;
- Establish a difference between logistic costs and the costs related to the activity of the company.

The creation of value is also based on the addition of services during the outsourcing phase. There are different possibilities that can be classified into a number of (non-exhaustive) categories:

Category 1: ***Transport and auxiliary operations***

Falling into this category are potential added value services operations such as upstream and downstream haulage in relation to the manufacturing process, the management of containers, etc.

Category 2: ***Reception of transport material and of human resources***:

Parking, gas station, creation of life centers, etc.

Category 3: ***Storage, warehousing***

Renting of warehouses (as self service, with heating, equipment, etc.), renting of land, etc.

Category 4: ***Processing of goods and production finishing operations***

- management of supplies,
- reception,
- weighing,
- quality control,
- tests,

- packaging,
- etc.

Category 5: ***Commercial operations***

- documents,
- inventory,
- publicity,
- etc.

Category 6: ***Computer operations***

- stock management,
- bar code management,
- sell-by date management,
- etc.

Category 7: ***Operations related to international trade***

- customs formalities.

Category 8: ***Operations related to final delivery***

- physical distribution to warehouses,
- placement of products on shelves,
- etc.

If subcontracting of the logistic aspects is interesting for various reasons (see above), companies however identify several limitations that hamper the systematic outsourcing of transport services in the logistic chain. Among these, we can mention:

- The total control of logistic chain, the coordination of flows (products, information, financial aspects) ;
- The selection of subcontractors and the transition towards a real partnership ;
- The risk of supplementary costs;
- The human resources problems ;
- The quality control in the eyes of the customer and the image ;
- The loss of information confidentiality.

That explains why prime contractors, in a first phase, will analyse the relevance of subcontracting of all or part of the logistic aspects. For this purpose, a list of basic criteria is established: geographical proximity, technical skills (equipment, labour force, capacity to evolve, etc), reputation, financial health, quality of communication, price competitivity, quality management systems, respect of deadlines, information transparency.

Finally, in order to avoid the risk of losing the control of operations during the transfer of execution of some tasks to a logistics partner, precise specifications are defined. They consist of a set of provisions about the nature of the operations and the conditions for their execution (means, material, methods to be used), emergency procedure, cost of operations, agreement in case of conflicts and controls established by the shipper.

The shipper, aware of the risks, applies a regular follow-up. Tests and audits are implemented in order to adjust the service to the needs of the shipper. Indicators are defined and monitored: non conformity rates, deadlines, final reception controls, reactions to claims, etc. Visits are regularly made to the service provider and to the customers. Satisfaction surveys are carried out with the final customers. Progress plans are activated if necessary.

II.5. Added value and port function

It is clear that during the enrichment process, the port function as well as the industries related to the transformation of goods transported on waterways are not isolated but examined as part of a whole set of services. The port development policy must be based on the double concern of maintaining or attracting traffics that create added value and on strong growth and promising markets, such as the container traffic.

Port authorities, port companies, as well as local development institutions, should also be concerned by the adaptation of the industrial port network that should occur simultaneously to the evolution of traffic. In other words, if the port develops container traffics, a logistic groupage and de-groupage platform, a distribution centre that offers several goods related services activities related to the repair of containers or the management of containers, should be created.

II.6. Ports and logistic demands

In the process of added value creation, ports appear as the natural place for logistic platforms. At the same time, they are also very sensitive links in the transport chains and networks because of the demands expressed by shippers and logistics operators, who have to offer perfect services.

The port is the natural place for the breaking of bulk in order to transfer the goods or their contents from one transport mode to another. As a consequence, the port is the ideal place where logistic companies can intervene and offer not only transport services but also services related to the goods. It is normal that complex structures for the processing of goods are developed in ports.

Together with the emergence of containers and during the first phase of this development, the ports have, in different ways according to the different countries, let these "boxes" go through the ports without paying much attention to their content or applying added value operations. As a matter of fact, this was at the time considered to be the task of shippers, consignees or services providers working far away from the port facilities. This is also the reason why several inland logistic areas developed, gathering industrial and service providers following the model of a huge logistic European chessboard. This evolution was detrimental to ports. At present, port authorities endeavour to win back these activities by anticipating the needs of the customers, if necessary by establishing partnerships with the existing inland logistic areas in order to ensure complementarity.

Nevertheless, ports remain weak links. At present, shippers can choose between various routes and therefore, it is necessary for port communities to make real efforts to keep the goods in the port. As a consequence, the objective is to establish synergies and convergence of interests between the various actors of such communities, in order to guarantee reliability, continuous services and good productivity levels.

CHAPTER III

OVERVIEW OF LITERATURE

The concept of added value is nowadays subject to various research projects. The overview of literature below gives some indications about the studies dealing with the creation of added value in the logistic chain. More detailed summaries appear in Annex 4.

III.1. Integration of intermodal transport in supply-chains (1998-1999)

This study was carried out by STRATEC and Price Waterhouses Coopers on behalf of DG Transport of the European Commission.

The integration is justified by the fact that the market share of multimodal transport is still insignificant when compared to traditional unimodal road transport. The main reasons mentioned by the users concern price competitivity, flexibility, reliability and the investments required.

III.2. PROMOTIQ

PROMOTIQ is a European project that is part of the programme « Research, technological development and demonstration programme », and more particularly of the line "Integrated transport chains".

The basic assumption of this project is that a new generation of services and operators could meet the needs of today's logistic trends, thereby making intermodal transport performant and competitive. The main feature of these new services is the added value they would bring to the present transport chains, by promoting the integration of transport modes and logistic operations in the chain and by improving the quality and the performance of intermodal transport.

III.3 PROTRANS

The main idea of Protrans is that the international competitivity of European industry will depend increasingly on its capacity to deliver, quickly and on time, the products adapted to the customers everywhere in the world. This definition of logistics gives an image in which logistics management becomes an important parameter in a competitive environment.

III.4. Intermodal Quality (IQ)

The main objective of the IQ project is to improve intermodal transport quality by providing the tools needed to increase European intermodal transport, focusing on:

- The interoperability between terminals ;
- The interconnectivity and accessibility of terminals.

CHAPTER IV

ADDED VALUE IN INTERMODAL TRANSPORT IN BELGIUM

IV.1 General overview of services offered by the Belgian terminals

The table below is an inventory of added value services offered by the Belgian terminals.

IV.1.1. Inland terminals

1 Western Flanders

	Terminal	Terminal category	Services
1	Flanders Container Terminal (FCT)	Road/short sea (particularly from Ireland)	Loading and unloading of containers Storage area (temporary) Maintenance/ repair of vehicles Customs office
2	River Terminal Wielsbeke *(Katoennatie)* (Terminal under construction. First activities foreseen for the end of 2003)	Road/Waterways	In the future: Transhipment of containers Storage warehouse Loading and unloading of containers Distribution Maintenance/ repair of containers Customs office
3	Avelgem Container Terminal (AVCT)	Road/Waterways	Light transport Avelgem – Antwerp - Rotterdam Storage Customs office activities Small repairs to containers Groupage

2 Eastern Flanders

	Terminal	Terminal category	Services
4	IPG: Intermodaal Platform Gent (Formerly called *CT Gent*)	Waterways/ road	Storage Stock management Loading and unloading of containers Handling of hazardous materials Maintenance and repair of containers Forwarding service Customs office Formation of railway convoys

3 Flemish Brabant

	Terminal	Terminal category	Address of terminal	Services
5	Brussels Terminal Intermodal (BTI)	Rail-Road Waterway	Voorhavenstraat 2 1000 Bruxelles	Loading and unloading of containers

4 Limburg

	Terminal	Terminal category	Services
6	Euro Terminal Genk (ETG)	Bimodal Rail/Road	Loading and unloading of containers and mobile bins between road and railway Repair of containers If necessary, storage (temporarily as a buffer-zone)
7	Trimodal terminal Genk	Trimodal Road/Rail/ Waterway	Containers loading and unloading Handling of containers, Packaging of bulk and unit goods Distribution (pre/post haulage) Handling of hazardous materials Storage Stock management Repair and maintenance of containers Repair and maintenance vehicles Possibility to buy/ rent/ lease infrastructure Access to cranes and support equipment Formation of convoys Tracking and tracing Forwarding service Customs office Daily river transport to Antwerp + twice a week to Rotterdam Daily rail transport to Zeebrugge/ Italy/ other destinations Cleaning of containers and mobiles bins

5 Antwerp

	Terminal	Terminal category	Services
8	Antwerpen Main hub	Road/Rail	Loading and unloading of containers, multimodal bins and trailers Plugs for refrigerated containers Renting/leasing and repair/ maintenance of containers Placement of liners Containers storage

			Containers distribution Customs office Renting of office space
9	Antwerpen Zomerweg	Rail/Road	Loading and unloading of containers, multimodal bins and trailers Trucking organisation (to take the containers to the customers) Advice for hazardous materials Small repairs Placement of liners Containers storage Containers distribution Customs office Renting of office space Plugs for refrigerated containers
10	Antwerpen Circkeldyck	Rail/Road	Renting/leasing and repair/ maintenance of containers Loading and unloading of containers and mobile bins Trucking organisation (to take the containers to the customers) Advice for hazardous materials Small repairs Placement of *liners* Containers storage Containers distribution Customs office Renting of office space Plugs for refrigerated containers
11	Antwerpen Schijnpoort	Rail/Road	Renting, repair and maintenance of containers Placement of liners Containers storage Containers distribution Customs office Renting of office space Plugs for refrigerated containers
12	Trimodal Container Terminal Belgium (TCT Belgium)	Trimodal terminal: Rail, Road, Waterway	Unloading and loading of containers Distribution of containers (pre and post haulage) Plugs for refrigerated containers Customs office Storage Stock management, maintenance/ repair of containers and vehicles, renting of office space Groupage Tracking & tracing

			Forwarding Service
13	Cargovill Container Terminal *(Hessenatie)*	Bimodal terminal : Road – Waterway	Containers distribution (pre and post haulage) Handling of hazardous materials Plugs for refrigerated containers Tracking & tracing Forwarding Services Customs office
14	Puurs Inland Terminal Zeekanaal (PITZ)	Trimodal: Rail, Road, Waterway	Loading and unloading of containers Containers distribution (pre and post haulage) Plugs for refrigerated containers Customs office
15	Dry Port Muizen	Rail/Road	Loading and unloading (from) to the wagons from (and to) wagons Plugs for refrigerated containers Storage (hazardous products max. 24h storage) Renting of office space Repair of containers
16	Ambrogio	Rail/Road	Loading and unloading of containers Containers distribution (pre and post haulage) Storage Stock management Maintenance/ repair of vehicles Tracking & tracing Forwarding service Formation of convoys (SNCB)
17	Water Container Terminal (WCT)	Road/Waterway	The services offered by the WCT or under its responsibility are : Navigation between sea quays (Rotterdam or Antwerp) and continental terminal quays (Meerhout container terminal) Transhipment at the Meerhout container terminal Pre and post haulage (by road) Maintenance/ repair/ cleaning of containers Warehouse for containers Stock management Customs office
18	Gosselin – GCT Deurne	Road/River	Loading and unloading of containers Storage

			Stock management Possibility to assemble products (Dis)assembly activities Renting of office space Tracking & tracing External: customs Groupage Maintenance/ repair of containers Distribution

6 Wallonia

19	Liège – Renory	Road/Rail/River	Transhipment of all kind of containers and mobile bins Storage "Door-to-Door" road services Repair and inspection of containers Cleaning of containers
20	Athus	Road/Rail	Transhipment of all kind of containers and mobile bins Storage "Door-to-Door" road service Repair and inspection of containers Cleaning of containers Possibility to load and unload
21	Dry port Mouscron/Lille international	Road/Rail	Transhipment of all kind of containers and mobile bins Storage

IV.1.2. Sea terminals

	Terminal	Terminal category	Services
22	Ocean Container Terminal Hessenatie Zeebrugge (OCHZ)	Sea terminal: Road, Rail and Waterway	Loading and unloading of trucks and wagons Storage Loading and unloading Warehousing Possibility of plugs use for refrigerated containers
23	Hessenatie Delwaide dock	Sea terminal: Rrail/Road/River	Loading and unloading Loading and unloading of containers Handling of hazardous materials Warehousing, Stock management Possibilities for packaging

			Office space renting Maintenance/ repair of containers, Forwarding services Customs office Formation of convoys
24	Hessenatie Europaterminal	Sea terminal: Rail/Road/River	Loading and unloading Loading and unloading of containers Handling of hazardous materials Warehousing, Stock management Office space renting Maintenance/ repair of containers, Forwarding services Customs office Formation of convoys (SNCB)
25	Seaport Terminals Vrasenedok (*Subsidiary of Katoennatie*)	Sea terminal: Rail/Road/River	Loading and unloading Loading and unloading of containers Handling of hazardous materials Warehousing, Plugs for refrigerated containers Forwarding services Light transport Formation of convoys (SNCB)
26	Noord Natie Terminals NV (Delwaide dock)	Sea terminal: Rail/Road/River	Warehousing, Loading and unloading of containers Repair of containers Repair of vehicles Plugs Office space renting Formation of convoys
27	Antwerp Combined Terminals	Sea terminal: Rail/Road/River	
28-30	P&O Ports : 3 terminals: Hanza Dock, Churchill dock and Delwaide dock	Sea terminal: Rail/Road/River	Loading and unloading Loading and unloading of containers Handling of hazardous materials Warehousing, Possibility of packaging products Maintenance/ repair of containers (only on the Delwaide dock) Access to cranes and support equipment Sporadic groupage Tracking and tracing Customs

IV.1.3. Analysis of added value services in intermodal platforms in Belgium

Each Belgian intermodal platform offers a set of clearly defined added value services.

The analysis of the Belgian terminals shows that they offer a variety of interesting added value services such as repairs, cleaning, maintenance of containers, advice on hazardous goods, organisation of trucking, customs office, etc.

On the other hand, it can be noted that many inland terminals organise pre and post haulage transport, which shows that terminal managers are really willing to meet the JIT (Just in Time) production demands of the companies. The organisation of warehousing services and stock management is also interesting for JIT production.

However, it should be noted that excluded the advisory service concerning hazardous goods, warehousing and stock management, nearly all the services offered refer to containers and not to goods as such. That is the case for cleaning, repair and inspection services, which are limited to containers. Considering that the container belongs to the shipping lines, these services are more interesting for the big shipowners who also own containers, and not for the owners of the goods that are transported in such containers. The platforms should think about offering, apart from the services concerning loading units, services concerning goods. Groupage of goods, labelling, packaging and repackaging, bagging, etc. are services that will be more appropriate to enhance loyalty of intermodal customers, as compared to loading unit services that have no direct impact on the activities of these customers. Nevertheless, the introduction of such services should be implemented at the request of users. It would indeed be unwise for a terminal to invest in expensive facilities to offer additional services without the existence of a real demand. The integration of added value services should therefore be the result of a concrete demand submitted by the customers.

CHAPTER V

CHOICES RELATED TO THE ESTABLISHMENT OF ADDED VALUE SERVICES

V.1. Selection criteria

The analysis of added value services above has highlighted a whole set of logistic services that could provide an incentive for an increased use of intermodal transport by various actors, if they were to be introduced in the intermodal transport chain. The research team advises the platforms to consider the offer of services related to the goods such as groupage, labelling, packaging and repackaging, bagging, etc. Along the same lines, it is quite useful to analyse the conditions which favour the effective establishment of such services in the inland logistic terminals and platforms.

The following results were obtained thanks to a telephone survey carried out among logistic operators in Belgium. A total of 35 intermodal operators were contacted, but only 10 agreed to give detailed answers to the questions. Out of these 10 operators, 6 are established in the port of Antwerp and 4 at inland terminals. They were selected because they intervene in the intermodal transport chain. Apart from transport as such, some of them offer additional services such as maintenance, repair and cleaning of containers, customs services, storage, etc. The survey showed that there are two decisive elements that influence lead operators - who offer added value services - to establish themselves at a terminal site: the potential of a region and the demands of a customer.

V.1.1. Potential of a region

A logistic operator can decide to locate the activities in a region or in a port when the region has some real potential. Usually, the operator identifies very promising activities in the region and will try to exploit them. He will then agree to make the investments needed. Afterwards, he will try to diversify his activities and to convince potential customers.

This first option is rarely used by investors because it has the disadvantage of being based on rather weak elements. Indeed, there is a strong risk that the customers will not follow suit or that the potential identified quickly disappears.

V.1.2. Customers' needs

A customer can ask for added value activities to be established in a specific region. In that case, the customer will have to guarantee an important flow. As a matter of fact, a company cannot establish itself for only 10 pallets a week. The flow should also be regular. The customer must be able to guarantee a specific flow for a certain period of time and guarantee this flow for the long term. Some operators mention a minimum of 10 years of guaranteed flows.

In some cases, operators who offer added value services follow one of their customers to a region because they have been working with the customer for some time in another region. In such a situation, it is preferable that the operator first obtains the backing of his customer, which is not sure, to have guarantees concerning the volume of flows, the frequency of these flows and the duration of the contract.

V.2. Obstacles to the introduction of added value services in a region

The people that were interviewed mentioned several obstacles that hamper the establishment of added value logistic services in a logistic center, the most important one being the question of investment. More specifically, building new facilities or renting existing sites is expensive. As a result, operators demand a guarantee from their customers concerning the flows to be handled in order to assure the payback of their expenses. If the flow is too low, there is a risk to work with permanent operating losses.

Specifically for Belgium, considering the short distance to the seaports where there are already several added value services located, another difficulty arises, i.e. the danger of dispersion. For the operators already present in the port, the establishment in ports and inland terminals might lead to the dispersion of resources, the consequence being organisational problems, an increase of costs and a decrease in operations profitability.

CHAPTER VI

NEW LOGISTIC CONCEPTS AND INTERMODAL TRANSPORT

VI.1. General considerations

The world of logistics is in permanent evolution. This evolution is mainly due to the behaviour of consumers who are indeed more capricious, unforeseeable and more powerful and to the fact that they want to be distinguished when the market becomes segmented. New products and wider ranges of products appear on the market.

On the other hand, the aspect of time is a constraint that becomes more and more oppressive in today's modern societies. Environmental, ethical and health considerations impose new specifications which are more and more demanding. Food security and the wish of the consumer for more product information impose the development of traceability measures. Moreover, competition increases and companies have to optimize their performances in order to establish themselves in saturated markets. Strategic alliances and subcontracting are also associated to these new trendencies.

For the logistic services of the companies, this new economic situation is translated into much more demanding specifications. At present, logistics are more precise, quicker and more flexible and therefore face new challenges.

VI.2. New logistic concepts

In order to answer to the new constraints of logistics, new logistic concepts have been introduced such as "Just in Time" (JIT), "Quick Response" (QR) or "Efficient Customer Response" (ECR). These new concepts generally articulate themselves in the context of a stronger integration of the logistic function, be it within the company or with the partners upstream and downstream the process. Marketing, sales and manufacturing data of the company as well as those of the partners are annexed to the logistic function in order to ensure a maximum internal compatibility but also compatibility between the various links of the chain.

VI.3. The JIT or Just In Time Concept

The JIT (Just in Time) concept concerns the temporal aspect. Thanks to a precise planning of all activities and to perfect synchronisation, efficiency is at its maximum, with a reduction of stocks and waste down to the minimum.

VI.4. The Quick Response (QR) Concept

The Quick Response (QR) enlarges the JIT concept to a whole chain. What is essential here is the transparency within the chain, the closer cooperation between the various partners and the quick and efficient exchange of information on orders, forecasts, production planning and sales. Thanks to such a close collaboration, the chain can act more quickly and more reactively.

VI.5. Efficient Consumer Response (ECR)

Efficient Consumer Response (ECR) is a chain strategy within the framework of which the partners cooperate in order to satisfy the final consumer by offering him the right product, at the right time and for the right price. The whole value chain has to be better organized by ensuring a higher efficiency of exchange systems, by making them less expensive and more reactive to the needs of the consumer: "*Working together to better meet the needs of consumers, more quickly and for a lesser cost"*. The concept is based on four elements of reflection: optimization of stocks, optimization of renewal of supplies (logistic part), and optimization of new products introduction and optimization of promotional actions.

VI.6. Success key-factors

These new logistic concepts are articulated around success key factors which are essential to ensure that the concept works. These success key factors have been identified for each one of the concepts described above and appear in the table below:

	JIT	QR	ECR
Key success factors	Planning and synchronisation of tasks	Information flows fluidity Cooperation between partners Transparency along the chain	Information flows fluidity Cooperation between partners Transparency along the chain Precise vision of the market

The success key factors for the various logistic concepts can be classified into four clusters:

1. Planning and synchronisation of tasks;
2. Information flows fluidity between the various partners;
3. Transparency of the chain;
4. Excellent knowledge of the market.

VI.7. New logistic concepts and added value services

The key success factors of the new logistic concepts help in identifying the added value services that should be integrated into the transport chain, to allow that production companies can include the intermodal system in their logistic strategy. The planning and synchronisation of tasks are made possible due to the improvement of communication between the company and the logistics provider. Tracking and tracing, bar code management as well as stock management are services that can best meet this demand because they allow the logistics provider to be informed in real time about the evolution of product consumption. As a result, replacement can be planned.

VI.8. Conclusions and recommendations

The added value services introduced at the moment of the breaking of bulk can encourage the shippers to use intermodal transport more often for their shipments. Although the advantages of such services are obvious in the eyes of the customers, their introduction in the intermodal chain should be the result of a demand from the customers to have such services. At present, there is not enough interest expressed by the companies. This could be due to the fact that companies have a very bad understanding of intermodal transport, as reflected in the complaints expressed by the shippers concerning this transport mode. More specifically, shippers consider that intermodal transport is too expensive as compared to road transport, that it is too slow and shows lack of flexibility, and that it cannot be applied to new production concepts.

As far as costs are concerned, if the price paid for road transport is lower as compared to the price of intermodal transport, it should be underlined that if generalized costs are considered, i.e. that a cost should take into account the external costs related to both routings, the differences in prices can be quite reduced. Furthermore, the outsourcing of some operations such as packaging, labelling, stock management, i.e. operations that are usually carried out by the companies themselves, should contribute to the decrease of the advantage of road transport as compared to intermodal transport in terms of logistic service prices. The increase of the quantity of goods to be transported through the use of intermodal transport as a result from this process will support a higher frequency of intermodal lines.

However, this optimism should be moderated as interviews with managers of several companies, with a high level of transport potential within the framework of the modal scan project, have shown that there are significant difficulties arising from the prospect of intensive use of added value services established in intermodal platforms: lack of trust in the intermodal option, too many weaknesses, lack of knowledge of intermodal options, difficult relocation of activities for the companies, etc.

In order to solve all these problems, it is essential that intermodal transport actors are gathered together within a platform of which the objective would be to ensure the promotion of the transport mode to potential users. Furthermore, it is essential that intermodal transport stakeholders and companies collaborate in order to know the real needs of the companies and to propose solutions that could meet these needs.

Another encouraging element resulting from the interviews with managers is an increased awareness of the problems related to road freight transport. As a result, companies are looking for good alternatives in order to protect themselves against external problems such as the congestion which, in the long term, might be a real disadvantage for their activities. In this respect, joint ventures could be envisaged between logistic services providers and companies in order to jointly organise the logistic chain. Logistic operators should thereby not limit themselves to being actors, only responsible for the execution of the needs of the shippers, but could effectively take part in the analysis and designing phases before the execution of operations.

Even though all the analyses show that added value services have clearly identifiable advantages for the companies, the concrete achievement of collaboration between companies and logistic operators is essential for a better assessment of the benefits of such a collaboration. The development of pilot projects could be the best way to convince more companies of the fact that the intermodal option is a credible alternative for their activities.

References module II

1 Les entreprises de logistiques. Synthèse n°38 de l'ISEMAR. Octobre 2001.

2 La création de la valeur ajoutée à la rupture de charge : plates-formes logistiques et ports. Synthèse n°25 de l'ISEMAR. Avril 2000

3 La mesure de la valeur ajoutée liée aux activités portuaires. Synthèse n°3 de l'ISEMAR. Décembre 1997.

4 LOGIC : Project funded by the European Commission under the transport RTD programme of the 4th framework programme. October 1998.

5 PROMOTIQ : Project funded by the European Commission under the transport RTD programme of the 4th framework programme. December 1999.

6 PROTRANS. Project funded by the European Commission under the Competitive and Sustainable Growth Programme of the 5th Framework Programme. October 2001

7 Intermodal Quality (IQ). Project funded by the European Commission under the transport RTD programme of the 4th framework programme-Integrated transport chains. May 2000.

8 Integration of Intermodal transport in supply chains. Etude réalisée par STRATEC et Price Waterhouses Coopers pour le compte de la Direction Générale des Transports de la commission européenne. 1998-1999

MODULE III THE INTRODUCTION OF "GROUPAGE" IN BELGIAN INTERMODAL TRANSPORT

CHAPTER I

INTRODUCTION

This module studies practical applications of the groupage concept. More specifically, it addresses the following question: "why do Belgian terminal operators not systematically provide, in contrast to a number of foreign operators, the opportunity to clients with small freight flows, to group their goods into single load units?"

In other E.U. countries such as France (e.g., inland navigation multimodal terminals of Macon and Chalons-sur-Sâone), Germany (e.g., the recently built "Container Terminal Altenwerder" in Hamburg), The Netherlands (e.g., the Mainport of Rotterdam), Italy (e.g., "Quadrante Europa Freight Village" in Verona and the "Interporto Rivalta Scrivia" freight village) and Portugal (e.g., "Terminal Multimodal Do Vale Do Tejo", in Lissabon), a number of terminals/freight villages do provide groupage services. These services are provided either directly by the terminal operators themselves, or by companies located on the terminal site.

In most of the academic and policy-oriented literature, bundling/groupage is defined as "the process of transporting cargo, with different origins and/or destinations in common transport units[i] and/or load units[ii] during shared parts of their routes." (Vleugel et al., 2001). In this paper, the "bundling" concept refers to the collection of goods to fill a transport unit. The "groupage" concept refers to the collection of goods to fill a load unit.

The research team is primarily interested in groupage in the context of intermodal transport, i.e., the transport of unitised freight by means of more than one transport mode, with a focus on the door-to-door logistics chain (Macharis, et al.,1999). Intermodal transport can play an important role in the reduction of road transport externalities by using trains, barges or short distance sea vessels for the largest part of the journey.

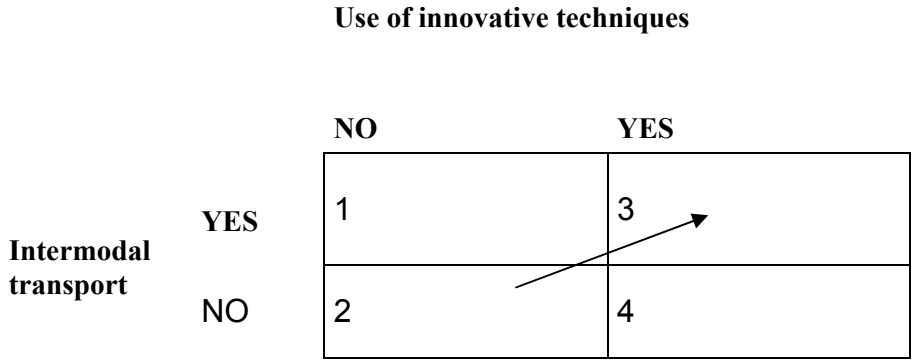
The empirical question arises whether the capability of intermodal terminals to offer a groupage service, could simultaneously open up a new market for intermodal transport.

At present, many forwarders with small freight flows use conventional (non-innovative) unimodal transport technologies to move their goods (see Figure 1). The reason is that small forwarders mostly do not have sufficiently large volumes to fill an entire container. Therefore, the least costly solution for such companies is to use trucks instead of trains or barges. However, if terminal operators were to offer a state-of-the-art groupage service, companies with small freight flows, currently relying on groupage companies for their transport (the latter mostly give preference to road transport,) would be provided a reasonable alternative to present unimodal practices. The terminals would then have the opportunity to transport these goods using an intermodal transport system.

Figure 1 illustrates the current situation in the transport sector and shows the desired movement from quadrant 2 to quadrant 3: only if the intermodal transport alternative is associated with innovative, customer-oriented solutions (including the groupage option), it can be expected that potential users would shift away from flexible road haulage.

FIGURE 1

Current situation and desired evolution for small and medium-sized transport system users.



Source: Authors

Quadrant 2 represents the current situation, whereby transport companies try to minimise costs by using unimodal, non-innovative transport techniques. Most of the time, these transport techniques are limited to road transport.

Quadrant 3 represents a more desirable situation, whereby intermodal transport is combined with innovative techniques. An example of an innovative technique in the context of bundling is the use of "new-generation" terminals, whereby the fully automated or semi-automated transhipment of cargo is made possible. In the domain of groupage, the efficient tracking and tracing of goods within single load units, may be critical to further advance the implementation of this practice.

Road transport does offer many advantages, such as a relatively fast door-to-door transport service, which has in many cases a better cost/quality ratio than intermodal transport systems (Trip, 2001). Key inputs to measure the cost/quality ratio include the utilization rate, frequencies, costs, speed, cycle times and reliability (Bontekoning et al., 2000). Furthermore, the financial position of road transport has recently been strengthened by the liberalisation of the transport sector in Europe, resulting in increased competition and efficiency gains (Delft University of Technology, 1999). However, road transport does lead to substantial negative environmental impacts, both in terms of pollution and congestion. These problems are now viewed as sufficiently important to warrant active policy intervention by the European Community. The 2001 "White Paper" on European transport policy (European Commission, 2001) aims to reduce the growth of road haulage from 50% to 38% between 1998 and 2010.

This objective could be reached through better use of alternative means of transport, such as trains, barges and short sea vessels. In other words, both pollution and congestion can likely be reduced by a modal shift toward intermodal transport, although such an intermodal strategy undoubtedly has limits, both in terms of scale (only a reduction of the growth in road haulage will be achieved, not a reduction in absolute terms) and scope (intermodal transport can lead to efficiency gains usually only for long distance transport, although there have been some successful cases on short distances).

In order to achieve a modal shift, intermodal transport has to become more competitive, which basically means that the cost/quality ratio of intermodal transport needs to be improved as compared to unimodal road transport. Intermodal transport often cannot compete with direct road haulage in terms of costs. Although rail and barge transport often are competitive

with road haulage, this financial advantage will in most cases be nullified by the additional costs of handling and pre and post haulage. Those added costs are high, especially for transport over short distances (Konings, 1996).

As far as the quality (of intermodal transport) is concerned, several improvements will need to be made, including: shorter lead times, higher transport frequencies, more destinations, better services for small shipments and flows, higher reliability, more flexibility in service provision, a better accessibility of the terminals, more suitable operation times and more sustainability (in terms of terminal noise, space occupation, visual intrusion, etc) (Kreutzberger, *et al.*, 1997).

One option to facilitate a modal shift is to encourage forwarders and shipping agents to cooperate with terminal operators. This would allow the former actors to provide demand driven groupage options within the context of supply driven innovative terminal technologies provided by the latter actors, especially "new-generation" terminals.

In general terms, many terminal operators have observed that shippers value supplementary terminal services. As a consequence, the number of those services has steadily grown, both on terminal sites and near terminals. In neighbouring countries such as Germany, Italy, the United Kingdom and the Netherlands, this has resulted in the emergence of 'freight Villages' or 'distriparks' (Konings, 1996). A freight village can be defined as the combination of an intermodal terminal and a commercial distribution estate. By means of a spatial concentration of logistic activities, co-operation between different transport modes and companies involved in distribution can be enhanced, so as to improve the commercial and environmental efficiency of freight distribution (Höltgen, 1995).

In contrast to what occurred in those countries, no similar developments took place in Belgium. However, offering (the value-added-service) groupage as an option is necessary in order to encourage companies with small freight flows to use intermodal transport. The main reason is that groupage allows a cost reduction of the main transport mode as well as any pre and post haulage costs for the same journey. The cost per unit of a half filled container is clearly much higher than that of a fully loaded container. Companies with small freight flows are reluctant to have their goods transported by train or barge, because they are not able to fill an entire container and, therefore, the transport costs remain prohibitive. However, these costs can be reduced by grouping goods of different companies into a single container. The following section will further specify the difference between bundling and groupage and highlight the advantages and the disadvantages of groupage. Furthermore, the results of a survey identifying the obstacles associated with groupage systems (as experienced by terminal operators and shipping agents) as well as the propensity of forwarders to outsource the groupage service to terminal operators, are discussed.

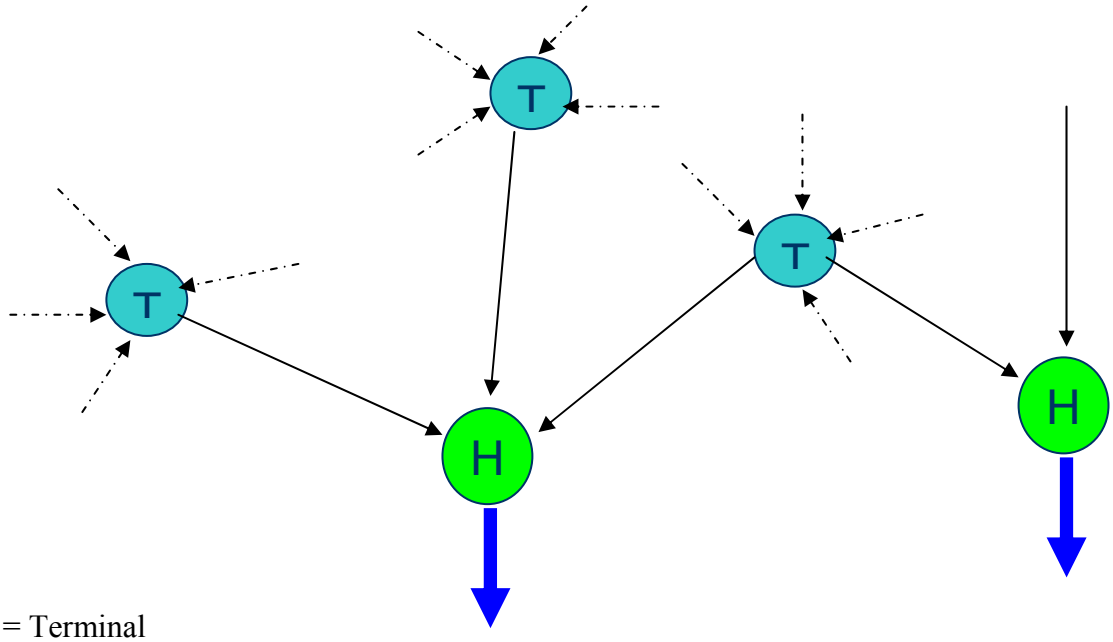
CHAPTER II

GROUPAGE VERSUS BUNDLING

Figure 2 illustrates the difference between groupage and bundling.

FIGURE 2

Groupage and bundling



T = Terminal

H = Hub

Source : Authors

The first step (T) in Figure 2 involves groupage. In most cases, a truck visits different companies and collects the packages. All the packages are centralised in a warehouse, located on the terminal site, where they are sorted according to their final destination. All the packages with a destination in the same general area are put together in a container.
After this operation bundling occurs in a second step (H). This means that all the containers (originating from different terminal sites) to be moved to the same region are transported (by train or barge) towards a hub, where new trains/barges are formed and loaded (through shunting or transhipment) with containers having (mostly) one and the same destination.

At the final destination, the packages will be de-grouped and delivered by a truck to the different consignees.

The academic and practitioner oriented literature provides detailed descriptions of the advantages associated with bundling (Bontekoning *et al.*, 2000, december 2000 and 2001), (Kreutzberger, 1997, 1998, 1999 and 2000), (Notteboom *et al.*, 1998), (Janic, 1999).

In contrast, the groupage concept, although similar in purpose and related to bundling, has not yet been carefully studied.

CHAPTER III

ADVANTAGES AND DISADVANTAGES OF GROUPAGE

One of the most important advantages of groupage is the impact on the cost per transported unit inside each container. When more goods are stuffed in a container, the unitary cost will decrease. In addition, there are also potential environmental benefits, because groupage should in principle not only reduce the number of semi-empty trips but also the overall distances travelled in tonkilometers, thereby resulting in lower emissions (European Commission, 2001).

The implementation of a groupage service on the terminal site may also be instrumental to reducing transport times, by cutting back the time necessary to transport the goods between the sorting centre and the terminal (Rossera *et al.* 1999).

Finally, groupage could create a form of customer loyalty. By offering this value added service, customers are not obliged to group elsewhere, before turning to the terminal for the transport of the goods. By offering not only the transhipment possibilities, but also groupage, the terminal operator simplifies the transport chain and creates a higher customer loyalty.

Groupage systems also have a number of disadvantages. One of the main disadvantages is that groupage implies more handlings and other operations at the nodes. This results in higher costs and lead times (Kreutzberger *et al*., 1997).

Another disadvantage concerns the added costs of storage (Campbell, 1990); the goods need to be stored until there is enough freight to fill an entire container.

The third disadvantage of groupage is related to the additional distances required if the groupage warehouse is not located on or close to the terminal. Some door-to-door transport routes will thus be faced with large additional distances and will suffer a substantial disadvantage vis-à-vis direct unimodal transport. The presence of detours means that time costs, as well as energy and environmental costs are increased (Kreutzberger *et al.*, 2000).

However, in spite of these disadvantages, the overall effect is likely to be positive in many cases. By offering the possibility of groupage (on the terminal site), the intermodal terminal is likely to increase its attractiveness as well as its potential to provide value added to customers. Although groupage is time consuming, it is important to note that without groupage, several origin to destination relations would not have barge or rail transport at their disposal (Kreutzberger *et al.*, 1997).

CHAPTER IV

SURVEY

IV.1. Groupage : actors and outsourcing

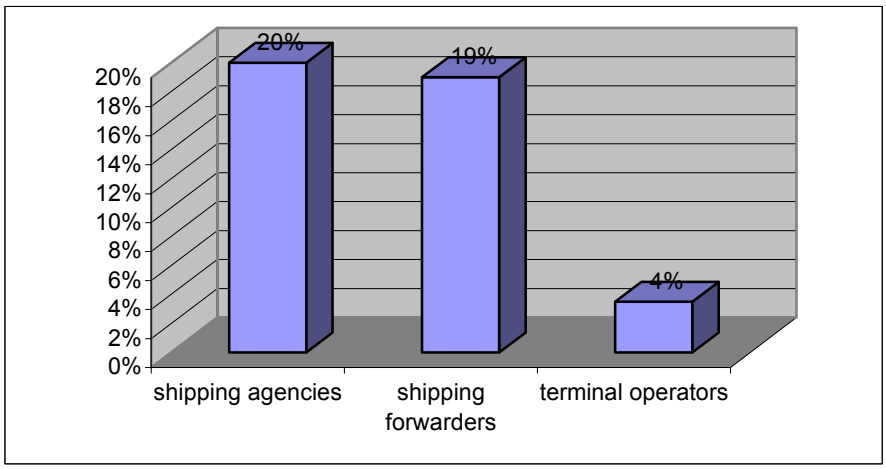
The research team conducted a survey with shipping agents, terminal operators and shipping forwarders in order to identify these actors' perceptions on groupage. Sixty shipping agencies with operations in Belgium were contacted as the result of a stratified random sampling in terms of size in this industry. A survey was administered on the use of intermodal inland terminal services use. Forty-seven shipping agencies indicated their willingness to participate in the survey, but only 15 of these firms (32%) appeared to make use of intermodal terminals at present. With regard to the intermodal terminals themselves, 17 Belgian terminal operators (out of 22) participated in the survey, but only 14 of them completed the entire questionnaire (the other 3 operators gave no information about the possible obstacles faced when offering groupage on the terminal).

About 50 of the 80 randomly contacted shipping forwarders located in Belgium, were willing to participate in the survey.

The first step of the survey consisted in identifying the extent to which the different actors offer groupage to their clients. Figure 3 illustrates the results.

FIGURE 3

Percentage of actors who offer groupage



Source: Authors

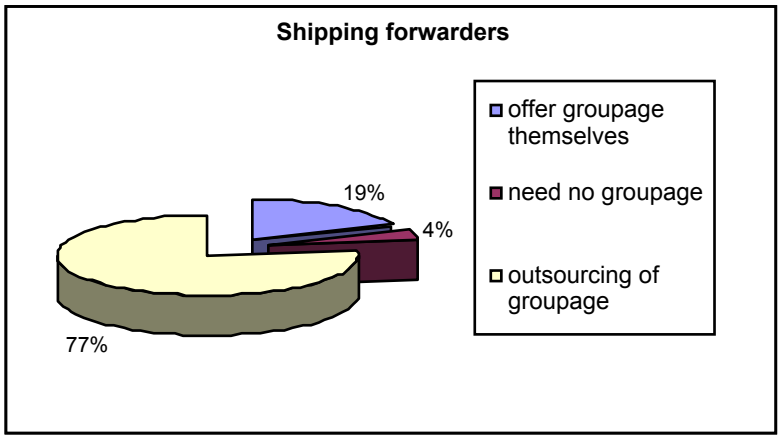
It can be observed that shipping agencies and forwarders play a more important role in groupage than terminal operators. In fact, out of the 17 interviewed Belgian terminal operators, only 1 (4%) recently decided to offer this service to his clients.

Given that shipping agencies, terminal operators and groupage companies mostly work under direct instructions of forwarders, the latter have the power to decide where groupage will take place. They can do it themselves or outsource the groupage activity to a specialised groupage company, a shipping agent or a terminal operator.

Figure 4 illustrates the extent to which forwarders outsource the groupage service.

FIGURE 4

Percentage of forwarders that (do not) offer groupage or outsource it.

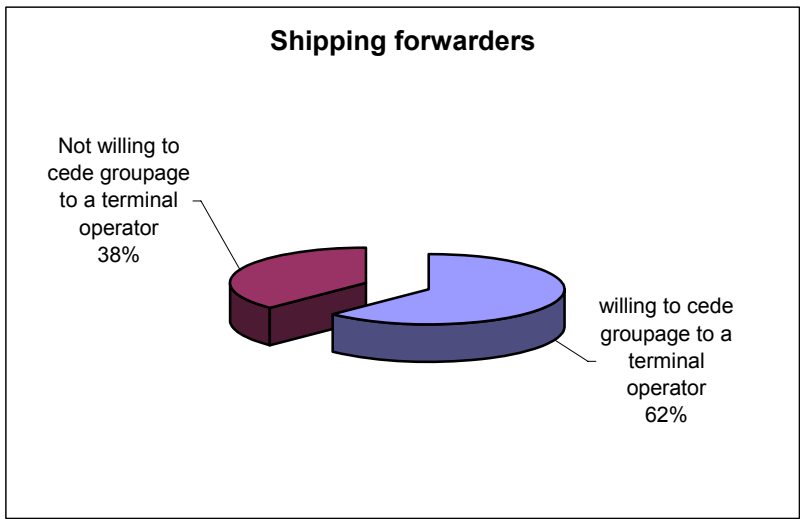


Source: Authors

Approximately 77% of the interviewed forwarders outsource the groupage activity. Given that this represents an important percentage, the research team tried to identify whether or not they were contemplating the outsourcing of the activity to *terminal operators* and if so, under which conditions.

FIGURE 5

Percentage of forwarders (not) willing to outsource groupage to a terminal operator.



Source: Authors

Approximately 62% of all the interviewed forwarders are willing to (partially) replace the contracts with specialised groupage companies by contracts with terminal operators. The

condition to realise this shift, is that terminal operators should guarantee a lower price and/or a service at least as good as the conditions forwarders can expect from their current contracts.

We observed that 48% of the forwarders, willing to outsource groupage to terminal operators, currently do not use intermodal terminals.

Nevertheless, about 38% of the forwarders prefer not to entrust the activity to terminal operators. The primary reason (56%) is that they offer groupage themselves and don't want to have their profit margins affected by outsourcing. The second most important reason (44%) is that they perceive a lack of know-how of terminal operators. The third most important reason (28%) is that forwarders wish to maintain good relationships with the groupage companies they are currently working with, which suggests that it is difficult to change the habits of some forwarders.

IV.2. Obstacles to groupage adoption

A number of obstacles explain why terminal operators and shipping agents are reluctant to offer a groupage service. It was asked why they currently do not offer the service. The answers to these questions are re-interpreted in this section.

The key obstacle faced by a terminal operator when contemplating to offer groupage is that it is very difficult to "stay neutral". For example, if a client wishes to group his goods at the terminal, but has not yet selected a shipping agency, it is strongly recommended to the terminal operator not to try to make that decision in his place. The choice of the shipping agency should remain the task of the forwarder. In this situation, staying neutral is a matter of survival. If the terminal operator goes beyond his task of groupage, the shipping forwarder becomes superfluous and a conflictual situation arises. Finally shipping forwarders will decide to leave the terminal.

Another problem of neutrality occurs for the terminal operator if he decides to attract a specialised groupage company to the terminal site. By doing so, he shows his preference for that one company. Other groupage companies might react negatively and reconsider using the terminal, just as well as some forwarders.

To avoid conflictual situations and loss of clients, it is vital for the terminal operator to maintain a neutral relationship with shipping agents, forwarders and shippers.

Only few terminal operators have succeeded in providing a profitable groupage activity on a *neutral* basis. In foreign countries indeed, groupage on terminal sites is often offered by a specialised groupage company and is not operated independently by the terminal operator.

In foreign countries it is mostly freight villages that offer this service. Freight villages usually have the following dual characteristics: the infrastructure falls under the domain of 'public' interest and the business-oriented transport services fall in the 'market' domain. As a result, they often necessitate the development of PPP (private public partnerships) funding schemes, sometimes in the form of a joint venture or concession (Tsamboulas, 2003). This means that the public agencies involved in some way with the groupage activity, can grant subsidies to compensate for possible losses caused by conflictual situations. As a result, it is not always clear if the service is profitable through normal exploitation or thanks to subvention measures.

The next obstacle to groupage is that it is not suitable for all types of goods. Some goods, such as "dangerous loads" are subject to severe regulations. One of these regulations dictates a required minimum distance between loads that must be respected when storing these goods. In some cases, the required distance is such that the goods cannot be placed together in the same container.

It is not only "dangerous goods" that are subject to regulations. Terminal operators, who collect small packages, store them in containers and distribute the goods afterwards, need to be familiar with the rapidly changing regulations concerning import, customs, health, sanitary inspections, etc. Given that groupage requires specialised staff for a constant follow up of the changes in regulations, it has become an activity that cannot be conducted by any terminal operator.

From a financial perspective, groupage usually cannot be offered by small agents or operators. For groupage to be a profitable activity, a minimum efficient size is necessary. If a shipping agent/terminal operator has to deliver a few small packages that do not fill an entire container, it may cost much more per unit than if a sufficient volume were available to fully load a container. Furthermore, if an entity that offers groupage is too small to benefit from scale economies, it will not be able to collect enough packages in a short period of time. This will result in long lead times and dissatisfied customers.

On the other hand, some of the interviewed teminal operators and shipping agents believe that if groupage is offered by a large entity that handles a considerable amount of small freight flows, the service will likely lead to financial benefits.

Another obstacle is the labour intensive nature of groupage. The groupage and de-groupage of goods is a labour-intensive activity. This implies that the labour costs will be relatively high. On maritime terminals, the labour costs are usually higher than on inland terminals, which favours the implementation of groupage on inland terminals. In the start-up phase, it is in some cases possible to reduce labour costs by adopting groupage with the current labour pool, without hiring more employees.

Besides labour costs, groupage also requires special cranes and forklifts, which represents a significant investment cost. From a financial point of view, it can take as long as 5 years for groupage to become profitable. During the first years, the costs strongly exceed any benefits. But after a few years and depending on the size and success of the terminal, groupage could develop into a lucrative activity.

From an organisational point of view, groupage requires careful, integrated logistical planning, especially when intermodal transport is considered. Indeed, if groupage is done at the point of origin, de-groupage will be required at the point of destination. This means that sufficient skilled labour and infrastructure, such as warehouses and cranes, must be present at both the origin and destination points. Furthermore, the use of trucks, barges and trains needs to be harmonised both during the collection phase and the distribution phase.

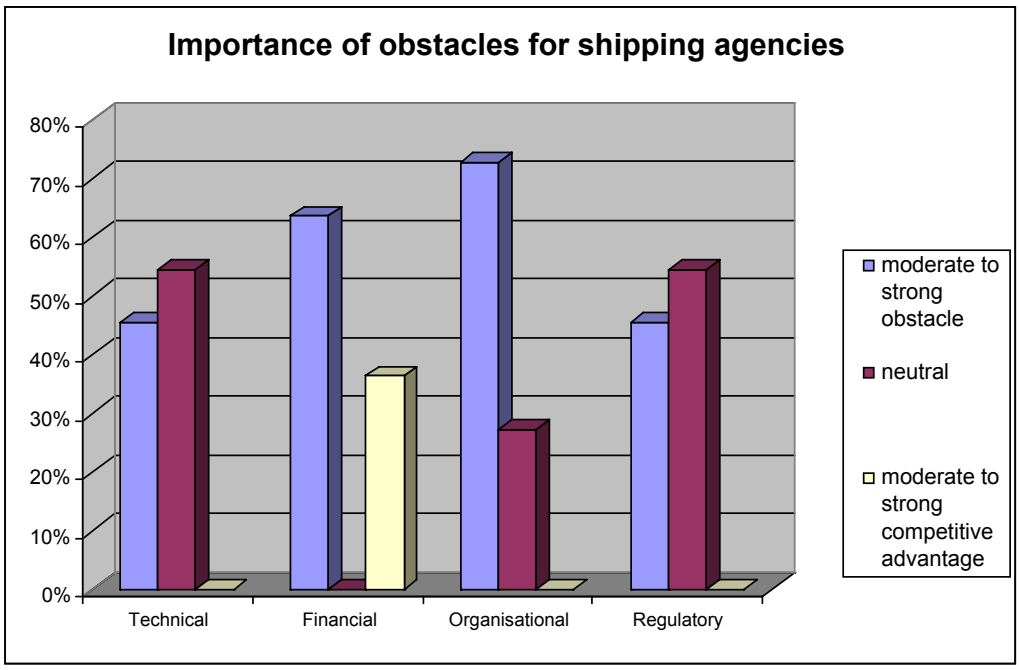
In addition to organisational problems, there are also some technical problems. The most important of these concern objects that simply will not fit in the containers, i.e., objects that are too large.

In order to encourage forwarders to group their goods and to use intermodal transport, a cognitive change is often required. Numerous forwarders show a conservative mindset and do not really want to change their transport strategies. Once they have established a system which moves their (often small volumes of) goods by truck, it is difficult to convince them to group the goods and to transport them using an intermodal system.

Figures 6 and 7 hereafter summarise the most substantial obstacles that hamper the offering of a groupage service, according to the terminal operators and the forwarders.

FIGURE 6

Obstacles according to shipping agents.

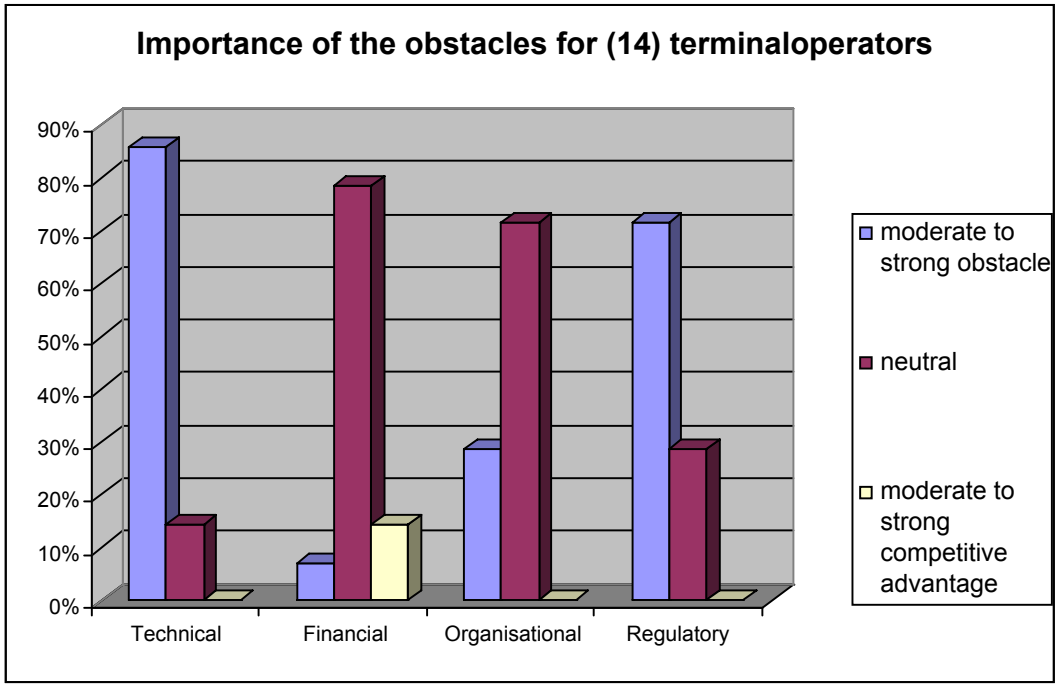


Source: Authors

Figure 6 suggests that according to shipping agents, the main obstacle to offer groupage is on the organisational level. Approximately 71% of the shipping agents believe that organising a groupage/de-groupage activity will encounter many difficulties. The second most important obstacle is one of financial nature. The other types of obstacles have approximately the same importance. It is important to note that although about 60% of the shipping agents believe there is a financial obstacle (related to the size of the investments required), the other 40% consider that groupage could offer a financial benefit.

FIGURE 7

Obstacles according to the terminals



Source: Authors

For terminal operators, the main obstacle appears to be a technical one, followed by organisational and regulatory factors. More than 80% of the respondents believe that the technical aspects of the service represent a moderate to a strong obstacle. About 70% of the respondents see regulatory issues as a moderate to a strong obstacle, while less than 30% believes organisational aspects to be moderate to strong obstacles.

Financial factors are not considered an obstacle or a benefit by 80% of the terminal operators. About 7% view the financial aspects as an obstacle, while 13% perceive groupage as instrumental to financial gains.

CHAPTER V

CONCLUSION

Terminal operators appear reluctant to group small freight flows into a single container. Several obstacles hamper the adoption of groupage; as a result, shippers with small volumes of goods turn to specialised groupage agencies, which currently have a preference to transport the goods by truck.

However, terminal operators could benefit from the groupage activity, namely if they were to provide this service themselves. Indeed, groupage opens a new market for intermodal transport. The main reason is that groupage results in a lower overall cost of the main transport mode due to lower unit costs. This means that adoption of groupage may reduce the barriers to a modal shift towards intermodal transport.

However, in order to make the service on the terminal profitable, the shippers and forwarders should be persuaded to outsource groupage to the terminal operators.

Further research to evaluate the market potential of these services for the various Belgian terminal operators is thus required. Here, the calculation of the costs and the benefits for the clients and the terminal operators should be analysed carefully.

References module III

1. Blauwens G., Janssens S., Vernimmen B., Witlox F., 2001, De keuze tussen vervoerswijzen op basis van het 'total cost concept', *Connektie magazine/tijdschrift vervoerswetenschappen, volume 10,* 28-32, September
2. Bontekoning Y.M., 2000, The importance of new-generation freight terminals for intermodal transport, *Journal of advanced transportation, Volume 34,* 391-413.
3. Bontekoning Y.M., Priemus H., Dekker R., 2000, A jump forward in intermodal freight transport: are hub-terminals an alternative for shunting? In: 6th TRAIL PhD-congress Scheveningen, 12-12-2000, (Delft University Press, Delft), 13-37, December.
4. Bontekoning Y.M., 2001, Will shunting Yards be replaced by new-generation intermodal hub-terminals?, May. In: Nectar Conference nr 6*,* 16-18 mei (Helsinki), 1-1
5. Bontekoning, Y.M., Macharis, C., Trip, J.J., forthcoming. Is a new applied transportation research field emerging? – A review of intermodal rail-truck freight transport literature. Transportation Research A.
6. Delft University of Technology, 1999, Promising innovative intermodal networks with new-generation terminals, TERMINET deliverable D7, May
7. European Commission, 2001, IDIOMA; Innovative Distribution with Intermodal Freight Operation in Metropolitan Areas. Best Practice Handbook.
8. Janic M., Reggiani A., Nijkamp P., 1999, Sustainability of the European freight transport system: evaluation of innovative bundling networks. *Transportation Planning and Technology,* Vol. 23, No. 2, 129-156, August
9. Kreutzberger E., Priemus H., Bovy P.H.L., 1997, New generation terminal and node concepts in relation to the innovation of bundling concepts in intermodal freight transport. Identification of promising developments, Transport, Infrastructure and logistics. 3rd TRAIL Year Congress. October
10. Kreutzberger E., Priemus H., Bovy P.H.L., 1998, The performance of new-generation terminal concepts for hub terminals and collection and distribution terminals. Balancing between effectivity and feasibility. (Delft University Press, Delft). October
11. Kreutzberger E., Priemus H., Bovy P.H.L., 1999, Innovative networks and new-generation terminals for intermodal transport. Improving the cost-quality ratio by bundling of flows, TRAIL Research School, Delft, December.
12. Kreutzberger E.D., Priemus H., Bovy P.H.L., 2000, New generation terminal concepts and innovative bundling concepts for combined transport. TRAIL Research School, Delft, December.
13. Macharis C. and Verbeke A., 1999, Intermodaal vervoer; economische en strategische aspecten van het intermodaal vervoer in Vlaanderen. (Garant, Leuven/Apeldoorn)
14. Notteboom T., Winkelmans W., 1998, Bundeling van containerstromen in het Europese havensysteem en netwerkontwikkeling in het achterland, *Tijdschrift vervoerswetenschap, 4/98*, 379-398.
15. Rossera F., Rudel R., Bern, 1999, The supply of combined transport services, *Materials of NRP*, Vol M7.
16. Rutten, B.J.C.M., 1995. On medium distance intermodal rail transport. PhD-thesis, Delft University of Technology, Delft.

17. Trip J.J. and Kreutzberger E., 2001, Complex bundling networks and new-generation terminals: a synthesis. The Netherlands Research School for Transport, Infrastructure and Logistics, Delft.

18. Vleugel J., Kreutzberger E., Bontekoning Y.M. (eds.), 2001, Concepts of innovative bundling networks. TRAIL Reports in transportation planning n°R 2001/03, Delft.

MODULE IV THE MODAL SCAN

CHAPTER I

METHODOLOGY OF THE MODAL SCAN

I.1. Introduction

The study of the modal scan is based on the application of the « modal scan » methodology initially developed in The Netherlands (Buck, 1997), and later on adjusted by the members of the research team VUB-Ulg. More specifically, the researchers in The Netherlands conceived a comprehensive manual that allows academic researchers and consultants to define the modal analysis in a very rigorous and systematic way.

In a first phase, the manual enables users to ask all the relevant questions in order to determine the current logistic profile of a commercial or industrial company. This is the moment when information is collected on transport volumes, frequency required, origin and destination of traffic flows, loading units required, price of transport, etc. In a second phase, the traffic flows that are likely to be transferred from the road network to the intermodal network are identified. During the third phase, the intermodal alternatives are thoroughly analysed and an intermodal solution is suggested to the company. The logistic management service of the company has the opportunity to react at that moment. Finally, a complete report of modal analysis is drafted and presented to the executives of the company. This presentation also includes a summary of practical questions related to the implementation of a real change towards a more intensive use of intermodal transport. The conventional tools of transport policy imply the introduction of normative rules or incentives on the market in order to foster companies to carry out modal transfers. This usually means an authoritative approach that very often proved its inefficiency. On the contrary, the approach with the modal analysis starts with the current logistic profile of the companies that have a substantial traffic and endeavours to demonstrate that intermodal transport is quite often a valid alternative to conventional road transport. The modal analysis results in practical solutions for the various companies with the aim of optimizing their logistic operations.

I.2. Objectives of a modal scan

The main objectives of a modal scan are:

- To apply a modal shift from road transport towards alternative transport modes, essentially railways and inland waterways;
- To identify the bottlenecks in multimodal transport;
- To encourage the logistic managers of companies to systematically think about multimodal systems as a credible alternative in their logistic strategy and not to go for the road option automatically;
- To inform companies about accessible multimodal possibilities;
- To be able to convince logistic managers that they should indeed use the multimodal system.

I.3. Information needed

I.3.1. Knowledge of the company

- Description of activities : finished products (annual report) ;
- Number of employees ;
- Turnover (for 2002) ;
- Main markets ;
- Description of the company position on the market ;
- Market trends ;
- Future expectations (generally speaking).

I.3.2 Profile of the logistic organisation

- Size of the logistic system (number of employees assigned to logistic tasks) ;
- Indications about the importance of outbound and inbound flows : quantity (in tons, number of trucks, number of containers, pallets …) ;
- Modal split of outbound and inbound flows (in general terms) ;
- Distinction between raw materials, intermediary products, finished products and packaging systems ;
- Cost of transport relative to the total cost of the product ;
- Number of transport partners and their identity;
- The 3 main regions of origin of the goods and the 3 main destinations (in many cases, companies have a few important transports and a lot of small ones);
- The modal split of these flows ;
- Packaging used for these flows (bulk, pallets, bags, containers…) ;
- Distribution pattern (distribution to many customers or only a few big customers) ;
- Organisation of these flows (outsourcing or not) ;
- Average loading factor of these flows ;
- Flows frequency (is it influenced by the seasons?).

I.3.3. Experiences with multimodal and intermodal transport

- Explanations about the reason why the current transport system was chosen ;
- Attention given by management to alternative transport modes ;
- Does the company have some experience in using other transport modes apart from the road? ;
- What is the result of such an experience? ;
- What are the obstacles that prevent the company from using intermodal/multimodal transport? (cost, service not reliable enough, long term contracts);

I.3.4. Attitude towards the Modal Shift project

- Is the project acknowledged and supported?
- Does the company want to participate to the scan?
- Is the management informed about the project?
- What are the conditions defined by the company to take part in the scan?

Scan Methodology Modal Shift

Step 1 Analysis Logistics Operation

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Step 2 Selection Flows of Goods

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Step 3 Analysing modal shift alternatives

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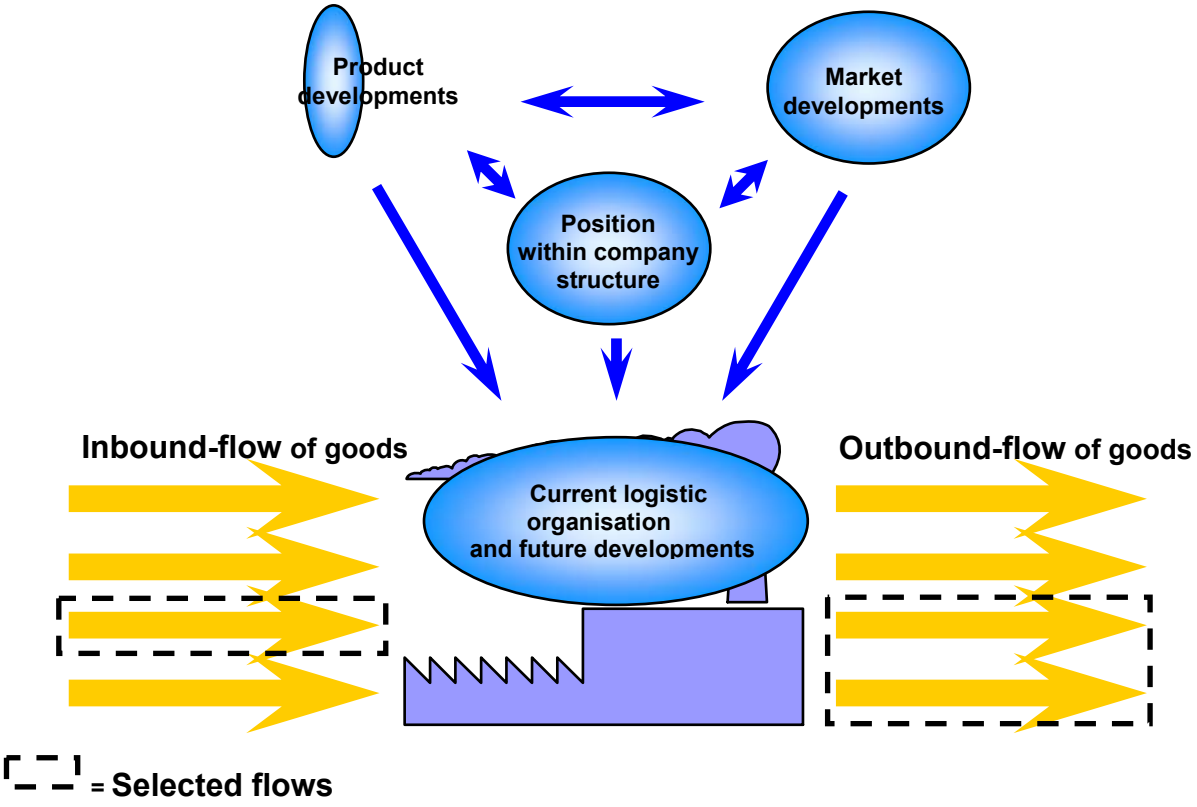
Step 4 Report and Recommendation

↓

Step 5 Implementation

Modal Shift Scan Approach



CHAPTER II

MODAL SCAN OF BELGIAN COMPANIES

II.1. Selection of companies

The modal scan was carried out in Belgium in ten companies, 5 of which are situated in the Walloon region and 5 in Flanders and Brussels. Two important parameters were taken into account for their selection, i.e.:

- the importance of inbound/outbound flows;
- the non use of intermodal transport in the company.

The selected companies were analysed on the basis of the following scheme:

1 Presentation of the company

Information collected: date of foundation, geographical situation, kind of products manufactured, number of employees, turnover.

2 Logistic organisation

Information collected: subcontracting, logistic partners, how many partners, trucks owned by the company, category of loading units, number of employees in the logistic department.

3 Outbound and inbound flows

Origins and destinations (main markets, importance of flows, transport currently used, price paid, kind of packaging,..).

4 Future trends

Growth or downsizing of production capacity, enlargement project or increase in production sites,…

5 Experience with intermodal transport

Does the company have some experience with intermodal transport ? What are the results of past experiences, e.g. problems faced in the past ? …

II.2. Reports of modal scan

The presentation of modal scan reports was done anonymously as requested by the companies analysed. The details of the scans are given in Annex 5.

II.2.1. Modal scan for company 1

The first company is specialized in multiple use butter production. It has 400 employees, among whom 40 are working in the logistic department. The company uses two kinds of raw materials, milk cream and solid butter. For the year 2002, the turnover was 300 million euros. The main markets are France (20%), Germany (12 to 15%) and Italy (~ 8%).

The last two years, 2001 and 2002, were not good for the company because of global economic conditions. The year 2003 did not start any better. The trend is still a stagnating market. At present, the company tries to keep its activity to an acceptable level, i.e. not to reduce its production. However, in the long term, it intends to increase its production as well as to improve its position in some market segments.

As far as the flows are concerned, 50 tank trucks with milk cream and 3 or 4 trucks fully loaded with blocks of 25 kilos of butter arrive each week at the company's site.

Today, they exclusively use trucks for transport. In total, the company works with eight different logistic partners, each one of them working on a specific destination.

Despite a catastrophic past experience with intermodal transport, the company is prepared to reconsider this system but under certain conditions, of which essentially the respect of deadlines and of the cold chain during the whole intermodal transport chain. A credible alternative is the piggyback system, which, unfortunately, is not yet organized in the region where the company is based because of insufficient flows. As a consequence, a more detailed study is needed in order to determine the conditions required to organise piggyback transport from the region where the company is based.

II.2.2. Modal scan of company 2

Company 2 is specialized in plastic production based on silicone. It is part of a world group of which the headquarters are based in the United States. The manufactured products are essentially used in the following sectors: construction industry, automotive industry, electronics, medicine, detergents.

The company employs 600 people, 40 of whom are assigned to logistic tasks. The products are essentially distributed in Europe, mainly Barcelona, Milan and Istanbul. There are other destinations, apart from the main ones: North Africa, South Africa, Middle East and Russia.

Concerning its general activities, the year 2002 was not very good because the annual operating results were below the forecasts. The year 2003 could not really invert the trend. However, the company launched a worldwide internet sales system that is quite successful and made it possible to limit losses on sales for 2002. In the future, the company intends to increase its production. A new production unit is currently being built and it will be operational very soon.

As far as flows are concerned, there are inbound flows of 8 to 10 containers and 30 to 50 trucks per day, while the outbound flows represent some 50 to 120 containers and 200 to 300 tons a day.

The logistic service is organised using SAP software. Transport as such is entirely entrusted to external partners for forwarding as well as receiving products.

Various kinds of packaging are used: smaller ones (small cardboard boxes) and bigger ones (containers), barrels (for liquid products) and big bags.

a Experience of intermodal transport

The company is very much interested by transportation modes different from the road system.

a.1. Railway

Several attempts were made to use the railway to transport products. More specifically, three lines were tested because of the important volumes related to them. Unfortunately, these attempts failed.

a.2. Waterway

As the company is situated close to a waterway, it is also very much interested by water transport. The company itself carried out a feasibility study bearing that idea in mind and the results were quite conclusive. Unfortunately, it was not possible to implement the water solution because of administrative problems.

II.2.3. Modal scan for company 3

The third company analyzed using the modal scan is specialized in the production of paper, more specifically non wove paper using the wet process. Because of many restructuring phases that led the company to change its product (abandoning the general production of paper to limit itself to non wove paper through wet process), the turnover that was dangerously decreasing, spectacularly recovered going from 2 939 000 euros in 2001 to 19 749 000 euros in 2002. For the year 2003, the company expects a turnover of 25 890 000 euros, a figure that will most certainly be reached and possibly exceeded considering the results for the first six months of 2003. Company 3 currently employs 50 persons of whom 5 are working full-time on logistic tasks. The company expects to increase its staff by around 50% to reach the number of 74 persons at the end of 2003 or the beginning of 2004.

a Outbound and inbound flows

Three products are used to manufacture non wove paper, i.e. wood wool (or wood pulp), synthetic fibres and chemical products. The company imports between 600 and 700 tons of wood pulp every month, which is equivalent to 60 to 70 containers per month; 300 to 400 tons of synthetic fibres delivered in containers and 300 to 400 tons per month of chemical products. In terms of trucks, these flows represent 75 to 80 trucks every month.

b Main markets

The products of company 3 are essentially used for sidings, for which there are in fact two varieties, the Backing and the Facing.

All these products are mainly sold in Western Europe (70%), in the Eastern European countries (17%) and in the US (10%). As far as the production for European countries is concerned, transport is organized by the customers and is done with trucks and semi-trailers. Company 3 is only responsible for transport outside Europe (exports).

The 70% of European sales are distributed as follows: 30% for Germany, 11 to 12% for France, 10% for Belgium, 10% for The Netherlands, 4% for Italy and 4% for the UK.

Concerning the Eastern European countries, the main market is Ukraine, representing 10%, followed by Hungary (5%) and Estonia and Poland with 2% each.

The finished products are packed as rolls of different diameters with a maximum height of 2.80 m. The outbound flows represent an average of 85 trucks per month.

c Market trends and expectations for the future

The market of non wove paper using wet process is currently booming. By the end of May 2003, the budget for the production of the whole year had already been exceeded, which implies that forecasts had to be adjusted and increased.

d Experience of intermodal transport

The company has had no experience of intermodal transport till now. The logistics manager thinks that the intermodal experience could not succeed because of the nature of the raw materials used, and of the organisation of the manufacturing process. Therefore, the company is at present not prepared to transfer part of its transport needs to the intermodal system.

II.2.4. Modal scan for company 4

Company 4 is a subsidiary of an international group, the main activity being the production and commercialization of natural mineral waters, fruit-based lemonades and snacks. The group's turnover in 2002 equalled EUR 235.4 millions. By the 31st of December 2002, the group was employing 919 persons, of whom 841 in Belgium. The group has four production sites in Belgium.

By the 31st December 2002, the scanned production site was employing 660 persons, of whom an average of 150 worked in the logistics field.

a Logistic organisation

The logistics department includes four services, i.e.: planning, supply, handling and forwarding services. The company does not own its own vehicles and subcontracts all transport activities.

As for transport as such, a distinction is to be made between primary transport, i.e. from the plant to the main warehouses in Belgium and The Netherlands, and secondary transport (from the warehouses to the final customers).

b Outbound and inbound flows

The transport of raw materials is organised by the providers of such materials. The inbound flows cover the following raw materials: cardboard boxes, stoppers, caps, polyethylene (PET), syrup-based products that essentially come from Italy, Belgium, The Netherlands, France and Germany. Between 8 and 10 tank-trucks arrive at the company 3 or 4 times a week. The syrup-based products are delivered in metallic containers of 1 000 litres.

The two main markets for the company are The Netherlands and the Belux (Belgium + Luxembourg). The flows to The Netherlands represent some 45 to 50 semi-trailers a day during the low season and between 90 and 100 semi-trailers a day during the high season. The flows for the Belux represent between 16 000 and 17 000 pallets per week as an average with peaks that can reach up to 25 000 pallets per week.

c Future trends and general evolution of the sector

Generally speaking, the European sector of soft drinks resisted quite well to the 9/11 events. The consumption of soft drinks increased by 2% in Belgium in 2002. Apart from the cola products, it remained stable. In The Netherlands, it decreased by 1.8% in total but increased by 1.3% if we do no take into account the cola products.

The market for lemonades is characterised by the proliferation of new products and the arrival of new actors from related sectors (milk, alcohol drinks assimilated to lemonades, etc.).

d Experiences of multimodal and intermodal transport

Company 4 is open to any initiative that would promote the so-called « soft transport means » and currently uses waterway transport for the products reserved to the big export sector that represents 2% of its production volume. Uptill now, the experience is considered as quite conclusive.

As for rail, although the various experiences carried out in the past failed, the company has launched a programme of intensive railway use for supplying its market in The Netherlands. Studies are underway and this mode of transport will soon be used in reality.

II.2.5. Modal Scan for company 5

Company 5 is one of the main European producers of marmalades and compotes. Founded in 1888, the company established itself in 1980 in state-of-the-art facilities in the province of Namur in Belgium.

Six important figures characterize the company :

- Annual turnover: +/- 100 million euros
- Staff: +/- 420 persons
- Total surface: 24 hectares
- Total built-in surface : 6 hectares
- Total production capacity: 75 000 tons
- Storage capacity: 25 000 tons of finished products and 10 500 tons of frozen fruit.

a Logistic organisation

a.1. Market situation

The main markets for company 5 are Belgium and its neighbouring countries: Germany, France, The Netherlands, the UK and overseas Canada, Saudi Arabia, Japan …

Shipping services are organised on the basis of three distinctive principles:

- The company is entirely responsible for its (door-to-door) transport (organisation, administrative expenses, insurance...)
- The company is partially responsible for transport to Antwerp or Rotterdam (organisation, administrative expenses, insurance…)
- The customer is responsible for the transport as soon as he collects the goods on the company grounds.

These three options always include the participation of a forwarder (even only one carrier) who is responsible for all the flows in one country.

b. Outbound and inbound flows

b.1. Inbound flows

The basic raw materials necessary for production are sugar products, glucose, fruit and packaging. Two to three tank-trucks (25 tons per vehicle) daily bring the sugar and the glucose needed for the stocks of the company. The sugar products come from Tirlemont (Belgium) while the glucose (in liquid form) comes from Belgium, The Netherlands and France.

The second group of raw materials is made up of fruit (50% of the supply), which arrives by semi-trailer with controlled temperature (frozen or fresh products). Frozen fruit comes from Belgium (25% of the flow), various countries of the EU (50%) and from Southern countries (25%); it represents 2 to 3 trucks a day (one truck = 25 tons).

Packaging represents some 17 trucks a week and is made up of: cardboard boxes, bags, barrels, film reels, cardboard trays, caps (relatively low proportion of the flow, one truck from time to time) and empties (2 to 3 trucks/day).

b.2. Outbound flows

The outbound flows are essentially represented by the finished products (90% of the total tonnage) and, in a lower proportion, intermediary products (10%) destined for the supply of other production companies in the agro-food sector.

The total of these flows represent about 55 000 tons annually: 90% is shipped as completely loaded units (containers, semi-trailers) and 10% by groupage. The finished products (90%) include a wide variety of marmalades, compotes, fruit in syrup and "corin", fruit-based desserts, pure fruit juice (100%), fruit spreads, the so-called "fruit pockets" (small juice packs for children), fruit delights and "fresh and fruits".

These flows are particularly fragmented:

- 40% of the finished products are for the Belgian market, half of it presented on pallets (products and stocks), the other half being freight for groupage, resulting from a "picking".
- 35% are exported to the neighbouring countries (The Netherlands, France, Germany,…) and are completely loaded pallets in semi-trailers (25 tons).
- 5% are used for big export markets and are shipped by containers (truck to Antwerp or Rotterdam to be followed by sea freight).

  Loading the containers is done manually because of costs (optimisation of the volume of the container). Therefore, the pallet is taken out before loading the goods in the container.
- The remaining 10% (semi-finished products for « subcontractors » in Belgium and in France) are usually shipped in containers (1 ton vats).

c Future trends and experience of intermodal transport

Intermodal transport does not play a role in the logistic policy of the company, for several reasons:

- in the current situation, deadlines cannot be respected by these alternative modes (schedule planned on beforehand as delivery planning);
- disparity of delivery sites and, moreover, fragmentation of quantities delivered;
- cold chain management affected by breaking of bulk towards alternative modes;
- intermodal infrastructure often is not adapted to the demands, specific to this kind of product.

II.2.6. Modal scan of Company 6

a Context

The company produces the following products:

- Intermediary products used for bread making and baking;
- Enzymes and emulsifiers;
- Pure or imitation chocolate, fruit-based products (flavourings, fillings, etc.);
- Frozen products (bread, pastry, etc.) and make-off products (pie bases, puff pastry, etc.).

The Groot-Bijgaarden site employs about 425 people. Turnover in 2002 was approximately 142 million €.

For additional information: see annex.

b Logistical organisation

Company 6 only organises outbound flows. Inbound flows are organised by suppliers.

Company trucks (13.6 metres) are used for deliveries in Belgium and Luxemburg (from Groot-Bijgaarden).

For transport to the rest of the world, external haulers and forwarding agents are used. More specifically, forwarding agents are used for sea- and airfreight.

Most transported goods are subject to specific temperature conditions. It is of crucial importance not to break the cold chain. As a consequence, refrigerated containers are used. The goods are loaded into the containers by the staff of Company 6. The drivers are not responsible for loading the containers.

Number of employees (Groot-Bijgaarden) active in the logistical department:

- Internal logistics (among other things, transporting palettes with forklift trucks): 4 people;
- Loading and unloading: 10 people;
- Administration (the choosing of haulers, order entry, etc.): 14 people.

c Inbound and outbound flows

c.1. Analysed flows

At the request of Company 6, the following outbound flows were analysed (please note: these are refrigerated/reefer container):

1) Groot-Bijgaarden – Parma (Italy): 5 trucks/week - distance*: 1050 km*

2) Groot-Bijgaarden – Sills (near Barcelona): 5 trucks/week - *distance: 1250 km*

3) Groot-Bijgaarden – Hilden (near Düsseldorf): 4 trucks/week - *distance: 250 km*

4) Groot-Bijgaarden – Moscow/St-Petersburg: 3 trucks/week - *distance: 2713km/2320 km*.

The average loading rate of these trucks is 90% (the load is limited by either weight or volume).

There is no return freight. This is likely to change in the future. The reason for this is the trend to use plastic palettes (more hygienic for food). These palettes can be re-used and thus brought back to the country. This is not the case for the time being, but this will undoubtedly change in the future.

No forwarding agents are used on these routes.

At present, carriers in the destination country take care of haulage (for instance, Spanish carriers when goods have to be sent to Spain). These carriers come to Belgium already loaded with freight and unload their goods (melons, oranges, etc.) near Groot-Bijgaarden. After that, they go to Company 6 and the goods destined for Spain are loaded onto the truck.

According to the Transport Manager of Company 6, it is unlikely that the current carriers will want to provide initial and terminal road haulage. They only concentrate on the full route (e.g. Spain-Groot-Bijgaarden and back, and not solely on a section of the route).

The load weighs 20 tonnes on average and the goods are piled on europalettes (80cm x 120 cm). About 32 to 33 palettes can be loaded onto a truck. The average weight of a palette is 650 kg.

c.2. Cost and transit time

1) Currently 1,300 €/truck; loading day X – unloading day X+2 (including sleeping times)

2) Currently 1,190 €/ truck; loading day X – unloading day X+2 (including sleeping times)

3) Currently 1,290 €/ truck; loading day X – unloading day X+1 (including sleeping times)

4) Currently 345 €/ truck; loading day X – unloading day X+1 (including sleeping times)

5) Currently 3,200 to 3,500 €/truck

The average cost of road transport is 1,300 € in Europe. 20 tonnes can be transported by truck. This is equal to a cost of 0.065 € per kg.

If one assumes that the average cost of a product of Company 6 is about 2 €/kg, transport costs account for about 3% of the total production price of 1 kg of goods.

These trucks can leave from Groot-Bijgaarden in one go, but cannot be carried to the client all at once (in other words, the containers can be stored at the terminal temporarily at the destination – connected to the electricity network).

d Future trends

As far as future trends are concerned, no spectacular changes are expected. Company 6 is constantly innovating and is not expecting any radical innovation in the near future.

e Experience with intermodal transport

Reasons for the choice of the current form of transport (road transport): fast, direct, price and a broad selection of haulage (a lot of choice).

Alternative means of transport have already been examined. About 2 years ago, Cargovil contacted Company 6, and it was examined whether certain flows could take place using inland waterway navigation. At the time, the cost was much higher than regular road transport, which is why no modal shift was achieved.

Uptill now, there has been some experience with alternative means of transport. Some goods destined for Algeria are transported to Marseille by train, where they are placed onto a ship.

The management knows about the project and supports a modal scan being done under the condition that confidentiality is guaranteed.

II.2.7. Modal scan of Company 7

a Context

This company was established in Antwerp in 1886.

Between July 2001 and July 2002 about 225 people were employed by Company 7, among which 152 full-time and 73 part-time. Turnover during that same period was 83 million € (56 million € in the previous financial year).

Company 7 spreads its activities in Belgium across 4 sectors, namely: sauces, dessert products, soups and snacks.

Desserts, snacks and sauces are produced in Puurs. Soups are produced in France, The Netherlands, Italy and the UK.

Company 7 is the market leader for mayonnaise in Flanders (and probably in Belgium as well). The company is also a market leader for topping sauces in Belgium.

For additional information: see annex.

b Logistical organisation

A distinction must be made between "transport outside Belgium" and "transport within Belgium and Luxemburg".

The Castelein company in Mechelen organises haulage to clients within Belgium (Cora, Laurus, etc., with the exception of Colruyt, Delhaize and Carrefour, which collect their goods with their own haulers). This company provides warehousing and transport; it has its own trucks. It decides on transport prices.

For export to other countries (about 20% of total production; mostly to France), Company 7 works out logistics itself (it contacts Belgian haulers) in the case of "inter-company transport". In the other case, the client organises transport (collection of products in Puurs).

The company does not own its own trucks.

The company does not organise the transport of inbound flows of goods, unless these are raw materials. For instance, Company 7 organises its supply of oil.

Approximately 40 people work in the logistical organisation (including administration) in the Castelein company.

In Company 7, about 12 people work in the warehouse and about 3 people are employed in the logistics department. The company has loading/unloading quays.

c Inbound and outbound flows

At the request of the company, 2 flows of goods will be analysed.

c.1. Outbound flow

Puurs – Tourcoing (near Lille) and surroundings.

This flow consists of some 600 palettes a year (or 115 palettes a week). About 33 full palettes (average palette weight is 600 kg) fit into a standard truck; therefore approximately 4 trucks are sent to northern France per week. The goods transported are mayonnaises and sauces.

Goods are currently being transported out of Puurs by truck and are unloaded on a platform in Tourcoing, with TNT as logistic service provider. A fine structured distribution network to clients is organised from there. There are loading/unloading quays on the Tourcoing platform.

The research team analyses the possibilities for transporting goods from Puurs to the platform. The fine structured distribution network remains the responsibility of the current haulers.

c.2. Inbound flow

Le Pontet (near Avignon) – Puurs.

This flow concerns 2 trucks per week, carrying 30 full palettes (soups, etc.). There are loading/unloading quays at the point of departure (Le Pontet). Transit time is currently about 2 days.

Le Pontet is close to the river Rhône.

c.3. Cost and transit time

1) Puurs – Tourcoing and surroundings currently costs 248 €/truck; loading day X – unloading day X

2) Le Pontet – Puurs currently costs 650 €/truck; loading day X – unloading day X+2

Expenditure on logistics is rather low at Company 7: it amounts to only 2% of total turnover.

d Future trends

The company is not expecting any future trends that will cause a radical change in logistics organisation.

e Experience with intermodal transport

Reasons for the current mode of transport (road transport): good price/quality ratio. The price perfectly matches the service offered.

The transport cost is one of the most important elements for company 7. Should the price of alternative transport cost less, company 7 would be prepared to accept the (probably) longer transit times (on the condition that it is not excessively longer).

Company 7 already has some experience with alternative forms of transport. Where possible, (cheaper) trains are used for certain flows from Italy and Spain. The company is open to new modes of transport if these are cheaper than road transport.

The top management is not aware of the experiment yet, but will soon be. One of the managers of the logistics department will be informing top management, but has already assured us that it would agree to have the experiment carried out.

Guaranteeing confidentiality was the most essential condition to have the scan done.

II.2.8. Modal scan of Company 8a and Company 8b

a Context

The Group, to which Company 8a and 8b belong, was set up in 1935 and is divided in several independently operating business units, based on 6 core activities, namely: paper recycling, paper production, corrugated cardboard production, carton compact production, the production of wrappers and angle cross-sections and trade.

At present, the Group has 23 production sites and 6 trade and service companies spread across the Benelux, France, the UK and Germany. The consolidated turnover of the Group was about 371 million € in 2002, employing approximately 2459 workers.

Company 8a's turnover in 2002 was: 106 860 000 €.

Company 8b's turnover in 2002 was: 98 657 000 €.

For additional information: see annex.

b Logistical organisation

Both companies have full control of the outbound flow of goods. They do not decide on the way the supplied goods are transported (these are delivered "franco", i.e. the supplier chooses the mode of transport).

The main outbound flows are to Belgium, France and England.

Transport currently takes place with standard trucks (trailers) – whether or not belonging to Company 8a/8b - of which the "body" cannot be detached from the chassis. All trucks are hired from a company nearby.

Neither company owns containers. When goods have to be sent in containers (e.g. to the Far East), external haulers that have containers are used. The containers are then loaded at the company site (without detaching the container from the chassis). The container is transported to a seaport terminal (e.g. Antwerp) in order to be put on a ship.

The truck and the freight cannot weigh above 44 tonnes in Belgium and England. The maximum in France is 40 tonnes.

Fifteen people are employed in the logistics department of Company 8b (white and blue collar).

c Inbound and outbound flows

c.1. Flows analysed

For this modal scan, the company wanted to have the following 2 outbound flows analysed:

1. Dendermonde – Raamsdonksveer (near Breda): approximately 15 trucks per week

The load consists of paper reels, which are transported to a sister company (Company 8a in The Netherlands) in order to be transformed into boxes. On average, some 27 tonnes of reels are transported per truck *(the average diameter of a reel is 1.4 m with a maximum height of 2.5 metres)*. About 12 reels of paper are transported per truck (the average weight of a reel is 2.25 tonnes).

As little handling of the goods as possible is desired: the more handling operations, the greater the risk of damage. The sister company in Raamsdonkveer has 3 loading quays (which means that containers can be unloaded on the site).

A Dutch carrier currently hauls these reels (which are loaded with goods on the Breda-Dendermonde route that have to be delivered close to Companies 8a and 8b). The truck is loaded with reels of paper on the Dendermonde-Breda route. In order to never be without a carrier, 3 different (Dutch) carriers are used regularly (when one cannot make it, another one is contacted). Forwarding agents are not used.

Three or 4 trucks belonging to Company 8a/8b are deployed on the Dendermonde-Breda route each week because return-freight has to be organised for waste cardboard/paper. This "waste" will be used as raw material in the production of cardboard.

2. Dendermonde – Waspik (near Breda): on average 15 trucks a week

There is storage space available in Waspik (which is being rented by a carrier). The carrier seeks subsequently finely structured distribution patterns. The trucks are loaded with used boxes, which are pressed flat and piled onto palettes. Some 11 tonnes of boxes are transported per truck.

If the palettes have the following measurements (1m x 1m x 1.2m), an average of 26 palettes can fit into one truck (average freight weight per palette: 11 tonnes/26 palettes = 420 kg).

If the palettes have the following measurements (1m x 1m x 0.8m), an average of 33 palettes can fit into one truck (average freight weight per palette: 11 tonnes/33 palettes = 330 kg).

The storage space in Waspik does not have any loading quays, which means that no containers can be unloaded on the site, but it does have swap bodies.

A Dutch carrier currently hauls these boxes (which are loaded with goods on the Breda-Dendermonde route that have to be delivered close to Company 8a and Company 8b). The truck is loaded with palettes filled with boxes on the Breda-Dendermonde route. In order to never be without a carrier, 3 (Dutch) carriers are used regularly (when one of them cannot make it, then another one is contacted). Forwarding agents are not used here either.

c.2. Cost and transit time

Transport costs are about 170 € per truck for the Waspik/Raamsdonksveer leg and the truck takes approximately 1.5 hours (without traffic jams).

Transport costs account for about 7% of the total cost of the packaging production (boxes, etc.) and approx. 3% of the total cost of paper production.

Some 30 people are employed in the logistics department of Company 8b.

d Future trends

As far as future trends are concerned, it is expected that Company 8b will increase its capacity in the next 5 years. The competition is also expected to expand its capacity.

Generally speaking, both companies expect to get heavy competition.

e Experience with intermodal transport

The management has shown an interest in alternative modes of transport.

A certain number of studies have already been carried out about the feasibility of introducing alternative modes of transport. Up to now the alternative modes were more costly than road transport and the service delivered was apparently not optimal. This is the reason why the transition to alternative forms of transport has not been made.

The management knows about the project.

Conditions for taking the scan: data confidentiality and a minimal workload for the Transport Manager.

II.2.9. Modal scan of Company 9

a Context

The factory in Aalst is specialised in the processing of carbohydrate.

The Group has a turnover of 1.2 billion € in Europe. The Group processed wheat and maize into starch and starch derivatives (such as sweeteners).

About 580 people were employed during last financial year.

For additional information: see annex.

b Logistical organisation

Company 9 organises the transport of core products to the client by itself. Side-products have to be collected by the client. Company 9 organises its own inter-company transport.

The Company does not own trucks. However, it does "possess" wagons. Company 9 has had customised tank containers made and now pays a lease price to the building firm of these tank containers. The price for haulage is either paid to the SNCF or the SNCB.

When the tank container arrives by rail at Aalst railway station, no post-haulage between the station and the company is required. The liquid goods are pumped out of the tank and are piped through to the company. The solid goods reach the company by conveyor belt.

Company staff unloads the goods.

There is no return freight.

c Inbound and outbound flows

c.1. Flows analysed

At the request of the company the following flows were analysed:

Aalst – Crolles (southern France; "département" 34): 5 to 6 tank containers per week (~1/day)

(*Crolles is situated to the east of Lyon (approx. 100 to 150 km), near Grenoble*)

Aalst – Apt (southern France): 3 to 4 tank containers per week

(*Apt is situated at some 40 km from Avignon*)

As the flows to be examined involve foodstuffs (bulk syrups), which are sometimes sensitive to temperature and lose their colour stability after a certain amount of days (some transparent sugars become brown after a number of days, and therefore cannot be used for specific purposes), it is essential to have an A-B type delivery time.

An intermodal alternative has already been looked for. More specifically, the company has worked with Fulltrans from The Netherlands – a hauler that has tank containers which can be detached from the chassis and which organised the whole intermodal route (played the role of forwarding agent and road carrier, as it were). Due to shortcomings on Fulltrans' side the goods kept arriving late at the client in southern France and this intermodal alternative was abandoned.

Nevertheless, Company 9 remained interested in looking to see whether it was possible to send both flows by rail. Since an A-B regulation was a requirement, inland waterway navigation is not feasible, and rail transport is the only possible option.

Transport is currently by road and is organised by Van Heyste in Knesselare (near Aalter). This hauler does not have tank containers that can be detached from the chassis. Therefore, it cannot be contacted for the intermodal option.

Since the company is working in the dairy product industry, the (client) companies are not very large and none of the above-mentioned Southern French clients have a rail connection. As a result, post-haulage is required.

Loading quays are not required to empty the tank containers. The tank containers are pumped empty from the chassis of the truck. Once the tank has been placed from the train onto the truck, it remains on the truck until it is necessary to place it back on the train to be sent back.

The leased wagons cannot be used on this stretch because they are only used for inter-company transport from a department in (Northern?) France and Aalst.

c.2. Cost and transit time

Aalst – Crolles: 50 to 60 € per ton; loading day X – unloading day X+1

Aalst – Apt: 50 to 60 € per ton; loading day X – unloading day X+1

It is assumed that the tank containers meant for road transport can carry approx. 25 tonnes in bulk, whereas tank container for intermodal transport could carry 27 to 28 tonnes (these are less bound by weight specifications in comparison to the road transport where trucks (chassis + load) cannot exceed 44 tonnes in weight).

Therefore this adds up to:

(50 to 60 €/ton) x 25 tonnes = 1,250 to 1,500 €/tank

d Future trends

No new trends are expected.

e Experience with intermodal transport

The company already has experience with intermodal transport. Some flows (e.g. liquid dextrose) coming from France are transported by rail shuttle. Other flows (bulk syrups) are transported to Italy by train.

The management knows about the project and agrees to a scan being done under the agreement that confidentiality is guaranteed.

Comment

The river Dender near the company's site can only accept ships of maximum 450 tonnes (limited).

II.2.10. Modal scan of Company 10

a Context

This is a mixed cooperative company with limited liability ("c.v.b.a."), grouping about 33 companies importing and exporting traditional Belgian fruit and vegetables, European fruit and vegetables, bananas and exotic fruit.

Some 650 people work in this c.v.b.a. (including those employed in correlated activities). Most companies (11) have between 10 and 28 employees.

This c.v.b.a.'s yearly turnover is around 500 million €.

For additional information: see annex.

b Logistical organisation

At present, all deliveries to Company 10 are by truck. Either the truck comes from one Southern European country or another, or else the truck has gone to collect the merchandise from a port or an airport. The three most important ports of arrival are: Antwerp, Rotterdam and Marseille.

16 companies employ less than 5 people in the logistics department, whereas 8 companies employ more than 5 people in logistics.

Most companies (20) own less than 5 trucks. Two of them have between 5 and 10 trucks and 2 of them have more than 10. The latter companies also carry out haulage activities, which explains their high number of trucks. It can already be stated that the companies only provide a small part of the haulage, which explains the small amount of trucks and positions in logistics.

Only one company outsources less than 50% of its haulage traffic and 1 company outsources between 50 and 75%. Once again, these are companies that carry out haulage activities themselves. Eighteen companies hire haulage partners externally and provide less than 5% of the transport logistics themselves. As a result, we can conclude that providing own transport is a costly and unprofitable activity.

Eleven companies have on average 15 partners for haulage. These are mostly road haulage companies. The 4 companies that have more than 20 haulage partners mostly have around 10 steady partners and contact other haulage companies on some occasions. Nine companies work with less than 10 haulage partners.

c Inbound and outbound flows

Company 10 trades more than 1 million tonnes of fresh fruit and vegetables per year, from the five continents. Around 80% of the goods are imported from the EU, broken down as follows: France = 30%, Italy = 30% and other countries = 10%. About 20% of the goods are imported from outside the EU, predominantly from South Africa, the US and Chile.

The three main destination areas are The Netherlands, Luxemburg, Germany/France.

c.1. Flows analysed

Out of all possible flows, we have chosen to analyse the stream of goods between the port of Antwerp and Company 10. We believed that this was the most important flow in light of the foreseen heavy congestion problems on the peripheric motorway around Antwerp.

Inbound flow:

For the time being, only containers for goods that are imported via inter-continental maritime transport are used.

It is estimated that 3,000 40' containers or 6,000 20' containers arrive each year. It is assumed that the ratio is about 50/50, so the flow to be analysed appears as follows:

1,500 40' containers and 3,000 20' containers per year;

This is equivalent to 30 40' containers and 60 20' containers per week.

c.2. Cost and transit time

Goods arriving at the Port of Antwerp on day X arrive at Company 10 on the same day.

The cost of transporting these 20' and 40' containers on the road is about 200 € per container.

d Future trends

Future trends	Amount	%
No changes	5	21%
New products	11	46%
New services	4	17%
New markets	13	54%
Changes in the organisational structure	6	25%
Expansions	7	29%
Relocations	3	13%
Other	2	8%

Five companies do not expect any changes in the future. Eleven companies are convinced that they must look for new products. This involves new crosses between varieties of fruit, which are either better quality or have a longer shelf life.

Four companies are expecting new services in the future. These new services mainly involve haulage and storage facilities. Thirteen companies believe that the most important goal for the future is finding new markets. This implies both further penetration in neighbouring countries and finding new clients in the Eastern European countries. With the new context of EU enlargement, the Eastern European countries are considered as a new opportunity. Six companies are planning a change in their organisational structure. The possibilities mentioned were: transition to another form of company, setting-up a subsidiary and delegating functions.

Seven companies feel obliged to expand their business activities and grow. Three companies also mentioned a possible relocation. This does not mean that they want to move their headquarters away from the site, but that they wish to relocate some storage areas to other parts of the country so that they can provide faster and more efficient distribution. Among the other possibilities, it was only mentioned once that the company wished to drive up imports. One company mentioned wanting to look for other clients in the future.

In general, it is clear that new markets and new products are among the most important future goals.

e Experience with intermodal transport

In the vicinity of Company 10 there is a private freight station with ten tracks. This was used very intensively in the years following the opening of the facilities. Up to 1992, importers got a yearly discount on actual tonnage from France, Italy and Spain. However, due to the increasingly negative experience companies had with rail transport, road transport became more common. More specifically, this shift was due to the fact that the goods did not arrive on time, or the merchandise was damaged. Rail transport has not been used in the last 10

years. The freight station is still there, but has been converted into a parking lot, with the possibility to make it operational again should the need arise.

The use of navigation by sea or inland waterways has been brought down to a minimum, as a ship is at sea for far too long to guarantee the freshness of products. The growth in exotic and overseas products has lead to a significant increase in the use of air transport.

CHAPTER III

RESULTS OF THE MODAL SCAN OF COMPANY 6 TO COMPANY 10

III.1. Results of the modal scan of Company 6

In this part of the document, an overview is given of the final result. All calculations are mentioned in detail in the annex.

III.1.1. Flows by Short Sea Shipping (SSS)

Groot-Bijgaarden – Parma (Italy): 5 trucks/week - distance*: 1050 km*
Groot-Bijgaarden – Sils (near Barcelona): 5 trucks/week - *distance: 1250 km*
Groot-Bijgaarden – St-Petersburg/Moscow: 3 trucks/week - *distance: 2713 km*
In the intermodal scenario, the transport units carried are 40' Reefer Container.

1.1. Figures

Shipping Company 1 organises haulage by Reefer Container to Valencia and La Spezia, also rents out Reefer Container and organises haulage domestically and abroad (distance Groot-Bijgaarden – Port of Antwerp: 50km; distance La Spezia-Parma: ~75km; distance Valencia-Sils: ~430 km). The rates mentioned were valid until the end of October 2003 (subject to any possible official increases in port charges, port rates, etc.).

The rental prices of the Reefers are included in the price of transport. The Reefers are dropped at the client (Company 6) two days before shipping. If the client wishes to receive the containers earlier, then a surcharge has to be paid.

Shipping Company 2 organises Reefer transport to St-Petersburg, rents out Reefer Container and organises haulage domestically. Haulage in St-Petersburg has to be organised separately.

Shipping Company 3 provides Reefer Containers that are transported from Groot-Bijgaarden to Rotterdam by truck. These are then put onto a ship and transported to St-Petersburg. The containers are carried from St-Petersburg to Moscow by truck.

1.1.1. Groot-Bijgaarden – Parma

The prices received from shipping company 1 are as follows:
- Initial haulage: 295 €/container;
- Customs charge: 31 €/container;
- Shipping documents: 21 €/container;
- Transfer in Antwerp: 159 €/container;
- Main haulage: 1200 €/container;
- Transfer in La Spezia: 158 €/container;
- Plugging charges: 25.83 €/day/container (1 day of plugging estimated);
- Lay-up of the container: 2 days free (if different: see above);
- Insurance costs: optional;
- Doc. fee: 36 €/container;
- Terminal haulage: 340 €/container.

Total cost per container via short sea shipping: 2,266 € (excluding VAT)

1.1.2. Groot-Bijgaarden – Sils

The prices received from shipping company 1 are as follows:

- Initial haulage: 295 €/container;
- Customs charge: 31 €/container;
- Shipping documents: 21 €/container;
- Transfer in Antwerp: 159 €/container;
- Main haulage: 1,200 €/container;
- Transfer in La Spezia: 110 €/container;
- Plugging charges: 44.5 €/day/container (1 day of plugging estimated);
- Space: 1.5 €/day/container (1 day of storage estimated);
- Lay-up of the container: 2 days free (if different: see above);
- Insurance costs: optional;
- Port tax: 3.78 €/MT payload (freight with a weight of 20 tonnes estimated: 75.6 €);
- Doc. fee: 40 €/container;
- Terminal haulage: 931.5 €/container.

Total cost per container via short sea shipping: 2,908.6 € (excluding VAT)

1.1.3.. Groot-Bijgaarden – St-Petersburg

The prices received from shipping company 2 are as follows:

- Initial haulage: 325 €/container;
- Main haulage (including transfer in Antwerp and in St-Petersburg, 3-day switch in Antwerp and 3-day switch in St-Petersburg): 1,900 €/container;
- Customs charge: approx. 50 € per container;
- Terminal haulage: unknown (distance between terminal and client = unknown).

Total cost Groot-Bijgaarden – St-Petersburg via SSS: 2,325 €/container + terminal haulage

1.1.4. Groot-Bijgaarden – St-Petersburg/Moscow

The prices received from shipping company 3 are as follows:

The price for transport between Groot-Bijgaarden and St-Petersburg amounts to 2,869 €/container (excl. VAT) for an average weight of 21,500 kg, in addition to 10 € for a bill of lading.

The price for transport between Groot-Bijgaarden and Moscow amounts to 3,544 €/container (excl. VAT) for an average weight of 21,500 kg, in addition to 10 € for a bill of lading. Administrative costs, customs visits and the hire of the Reefers are included in these prices.

1.2. Comparison with road transport

Total cost per Reefer Container by truck Groot-bijgaarden - Parma: 1,300 €
Total cost per Reefer Container by truck Groot-Bijgaarden - Sils: 1,190 €
Total cost per Reefer Containerby truck Groot-Bijgaarden – St-Petersburg/Moscow: 3,200 to 3,500 €/Container

1.3. Frequency and transit time

Frequency of the departures to Valencia and La Spezia: once a week.

Transit time is more or less identical for both destinations:

- Container is made available 2 days before shipment;
- Transport by sea takes 7 days;
- Terminal haulage takes an estimated 2 days.

Total transit time: approx. 11 days

Frequency of the departures to St-Petersburg: once a week.

Transit time by ship is 5 days. It is possible to organise the loading in Groot-Bijgaarden + the initial haulage + the loading on the ship on the same day.

The total transit (i.e. full container from Groot-Bijgaarden to St-Petersburg and empty container from St-Petersburg back to Groot-Bijgaarden) takes 12 days at most.

Frequency of the departures to St-Petersburg: twice a week (Wednesday and Sunday) from Rotterdam via Helsinki. Transit time is between 5 and 7 days.

III.1.2. Flows by train

Groot-Bijgaarden – Parma (Italy): 5 trucks/week - distance*: 1,050 km*
Groot-Bijgaarden – Sils (near Barcelona): 5 trucks/week - distance*: 1,250 km*
Groot-Bijgaarden – Hilden (near Düsseldorf): 4 trucks/week - distance*: 250 km*
Groot-Bijgaarden – Moskow/St-Petersburg: 3 trucks/week - distance*: 2,713km/2,320 km.*
In the intermodal scenario, the transport units carried are 40' Reefer Container.

2.1. Figures

For the initial haulage of a 40' Reefer Container by train, prices are as follows:

- Initial haulage Muizen – Groot-Bijgaarden – Muizen (45 km x 2) = 217 € /Reefer Container;
- Initial haulage Antwerpen – Groot-Bijgaarden – Antwerp (75 km x 2) = 270 € /Reefer Container.

2.1.1. Groot-Bijgaarden – Parma

Route: Groot-Bijgaarden – Muizen – Bologna – Parma:

- Transfer in Muizen, main haulage, transfer in Bologna: 842 € /Reefer Container;
- Terminal haulage Bologna – Parma –Bologna (115 km x 2) = 332 €/Reefer Container;
- Rental of Reefer Container: 47.5 €/Reefer Container;
- Return train journey of the empty containers = 669 €.

Total cost per train (excluding VAT) = 217 € + 842 € + 332 € + 47,5 € + 669 € = 2,107.5 €

2.1.2. Groot-Bijgaarden – Sils (near Barcelona)

Route: Groot-Bijgaarden – Muizen – Barcelona – Sils:

- Transfer in Muizen, main haulage, transfer in Barcelona: 981 €/Reefer Container;

- Terminal haulage Barcelona – Sils –Barcelona (105km x 2) = ?? €/Reefer Container3 Upper limit = 324 EUR/Reefer Container (=162 € for haulage between [51; 70] km; 162 € x 2 (for 105 km));
- Rental Reefer Container: 47.5 €/Reefer Container;
- Return train journey of empty containers = 715 €;

Total cost per train (excluding VAT) = 217 € + 981 € + 324 € + 47.5 € + 715 € = 2,284.5 €

2.1.3. Groot-Bijgaarden – Hilden

Route: Groot-Bijgaarden – Muizen – Herne/Wanne – Düssseldorf:

- Transfer in Muizen, main haulage, transfer in Herne: 273 €/Reefer Container;
- Terminal haulage Herne – Düsseldorf – Herne/Wanne (55km x 2) = 163 €/Reefer Container;
- Rental Reefer Container: 42 €/Reefer Container;
- Return train journey of empty containers = 221 €;

Total cost per train (excluding VAT) = 217 € + 273 € + 163 € + 42 € + 221 € = 916 €

2.1.4. Groot-Bijgaarden – St-Petersburg

Route: Groot-Bijgaarden – Zomerweg Antwerp – St-Petersburg:

- Transfer in Antwerp, main haulage: 1,902 € /Reefer container.

IFB organises train transport to St-Petersburg but does not place the container on a truck over there. As far as the costs of the transfer and terminal haulage by truck are concerned, Express-Delta, in the Russian Federation (St-Petersburg), is used (on 30/07). According to this firm, it costs ~150$/Reefer Container in order to take it off the wagon and to carry it by truck to the St-Petersburg region.

- Rental Reefer Container: 61.5 €/Reefer Container;
- Return train journey of empty containers = 1,544 €;

Total cost per train (excluding VAT) = 270 € + 1902 € + 150 € + 61,5 € + 1544 € = 3,927.5 €

2.1.5. Groot-Bijgaarden – Moscow

Route: Groot-Bijgaarden – Zomerweg Antwerp – St-Petersburg:

- Transfer in Antwerp, main haulage: 1,874 €/Reefer Container.

IFB organises train transport to Moscow but does not place the container on a truck over there. As far as the costs of the transfer and terminal haulage by truck are concerned, a transport company in Moscow has to be contacted (IFB could not give us any further information about this).

- Crane costs + terminal haulage up to the client in Moscow = unknown;
- Rental Reefer Container: 61.5 €/Reefer Container;
- Return train journey of empty container = 1,516 €;

[3] *(The data for Barcelona only goes until 70 km; however it is possible to organise terminal haulage up to Sils, but this price has to be agreed: (price [51km ; 70km] x 2) = 162 x 2 = 324* €)

Total cost per train (excluding VAT) = 270 € + 1874 € + 61.5 € + crane costs in Moscow + terminal haulage + 1,516 € = 3, 721.5 € + crane costs in Moscow + terminal haulage

2.2. Comparison with road transport

Total cost per Reefer Container by truck Groot-Bijgaarden-Parma: 1,300 €
Total cost per Reefer Container by truck Groot-Bijgaarden-Sils: 1,190 €
Total cost per Reefer Container by truck Groot-Bijgaarden-Hilden: 345 €
Total cost per Reefer Container by truck Groot-Bijgaarden-St-Petersburg/Moscow: 3,200 to 3,500 €.

2.3. Frequency and transit time:

Groot-Bijgaarden-Parma:

By truck: loading day X – unloading day X+2 (including sleeping times)
By train (Muizen-Bologna): daily train connection; transit time: A-D + 1 day collection + 1 day unloading

Groot-Bijgaarden-Sils:

By truck: loading day X – unloading day X+2 (including sleeping times)
By train: from Muizen to Bologna: daily train connection; transit time: A-D + 1 day collection + 1 day unloading

Groot-Bijgaarden-Hilden:

By truck: loading day X – unloading day X +1 (including sleeping times)
By train: from Muizen to Herne: train connection 3x per week; transit time: A-B + 1 day collection + 1 day unloading

Groot-Bijgaarden-St-Petersburg/Moscow:

By train: from Antwerp to Moscow/St-Petersburg: train connection 3x per week; transit time: 10 days + 1 day collection

III.1.3. Comments

1. The transfer in Moscow/St-Petersburg is not provided by IFB; this has to be organised by the client.
2. The problem with destinations such as Spain, Italy, St-Petersburg and Moscow is that the genset is not comprehensive enough (in terms of hours) to keep the goods cooled for the duration of the journey. In general, gensets (clip-on systems) "only" last for 60 hours.
3. It is the client's full responsibility to send Reefer Containers. ICF will not accept any responsibility for any possible defective or lack of operation of the cooling installations.
4. The freight weighs 20 tonnes on average, an empty 40' Reefer Container weighs between 5 and 6 tonnes; the weight of the loaded container (=gross weight) is in the [22.001 – 31.000]-tonne range.

III.2. Results of the modal scan of Company 7

III.2.1. Flow by inland waterway navigation:

1. Le Pontet – Puurs: 2 trucks/week - *distance: 900 km*
2. Puurs – Tourcoing: 4 trucks/week - *distance: 105 km*

1.1. Figures

AVCT Avelgem was contacted for the first flow. The question was asked whether it was possible to transport the goods from Le Pontet (of Avignon) to Avelgem by inland waterways. According to the contact person in AVCT there is no possibility of reaching Belgium from this place in southern France by inland waterways.

According to the Flemish Office for the promotion of inland waterway navigation ("Promotie Binnenvaart Vlaanderen"), it is not possible to navigate to southern France because the canals are too narrow for the containers. It is advisable to do this via SSS to Marseille and then sail northwards from there with an inland navigation vessel or to organise that stretch by truck.

The Port of Lille was contacted for the second flow. This Port organises inland waterway transport between the Ports of Antwerp and Lille as well as terminal haulage between the Port of Lille and the Tourcoing platform. However, it does not provide containers, does not perform any stuffing and stripping and does not organise any haulage between Puurs and the Port of Antwerp.

A haulage company in Antwerp was contacted for road transport.

1.2. Total cost (excluding VAT)

Rate for 1 40' container:

- Rental of container: 12 €;
- Initial haulage Puurs-Port of Antwerp: 210 €;
- Handling in Antwerp: 25 € + 50 € = 75 €;
- Main haulage Port of Antwerp-Lille: 91.8 €;
- Handling in Lille: 18.7 € + 22.6 € = 41.3 €;
- Terminal haulage Lille-Tourcoing-Lille: 142.82 €;
- Handling in Lille: 18.7 € + 22.6 € = 41.3 €;
- Return empty container Lille-Port of Antwerp: 91.8 €;
- Return empty container Port of Antwerp-Puurs: 210 €;

Total cost for 1 container: 496 € + max* 420 € = **916 €** (excluding VAT)
496 € + min* 210 € = **706 €** (excluding VAT)

*If the container is transported directly (in 1 go) from Berchem to Puurs (loading time = 2 hours) and then to the Port of Antwerp, the whole route does not cost 420 €, but 210 €.

*If the terminal haulage of one leg (Port of Antwerp-Puurs) can be combined with the initial haulage of the following leg (Puurs- Port of Antwerp) on the same day (with 2 hours' loading time after the arrival of the container in Puurs), the rate is 210 € instead of 420 €.

1.3. Comparison with road transport

The Puurs-Tourcoing route currently costs 248 € by truck

The Le Pontet – Puurs leg currently cost 650 €/truck

1.4. Frequency and transit time

Because an inland navigation vessel is underway for some 28 hours, one can estimate that it takes the goods two days to reach Tourcoing from Puurs.

Antwerp–Lille:

Service	ETD	ETA
Barge	Monday 10 AM	Tuesday 2 PM
	Tuesday 10 AM Wednesday 10 AM	Wednesday 2 PM Thursday 2 PM
	Thursday 10 AM	Friday 2 PM
	Friday 10 AM	Monday 8 AM

Lille – Antwerp:

Service	ETD	ETA
Barge	Monday 10 AM	Tuesday 8 AM
	Tuesday 10 AM Wednesday 10 AM	Wednesday 8 AM Thursday 8 AM
	Thursday 10 AM	Friday 8 AM
	Friday 10 AM	Monday 8 AM

III.2.2. Flow by rail transport

1. Le Pontet–Puurs : 2 trucks/week - *distance: 900 km*
2. Puurs–Tourcoing : 4 trucks/week - *distance: 105 km*

2.1. Figures

CNC Transports (terminal in Avignon) was contacted for the first flow, but there was no answer, even after 3 months. That is why IFB was contacted again. The research team still got no answer.

The following can be calculated for the second flow:
Rental container (5 days): 15 €;
Initial haulage Muizen-Puurs-Muizen: 192 €;
Main haulage by train Muizen-Moeskroen (including transfer): 105 €;
Terminal haulage Moeskroen-Tourcoing-Moeskroen: 184 €;
Return journey of empty containers Moeskroen-Muizen: 105 €;
Haulage Muizen-Puurs: 192 €;

Total cost per train = 496 € + 105 € + 192 € = **793 €**

2.2 Comparison with road transport

The Puurs-Tourcoing route currently costs 248 € by truck

The Le Pontet – Puurs leg currently costs 650 €/truck

III.3. Results of the modal scan of Company 8a and 8b

III.3.1. Flows per train:

Dendermonde–Raamsdonksveer: 12 40' containers per week
Dendermonde–Waspik: 15 40' swap bodies per week

1.1 Figures

If the choice is made to make the journey by train, initial haulage is partially needed for the leg between Oudegem and Antwerp (42 km). There is a straight line to Breda from Antwerp (60 km). The problem however is that goods haulage in The Netherlands is mainly concentrated on the Antwerp/Rotterdam corridor, where 3 potential intermodal terminals can be accessed.

This means that firstly initial haulage of 42 km is needed between Oudegem and Antwerp, followed by a rail leg of 92 km and terminal haulage of 30 km.

If one considers that the truck leg is about 90 km, one clearly sees that rail transport is not a realistic option.

In addition to this, it has to be mentioned that only maritime containers can be used on these routes. Working with swap bodies, for which initial and terminal haulage is necessary, is not economically viable, and no firm applies it. All flows are delivered by truck.

Conclusion: for both options, rail transport is not economically profitable.

III.3.2. Flows by inland waterway navigation

Dendermonde – Raamsdonksveer: 12 40' containers per week
Dendermonde – Waspik: 15 40' swap bodies per week

2.1 Figures

CEM (Container Exploitatie Maatschappij) was contacted for both corridors. The traffic would pass through Intermodaal Platform in Ghent.

There was a request for prices made at the end of August 2003. However, no reply was given, even after several telephone calls.

III.4. Results of the modal scan of Company 9

III.4.1. Flows by train

Aalst – Crolles (southern France, near Grenoble): 5 to 6 tank container per week (*contents: 33,000 litres*)
Aalst – Apt (southern France, near Avignon): 3 to 4 tank container per week (*contents: 33,000 litres*)

Company 9 prefers an A/B-service. The company does not intend to switch to another mode of transport if the service is not an A/B-type one.

This implies that inland waterway navigation or Short Sea Shipping will not be considered. The only option that will be studied here is rail. IFB was contacted for these flows.

1.1. Total cost

The price of the initial haulage between Aalst and the Main Hub Antwerp + main haulage by train Main Hub Antwerp – Avignon + terminal haulage between Avignon and **Crolles** = **700 €** for a 7.15 tank.

The price of the initial haulage between Aalst and the Main Hub Antwerp + main haulage by train Main Hub Antwerp – Avignon + terminal haulage between Avignon and **Apt = 747 €** for a 7.17 tank.

Rental of a tank container: 17.6 US$/day; rented for a period of 4 days.

Return of empty tank container (southern France – Aalst): 350 €/tank container.

Aalst – Crolles: 700 € + 70.4 € + 350 € = **1,120.4 €/tank container**
Aalst – Apt: 747 € + 70.4 € + 350 € = **1,167.4 € / tank container**

1.2. Comparison with road transport

The **total price** per truck fluctuates between **1,250 and 1,500 €**/tank container

1.3 Comment

According to the contact person at IFB, it is not realistic to expect an A/B-service for such a small amount of tank containers (as requested by Company 9). No direct train can be guaranteed.

III.5. Results of the modal scan of Company 10

III.5.1. Flows by internal waterway navigation

Company 10 has a potential of 30 40' containers and 60 20' containers between the ports of Antwerp and Brussels (where Company 10 is located).

1.2. Figures for inland waterway navigation

For container traffic from Antwerp to Company 10 via Cargovil Container Terminal including the return of the empty containers to Antwerp, the following is valid:

Haulage, lighter and truck, including handlings:

220 € per 20' Reefer Container

270 € per 40' Reefer Container or 40' High Cube Reefer Container

The following costs need to be taken into account here:

- Night shift supplement at the Cargovil Container Terminal: 12 € per container;
- Extra cost tug for the handling of the chassis on the premises of Company 10 (chauffeur, fuel and hauler– place at the port & and then take away): 30 € per container;
- Reefer surcharge at Cargovil Container Terminal (connection, monitoring, electricity): 15 € per container.

Possibly some minor costs for communications, administration, etc., as of yet undefined or calculated, which will only come to bare when definitive negotiations and/or actual implementation take place.

1.3. Total cost per inland waterway navigation

For a 20' Reefer Container: 220 € + 12 € + 30 € = 262 €
For a 40' Reefer Container: 270 € + 12 € + 30 € = 312 €
Communication and administration costs to be defined have to be added to this.

1.4. Comparison with road transport

On average, the cost of transporting 20' and 40' containers by road on this leg amounts 200 €/container.

1.5. Transit time

Passage time from Antwerp to Company 10:

Day A: loading in Antwerp;
Day B: unloading at Cargovil Container Terminal;
Day C: delivery to Company 10 between 3 and 5 AM.

III.6. Some observations

The modal scan revealed some interesting elements that, if taken into account, could mean a chance for an actual modal change between road haulage and the intermodal way. The positive side is:

- Increased awareness of manufacturing companies of the current and future difficulties of road haulage;
- The willingness of companies to integrate intermodal transport in their logistics;
- The existence of a genuine potential that can be transferred to the intermodal way.

Unfortunately it transpired from the study that there are some difficulties impeding true intermodal transport, which are, among others:

- Disastrous intermodal experiments, making companies reticent about re-trying the intermodal option;
- Preconceived ideas about intermodal transport in general:
    - Too expensive (even though it is not always the case);
    - Does not fit in with the JIT strategy well, which is untrue;
    - Intermodality across a short distance does not work (incorrect).
- Shippers' lack of information about the intermodal possibilities that exist in their region;
- Administrative slowness making it impossible to implement intermodality.

These bottlenecks, which are slowing down the development of intermodal transport in Belgium, are summarised in the table of chapter IV "Final conclusions" of Module IV , along with some solutions to the encountered problems.

III.7. Reasons for the high cost of intermodal transport

The detailed calculations to assess the financial impact of a modal shift to train/inland waterway navigation/SSS, show that there are a number of reasons why this shift is expensive in a lot of cases. These reasons are explained below.

a Initial and terminal haulage

Remarks:

Initial and terminal haulage constitute a large part of the total cost of intermodal transport. The part of initial and terminal haulage together fluctuates between 23% and 62% of the total cost.

The cost per kilometre of road transport varies, depending on the country. Belgium would be one of the most expensive countries.

The shorter the total journey, the greater the part of the initial/terminal haulage part in the total cost.

The cost per kilometre of road transport decreases as the amount of kilometres increases.

b Volume

The volume of the most frequently analysed flows is too small to negotiate. In most cases the amount is less than 10 containers a week.

c Short journeys

A number of the flows analysed are transported across relatively short journeys. The shorter the route, the greater the part of transfer costs and the initial and terminal haulage costs in the total cost. This important part cannot be offset by a lower cost of the main leg (by inland navigation for instance), given that this journey is short. This is true for traffic to southern Netherlands, northern France and western Germany.

For transport to Spain and Italy, which are long haul, there is another problem, that of the stiff competition in the road haulage sector.

d Stiff competition

Transport to Spain and Italy, which is organised using intermodal trasnport, is uncompetitive compared to road despite the long distance. This is because a great number of goods are transported from Spain/Italy to Belgium by truck. In order to avoid empty returns truck carriers offer very low rates for return haulage (from Belgium to Spain/Italy). Therefore, it is almost impossible to compete with these extremely low prices.

e Lack of/incomplete infrastructure

In the case of Company 8a, there is a train track just near the company premises. However, no connection has been made. If the freight has to be transported by rail, this freight first has to be brought to a terminal nearby (Antwerp). Hence, an additional cost for initial haulage has to be paid. The company is currently discussing a subsidised connection to the track with the municipal authorities. The total cost would amount to some 1,507,000 €, to which Company 8A/8B only wishes to contribute a maximum of 375,000 €.

Company 9 is situated close to the river Dender. However, the problem with the Dender is that it is not deep enough to accept big ships. The Mayor of the city of Aalst wants a deepening of the Dendermonde-Aalst strip in order to allow access to Aalst for ships of 1,350 tonnes. If the Dender were deepened, Company 9 would be able to transport up to 100,000 additional tonnes a year.

f Guideline prices

It is important to mention that the prices received are guideline prices. That means that they can be negotiated downwards. As a result, the prices given are maximum prices.

g Empty return journeys

As rail operators do not offer containers in most cases, the client has to organise container rental. Minimum rental time ranges between 6 months to 3 years, depending on the type of container. This also means that when these containers are used for a particular destination, they have to be brought back to Belgium. If this cannot be combined with the transport of freight, the container will return empty. As a consequence, the whole cost (the journey both ways) is calculated on the basis of the outward journey, not followed by a loaded return journey. This as opposed to outward journeys that can be combined with loaded return journeys, where the cost of both journeys (outward journey and return journey) can be examined separately.

The table below provides an overview of the cost per trip for each journey. Additional information is added for rail transport, indicating the importance of loaded return freights. In addition to the cost by train, where an empty return journey is assumed and there is no subsequent return journey within 2 hours of the return of the freight, the calculations were made for a) the case where a to-trip is planned right after the return trip and b) the case where a loaded return trip takes place.

		Price (in € per container)					
Departure	Destination	Road	Inland navigation	Rail (without further journey)	Rail (with further journey)	Rail (with loaded return journey)	SSS
Aalst	Crolles	1,250 to 1,500	-	1,120.4	< 1,120.4	<< 1,120.4	-
Aalst	Apt	1,251 to 1,500	-	1,167.4	< 1,167.4	<< 1,167.4	-
Puurs	Tourcoing	248	Min. 706 max. 916	793	601	398	-
Le Pontet	Puurs	650	-	???	???	???	-
Oudegem	Raamsdonk sv	170	???	Unrealistic	Unrealistic	Unrealistic	-
Oudegem	Waspik	170	???	Impossible	Impossible	Impossible	-
Gr-Bijgaarden	Parma	1,300	-	2,099	1,882	1,408	2,266
Gr-Bijgaarden	Sils	1,190	-	2,276	2,059	1,543	2,908.6
Gr-Bijgaarden	Hilden	345	-	910	693	693.5	-
Gr-Bijgaarden	St-Petersburg	3,200 to 3,500	-	3,912	3,642	2,282.5	2,325 + terminal haulage
Gr-Bijgaarden	Moscow	3,200 to 3,500	-	3,706 + terminal haulage + crane costs	3,436 + terminal haulage + crane costs	<< 3,436 + terminal haulage + crane costs	3,554

The above table shows that it is very important for a company to avoid empty return journeys: the cost can be reduced by 50% in that case.
Furthermore, road haulage from Groot-Bijgaarden to St-Petersburg could be shifted to SSS. This would mean a cost saving of at least 10%.
Also, road haulage from Aalst to Crolles and Aalst – Apt could also be changed to rail transport from a financial point of view. It would cost about 10% less.
However, transit time is a problem. The company scanned has chosen an A/B-service, but this is not likely to be possible given the insufficient offer of tank containers

CHAPTER IV

FINAL CONCLUSION

During the study, the research team observed several bottlenecks, which could be solved thanks to intervention of the government and/or by actions undertaken by the shipper and/or the intermodal operators. The following paragraphs will summarize these bottlenecks and the actions to be taken by the different actors.

The first bottleneck concerns the difficulty of clients to find the price of an intermodal trip. To solve this problem a website could be created containing the possibilities and the prices of the different transport modes. To realise this, government could subsidize the creation and promotion of the website. The intermodal operators could also play a role by communicating the current prices of transport. Shippers would then have to consult the website.

The second bottleneck relates to the high prices of pre and post haulage. This problem could be tackled by grouping the intermodal operators, in order to enable them to negotiate with road hauliers and to obtain lower prices from them. Government could apply fiscal measures to pre and the post haulage, while the shipper could make the pre and the post haulage more efficient by centralising it.

The third bottleneck refers to the absence of a groupage service on the Belgian intermodal terminals. The solution could consist of the terminal operator offering the service himself. To achieve this, the government should finance a part of the start-up costs. Furthermore, a complementary study should be requested by the government to analyse the potential flows that could be grouped by each terminal in Belgium. The intermodal operators should contact shipping forwarders as well as shippers to convince them to entrust them groupage activities.

The fourth bottleneck refers to former disastrous experiences with intermodal transport, which was too costly and not reliable. The cost problem could partially be solved by grouping the intermodal operators, in order to enable them to negotiate with road hauliers and to obtain lower prices for the pre and post haulage. The current low frequency of departures could be increased by grouping small freight flows or by attracting more clients to the intermodal terminal (action to be undertaken by the terminal operator). The reliability could be enhanced by offering a tracking and tracing service (see infra, 10^{th} bottleneck). The government could subsidise a part of the intermodal transport costs, as this is currently the case in France and Germany. Another action of government consists of prohibiting freight transport by road between Saturday 10pm and Sunday 10pm (as described in the proposition of the European Commission approved by the European Parliament in July 2002), except when the haulier can prove that the transport concerns pre and end haulage as part of the intermodal chain. Shippers should reconsider the intermodal option.

The fifth bottleneck is that a lot of shippers ignore the existence of intermodal options. The government could order and subsidise the creation of a website, summarizing the possibilities and the prices of intermodal transport. The interested shippers could execute a modal scan of their company and intermodal operators should 'help' them by informing them about the prices and the real possibilities they can offer.

The sixth bottleneck concerns the administrative slowness, which discourages shippers to invest in intermodal infrastructure. The government could play a key role by adopting a prioritary treatment of requests concerning the construction of intermodal infrastructure.

The seventh bottleneck lies in the fact that the majority of the return trips are operated with empty containers. Off course, this increases the cost of the trip. A solution to this problem is to find shippers in the country of destination who need to have their freight transported to Belgium. At present, an internet site exists for road transport; shippers (from Belgium) enter their data concerning the type of container they propose to the foreign shippers to be filled with their freight, the date of departure etc. in order to avoid empty return trips by truck. The idea behind this website could be used to create a new website for intermodal transport. The government could again help to finance the realisation of this website. Another solution to the empty return problem is to introduce the grey containers, which can be utilised by everybody.

The eighth bottleneck refers to inappropriate infrastructure. Some companies are situated next to waterways, but are unable to use them because they are not deep enough. Government should order the dredging of potentially important waterways. Other companies are located near a railway but do not have access to it. Governmental authorities should intervene financially to enable those companies to benefit from their proximity to a railway and to have access to it. The companies (shippers) should pay the other part of the infrastructure costs.

The ninth bottleneck concerns the absence of value-added services on the terminal site. The government could at first order a complementary study to analyse the potential services that should be offered. As a complementary measure, intermodal operators should question shippers and freight forwarders to know their needs. Interviews already pointed out the need to offer freight handling services and services aiming at finalising the freight. Shippers should consider the outsourcing of some logistic activities to terminal operators.

The tenth bottleneck concerns the misperception of shippers/freight forwarders that intermodal transport is not compatible with the Just-in-Time concept. By introducing services on the intermodal terminals such as stock management, tracking and tracing, etc., and by reorganising the shippers logistics while taking into account the duration of the intermodal journey, it is possible to maintain the JIT-concept.

Overview of the bottlenecks of intermodal transport in Belgium

The table below is an overview of the characteristic bottlenecks for intermodal transport in Belgium. The table also indicates how to tackle a bottleneck.

	Bottleneck	Proposed solution	Authorities	Shippers	Intermodal operators
1	Clients find it difficult to find out about prices for intermodal transport	Development of a website devoted to intermodal transport	- Subsidise the website - Promote the website	Consult the website	Make the necessary data (standard prices) available
2	High cost of initial and terminal haulage	Grouping of the intermodal players with a view to negotiating lower prices with road carriers	Fiscal measures for initial and terminal haulage (problem: control)	Making initial and terminal haulage more efficient by centralising it	Negotiating prices of initial and terminal haulage with haulers
3	There is no consolidation service on Belgian intermodal terminals	Negotiate with shippers and forwarding agents with the aim of leaving consolidation up to terminal operators, thereby making use of intermodal transport	The authorities can finance the start-up costs of the service	Make use of the consolidation services	To take up contact with the shippers and the forwarding agents
4	Disastrous experience with intermodal transport (high cost, infrequent and unreliable)	Price: see point 2 Frequency: see point 3 (frequency can only be increased if there is a large enough volume) Reliability: see point 10 (adding a tracking and tracing service)	- Subsidise intermodality; a certain percentage of the costs can be borne by the authorities, as is already the case in France and Germany - To ban the transport of goods by road between 10 PM on Saturday until 10 PM on Sunday *(as described in the European Commission proposal, which was*	Give the intermodal option another chance.	- Attract more clients (see point 3) in order to increase frequency - Negotiate the prices of initial and terminal haulage with the road carriers

			approved by the European parliament in June 2002), except if the carrier can prove that it is carrying out initial and terminal haulage as part of an intermodal route		
5	Sometimes shippers are not aware that there are intermodal options	Development of a website + Modal scans	- Subsidise the creation of a website - Promotion of the website (via advertising billboards, among other things)	- Show an interest in alternative transport options - Have a modal scan taken	- Promote intermodal transport - Take up contact with the transport managers of the major companies nearby
6	Administrative slowness	Accelerating administrative formalities (e.g. building permission, etc.)	Grant preference to the requests for building permission that involve intermodal transport	/	/
7	Empty return journeys = high cost	- Creation of a website similar to that of www.teleroute.be[5], but for intermodal transport - Use of grey containers: these are usable by all	/	Consult the website	/
8	Unsuitable infrastructure	- Maintenance of waterways (dredge)	Finance a part of the works	Finance the other part of the works	

[5] You receive an order for cargo to be transported from Charleroi to Como, in Italy, but how do you find freight to offset your truck's return journey to Belgium? That is exactly why there's the Teleroute freight exchange. Type in – on-line- the departure and arrival region and the town of your load, as well as all information concerning haulage and return freight (date of loading, maximum weight, truck length, etc.). In one click you will then see the complete list of possible loads that correspond to your request. Select the one that suits your need, call the contact person, and then make arrangements together.

		- Facilitate the access to the track of companies situated alongside it			/
9	Lack of value-added services	Introduction of services involving the handling and finishing of the goods	Finance the services	Consider outsourcing certain logistical activities	Take up contact with the shippers and the forwarding agents
10	Incompatibility between the intermodal alternative and the JIT concept	Introduction of specific value-added services such as storage management, tracking and tracing, etc.	/	To reorganise the logistical process of the company by taking account of the duration of the intermodal journey	Introducing a tracking and tracing service so that the shipper can intervene in the event that (delivery) deadlines are not met

ANNEXES

Annex 1 Summary of the studies dealing with the calculation of intermodal transport costs

Annex 1.1. PROGNOS

The idea of the PROGNOS study is to identify a corridor that would satisfy the two following characteristics:

- The shipper should have the possibility to choose one of the two transport systems: unimodal (train or truck) or intermodal.
- For each trip, there should be a possibility to transport various kinds of goods and for each of these goods one transport system should be more advantageous as compared to the other, by transporting the selected goods in the appropriate loading unit.

All these conditions are met on the corridors Hamburg – Munich, Bremen – Stuttgart, Hamburg – Frankfurt and Düsseldorf – Stuttgart. The Hamburg – Frankfurt corridor is the one that best meets the PROGNOS conditions and it was chosen as a reference for the study.

The result of the project is the determination of the global transport price « door-to-door » by road, a price that is compared to that of intermodal transport. Prices are calculated for a semi-trailer.

Annex 1.2. A. Richey - ''Combined Transport between Germany and Italy, going through Austria and Switzerland – Perspective of the German Railway Company Deutsche Bahn AG''

This study is a compilation of case studies on intermodal transport between Italy and Germany through the Swiss and Austrian corridors in the Alps. The report prepared by A. Richey analyzes the following connections by train : Cologne – Trento, Cologne – Verone, Nuremberg – Verone, Munich – Verone, Chemnitz – Bologne, Chemnitz – Fiorenzola, Chemnitz – Rubiera and Chemnitz – Castelguelfo for the Austrian corridor and Cologne – Busto, Mannheim – Busto, Duisbourg – Busto, Brême – Milan and Neuss – Gallerate for the Swiss corridor.

Unfortunately, the idea of A. Richey was to make an inventory of today's situation of transalpine combined transport in a more general way, and not to analyse these corridors on the basis of the kind of loading units used, the kind of goods transported, the transport costs and the time needed to carry out such transport operations. The study explains that there are 66 trains every week between Germany and Italy. Another result of this study is that the corridors longer than 550 kilometres increase the attractiveness of intermodal transport and for that reason, the railway is in a good competitive position as compared to other transport means.

The analysis by G. Bahm and B. Grüber shows that the political decisions adopted in Switzerland, aimed at allowing 28 ton trucks to transport goods on roads, imply the increase of the external costs of transport. This study considers that the 40 ton-trucks have to avoid Switzerland and go through the French or the Austrian part of the Alps. The costs in energy,

time and maintenance linked to such a trip on the Austrian roads are higher than they would be if such a law did not exist in Switzerland, and if the direct trip were possible through the Swiss corridors. The second conclusion of the work by G. Bahm and B. Grüber is that the congestion in the Alps region implies higher costs as far as the noise and the environmental pollution are concerned, as compared to any other place in Europe because of the topography of the Alps.

Annex 1.3. PETS

In the European PETS project, 14 corridors going through the Alps are analysed ; three of them in the French Alps (Ventimiglia, Mont-Cenis, and the Mont-Blanc), four in the Swiss Alps (Grosse St. Bernard, Simplon, Gottard, and San Bernardino) and seven on the Austrian roads going through the Alps (Reschenpass, Brenner, Falbertauern, Tauern, Schoberpass, Semmering and Wechsel). The study analyses the transport systems used – trucks, piggyback, train, combined transport – the objective being to identifiy the least expensive one through the Alps. Unfortunately, the PETS-project did not analyse all the corridors but only those of these alpine countries.

Within PETS, only maintenance and repair costs for the infrastructure such as the road, the railway and the buildings as well as the energy used for transport itself are listed for the case studies of intermodal transport. Moreover, the study mentions that all costs in the Swiss part of the corridor are higher than in any other European country, more particularly the environmental ones.

Annex 1.4. Inquiry Commission of the German Parliament –''Protection of terrestrial atmosphere''

A real large scale study is the one carried out by the Inquiry Commission of the German Parliament. In a first phase, it examines the situation of transport for packaged goods in fully loaded trucks on the corridors Stuttgart - Mannheim, Stuttgart - Frankfurt, Stuttgart - Cologne and Stuttgart – Bremen. In a second phase, it analyses the transport of bulk goods on the corridors Karlsruhe - Stuttgart and Karlsruhe - Frankfurt. Such analyses take into account the rail, road and waterway transport.

These studies are based on the assumption that pre and post haulage take place in a maximum radius of 40 kilometres around the terminal.

Annex 1.5. M. FONGER – ''Gesamtwirtschaftlicher Effizienzvergleich alternativer Transportketten''

(Comparison of global economic efficiency of alternative chains of transport)

In this German study, the various transport segments and loading units as well as the time needed for the transport on all predetermined corridors are analyzed. This study led to the final result that all the cost elements for combined transport as well as for unimodal road transport were identified and listed. The study cases focus essentially on different rail-road combined transport systems. M. Fonder refers to combined transport and unimodal road transport for the following transport chains:

- National railway corridors between the terminal of origin and the terminal of destination using a direct itinerary:
  - The average distance (less than 500 km) is that of the corridor between Düsseldorf/Krefeld and Stuttgart;

- The longer distance (more than 500 km) is that between Hamburg and Stuttgart with the same kind of train.

- National railway corridors between the terminal of origin and the terminal of destination with a scheduled train. The transport chain is between Rheine and Mannheim/Ludwigshafen.
- National railway corridors between the terminal of origin and the terminal of destination with a scheduled train. The transport chain is between Wuppertal and Viena.

The research examines transport costs for unimodal road transport and compares them to combined transport costs using the railway as the main system and the road for the pre and post haulage, and applying an analysis based on global costs. The transport activity is divided into ten added value steps. The cost elements derived from these ten added value steps can easily be divided into internal and external costs. The internal part of cost elements concerns: availability, loading and unloading, transhipment, intermediary storage, train formation, pre and post haulage, main transport and finally the costs for the empty trip. It is explained why the classification of all the internal costs into ten added value steps is important when calculating the total costs of transport. Also, it is argued that the number of truck drivers depends on the length of the corridor.

If the transport chain is longer than a certain number of kilometres, the shipper must use two drivers to carry out the trip and as a result, some of the costs for these ten added value steps will increase.

The external costs for freight transport, by road or by intermodal transport, are included in the analysis. The idea of this study is to calculate the external costs for each corridor analysed. The external costs of four corridors cover all the environmental costs, resulting from air pollution as well as noise pollution. Costs for the infrastructure as well as those related to accidents are also taken into account. It is assumed that the railway infrastructure costs – as compared to those for the road – are already part of the railway transport price.

Annex1.6. PACT – Projects on Combined transport in the Nordic Corridor

In this study of the northern part of the European continent, the idea was to assess the real situation of costs for the various transport alternatives. The partners of the project examined various corridors in the Scandinavian and Nordic transport systems.

The three corridors analysed in PACT 2 all have Oslo as a starting point and lead to somewhere in Italy. Two end up in Vern and the final destination of the third one is the city of Bust. But all three corridors have to stop at the Hamburg terminal, implying that the real important part of the analysis is the trip between Oslo and Hamburg, from where all three corridors follow different directions. The first step consisted in analysing each transport chain taking into account the length, the transport system used and the important terminal for each corridor as well as the time needed. Unfortunately, the loading units used as well as the kind of goods are not specifically referred to. At the end of PACT 2, the Nordic corridor is compared to the Scandinavian corridor, with the objective to assess the potential of intermodal transport.

PACT divides the costs into different groups of costs that are required to analyse the transport chain. For that purpose, eight cost groups were identified:

- Loading (shipper),

- Road transport (pre haulage),
- Handling,
- Terminal,
- Main transport,
- Ferry and infrastructure,
- Road transport (post haulage),
- Unloading (consignee).

Moreover, PACT focussed on the internal transport cost and particularly the level of costs for each part of the corridor studied. The final result is the definition of separate proportions for all costs in the different cost elements.

The costs related to each step of the whole corridor are not divided in the same way as the Fonger study (see supra) did, but only the costs for each step of the transport chain are mentioned in the PACT project. Only the terminal costs are more precisely examined.

Annex 1.7. IMPULSE

Impulse, another study by the European Commission, examined the freight transport costs. Unfortunately, IMPULSE did not study specific corridors between European countries, but rather road transport, rail transport and the combination of both systems in general terms. It takes into account three categories of loading units: a mobile bin, a 20' container and a 40' container. Moreover, it considers that pre and post haulage can take place in different ways. IMPULSE analysed six of them. The differences are due to the method for collecting the goods, the people responsible for its organisation, and the people who manage the process.

In order to analyse the costs of the total transport chain, the research team divided the corridor into the various steps through which the goods have to travel when they are transported by combined transport or by unimodal road transport.

IMPULSE clearly identifies and analyses the cost elements in a detailed way. In a first phase, the costs generated by unimodal and intermodal transport are divided into road costs and railway costs; in a second phase, into variable and fixed costs. For railway transport, the partners of the project added a few overheads such as:

- The price for the use of the railway covering infrastructure cost as well as energy costs,
- Manœuvres and delivery costs,
- Costs for running the train,
- Handling at the shunting yard,
- Transhipment costs at the terminal,
- Management overheads.

With the exception of the first one, all these costs normally concern the terminal, the shunting yard or the transhipment site, so that they only exist when intermodal transport is considered (pre haulage by truck and main transport by train).

Annex 1.8. RECORDIT

The objective of RECORDIT is to analyse the internal and external costs of a door-to-door intermodal transport along some selected corridors, to calculate the costs for three intermodal corridors that were chosen and to compare the costs to unimodal road transport for the same corridors.

In order to reach that objective, the partners of RECORDIT defined a methodology and principles to be applied to calculate the cost of an intermodal transport chain, the results being presented as a cost per loading unit. Four loading units are presented in RECORDIT: 2 mobile bins, one of Class A and the other one of Class C and two containers, a 20' and a 40'.

The study also gives information about the time needed for an intermodal as well as a unimodal transport operation. The intermodal transport corridors selected are:

- Freight transport between Brindisi-Milan-Munich-Hamburg and Gothenborg,
- The trimodal transport chain on the corridor between Genoa-Basel-Rotterdam and Manchester,
- The intermodal door-to-door transport chain along the corridor Barcelona-Lyon-Turin-Verona-Budapest and Warsaw.

In a first phase, the study defined nine groups of costs. The cost structures were analysed using these transport groups. More specifically, this was achieved through the evaluation of driving costs and the costs for the various operators and users of each transport block, and taking into account those parts of the corridors where the operators intervene for several transport blocks, and of the place where and the moment when a cost related to an operator is a cost for a user along different parts of a corridor.

The objective of the first phase is to evaluate the cost structure through the collection of data on costs. Therefore, the purpose of RECORDIT was to make an inventory of real costs for a corridor and the research team made efforts to obtain the information using the bottom-up approach. When it was not possible to obtain the value of costs from the intermodal operators for each one of the cost items listed, these were evaluated on the basis of the concerned companies accounts or through an analogy with data from other European studies.

The comparison between the all-road system and the intermodal solution showed that taxes paid by the shippers are lower for the all-road option as compared to the intermodal solution in a specific corridor, be it in terms of internal costs or of transport duration (which is an important point for the economic actor concerned by door-to-door transport).

As for transport durations, the ratio is of 1 to 4 in the case of the Genoa – Manchester corridor which is the only one where the intermodal solution is more competitive when the total cost is considered.

The following factors were identified as giving an important competitive advantage in terms of duration to unimodal road transport:

- Very long waiting times at the intermodal terminal because of the lack of planning for direct intermodal services along the whole corridor;
- Lack of interoperability between the various planned handling systems, the waiting times becoming longer;
- Transit times are too long on the navigable part of the trimodal corridor (although river transport is the only transport mode that contributes to the reduction of the total cost of intermodal transport, lower than the price of road cost);

- Legislation on breaks and night rests is the only important element that increases the transport duration for the all-road system: although the times reported are inferior to the ones of the respective intermodal solutions, the breaks are very important. Moreover, they are very significant as the time value of the breaks can be compared to the transport duration on the corridor Barcelona-Warsaw, where three night rests are required. If night rests as well as breaks were not entirely taken into account as far as their planning and duration are concerned, the road solution would significantly increase its competitiveness in terms of time.

Generally speaking, the lack of flexibility is a very important element for the selected intermodal corridors, as few direct and frequently used connections exist.

The identification of these weak points led the partners to present some recommendations aiming at improving intermodal transport, in order to foster a modal transfer from unimodal road to intermodal transport.

Annex 2 Global structure of intermodal price

The following abbreviations are used:

- E-D : Shipper (or consignee)
- PA : Pre (Post) Haulage
- TF : River Terminal
- TFr : Railway Terminal
- GT : Shunting yard
- TPR : Main Transport by Road
- TPT : Main Transport by Train
- TPB : Main Transport by Barge
- TPM : Main Transport by Sea

COST OF INTERMODAL TRANSPORT : GLOBAL FORMULATION									
Staff	E-D	PA	TF	TFr	GT	TPR	TPT	TPB	TPM
Gross salary driver		X			X	X	X	X	X
Gross salary workers	X		X	X	X				
Expenses driver (meal …)		X				X	X	X	X
Social security	X	X	X	X	X	X	X	X	X
Overhead costs	X	X	X	X	X	X	X	X	X
Administrative costs	X	X	X	X	X	X	X	X	X
Advertisement	X	X	X	X	X	X	X	X	X
Legal expenses	X	X	X	X	X	X	X	X	X
Fixed assets / Maintenance assets	E-D	PA	TF	TFr	GT	TPR	TPT	TPB	TPM
Containers: depreciation and interests	X	X	X	X		X	X	X	X
Repairs to containers	X	X	X	X		X	X	X	X
Maintenance containers		X				X	X	X	X
Invest. Vehicles : depreciation rate + interests		X				X	X	X	X
Maintenance vehicles		X				X	X	X	X
Repairs to vehicles			X	X	X				

Equipment (cranes, gantry cranes…): depreciation + interests			X	X	X				
Equipments : maintenance and repairs			X	X	X				
Buildings: depreciation and interests	X		X	X	X				
Buildings: maintenance and repairs	X		X	X	X				
Land: interest (for a certain period of time)	X		X	X	X				
Energy, communication and consumables	E-D	PA	TF	TFr	GT	TPR	TPT	TPB	TPM
Fuels		X			X	X	X	X	X
Electricity	X		X	X	X		X		
Lubrificants and lubricating oil		X	X	X	X	X	X	X	X
Tyres		X				X			
Phone, telecommunication, radio	X	X	X	X	X	X	X	X	X

Stock management	E-D	PA	TF	TFr	GT	TPR	TPT	TPB	TPM
Loading/ unloading	X								
Transhipment			X	X					
Shunting, reorganisation			X		X				
Storage costs	X		X	X					
Time	E-D	PA	TF	TFr	GT	TPR	TPT	TPB	TPM
Breaks		X	X	X	X				
Breaks driver (Meals+rest)						X			
Parking, port expenses			X			X		X	X
Organisational costs	E-D	PA	TF	TFr	GT	TPR	TPT	TPB	TPM
Supervision and control	X	X	X	X	X	X	X	X	X
Safety Test (with loading units)	X	X	X	X	X	X	X	X	X

Formation of convoys	X	X	X	X	X	X	X	X	X
Insurance and taxes	E-D	PA	TF	TFr	GT	TPR	TPT	TPB	TPM
Insurance goods (fire,…)	X								
Risk Insurance for the company	X								
Insurance vehicles and loading units		X	X	X	X	X	X	X	X
Third party insurance		X				X		X	X
Taxes vehicles (circulation, stamps,…)		X				X			
Tolls, road-pricing		X				X			
Taxes for the use of railways					X		X		
Taxes for locks								X	
Costs including internal and external items	E-D	PA	TF	TFr	GT	TPR	TPT	TPB	TPM
Congestion costs		X				X		X	
Location slots (in terminals, trains and barges)			X	X	X		X	X	X

Annex 3 Calculation Model for river intermodal prices

RIVER INTERMODAL PRICE New vessel of 2000 tons Exploitation Regime: acquisition LF=100%	
Vessel capacity (tons)	2000
Vessel Length	80
Vessel Width	9,5
Loading levels	2
Loading vessel in TEU	76
% of TEU	60%
% of FEU	40%
Number of containers loaded onto the vessel	60
Fuel consumption	
Engine power (cv)	900
Number of engines	1
Specific consumption (l/cv/hour)	0,25
Duration of round trip (hours)	40
Price of fuel (liter in euros)	0,25 €
Number of round trips per week	2
Consumption per round trip (euro)	4.446,00 €
Annual Consumption (euros/year)	**231.192,00 €**
Salaries	
Employer contribution on gross salary in %	81,13
N° of working hours per day (regular basis)	8
N° of extra working hours per day	7
Hourly wage captain	10,48 €
Hourly wage Sailor 1	7,93 €
Hourly wage Sailor 2	7,06
N° of Sundays per year	52
Holidays (in days)	24
Legal holidays (in days/year)	9
N° working days/year	280
Wage cost regular hours	103.339,39 €
Wage cost extra hours	90.421,97 €
Total wage cost	**193.761,35 €**
Annual insurance premium	**42.000,00 €**
Maintenance expenses	28.920,91
Financial expenses (funding 70/30)	
Purchasing price vessel (in euros)	2.726.828,8
Interest rate personal contrib. (%)	5
Interest rate bank loan in %	6,5
Total financial expenses	**164.973,14 €**
Depreciation period (years)	20
Annual depreciation	**136.341,44 €**
Administrative costs	**12.394,68 €**
Ship's dues	
Ship's dues per tkm in the Walloon region	0,00025 €

Ship's dues per tkm in Flanders	0,00025 €
Distance travelled in the Walloon region (km)	100
Distance travelled in Flanders (km)	25
Total ship's dues per round trip	**125,00 €**
Annual ship's dues	**13.000,00 €**
Port dues	
Dues per berthing per 24 hour period	100,00 €
Number of berthings per week	2
Annual port dues	**10.400,00 €**
Daily accessory expenses	100
Annual accessory expenses	**28.000**
Annual vessel operating expenses	**860.983,53 €**
Annual production	
Container capacity per trip (TEU)	90
Average loading factor (%)	100
Annual production (containers)	18.720
Intermodal transport cost	
Pre/post haulage price	100
Handling costs	50
River transport cost	**45,99 €**
Intermodal cost	**195,99 €**
Operating profit (% of river cost)	50%
Intermodal price	**218,99 €**

Annex 4 Summary of the studies on added value services

Annex 4.1. Integration of intermodal transport in supply-chains (1998-1999)

This study was carried out by STRATEC and Price Waterhouse Coopers on behalf of DG Transport of the European Commission.

It is motivated by the fact that the share of multimodal transport on the market is still insignificant when compared to traditional unimodal road transport. The main reasons invoked by users concern price competitivity, flexibility, reliability and the amount of investment.

A future intermodal offer could give an answer to the increase of road congestion and its social and environmental consequences and could be a significant contribution to the improvement of European industries competitivity by giving an added value to the European supply chains.

The objective of the project is to identify and evaluate the opportunities to create added value in the logistic activities during intermodal transhipment operations for the transport of goods as well as to create an indicator of perception of intermodal transport of goods.

The perception indicator is quantitative, as it allows to measure and control the competitivity of intermodal transport as compared to road transport. This indicator supports:

- Logistic services providers in their long term decisions and their investments in intermodal development;
- Political decision-makers to assess the foreseeable impacts of policies promoting intermodal transport.

The approach is based on the establishment of a quantitative « utility function » for shippers as far as intermodal transport is concerned:

- By measuring their propensity to use intermodality, considering some clearly defined alternatives;
- By using the «stated preferences » methodology ;
- On the basis of a sample of shippers representative of the main categories of the supply chains;
- By asking the respondents to make a modal selection between various representative corridors for which various intermodal solutions are available.

Annex 4.2. PROMOTIQ

PROMOTIQ is a European project that is part of the programme « Research, technological development and demonstration programme » and more particularly of the line "Integrated transport chains".

This research project is based on the assumption that a new generation of services and operators could satisfy current logistic trends, simultaneously making intermodal transport more performant and more competitive. A typical feature of these new services is the added value they would give to the current transport chains by promoting the integration of transport modes and logistic operations in the chain and by improving the quality and the performances of intermodal transport.

On the other hand, the project suggests as a second hypothesis, namely that the definition of such services should take into account the structure of the transport market and its competitive environment. This would imply that these new competitive services can be operational in the long term.

The PROMOTIQ project developed an analysis procedure with the aim of identifying opportunities and barriers to the evolution of intermodal operators as well as other actors who offer more competitive door-to-door services.

Once the opportunities and barriers have been identified, the project suggests action plans for the promotion and the establishment of a new generation of services and actors on the intermodal transport market.

Annex 4.3. PROTRANS

Carried out at the request of DG Transport and Energy of the European Commission (5th framework programme in the field of R&D), PROTRANS examines the following questions:

- The analysis of the market of services offered by the logistic providers in Europe (companies, providers, customers, nature and volume of goods concerned, added value …) ;
- The analysis of the geographical sites chosen by logistic service providers in various parts of Europe ;
- The analysis of the success and failure elements in the various regions ;
- The prospective study of the evolution of demand and supply of technologies on the logistic services market ;
- The study of the relationship between intermodal transfer and added value services provided ; spill-over effect of intermodal platforms on the location of companies ; development of a PI (Perception Indicator) of integrated logistic chains, according to the shippers ;
- Conclusions concerning land-use management and intermodal transport planning for goods.

The starting point of the study is that the international competitivity of the European industry will depend more and more on its capacity to deliver, quickly and in time, products that are adapted to the customers everywhere in the world. This logistics concept leads to an image reflecting that management becomes an important parameter in terms of competition. During the 90s, the focus of logistics changed, going from the essential efficiency of internal processes in the logistic function to a stronger interest in the improvement of external logistic processes along the whole supply chain. The main potential for improvement is not to be found within the companies anymore but at the level of the interfaces between independent companies that are part of the same supply chain. As a result, outsourcing of logistic activities is a current practice for companies, leading to a stronger role for subcontractors in the supply of logistic services.

Another objective of PROTRANS was to identify the most important challenges and to determine the barriers, the factors of success and failure as well as to assess the future importance of strategies adopted by logistic services providers for intermodal transport.

Furthermore, an analysis was carried out in order to identify the conditions that would optimize possibilities of modal transfer between road-rail intermodal transport and road

transport. The conclusion was that logistic services providers can influence this modal transfer by improving the efficiency of their operations. Various potential actions have been taken into account to quantify such efficiency, as well as the impact of services on intermodal transport. The analysis showed that the strongest impacts on the market share of intermodal transport are the price, the duration of the trip, the follow-up of shipments (tracking and tracing) and reliability. The combined variations of some of these potential actions can lead to a higher demand for intermodal transport.

On the basis of all these results, PROTRANS formulated a few recommendations for political decision-makers that would foster the transfer from road transport to intermodal transport.

Annex 4.4. Intermodal Quality (IQ)

Intermodal Quality is a European project carried out within the context of the IVth research programme of the European Commission and more specifically under the line "Integrated transport chains". More than 20 organisations took part in the consortium.

Quality is a major factor of competition between intermodal transport operators. It includes quality as perceived by the final users ("external quality") and by intermodal operators ("internal quality").

The main objective of IQ is to improve the quality of intermodal transport by providing the tools needed to increase European intermodal transport in terms of:

- Interoperability between terminals,
- Interconnectivity and accessibility of terminals.

a Integrated Approach

The IQ project has opted for an integrated approach, which means that it strives for an integration between technology, organisation, space and economy. The project focuses both on the improvement of the terminal quality, and that of transport networks, as both aspects cannot be separated.

b Results

The IQ project meets the objectives of transport common policy to a large extent because :

- It provides transport operators and users, the industry and public services with an appropriate decision support tool that makes it possible to have a better knowledge and understanding of mobility and circulation.
- It increases the efficiency of intermodal transport using the definition of European transport networks, while at the same time improving the cooperation between modes and the respect of sustainable development conditions.
- It favours facilities design and management with the aim of reducing environmental damage and of increasing price-quality ratio.

c Specificity of the IQ project

The main difference between IQ and other (mobility) projects is that until now, too many of these projects only focussed on specific elements (e.g. a new technical concept, the improvement of specific corridors or a specific mode of transport). On the contrary, IQ opted for an integrated approach and takes into account three classic elements: organisation of terminals, economic analysis (analysis of the market) and analysis of network functioning.

Annex 5 Detailed reports on modal scan for the Belgian companies

Annex 5.1. Modal scan of Company 1

a Introduction on Company 1

Company 1 specializes in the production of multiple use butter. It produces two kinds of butters, differentiated by their use, i.e.:

- industrial butter for companies and confectioners, ice-cream makers, …;
- butter for general consumption.

Industrial butter represents 80% and general consumption butter 20% of the company's production. The company has 400 employees of which 40 work on logistic tasks. The turnover for the year 2002 equalled 300 million euros.

b Logistic organisation

At present, transport is exclusively carried out by trucks. Depending on the quantities ordered, it is possible to have a full truck for only one customer or to group various orders into one truck.

For the orders from France, fully-loaded trucks are often sent out from the production site of the company. On average, 3 daily trucks of 15 tons of light butter are sent to France. According to French legislation, it is not possible to have a load of more than 21.6 tons per truck. It can roughly be estimated that the quantity of butter sent to France on a yearly basis equals 16 000 tons.

For the German market, it can be estimated that 80% of the trucks that leave the company are fully-loaded and 20% are the result of groupage, carried out by the carrier. The flow to Germany equals, on average, one fully-loaded truck per day and one truck resulting from groupage per week. Germany consumes both industrial and general consumption butter.

The Italian market only needs industrial butter, i.e. 500 tons per month.

Deliveries are carried out from Monday to Friday. Delivery schedules have been shortened in the recent past because of the reduction of working hours decided by some European countries, among which France.

b.1. Logistic Partners

In total, the company works with eight different logistic partners, each responsible a specific destination. As a consequence, the company has:

- a partner for transport to France,
- a partner for Spain,
- a partner for Portugal,
- a partner for Italy,
- a partner for the Benelux,
- a partner for Switzerland,
- a partner for the UK,
- a partner for the Eastern European countries.

The distribution of goods is the responsibility of the logistics partner and the company only intervenes if customers complain about the lack of delivery or the late deadline of delivery.

The flows are subject to seasonal fluctuations because of the specificity of the products. Therefore, orders are more important at the end of the year and for Easter and Halloween, because during such periods, there is a higher level of consumption of pastries. On the other hand, January and February are months during which orders decrease. Apart from these periods, there is hardly any fluctuation during the rest of the year. The average loading factor of the trucks is of 90% on an annual basis.

b.2. Markets

The main markets for Company 1 are:

- France, representing 20 % of the company production with industrial and general consumption butters.
- Germany is the second market for the company with 12 to 15% of the production. As it is the case for France, both products (industrial butter and general consumption butter) are sold.
- Italy is the third important market for company 1 (~ 8% of the production). Italy essentially consumes industrial butter.

Alongside these three main markets, the company sells its products to Portugal, The Netherlands, Belgium and outside the European Union.

Concering competition, it should be mentioned that there are a few big butter producers in Europe, among which:

- Lactalis in France,
- Campina in Belgium (Flanders),
- VIV in The Netherlands.

Company 1 ranks among the first three world producers of butter and is a world leader for some high technology butters. More specifically, the butter produced must contain the lowest possible level of water and other dry matters, which requires a high level of technology in the extraction of water and unwanted dry matters, in order to guarantee the purest 99% butter. Company 1 specializes in the production of this kind of quality butter.

c Outbound and inbound flows

c.1. Raw materials : origin and packaging

The company needs two kinds of raw materials for its production, i.e.:

- Milk cream with 35% of fats and 65% of water and "babord" (buttermilk)[6],
- Raw butter containing 82% of fats and some dry solids.

Milk cream, delivered in tank-trucks, essentially comes from West-European countries : France, The Netherlands, Belgium and the UK.

Butter mainly comes from Spain, Ireland, Poland and New Zealand. It is delivered in blocks of 25 kilos. It should be noted that the butter coming from New Zealand is lightly salted.

[6] « Babord » is the term used in this professional sector to refer to everything that is left of milk cream after the extraction of butter.

Therefore, the company uses it in low quantities since it requires desalting operations that are quite expensive.

As far as flows are concerned, 50 tank trucks arrive weekly at the company with milk cream and 3 or 4 fully-loaded trucks with 1 block of 25 kilos of butter on a daily basis.

c.2. Finished products : packaging and destination

Several kinds of packaging are used for the delivery of the finished products. Industrial butter is packed either in hermetically sealed barrels of 200 kg to avoid sensitiveness to temperatures. More specifically, butter does not melt in well-sealed barrels and can therefore be transported to the various final destinations without having a constant cooling.

Butter can also be presented in packages of 10 and 25 kilos. In this case, the cold chain can not be interrupted during transport. Packages of 10 kilos are made up of four 2.5 kilo units placed in a big cardboard box. This is the kind of packaging usually used for the supply of skilled tradesmen.

For general consumption butter, it is packed either in small containers or in even smaller packages that are placed in bigger cardboard boxes, ready for palleting and placement in semi-trailers.

d Market trends and expectations for the future

The last two years, 2001 and 2002, were not very good because of the world economic situation. 2003 did not start much better. The trend is still a stagnating market. As a result, the company currently tries to maintain its activity at an acceptable level, i.e. not reducing its production.

However, in the long term, the company intends to increase its production and to consolidate its dominant position in some market sectors.

e Experience with multimodal transport

Company 1 is very much interested in multimodal transport. Indeed, following a proposal made by the logistic operator Eucotrans, the company tried to use rail to ship its products outside Europe, using the Eupen-Droixhe-Antwerp corridor. In practice, containers were loaded in Antwerp and transported to the railway terminal of Bressoux in Liège and later on transported by trucks to the production site of Eupen, situated some 50 kilometres from the railway terminal of Liège. The containers were then filled in and sent back by trucks to the railway terminal of Bressoux, and then loaded on wagons to the port of Antwerp.

Generally speaking, it can be said that the experience was a real failure, as in one week the company missed two offshore vessels. The first time, there was a mistake concerning the container; another container was loaded instead of the one for Company 1. During the time needed to realize there happened a mistake, the vessel on which the container was to travel had already left. In the second case, the container missed the vessel because of the lack of available locomotives. The consequence is that customers of the company at the other end of the chain were affected and threatened with working with other suppliers. As a result, the company decided to stop using this kind of transport and does not consider using it again in the future, except if it is possible to give a guarantee that its reliability is similar to that of unimodal truck transport.

Furthermore, the specific characteristics of most products of Company 1 impose that the cold chain cannot be interrupted during transport, which is something rail transport cannot guarantee. At the same time, the duration of transport plays an essential role. More specifically, as soon as the product is packed and placed in containers or trucks, it has to be

loaded onto the vessel in a maximum period of 48 hours, a demand that cannot be guaranteed by the Belgian railway system.

At present, the only other possible multimodal alternative is the inland waterway system. Unfortunately, the currently proposed frequency service does not solve the problems imposed by railway transport.

Annex 5.2. Modal scan of Company 2

a Introduction : Presentation of Company 2

Company 2 specializes in the production of silicon-based plastic materials. It is part of a world group with headquarters in the US. The products are used for:

1 The construction sector as insulating materials, for door and window gaskets, multiple-use insulating foams, silicon for bathrooms, glazier's putty…

2 The cosmetic industry, where the products are used to manufacture perfumes, shampoos …

3 The automotive sector, essentially bearing grease;

4 For the electronic sector, mainly for circuit boards;

5 In the medical sector: tubes for baxters or for artificial respiration equipment…

6 For manufacturing detergents.

The construction sector products represent the largest part of the production in terms of volume, the other products being characterized by a higher added value, because they are high technology products, some of them patented. Products with high added value are often developed in the laboratoies of Company 2 in close cooperation with the customer. The Belgian production site of company 2 employs 600 employees, 40 of them for logistic tasks.

b. Logistic organisation

The logistic chain Company 2 is organised using SAP software. When a private customer or a company orders products, the order is logged by the responsible operator. SAP allows to inform all concerned units in real time. As a result, all units can be prepared in their specific field of competence in order to meet the demands. The orders department for raw materials is instantly activated to ensure that the raw materials needed to complete the order are available at the production site in time. At the same time, the shipping department takes all the necessary steps in order to ensure the transport to the customer; the transport partner is also informed in real time and can take the measures needed to transport the goods…

Transport of the goods is the entire responsibility of external partners. For the shipping of products, the company works with only one partner, UTI, which is responsible for all shippings. For the delivery of raw materials, UTI organizes the transport of some products, while the transport of products in tanks is entrusted to two other partners, Vervaeke and Samate.

The company has a warehouse in Houdain, situated about 10 km from the main production site, where products imported from other sites are stored, as well as some finished products manufactured at the Belgian production site. Large orders of finished products are processed at this production site.

b.1. Packaging used

Several kinds of packaging are used, going from smaller ones (small cardboard boxes) to the biggest (containers). Semi-finished products used as raw materials for other companies are packed in "IBC's", i.e. big plastic baskets with one cubic meter of capacity, or in big bags. For instance, the powder used for detergents is packed in big bags to be shipped to other plants that will place it in small cardboard boxes, in pouches, ….The liquid product is shipped either in steel or plastic barrels of 190 to 250 kilos. In general, the barrels are loaded into 20' or 40' containers, with 72 barrels per 20' container or onto semi-trailers. The finished products are usually packed in cardboard boxes that will be palletized and placed in containers or semi-trailers.

The raw material, i.e. silicon powder, is delivered in tanks. It comes from the production site of Barry in the UK and transits through the port of Antwerp where it is stored in silos. The tanks are filled with the product contained in the silos and transported by truck to the production site of Company 2.

b.2. Main markets

The organisation of the group is characterized by the presence of production sites on the continents where there is a high demand, i.e. Europe, North America and Asia. The main destination for the outbound flows from the Belgian production site is the European market. There is also an important inter-site traffic, particularly for the supply of raw materials coming from Barry (90%) and from the US (10%) that will be used by the Belgian plant, and traffic of semi-finished and finished products from the Belgian site to the various production and distribution centers among which Wiesbaden in Germany and Houdain.

In Europe, the main destinations are Barcelona, Milan and Istanbul in Turkey. Alongside these destinantions, we find others such as Northern Africa, South Africa, the Middle East and Russia.

c. Future trends and position of the company on the market

As part of a big world group, the Belgian site is not very much interested in its position on the market, this interest being the task of the general global management. However, it is useful to mention that of all the European sites of Company 2, the Belgian plant is by far the most important one. Indeed, out of the 900 people employed by the group in Europe, 600 are based in Belgium. The other European production sites are Barry in the UK and Wiesbaden in Germany. Alongside these production sites, the group has four distribution and customer-service centers in Milan (Italy), Lyon (France), Meriden (UK) and Barcelona (Spain). As a competitor, we can mention the Vacker group, but the competition is at global rather than at European level.

Concerning activities in general, the year 2002 was not very good because the annual operating results were below the forecasts. The year 2003 could not really invert this trend. However, the company launched a worldwide internet sales system that is quite successful and made it possible to limit the reduction of sales for 2002.

In the future, the company intends to increase its production. A new production unit is already being built on the Belgian site and it will be operational in the near future.

d. Outbound and inbound flows

The flows can be classified per site:

Storage site of Houdain

- Inbound flows: 8 to 10 containers a day (except on Saturdays and Sundays)

- Outbound flows: 500 to 1200 tons of goods per day, equivalent to 50 to 120 20' containers per day (~ 10 tons/20').

Production site:

- Inbound flows: 30 to 50 tank trucks per day.
- Outbound flows: 200 to 300 tons per day.

e Experience with intermodal transport

Company 2 is very much interested by alternative transport modes since there are more and more problems with unimodal road transport, particularly delays due to congested roads, drivers' weariness... Moreover, the Belgian sites of Company 2 are situated as follows: one is close to a waterway (production site) and the other one, the warehouse of Houdain, is within the railway station of Houdain. They are therefore very well located to use waterways as well as the railway.

e.1. Railway

Several attempts have been made to use rail transport. More specifically, three lines have been tested because of the importance of the volumes they could absorb. Unfortunately, all these attempts failed, the main reason being, in short, that there was a lack of coordination between the laws of the various countries through which the convoy had to travel. Indeed, some of them do not accept that the locomotives of another country travel on their own territory. This means that the convoy must be pulled by a national locomotive, which usually is hardly ever available within a period of time that would ensure the fluidity of traffic.

Moreover, each country has its priorities that will determine the order in which the convoys are organised. Such priorities are usually far from meeting the needs of shippers, which often means unacceptable delays that threaten the existence of the company. For instance, a convoy was organized to transport goods to customers in Barcelona; the company had promised to deliver the goods within three days, but the convoy was blocked in France because another customer of the French railway company had the priority. As a reaction to the complaint from its customer, Company 2 decided to ship the same products to the customer, but this time using the road system. In the end, the road shipment that left four days after the train had left, arrived two days before the train.

The same happened with shipments to Milan. Faced with the risk of losing important customers, the company decided, reluctantly, to abandon that system. But today, the company intends to try it once again by sending a shipment to Istanbul, using the "hub and spoke" model, i.e. the goods, coming from different places, will be sent to Vienna where complete trains for various destinations will be formed. The company hopes this will be a conclusive experience, because it is reluctant to develop other alternatives.

As for the Houdain site, there is a project for building a multimodal station, which would favour the company.

e.2. Waterway

As it is located close to a waterway, Company 2 also shows great interest in river transport. Bearing this idea in mind, a feasibility study was carried out by the company itself and the results were conclusive. Indeed, the company often receives between 20 to 30 containers at the port of Antwerp, which have to be moved to its production site in Belgium as well as to its storage site in Houdain. The study showed that it is very interesting to assign a complete barge to the transport of such containers towards inland sites. As for bulk products, instead of sending tank trucks to Antwerp, it would be more advantageous to delocate the silo situated in

the Port of Antwerp to the inland production site. The only problem is that an unloading ramp has to be installed on the company site, which could only be done by the regional authority responsible for the construction of such infrastructure. Although the company could find the budget needed for this project, it was obliged to use it for other purposes, as the authorities delayed taking action and it had therefore become difficult for the Belgian management of Company 2 to go on defending this project in front of the general group management.

Company 2, although still interested by inland waterways possibilities, is currently not ready to assign a new budget to relaunch the process required for the building of the unloading ramp. Furthermore, because of a company strike at the beginning of the year, the general management decided to freeze all investments until the end of 2003. Still, if the company could receive realistic proposals concerning the use of other alternatives, it promised to study them seriously and with a lot of attention.

Annex 5.3. Modal scan of Company 3

a. Presentation of Company 3

Company 3 specialises in the production of papers, particularly the non wove paper by wet processing. It is obtained by mixing wood fibres with synthetic fibres and adding a few chemical products to the mix.

Since its founding in 1909, the plant has gone through various turbulent times, until it was bought in 1993 by a big French group following the bankruptcy of another world group to which it belonged. At that time, the plant was manufacturing one-side coated paper for labels.

In 1996, the plant became part of a French Group, of which it became the Belgian subsidiary. In September 2000, the plant stopped producing one-side coated paper for labels and totally transformed its machinery in order to produce non wove paper by wet processing. This stop in production is the result of the need for the group to which Company 3 now belongs, to invest in a sector showing increasing demand. During the same year the company was bought by another big world group specialized in paper production. As a result, company 3 became the Belgian subsidiary of that big world group in January 2001 and its name, still the one it uses today, was changed once again in January 2002.

Turnover

The table below shows the evolution of production as well as the turnover. It can be observed that in 2001, the turnover reached 2 939 000 euros, an amount that was afterwards increased to 19 749 000 euros. For the year 2003, the company is hoping to have a turnover of 25 890 000 euros, a result that will most probably be reached, if not exceeded considering the figures obtained for the first six months of the year (2003).

	2000	2001	2002	Budget 2003
Production (in tons)		**1171**	**6304**	**7942**
Sales (in tons)	Coated paper for labels and	**904**	**5965**	**7942**
Turnover:	company out of operation			
Belgium (000 €)	for reconversion,	**214**	**2116**	
Exports (000 €)	No comparable Data	**2725**	**17633**	
Total (000 €)		**2939**	**19749**	**25890**

b Logistic organisation

In June 200, the plant was employing 113 persons, but the new orientation of the plant was accompanied by an important restructuring that led to the loss of 63 jobs, the company being left with only 50 persons. Production is organised in three shifts but initially it was based on only two shifts. It is only in December 2001, that it starts with three shifts. A fourth shift is established in June 2002 and a fifth one is currently being formed. The number of employees will increase to 74 by the end of 2003 or the beginning of 2004.

As for logistics, 5 employees are working full time on logistic tasks, i.e. a logistics manager, an agent responsible for raw materials and shippings, three drivers of lift trucks and two other persons who work half-time on logistic functions, i.e. a management assistant and a receptionist and order controller.

c Outbound and inbound flows

c.1. Raw materials

Three products are used to manufacture non wove paper, i.e. :

- Wood fibres,
- Synthetic fibres,
- Chemical products.

The wood pulp is supplied by other companies of the group and comes essentially from the US, Brazil and the Nordic countries (mainly Sweden and Finland). Paper pulp is packed in containers in Antwerp where it is stored in warehouses, especially rented for that purpose. The Belgian company is itself responsible for the organisation of the container transport from Antwerp to the plant. It entrusts the transport operation to a family company with whom it has a long-term privileged relation. The plant imports on average 600 to 700 tons of paper pulp every month, which represent 60 to 70 containers per month.

Synthetic fibres mainly come from Japan, the US, Germany and Italy. The plant imports some 300 to 400 tons of synthetic fibres delivered in containers.

The chemical products come from Belgium, Germany and France, and represent between 300 and 400 tons imported every month. These products are supplied by four main companies, the most important being Stora Enso.

For the delivery of synthetic fibres and chemical products, the company has a special agreement with its suppliers. The raw materials are directly supplied to the plant. This kind of contract is called "delivered at plant" which means that the suppliers have to organise themselves the transport of the goods to the plant.

The table of flows below gives an idea of the importance of inbound flows, indicating the number of trucks received. It should be noted that the delivery rate is of some 750 to 800 tons per month.

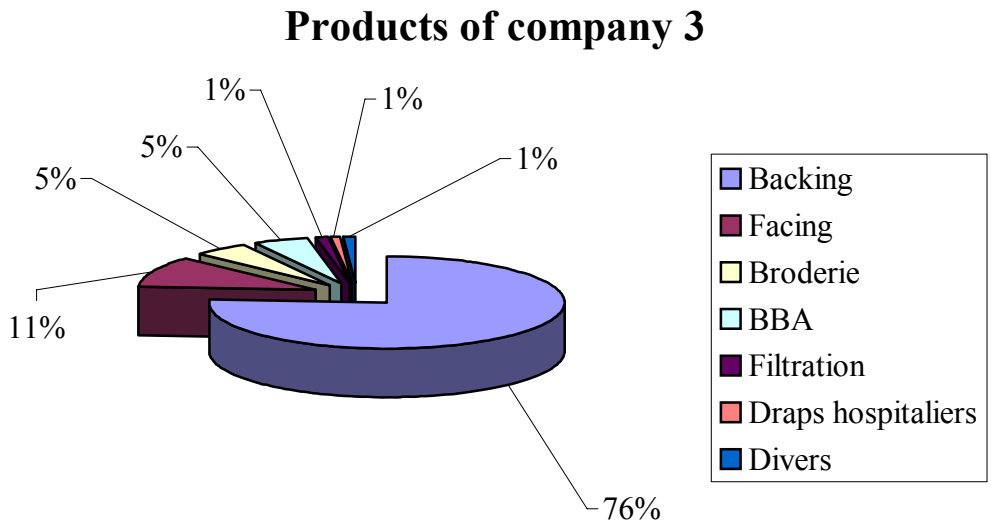
	Number of trucks Arriving in 2002	Number of trucks Arriving in 2003
January	**83**	**88**
February	**62**	**87**
March	**112**	**90**
April	**94**	**102**
May	**94**	**105**
June	**87**	**104**
July	**112**	
August	**31**	
September	**104**	
October	**111**	
November	**87**	
December	**68**	
Total /year	**1045**	**576 for 6 months**

c.2. Products and main markets.

Several products are manufactured by Company 3, all derived from non wove paper, namely:

- Products for wall siding, two categories : Backing and Facing,
- Embroidery frames,
- The BBA (no other qualitification),
- Filtration products (various filtres),
- Sheets for hospitals.

The quantities produced for each product are represented below. We can observe that products for siding represent 87% of the total production of the Belgian plant, followed by embroidery products and the BBA.



All these products are mainly sold to Western Europe (70%), to the Eastern European countries (17%) and to the US (10%). As for the production for European countries, transport is organised by the customers themselves and is done by trucks and semi-trailers. Company 3 only organises the transport for export outside Europe.

The 70% of European sales are divided as follows:

- 30% for Germany where the company has 3 important customers representing 140 tons of products per month, i.e. 4 to 5 trucks of 20 to 24 tons per customer. These customers are based in Breisach (400 km from the Belgian production site), in Gummersbach (190 km from the Belgian production site) and in Wuppertal (170 km from the Belgian production site);
- 11 to 12 % for France where the company has one important customer based in Abbeville (390 km from the Belgian production site);
- 10% for Belgium;
- 10% for The Netherlands;
- 4% for Italy;
- 4% for the UK.

Among the Eastern European countries, the main market is represented by Ukraine with 10%, followed by Hungary (5%) and Estonia and Poland with 2% each.

As for the countries that are not members of the European Union, the company is responsible for customs formalities for its shipments. The table below gives an idea of the importance of outbound flows for the Belgian plant.

	Number of trucks Leaving the plant in 2002	Numbers of trucks Leaving the plant in 2003
January	**51**	**76**
February	**69**	**75**
March	**74**	**82**
April	**87**	**79**
May	**76**	**75**
June	**63**	**75**
July	**89**	**71**
August	**10**	
September	**66**	
October	**82**	
November	**74**	
December	**48**	
Total /year	**789**	**458 for 6 months**

c.3. Packaging used

Raw materials are delivered in containers in the case of paper pulp and synthetic fibres, and in barrels of various dimensions for the chemical products, although these barrels are loaded in containers as well as in semi-trailers.

Finished products are presented as rolls of a maximum height of 2.80 m and with variable diameters. At the request of the customer, the paper rolls can be directly loaded in a truck or a semi-trailer (if the roll is very high) or grouped by 2 or 3 onto a pallet that will be loaded on a truck or a semi-trailer later on.

d Market trends and future expectations

The non wove paper market is currently in full expansion. By the end of May of this year (2003), the budget foreseen for a whole year's production had already been exceeded; forecasts had to be adapted and figures increased. To respond to the evolution of the market, the company hired more staff, the objective being to shift from the regime of a closure one every two week-ends to a full regime of 7 days a week during the whole year.

Today, the Finnish group to which Company 3 belongs ranks number 7 at world level for the production of paper and the objective is to be among the first three at world level. In order to reach this objective, the group intends to buy a few of its global competitors. At European level, the Belgian plant is the only one that produces non wove paper by wet processing.

e Experience of intermodal transport

Until today, Company 3 has no experience with intermodal transport. The logistics manager believes that the intermodal experience would not succeed because of the specific nature of the raw materials and of the organisation for the transport of the goods manufactured by his company.

Indeed, as indicated above, according to the terms of the contracts signed with the European customers, the customer is responsible for the transport of the products from the plant to their

warehouses and the logistics manager therefore has no control whatsoever on the process itself.

On the other hand, the recovery of paper pulp containers at the port of Antwerp is organised by the company and is done by road transport. According to the logistic manager, this is the best way to apply the JIT production strategy adopted by the company. Furthermore, as stated once again by the logistic manager, the product to be transported is characterized by a very low per unit weight. As a result, it is more advantageous to transport the product by trucks because the price is determined by the surface occupied, while in the case of the train it is fixed per wagon, an option that is not interesting for the company. Moreover, the lack of flexibility, the time required, the additional handling operations and the distance from the closest railway terminal (more than 50 kilometres from the production site) are other disadvantages. As for intermodal transport using waterways, the manager was not yet aware of the new possibility to use the river shuttle service for the transport of containers that is organised from the port of Renory in Liège, situated about 50 kilometres of the plant.

We informed him about this new possibility and asked his opinion about the potential use and the conditions required. He is in favour of using waterways if it is less costly than the road. Road prices between the production site and the port of Antwerp equal 250 euros (figure given by the manager himself) and the waterway (excluding pre and post road haulage) would cost 250 euros for transporting a container. As a consequence, the manager considered that he cannot change the mode used. The research team was also interested to know which logistic (added value) activities he would like the intermodal system to offer in order to make it more attractive. He answered that he had no intention of subcontracting any logistic activity, with the exception of transport itself. As a conclusion, the research team believes that Company 3 is not ready to transfer tonnage to the intermodal transport system today.

Annex 5.4. Modal scan of Company 4

a The international group

Company 4 is part of an international group whose main activity focuses on the production and commercialisation of natural mineral waters, fruit lemonades and fruit-snacks. A famous thermal center and a research and hydrogeology laboratory complete its activities. In 2002, the group's turnover was of EUR 235.4 millions. By the 31st December 2002, it employed 919 persons, of whom 841 in Belgium. The group is a leader in mineral waters in the Benelux. In Belgium, it counts four production sites and a thermal center with numerous fitness and conditioning programmes that attract every year more than 6000 curists.

Company 4 is the main production unit of the group and accounts for 85% of the volumes sold. It has 14 production lines for a wide variety of packaging with reusable (plastic or glass), recyclable and single use options. By the 31st December 2002, it was employing 660 persons, of whom about 150 usually work on logistic tasks. Company 4 has a seasonal production, with a high and a low season. During the high season, i.e. from May to August, the staff is increased employing interim workers. As a result, the number of employees varies between 660 to 750 and sometimes 800. These employment peaks tally with production peaks. During the high season, the working regime goes from the usual 2 shifts (6-14 and 14-22) to three (6-14, 14-22 and 22-6). The production then reaches some 950 to 1000 pallets[7] per day during 5 days, i.e. from Monday to Friday. The outbound flows represent between 90 to 100 full semi-trailers a day, while they reach the figure of 45 to 50 a day during the low season.

[7] One pallet equals to 112 packs of 6 water bottles and weights close to 1 ton.

b Logistic organisation

The logistic department employs an average of 150 persons. It includes the following services: planning (intervenes upstream for the planning of purchases and downstream for the planning of shipments), supplying (acts exclusively upstream in order to ensure the supply to the plant, taking into account the production forecasts), handling (upstream during the production process and downstream the production process) and finally the shipping service (responsible for picking up the finished products and for the follow-up of orders). It is important to mention that company 4 has no vehicle fleet. All the transport services are entrusted to subcontractors.

For the supply of its most important markets, i.e. Belux and The Netherlands, Company 4 rents two big warehouses, one of 20.000 m² in the Liège area (Haut Sarts), with a capacity up to 17000 pallets, and the other in Weert in The Netherlands.

As far as transport is concerned, a difference has to be made between primary transport, i.e. from the plant to the warehouses in the Hauts Sarts and the warehouse of Weert, and secondary transport (from the warehouses to the final customers). Company 4 works with two partners for primary transport[8]: one for the transport to the Hauts Sarts and another one for the transport to The Netherlands. Secondary transport is organized through 5 carriers for the Belux area and five others for The Netherlands. In order to ensure efficiency and optimal loading factors, Company 4 delivers its important customers, who are the main distributors of its goods, through its central warehouses. These important deliveries are done with semi-trailers. On the other hand, it sometimes happens that a big customer asks Company 4 to give direct help for the sales centers. In such cases, transport is done with tractor and semi-trailer since this is advantageous for the delivery of grouped cargos.

b.1. Markets

The main markets for Company 4 can be listed as follows:

1) The Netherlands with 48 % of the total production volume of the company.
2) The Belux area (Belgium + Luxembourg) with 47 % of the volume. Company 4 is the leader for mineral waters on that market.
3) The UK, representing 3%,
4) The export sector (USA, Bahrein, Denmark,…), close to 2%,
5) The North of France, where some products of Company 4 are sold, but the quantities are insignificant.

b.2. Products and packaging

Company 4 sells a wide variety of products going from mineral waters to lemonades and several other drinks. As for the packaging used for the finished products, the innovation policy of the group was translated in 2002 into the launching of the following products:

- The new blue bottles of 0.50 and 0.33 litres for the main product that replaced the existing formats, thereby finalising the harmonisation of the PET[9] range. These bottles made it possible to save on raw materials and the products are also more visible on the shelves.

[8] The manager refused to give the names of the primary transport partners.
[9] Polyethylene

- The new format for the main 2.0 litres product in PET that extends the existing range.
- The new variety Apple Cherry in the range of still mineral lemonades in cardboard packaging.
- The new Orange-Yuzu taste to replace Orange in the mineral gas lemonades.
- A 5.0 litres format in PET for mineral water.

The new products launched in the last three years contributed up to 7.5% to the volume for 2002.

c Outbound and Inbound flows

c.1. Inbound flows

The inbound flows are represented by the following raw materials: cardboard packaging, stoppers, caps, polyehtylene (PET), syrup products. They essentially come from:

- Italy, more specifically Sicily for syrup products,
- Belgium and The Netherlands for the PET,
- France and Germany for cardboard packaging.

The PET and the syrup products are delivered in tanks. The plant receives between 8 and 10 tank trucks a day, 3 or 4 times a week. Syrup products are delivered in metallic containers of 1000 liters. The logistics manager could not give more information concerning the number of metallic containers per week. However, he said that generally speaking, the inbound flows are equivalent to 20% of the outbound flows. In clearer terms, to take out 100% of the flow, 20% of the raw materials first have to have been received.

The transport of raw materials is organized by the supplying companies. Company 4 signed contracts "delivered at plant" with its suppliers.

c.2. Outbound flows

The flows to The Netherlands all arrive at the Weert Warehouse. The distribution is carried out from that main storage area. Company 4 guarantees a delivery "H=6", which means that the orders have to be delivered to the customers at the latest six hours after being logged. In order to guarantee the respect of the deadlines, the deliveries are exclusively by road.

As for the flows as such, there are between 45 and 50 semi-trailers a day that leave the plant five days a week to The Netherlands during the low season and up to 90 to 100 semi-trailers per day five times a week during the high season. A semi-trailer can be loaded with 26 pallets of products equivalent to 1 ton.

For the Belux area, the flows are divided into two parts. First, the transport by semi-trailers to the Hauts Sarts warehouse. Second, the part represented by the storage on the production site of the plant from where it will directly be transported to the central warehouses of the customers. Indeed, the storage capacity of the Hauts Sarts warehouse is not adequate to absorb all the stocks for the Belux market. The global flows for that market represent between 16 000 and 17 000 pallets per week with peaks going up to 25 000 pallets per week. For that market, Company 4 works with deadlines of D+2 (delivery to the customer 2 days after the order has been logged), the objective being to work on a D+1 basis in the medium term.

For reasons of confidentiality, the manager did not want to inform us about the logistic costs for his company for shipping the products as well as for receiving the raw materials. He just said that these were minimal costs.

d Future trends and general evolution of the sector

In a particularly unfavourable economic context, characterized by the consequences of the tragic international events of 2001 and the collapse of the financial markets, the European sector of soft drinks resisted well.

The weather conditions, the erratic influence which was very significant on the main markets of Company 4, were contrasting. If the average temperature for the year (2002) was high, of the peak months were disappointing, particularly in May and July. In such a context, the sector of bottled waters confirmed its historical evolution, with a 4.3% increase in the European Union. The consumption of lemonades increased by 2% in Belgium. Apart from the cola products, the market remained stable. In The Netherlands, it decreased by 1.8% in total but increased by 1.3% if colas are not taken into account.

The lemonades market is characterized by the multiplication of new products and the arrival of new actors from related sectors (milk, alcoholic beverages assimilated to lemonades…)

e Experiences of multimodal and intermodal transport

Aware of the problems generated by road transport, the company is open to any initiative aiming at the promotion of so-called "soft" transport alternatives. Therefore, it decided to use waterways for the transport of its long distance exports that represent 2% of its production volume. In concrete terms, the products for long distance exports are transported by semi-trailers to the river terminal of Renory in Liège where they are then loaded in containers transported to the port of Antwerp for their export. The use of waterways is made easier by the terms of delivery that are quite long, since the deliveries can take place one month after the order has been received. Currently, the company considers the experience quite conclusive.

As for the use of rail, the company is situated close to a railway station. As a consequence, it could use this alternative for primary transport quite easily. Unfortunately, past experience was so catastrophic that the company is not considering the possibility of trying it again. The main reproach is the lack of reliability and flexibility, the frequencies that are too low and the costs too high as compared to road transport (the railway is in fact 30% more expensive than the road).

The Company is currently developping a project aiming at a modal shift from the road to the railway for its flows to The Netherlands. But the initiative, supported by the regional public authorities, first has to overcome two major difficulties. The first one is related to investments, as railway transport requires to buy "rails trailers", which are trailers on wheels that can be loaded onto a railway wagon. The railway company has promised to be equipped with such systems very shortly.

The second problem is a cost issue. More specifically, railway transport, as it is considered in this case, is 30% more expensive as compared to road transport. In this respect, the project will benefit from European funds, within the framework of the Marco Polo programme. Such aids aim at covering the additional 30% of the cost generated by the modal change. Unfortunately, such aids will only be granted for a three-year period after which the company will have to pay the additional cost itself, something it off course will refuse to do.

Furthermore, the Weert warehouse in The Netherlands is not linked to the railway, which means an additional transhipment and, hence, an additional cost. As a conclusion, the company does not think it might use the railway, even only for part of its flows to The Netherlands. The flows to the Hauts Sarts are faced with the same problems as those to The

Netherlands. As a result, Company 4 does not consider using railway transport in the near future.

Annex 5.5. Modal Scan of Company 5

a Presentation of the company

Company 5 is one of the biggest European producers of marmalades and compotes. Created in 1888, it established itself in state-of-the-art facilities in the province of Namur in Belgium in 1980. A few figures can be mentioned to give an indication of the company's profile:

- Annual turnover: +/- 100 million euros ;
- Staff: +/- 420 persons ;
- Total surface: 24 hectares ;
- Built-on total surface : 6 hectares;
- Total production capacity: 75 000 tons ;
- Storage capacity: 25 000 tons of finished products and 10 500 tons of frozen fruit.

b Logistic organisation

b.1. Market

Company 5 is a leader on the Belgian market for marmalades and compotes. Its products are distributed in all points of sale in Belgium. Moreover, 60% of the production is exported to neighbouring countries (Germany, France, The Netherlands, the UK) and even further (Canada, Saudi Arabia, Japan…)

Company 5 opened a sales office in Poland and Tchequia very recently and everywhere in Europe, it has close relations with other companies specialized in fruit processing. With such a position, it can have the important synergies that will allow it to increase its industrial possibilities. Shipments can be organized on the basis of three different models:

- Company 5 is fully responsible for the (door-to-door) transport (organisation, administrative expenses, insurance) ;
- Company 5 is partially responsible for transport to the port of Antwerp or the port of Rotterdam (organization, administrative expenses, insurance…) ;
- The customer is responsbile for the transport and picks up the goods at the plant of Company 5.

In each of these three options, there is always a forwarder (or even only one carrier) responsible for the whole flow for one sole country. Loyalty and long-term cooperation therefore represent values that are the base for the contractual relations established for subcontracting the transport. The company also acts as a customs agent.

c Outbound and inbound flows

c.1. Inbound flows

The raw materials required for the production are sugars and glucoses, fruit and packaging. Two to three tank trucks (25 tons per vehicle) daily bring the sugar and the glucose to the company's warehouse. Such a frequency is mainly due to the storage capacity of silos equivalent to 2 – 3 days of production. Sugar comes from Tirlemont (Belgium) while glucose (in liquid form) comes from Belgium, The Netherlands and France. The nearly tight flow of supplies for raw materials is a strategic decision.

The second category of raw materials is fruit (50% of the supplies). It is delivered by semi-trailers with a controlled temperature (fresh or frozen products). Fresh fruit (apple and

rhubarb) arrive during the crop period from Belgium and (to a lesser extent) from The Netherlands. Frozen fruit comes from Belgium (25% of the flow), various countries of the EU (50%) and from Southern countries (25%) and represent two to three trucks per day (one truck = 25 tons). Fresh fruit is essentially loaded onto pallets (95% of the flow) and, to a lesser extent, as a bulk product (5%).

Storage preferably takes place in the company's facilities instead of those of the supplier. The orders are not the result of short term needs for production (e.g. it happens that the internally stored quantity for a certain kind of fruit covers the next 6 months of production). Such a policy can be explained, among other things, by the lack of price stability on the fruit market, which means that internal stocks are favoured.

Packaging also represents an important part of inbound flows. It is nearly always brought to the company on pallets loaded onto conventional semi-trailers. There are various categories of packaging:

- Cardboard boxes and bins that contain 5 kg,
- bags,
- barrels,
- film reels,
- unassembled cardboard trays that represent 2 trucks a week (mainly from Belgium),
- caps (relatively low part of the flow, one truck from time to time),
- empties representing 2 to 3 trucks per day, from Belgium, Germany and France.

Cardboard trays (very highly loaded pallets) and empties are estimated in volume and not in tons because of the important space that they occupy in the semi-trailer. The supplying flows of the other components (cardboard boxes, bags, barrels, film and caps) are more limited. As a result, these are only ordered when a specific need arises.

c.2. Outbound flows

The outbound flows are essentially represented by the finished products (90% of the total tonnage) and, to a lesser extent, by intermediate products (10%) that will supply other companies of the agro food sector. The total of these flows represents some 55 000 tons per year: 90% shipped by completely loaded units (containers, semi-trailers) and 10% by groupage. The finished products (90%) represent a wide range of different products:

- marmalades,
- compotes,
- fruit in syrup and "corins",
- fruit desserts,
- 100% fruit juice,
- fruit spread,
- «fruits pockets » (juice packs for children essentially),
- fruit delights,
- «fresh & fruits».

These flows are particularly fragmented:

- 40% of the finished products are sold on the Belgian market, half of them presented on pallets as products and stored as such, the other half being the result of a groupage, after a « picking ».
- 35% are exported to neighbouring countries (The Netherlands, France, Germany…) and are presented as complete loading units on pallets in semi-trailers (25 tons).

- 5% are used for long distance export and are shipped by containers (trucks then sea freight at the Antwerp or Rotterdam ports)

Containers are manually loaded for cost reasons (optimization of the containers volume). For this purpose, the pallet is taken away before the goods are loaded into the container.

- The remaining 10% (semi-finished products for « subcontracting » customers located in Belgium and in France) are usually shipped in containers (vats of 1 ton).

d Future trends and experience of intermodal transport

Currently, intermodal transport hardly exists in the logistics strategy of Company 5, for several reasons:

- Given the current situation, the deadlines can not be respected by those alternative modes (pre-determined schedule on the basis of delivery planning);
- The dispersion of delivery sites and, furthermore, the fragmentation of the quantities delivered;
- The cool chain management that suffers from the breaking of bulk when using alternative modes;
- The intermodal infrastructure is in most cases not adapted to the demands posed by this kind of product.

The possibility to ship containers by waterway to the Antwerp and Rotterdam ports was analysed. Besides today's limitations in the field of pre haulage, the volumes transferred are not sufficient (3 containers/week as an average).

Supplying sugar using waterways is also inappropriate for two reasons:

- Pre haulage is necessary between Tirlemont and the closest loading site (not profitable for such a short distance),
- The Flawinne harbour is not equipped with the silos needed to receive the goods.

Railway was used to supply Company 5 with frozen fruit coming from the Eastern European countries (degroupage at the Jambes station followed by post haulage from the Flawinne station). However, Company 5 decided to opt for the road for two reasons:

- Goods safety (optimum controlled temperature) was not sufficiently ensured by the railway system;
- The fragmentation of quantities into different time slots, which is possible using road transport, is better adapted to the storage capacities and the production conditions of the company.

Annex 6 General information about the scanned companies

Annex 6.1. Comprehensive context of Company 6

Company 6 was established at the heart of Brussels in 1919. In 1968, Company 6 settled in Groot-Bijgaarden, where its present headquarters is located (as well as the Research centre and the Innovation Centre). Within the company, a distinction is made between the "BeLux" department, focussing primarily on the Belgian and Luxembourg market and the "rest of the company", concentrating on the rest of the world.

The Group was created in 1997, grouping around 102 companies and 58 production sites across the globe. The Group has over 4600 employees worldwide, 425 of which are employed on the Groot-Bijgaarden site, and is represented in more than 120 countries. The turnover of Company 6 was approximately 142 million € in 2002.

The Group is made up of four departments:

1. *Bakery and Confectionery Products Division*: including the production of goods used in bread making and baking (e.g. preparation agents, flour mixes, margarines, etc.). Companies active in this department: Company 6.

   Food Ingredients Division: emulsifiers, enzymes, etc. Company 6 has been making its own emulsifiers since 1955, which are used in preparation agents. Emulsifiers determine the quality of bread and baking goods. They encourage a nice crumb structure, provide sufficient bulk and guarantee long-lasting freshness. A number of years ago (1984) the company also invested in the development and production of enzymes. Enzymes are proteins that, in small amounts, make interaction possible between the different dough ingredients.
   Companies that are active in this division: Beldem, Gelka.

2. *Chocolate, Fruit and Vegetable Cream Industrial Division*: production of pure or imitation chocolate, fruit-based products (flavourings, fillings, etc.)
   Companies that are active in this division: Belcolade, Debelis, Belgaarde, Cuore.

3. *Frozen and Make-off Products Division*: frozen products (bread, pastry, etc.) en make-off products (pie bases, puff pastry, etc.)
   Companies that are active in this division: Lys, Berlys.

Company 6 delivers some 250 products to the Belgian market in total. Company 6 is a market leader for professional baking goods.

Annex 6.2. Comprehensive context of Company 8

Company 8a (est. 1995) and Company 8b (est.1995) are both situated in Oudegem (near Dendermonde).

Company 8a (532 employees) concentrates on 2 core activities: the production of corrugated cardboard and the production of carton compact, whereas Company 8b (273 employees) is concentrated on paper production.

Corrugated cardboard is composed of different sorts of paper, of which the middle layer has a wavy profile.

Carton compact is recommended for use in humid conditions such as wrapping of poultry, meat, vegetables, other foodstuffs and flowers.

The paper is made for packaging purposes on the basis of recuperated paper and carton.

The whole group produced 408,000 tonnes of paper in 2002 (of which 344,000 tonnes in Company 8b).

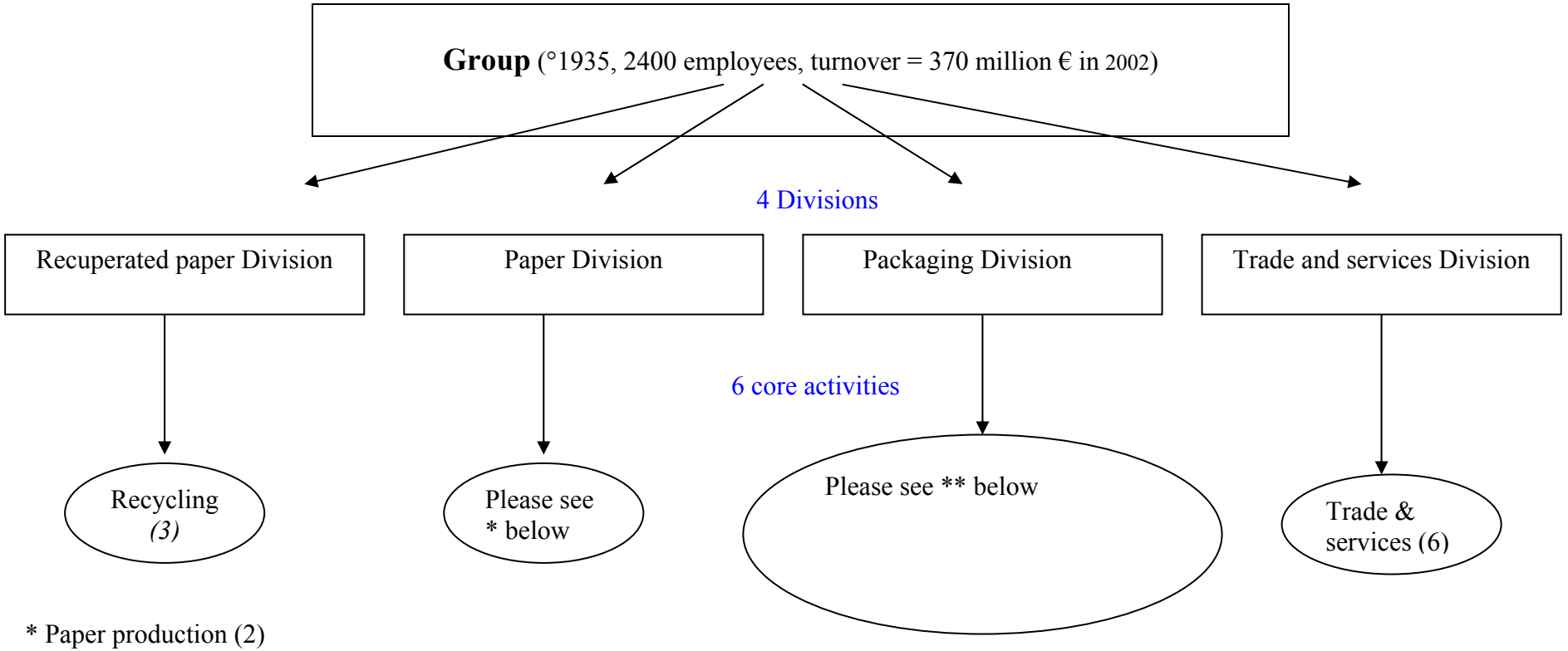
The whole group produced 261,000 tonnes of corrugated cardboard in 2002.

The whole group produced approximately 38,000 tonnes of carton compact in 2002.

Company 8b is the biggest producer of paper in Belgium. It is one of the top-ten paper producing companies in Europe.

The turnover of Company 8a in 2002: 106 860 000 €.

The turnover of Company 8b in 2002: 98 657 000 €.



* Paper production (2)

** Corrugated cartion prodution *(9 +4)*
Carton compact production *(1)*
Production of wrappers and angle cross-sections *(4)*
Company 8a (Oudegem) : 2 core activities, i.e.:

- Corrugated carton production
- Carton compact production

Company 8b (Oudegem) : 1 core activitiy, i.e.

- Paper production

Annex 6.3. Comprehensive context of Company 9

The Group has 13 production units in Europe. The factory in Aalst is the largest production unit in terms of volume: 400,000 tonnes of wheat are processed and 250,000 tonnes of dextrose syrup are subject to further refining yearly.

The output of the main products (per year): 450,000 finished products, of which 75% are liquid goods (bulk; sugar syrups) and 25% are powders, half of which are bulk products and packaged goods. The liquid goods products are mainly used in the food industry and the powders in the food, paper and carton industries.

The output of side-products (per year): 350,000 tonnes (wheat chaff, etc.), mainly used in the livestock feed industry.

Company 9 carries out blending, i.e. it has a basic mix in stock and adds certain ingredients in order to get the right blend for each client, just before delivery to the client.

The products of Company 9 are bulk and of low value. As a consequence, it is important to keep transport as cheap as possible.

Annex 6.4. Comprehensive context of Company 10

Company 10 was established in 1981 and is a mixed cooperative company with limited liability (c.v.b.a.). The associates are: the "Gewestelijke Ontwikkelingsmaatschappij voor Brussel" (G.O.M.B., the Brussels Regional Development Company), the City of Brussels and 34 associates from the private sector, particularly importers – exporters of fruit and vegetables that franchise the 64 warehouses in the main building.

The main building has 33 companies with business activities in the import and export of fruit and vegetables. Twenty-four out of these 33 companies took part in the modal scan analysis.

The companies on the site each focus on a particular type of fruit or vegetable. First and foremost, there are the companies that are specialised in traditional Belgian products. Then there are the companies that are specialised in importing European fruit and vegetables, mainly from Spain, Italy and France. This is the most prevalent type of company on the site. Other companies in the complex have specialised in "opposite seasons"; they concentrate on the import of fruit and vegetables that are only available in summer in Europe, but are available in the southern hemisphere in our winter. Furthermore, there are banana-importing companies. Finally there are companies that import exotic fruit. Exotic fruit is practically bought in large quantities due to its limited shelf life and high price. Exotic fruit has to be stored in a different way compared to other sorts of fruit. The ripening process of normal fruit is slowed down in low temperatures, but exotic fruit can never be subject to temperatures around freezing point. It is best kept at room temperature.

The facilities also include a whole series of complementary activities such as the Federal Agency for Food Chain Safety (FAVV), a customs agency, a transport company, cafeterias, a petrol station, a newsagent, etc. In total, over 50 companies are located on the site.

Some 650 people work in the complex (including those working in correlated activities). Most companies (11) have between 10 and 28 employees. Companies with less than 10 people are also well represented in the complex (7). Only 1 company has more than 50 employees.

The biggest group (9 companies) has a turnover between 10 and 20 million € a year. Seven companies have an annual turnover of less than 5 million €/year. The total annual turnover of the complex amounts to about 500 million €.

Annex 7 Detailed calculations

Annex 7.1. Results of the modal scan of Company 6

1.1. Flows:

The containers transported are 40' Reefer Containers.

Groot-Bijgaarden – Parma (Italy): 5 trucks/week - *distance: 1050 km*

Groot-Bijgaarden – Sils (near Barcelona): 5 trucks/week - *distance: 1250 km*

1.2. Figures for SSS transport (Shipping company 1)

Shipping company 1 provides Reefer transport to Valencia and to La Spezia, rents out Reefer Containers as well and organises haulage domestically and abroad (distance between La Spezia-Parma ~75km; distance between Valencia-Sils: ~430 km). The rates mentioned are valid until the end of October 2003 (subject to increases in port costs, port rates, etc.).

The rental price of the Reefers is included in the price of transport. The Reefers are delivered tp the client (Company 6) 2 days before shipment. If the client wishes a faster delivery of these containers, a surcharge must be paid.

1.2.1. Initial haulage

a Initial haulage Groot-Bijgaarden – Port of Antwerp (50 km):

[10]*Max free time for loading / waiting for customs papers: 2 hours as from arrival, thereafter waiting time to be paid: 35 € /hour*

surcharge for imo cargo: 10 %

multi-stop without detour (if applicable): 43.75 €/container

Customs export documents (as per EU rules) to be issued and validated by suppliers at area of origin and to be handed over to trucker (if suppliers unable to issue/validate customs document, customs agents at area will have to be appointed; consequential expenses and detour on request).

As per Antwerp Rules cargo is collected, transported and stored at risk of the mandator, no insurance for risks is being taken unless specifically requested and paid for.

Courier service (if required) 56 € / set

Customs clearance at Antwerp: 31 € / container;
Issuing of shipping documents: 21 € / container;
Transfer of truck on ship: THC loadport 159 € / container [Terminal Handling Charge (THC)].

Total cost of initial haulage: 295 €/container.

[10] The text in italic indicates costs that are not automatically applicable to Company 6 (= these costs will only have to be paid in specific circumstances, e.g. if the containers are stored at the terminal or additional insurance costs, etc.)

b Main haulage Antwerp/Valencia or La Spezia

The cost of the main haulage amounts to approx.: 1,200 € / 40' Reefer all-in.

1.2.3. Terminal haulage

a Terminal haulage: La Spezia - Parma (100 km)

The maximum permitted weight is 26 tonnes, including the weight of the container.

Transfer of ship on truck: THC La Spezia 158 €/40' Reefer.

Plugging charges in La Spezia 25.83 € per day per container.

Documentation fee 36.00 € per container.

House delivery Parma 340 € / 40' Reefer (unstuffing & customs formalities always to be borne by receivers).

Container demurrage 2 days free of demurrage as from arrival vessel, thereafter 3rd to 5th day USD 75 per day per container. 5th day onwards USD 100 per day per container.

b Terminal haulage: Valencia – Sils (400 km)

The maximum weight is 26 tonnes, including the weight of the container.

Transfer of ship on truck: THC Valencia 110 € /40' Reefer.

Plugging charges in Valencia 44.50 € per day per container.

Wharfage (port tax): 3.78 € per MT payload.

Documentation fee: 40.00 € / container.

House delivery Sils (Gerona) 931.50 € / 40' Reefer (unstuffing & customs formalities always to be borne by receivers).

Port storage 1.50 € per day per container (i.e. cost of space use of the container).

Container demurrage 2 days free of demurrage as from arrival vessel, thereafter 3rd up to 5th day USD 75 per day per container. 5th day onwards USD 100 per day per container.

1.2.4. Total cost (excluding VAT)

a Groot-Bijgaarden – Parma

- Initial haulage: 295 €/container;
- Customs charge: 31 €/container;
- Shipping documents: 21 €/container;
- Transfer in Antwerp: 159 €/container;
- Main haulage: 1,200 €/container;
- Transfer in La Spezia: 158 €/container;
- Plugging charges: 25.83 €/day/container (1 day of plugging estimated);
- Lay-up of the container: 2 days free (otherwise: see above);
- Insurance costs: optional;

- Doc. fee: 36 €/container;

- Terminal haulage: 340 €/container.

Total cost per container short sea shipping: 2,266 € (excluding VAT).

b Groot-Bijgaarden - Sils

- Initial haulage: 295 €/container;

- Customs charge: 31 €/container;

- Shipping documents: 21 €/container;

- Transfer in Antwerp: 159 €/container;

- Main haulage: 1,200 €/container;

- Transfer in La Spezia: 110 €/container;

- Plugging charges: 44.5 €/day/container (1 day of plugging estimated);

- Space: 1.5 €/day/container (1 day of storage estimated);

- Lay-up of the container: 2 days free (otherwise: see above);

- Insurance costs: optional;

- Port tax: 3.78 € /MT payload (freight with a weight of 20 tonnes assumed; 75.6 €);

- Doc. fee: 40 €/container;

- Terminal haulage: 931.5 €/container.

Total cost per container short sea shipping: 2,908.6 € (excluding VAT).

1.3. Figures for SSS transport Groot-Bijgaarden – St-Petersburg (Shipping company):

Groot-Bijgaarden – St-Petersburg: 3 trucks/week - distance: 2,713 km/2,320 km

Groot-Bijgaarden – St-Petersburg: 3 trucks/week – distance: 2,320 km

Groot-Bijgaarden – Moskou: 3 trucks/week – distance: 2,713 km

The rental price of the Reefer Container is included in the prices below.

1.3.1. Initial haulage Groot Bijgaarden – Antwerp:

The initial haulage involves the Antwerp – Groot-Bijgaarden – Antwerp loop. The cost for this is 325 € for a 40' Reefer Container.

1.3.2. Main haulage

(Antwerp – St-Petersburg on FLT basis: EUR 1,900 € / 40' (the transfer onto a ship in Antwerp is included in this as well as the transfer on the truck in St-Petersburg, 3-day switch in Antwerp and 3-day switch in St-Petersburg)

There is a charge of 50 €/day for extra plugging (both in Antwerp and in St-Petersburg).

Customs charges in Belgium: between 40 and 50 € per container or customs charges in Russia: these range between 40 en 50 € per container (to be borne by the receiver).

It costs 15 € for a bill of lading to be issued.

1.3.2. Terminal haulage

One has to organise haulage in St-Petersburg oneself. The Reefers can be stored in St-Petersburg for a while.

In principle, the goods are to be cleared within 10 days. If the goods have to stay in transit for a longer period, extra storage costs and extra customs formalities must be paid.

1.3.4. Total cost (excluding VAT)

To transport a fully loaded 40' Reefer Container from Groot-Bijgaarden to St-Petersburg, the following amount must be paid:

- Initial haulage: 325 €/container;
- Main haulage (including transfer in Antwerp and in St-Petersburg, 3-day switch in Antwerp and 3 days 3-day switch in St-Petersburg): 1,900 €/container;
- Customs charges: about 50 € per container;
- Terminal haulage: unknown (distance between terminal and client = unknown).

Total cost Groot-Bijgaarden – St-Petersburg via SSS: 2,325 €/container + terminal haulage

1.4. Figures for the SSS transport Groot-Bijgaarden – St-Petersburg/Moscow (Shipping company 3)

The shipping company provides the Reefer Containers to the company and these are transported by truck from Groot-Bijgaarden to Rotterdam, where they are put onto a ship and transported to St-Petersburg. The containers are brought from St-Petersburg to Moscow by truck.

The price of transport between Groot-Bijgaarden and St-Petersburg amounts to 2,869 €/container (excl. VAT) for an average weight of 21,500 kg.

The price of transport between Groot-Bijgaarden and Moscow amounts to 3,544 €/container (excl. VAT) for an average weight of 21,500 kg.

Administrative costs, customs visits and the rental of the containers are included in these prices.

The following charges must be added to the prices mentioned above (generally applicable to Russia):

Excess weight: 52 €/container.
10 € per bill of lading.
Documentation fee: 50 $/container.
Customs inspection in St-Petersburg:
Opening of doors: 70 $/40'container.
Full check: 120 $/40'container.
Place at the terminal in St-Petersburg: free for 7 days, after:
- between 8 and 15 days: 12 $/day for 40';
- more than 15 days: 24 $/day for 40'.

Demurrage at terminal: free for the first 7 days, after:
20 $/day/container.

Electricity costs: free for 4 days, after 40 $/container/day.
Free time at the receiver: 24h, after:
- during first 10 hours: 10 $/hour/truck;
- after 10 hours: 240 $/day/truck.

The definitive cost per 40' Reefer Container from Groot-Bijgaarden to St-Petersburg amounts to (2,869 € + 10 €) = **2,879 €** without any of the above-mentioned charges.

The definitive cost for Groot-Bijgaarden - Moscow amounts to (3,544 € + 10 €) = **3,554 €** without any of the above-mentioned charges.

1.5. Figures for transport by rail (IFB)

Groot-Bijgaarden – Parma (Italy): 5 trucks/week - distance*: 1,050 km*

Groot-Bijgaarden – Sils (near Barcelona): 5 trucks/week - distance*: 1,250 km*

Groot-Bijgaarden – Hilden (near Düsseldorf): 4 trucks/week - distance*: 250 km*

Groot-Bijgaarden – Moscow/St-Petersburg: 3 trucks/week - distance*: 2,713km/2,320 km*

1.5.1. Initial transport:

The following prices apply for a 40' Reefer Container by rail (IFB):

Initial haulage Muizen – Groot-Bijgaarden – Muizen (45km x 2) = 217 €/Reefer Container

Initial haulage Antwerp – Groot-Bijgaarden – Antwerp (75km x 2) = 270 € /Reefer Container

1.5.2. Main haulage

a Groot-Bijgaarden – Parma

Route: Groot-Bijgaarden – Muizen – Bologna – Parma

Transfer in Muizen, main haulage, transfer in Bologna: 842 € /Reefer Container

b Groot-Bijgaarden – Sils (near Barcelona)

Route: Groot-Bijgaarden – Muizen – Barcelona – Sils

Transfer in Muizen, main haulage, transfer in Barcelona: 981 €/Reefer Container

c Groot-Bijgaarden – Hilden

Route: Groot-Bijgaarden – Muizen – Herne/Wanne – Düsseldorf

Transfer in Muizen, main haulage, transfer in Herne: 273 €/Reefer Container

d Groot-Bijgaarden – St-Petersburg

Route: Groot-Bijgaarden – Zomerweg Antwerp – St-Petersburg

Transfer in Antwerp, main haulage: 1,902 €/Reefer Container

e Groot-Bijgaarden – Moskou

Route: Groot-Bijgaarden – Zomerweg Antwerp – St-Petersburg

Transfer in Antwerp, main haulage: 1,874 €/Reefer Container

1.5.3. Terminal haulage

a Groot-Bijgaarden – Parma

Bologna – Parma –Bologna (115km x 2) = 332 €/Reefer Container

b Groot-Bijgaarden – Sils (near Barcelona)

Terminal haulage Barcelona – Sils –Barcelona (105km x 2) = **??** €/Reefer Container[11]

Upper limit = 324 €/Reefer Container (=162 € for transport between [51; 70] km; 162 € x 2 (for 105 km))

c Groot-Bijgaarden – Hilden

Terminal haulage Herne – Düsseldorf – Herne/Wanne (55km x 2) = 163 €/Reefer Container

d Groot-Bijgaarden – St-Petersburg

IFB organises rail transport to St-Petersburg but does not place the container on a truck over there. As far as the costs of the transfer and terminal haulage by truck are concerned (on 30/07), Express-Delta, in the Russian Federation (St-Petersburg), is called on. According to them, it costs ~150$/Reefer Container in order to take these off the wagon in St-Petersburg and to carry them by truck to the St-Petersburg region.

e Groot-Bijgaarden – Moskow

Crane costs + terminal haulage to the client in Moscow = unknown

1.5.4. Rental Reefer Container

ICTC was contacted for this, tel.: 03/286.70.70

I.C.T.C.nv
Elisabethlaan 156
2600 Berchem
Tel.: 03/286.70.70

If the Reefer Container is hired for a period of 6 months, the cost per day is:

- *For the Reefer: 9.5 €;*
- *For the genset: 12 €;*
- *For the upkeep of the Reefer: 4 €;*
- *For the upkeep of the genset: 5 €;*
- *Per Reefer Container: Inspection + placement of the (reefer + genset) on the chassis at the depot (thus in month 1) = 127 € (thus the client has to collect the Reefer himself/herself);*
- *Per Reefer Container: Inspection + take off (reefer + de genset) from the chassis at the depot (thus in month 6) = 127 € (thus the Reefer has to be delivered to the depot by the client).*

Per day = 9.5 € + 12 € + 4 € + 5 € = 30.5 €/day/Reefer with genset.

The inspection costs (127 € x 2 = 254 €/container for 6 months i.e. 180 days) shall be added per trip depending on the amount of days the Reefer Containers are on the road.

[11] *The data for Barcelona only goes until 70 km; however it is possible to organise terminal haulage up to Sils, but this price has to be agreed. Guideline price: (price [51km ; 70km] x 2) = 162 x 2 = 324* €.

For Sils: (254 €/180 days) x 6 days x 2 (outward and return) = 17 €

For Parma: (254 €/180 days) x 6 days x 2 (outward and return) = 17 €

For Hilden: (254 €/180 days) x 4 days x 2 (outward and return) = 11.5 €

For St-Petersburg: (254 €/180 days) x 11 days x 2 (outward and return) = 31 €

For Moscow: (254 €/180 days) x 11 days x 2 (outward and return) = 31 €

Total price per day:

For Sils: 30.5 € + 17 € = 47.5 €/Reefer Container⇒ for 5 containers: 237.5 €

For Parma: 30.5 € + 17 € = 47.5 €/Reefer Container⇒ for 5 containers: 237.5 €

For Hilden: 30.5 € + 11.5 € = 42 €/Reefer Container⇒ for 4 containers: 168 €

For St-Petersburg: 30.5 € + 31 € = 61.5 €/Reefer Container⇒for 3 containers: 184.5 €

For Moskou: 30.5 € + 31 € = 61.5 €/Reefer Container⇒for 3 containers: 138 €

If these are hired for less than 3 months, the price increases. If they are hired for more than 6 months, the price decreases.

1.5.5. Return journey of empty containers

a Groot-Bijgaarden – Parma

Return journey of empty containers by rail= 669 €

b Groot-Bijgaarden – Sils

Return journey of empty containers by rail = 715 €

c Groot-Bijgaarden – Hilden

Return journey of empty containers by rail = 221 €

d Groot-Bijgaarden – St-Petersburg

Return journey of empty containers by rail = 1,544 €

e Groot-Bijgaarden – Moscow

Return journey of empty containers by rail = 1,516 €

1.5.6 Total cost (excluding VAT)

a Groot-Bijgaarden – Parma

Total by rail = 217 € + 842 € + 332 € + 47.5 € + 669 € = 2,107.5 €

b Groot-Bijgaarden – Sils

Total by rail = 217 € + 981 € + 324 € + 47.5 € + 715 € = 2,284.5 €

c Groot-Bijgaarden – Hilden

Total by rail = 217 € + 273 € + 163 € + 42 € + 221 € = 916 €

d Groot-Bijgaarden – St-Petersburg

Total by rail = 270 € + 1,902 € + 150 € + 61.5 € + 1,544 € = 3,927.5 €

e Groot-Bijgaarden – Moskow

Total by rail = 270 € + 1,874 € + 61.5 € + crane costs in Moscow + terminal haulage

+ 1,516 € = 3,721.5 € + crane costs in Moscow + terminal haulage

1.5.7. Comparison with road transport

a Groot-Bijgaarden – Parma

Total by truck = 1,300 €

b Groot-Bijgaarden – Sils

Total by truck = 1,190 €

c Groot-Bijgaarden – Hilden

Total by truck = 345 €

d Groot-Bijgaarden – St-Petersburg

Total by truck = 3,200 to 3,500 €

e Groot-Bijgaarden – Moscow

Total by truck = 3,200 to 3,500 €

1.5.8 Frequency

a Groot-Bijgaarden – Parma

Truck: loading day X – unloading day X+2 (including sleeping times)

Rail: from Muizen to Bologna: daily connection; transit time: A-D + 1 day collection + 1 day unloading

b Groot-Bijgaarden – Sils

Truck: loading day X – unloading day X+2 (including sleeping times)

Rail: from Muizen to Bologna: daily connection; transit time: A-D + 1 day collection + 1 day unloading

c Groot-Bijgaarden – Hilden

Truck: loading day X – unloading day X+1 (including sleeping times)

Rail: from Muizen to Herne: connection 3x per week; transit time: A-B + 1 day collection + 1 day unloading

d Groot-Bijgaarden – St-Petersburg

Rail: from Antwerp to Moscow/St-Petersburg: connection 3x per week; transit time: 10 days + 1 day collection

e Groot-Bijgaarden – Moskou

Rail: from Antwerp to Moscow/St-Petersburg: connection 3x per week; transit time: 10 days + 1 day collection

1.5.9. Comments

1. IFB does not provide Reefer Containers. As a consequence, Company 6 must source its own Reefer Containers with genset.
2. IFB does not organise the transfer in Moscow/St-Petersburg; the receiver must organise it.
3. The problem with destinations such as Spain, Italy, St-Petersburg and Moscow is that the genset is not comprehensive enough (in terms of hours) to keep the goods cooled for the duration of the journey. In general, gensets (clip-on systems) "only" last for 60 hours.
4. It is the client's full responsibility to send Reefer Containers. ICF will not accept any responsibility for any possible defective or lack of operation of the cooling installations.
5. The freight weighs 20 tonnes on average, an empty 40' Reefer Container weighs between 5 and 6 tonnes; the weight of the loaded container (=gross weight) is in the [22.001 – 31.000]-tonne range.

Annex 7.2. Results of the modal scan of Company 7

1. Flow:

Puurs – Tourcoing: 4 trucks/week - *distance: 105 km*

1.2. Figures for inland waterway transport:

The Port of Lille was contacted for this route. It organises inland navigation between the port of Antwerp and the port of Lille as well as terminal haulage between the port of Lille and the Tourcoing platform. However it does not provide containers, does not do any stuffing and stripping and does not organise any traction between Puurs and the Port of Antwerp.

Gondrand NV in Antwerp was contacted for the prices of road haulage:

- Collect an empty container in Berchem (container depot) and transport to Puurs (Company 7): 210 €;
- Transport a full container from Puurs to the Port of Antwerp: 210 €;
- Transport an empty container from the Port of Antwerp to Puurs: 210 €;
- It makes no difference whether the container is loaded or empty;
- If the container is transported directly (in 1 go) from Berchem to Puurs (loading time = 2 hours) and then to the port of Antwerp, the whole route does not cost 420 €, but 210 €.

If the terminal haulage of one leg (Port of Antwerp-Puurs) can be combined with the initial haulage of the following leg (Puurs- Port of Antwerp) on the same day (with 2 hours' loading time after the arrival of the container in Puurs), the rate is 210 € instead of 420 €.

1.2.2. Main haulage

a Handlings at Antwerp

Average applicable price:

25 € / handling road (take container from the truck and place on ground).

25 € / handling road (take container from the ground and place on truck).

50 € / handling barge (take container from the ship and place on ground).

50 € / handling barge (take container from the ground and place on ship).

For each Antwerp-Lille route both handlings are required; the container is first taken off the truck and placed on the ground ⇒ 25 €. After that, the container is taken from the ground and placed on the ship ⇒ 50 €.

b Inland navigation route Antwerp – Lille:

47.80 € for a 20'container

91.80 € for a 40'container

1.2.3. Terminal haulage

a Handlings in Lille

22.60 € / handling road (take container from the truck and place on ground)

22.60 € / handling road (take container from the ground and place on truck)

18.70 € / handling barge (carry the container from the quay onto the ship)

18.70 € / handling barge (put the container on the quay from the ship)

For each Antwerp-Lille route both handlings are required; the container is first taken from the ship and placed on the ground ⇒ 18.7 €. Afterwards the container is taken from the ground and put on the truck ⇒ 22.6 €.

b Terminal haulage Lille – Tourcoing:

The full container is transported from Lille to Tourcoing (approx. 15 km) + the empty container is brought back to Lille.

142.82 € for either a 20' or a 40' container.

1.2.4. Rental of the containers:

The following company was contacted:

I.C.T.C.nv
Elisabethlaan 156
2600 Berchem

Tel.: 03/286.70.70

The rental price of the containers is as follows:

1. For a **five-year** leasing contract:
   - 20': 1.05 $ per container per day;
   - 40': 1.7 to 1.8 $ per container per day.

2. For a leasing contract of **90 days** (= minimum period):
   - 20': 1.8 $ per container per day;
   - 40': 2.2 $ per container per day.

Handling costs (= placement on chassis): 35 $ per container at departure (= start of leasing period) and 35 $ per container at arrival (at end of leasing contract).

If the company opts for a minimum lease period, it will have to pay the following amount for a 40' container for 90 days:
- 90 days x 2.2 $/day = 198 $;
- 35 $/container x 2 = 70 $;
- this is on average: (198+70)/90 = 3 € a day.

If one assumes that the containers are kept immobile for (at least) 4 days for the Puurs-Tourcoing-Puurs route, this amounts to paying 3 €/day x 4 days = 12 € for 1 container.

Since a container departs daily and is on the road for 4 days, a same container cannot be used twice during a week. This means that 4 containers have to be ordered.

The total cost for the rental of 4 containers amounts to: 12 €/container x 4 containers = 48 €.

1.2.5. Total cost per inland navigation trip (excluding VAT)

Rate for one 40' container:

Rate for 1x 40' container:
- Rental of container: 12 €;
- Initial haulage Puurs-port of Antwerp: 210 €;
- Handling at Antwerp: 25 € + 50 € = 75 €;
- Main haulage Port of Antwerp-Lille: 91.8 €;
- Handling at Lille: 18.7 € + 22.6 € = 41.3 €;
- Terminal haulage Lille-Tourcoing-Lille: 142.82 €;
- Handling at Lille: 18.7 € + 22.6 € = 41.3 €;
- Return empty container Lille-Port of Antwerp: 91.8 €;
- Return empty container Port of Antwerp-Puurs: 210 €.

Total cost for 1 container: 496 € + max 420 € = **916 €** (excluding VAT)

496 € + min 210 € = **706 €** (excluding VAT)

Annex 7.3. Results of the modal scan of Company 9

1. Flow:

Aalst – Crolles (southern France, near Grenoble): 5 to 6 tank containers per week (*contents: 33,000 litres*)

Aalst – Apt (southern France, near Avignon): 3 to 4 tank containers per week (*contents: 33,000 litres*)

2. Figures for rail transport:

Company 9 prefers an A/B-service. The company does not intend to switch to another mode of transport if the service is not an A/B-type one.

This implies that inland waterway navigation or Short Sea Shipping options will not be considered. The only option that will be studied here is rail transport. IFB was contacted for these flows.

2.1. Initial, main and terminal haulage

The **total price** for initial haulage between Aalst and Main Hub Antwerp + main haulage per train Main Hub Antwerp – Avignon + terminal haulage between Avignon and **Crolles** = **700 €** for a 7.15 tank.

The **total price** for initial haulage between Aalst and Main Hub Antwerp + main initial haulage per train Main Hub Antwerp – Avignon + terminal initial haulage between Avignon and **Apt** = **747 €** for a 7.17 tank.

2.2. Rental of the tank containers:

ICTC/GES only rents out tank containers with a capacity of 31,000 litres or 35,000 litres.

The cost for the rental of such tank containers is as follows:

- 17 US$ per tank container per day if the tank container is rented for a minimum period of 3 years;
- If this rental period is increased to 5 years, the daily price is 15.75 US$.

The handling costs in Antwerp (placing the tank container on the truck at the start of the leasing period + collection the tank container at the end of the leasing period) is 90 US$ x 2. The handling costs in Aalst are estimated at 35 US$ x 2.

2.3. Transport of the tank container (from the depot to Company 9)

The **transport** of the tank container from Antwerp to Aalst: 200 € on average.

The **transport** of the tank container from Aalst to Antwerp: 200 € on average.

2.4. Return of empty tank containers (southern France – Aalst):

This should amount to approximately 350 €/tank container

2.5. Total cost per track

If the rental period of the tank containers amounts to 3 years, the total cost will be:

(17 US$ x 365 days/year x 3 years) + 2 x 90 US$ + 2 x 35 US$ + 400 US$ = 18,615 US$ + 650 US$ = 19,265 US$

This amounts to 17.6 US$ per day.

The trip to southern France takes 2 x 2 days; which amounts to:

$\Rightarrow$ 4 x 17.6 US$ = 70.4 US$/tank container

Aalst – Crolles: 700 € + 70.4 € + 350 € = **1,120.4 € / tank container**

Aalst – Apt: 747 € + 70.4 € + 350 € = **1,167.4 € / tank container**

2.6. Comparison with road transport:

The **total price** by road fluctuates between **1,250 and 1,500 €/tank container.**

2.7. Comment

According to the contact person at IFB it is not realistic to expect an A/B-service for such a small amount of tank containers (as requested by Company 9). No direct train can be guaranteed.