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Inland waterways transport systems

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VII — 42

Inland waterways transport systems

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Luxembourg: Office for Official Publications of the European Communities, 1996

ISBN 92-827-7334-5

Printed in Belgium

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Abbreviations used in the Study:

EDI	Electronic data interchange
ETA	Expected time of arrival
ETD	Expected time of departure
JIT	Just in time
PC	Personal computer
PC-LAN	Local communication network for personal computers
VAL	Value added logistics
VTM	Vessel traffic management system
VTMS	Vessel traffic management system
VTS	Vessel traffic system

Cargo-sectors:

CS	Containers/Swapbodies
DB	Dry bulk
FC	Fluids/Chemicals
GE	General

Countries:

B	Belgium
D	Germany
F	France
NL	Netherlands

Usergroups:

Ag	Agencies (Shippers, Forwarders, Transport agencies, Carriers)
HA	Harbours (Public and Port authorities, Container terminals)
Ot	Others (Shipbuilding, Research institutes)
Sh	Shipping (Shipping and Road transport companies)

SUMMARY

This report describes the results of the study on "Inland Waterway Transport Systems". The aim of this study is to provide an analysis of the possibilities and conditions for an efficient integration of inland waterway transport into the logistics and multi-modal transport chain, taking into account the requirements of the participants.

The study was focused on the existing logistic organisation and the impact on this logistic organisation by developments on a number of important topics such as :

- Ship construction and transshipment.
- Infrastructure of inland waterways.
- Information and telecommunication.

It was considered that the involvement of participants, operating in the field of inland waterway transport, is essential. Therefore in this study a practical approach of communication with the participants (in the different countries with a developed waterway infrastructure) is used providing a maximum of information "out of the field" by means of interviews and telephone-interviews. In addition a short survey on documentation has taken place to support the interviews and to fill potential gaps in information.

Also a method of analysis is developed that is capable of transforming the received information to a set of possibilities, requirements and obstacles on the for this study required tactical and strategic level. This is supported by a logistic chain model for each identified transport sector in inland waterways.

Conclusions

The primary conclusions emerging from the collected information can be formulated as follows

On logistic organisation :

The logistic organisation will see a further development in integration of the total chain. Bigger companies and corporations will evolve taking command over the total chain. Specially in the container transport sector this will happen.

The main obstacle is the way inland waterway transport is now internally organised. The low organisation degree hampers innovative initiatives as it is not clear how investment and risk management must take place. The process of logistic integration will therefore have a slow pace. Apart from this, inland waterway transport has some strategic disadvantages with respect to other transport modalities: speed and a coarse grained distribution profile. This limits the capability of a modality shift to inland waterway transport.

The most important requirement for a growth of inland waterway transport is the harmonisation of regulations. Although this is already reached to a certain degree further developments are needed to develop a free market. Also the time needed for new licences and agreements with authorities when new initiatives are developed (e.g. the building of new terminals) must be reduced.

On ship construction :

Ship design (and integrated transshipment equipment) dedicated for optimising the transport capability and taking into account the obstacles on the intended routes of operation must provide a more economic feasible ship for operations in not well developed inland waterway areas. In this way, together with new transshipment equipment the total distribution will be more fine-grained, enabling more multi-modal transport.

The main obstacle is the unwillingness to invest due to the over capacity in Dry Bulk and the internal organisation of inland waterway.

The most important requirement to be fulfilled is the re-evaluation of the now existing regulations for ship construction in the view of new innovative ideas on ship construction.

On transshipment :

The key to success in multi-modal transport is transshipment. New transshipment concepts, methods and -equipment, operating much faster and cheaper is an essential condition for an efficient integration of inland waterway transport into the logistics and multi-modal transport chain.

The main obstacle is the slow pace of the planning and negotiations for the development of new terminal and transshipment equipment. The feasibility studies needed are expensive and hamper the willingness to invest in new concepts and ideas.

The most important *requirement* to be fulfilled is a better functioning internal organisation in inland waterway.

On information and communication :

The capability of information and communication technology is now sparsely used. There is a need for integrated telematics systems for message handling and relative simple functions. Especially the midsize and smaller companies will benefit from this. The big companies already take reasonable care of their own.

The main *obstacle* is the low level of knowledge on the capabilities of information systems. Also the initial investments are relative high.

The most important *requirement* is the standardisation and harmonisation of messages, protocols etc. to enable free exchange of information.

On infrastructure :

The infrastructure is more or less fixed. By investment in removing obstacles priority must be given to the other transport axes than the Rhine. The East-West axis has in this priority a slight preference.

The main *obstacle* is the huge investment needed for removing obstacles in inland waterways and the way it is now financed (by local/national government). However, the removal of important obstacles has a bigger than local effect on inland waterway transport.

The most important *requirement* is, that the inland waterways can be used 24 hours/ 7 days a week. Especially the smaller waterways will benefit from this.

1 INTRODUCTION

1.1 BACKGROUND

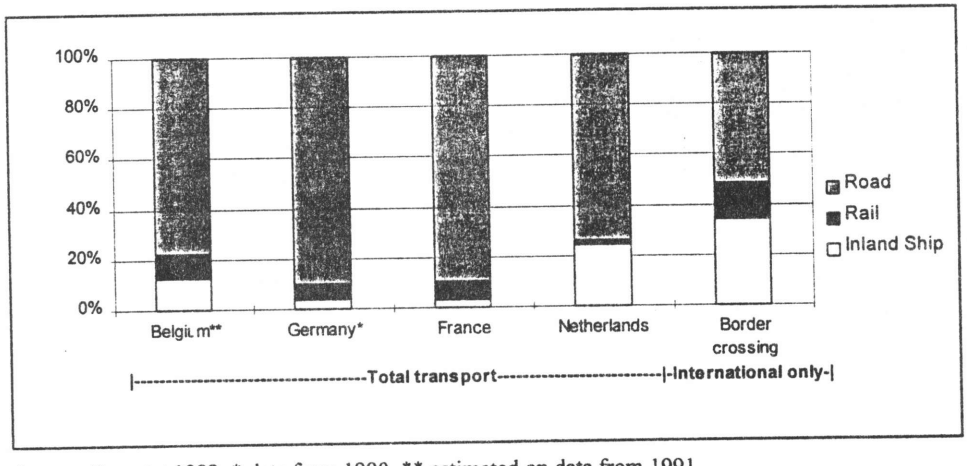
As concluded in many studies and reports the other modes of transport (rail and road) have now reached its limits in many places. When placed against the estimated growth of transport in this decade it is unlikely that further development of these modes of transport can solve the problems arising form the growth (current estimate: 30% in the year 2000).

To give an indication of the importance of transport table 1.1 gives the modalsplit of the total amount goods transported inside the countries as well as the international transport across borders. The figure shows only the four EC-countries with substantial inland waterway transport. As can be seen the modal split is greatly in favour of road transport.

	Belgium**	Germany*	France	Netherlands
Road	360.485	3.574.125	1.385.925	460.417
Rail	46.569	252.376	115.687	12.430
Inland shipping	56.402	138.393	50.420	150.192

Source: Eurostat 1992, * data from 1990, ** estimated on data from 1991.

Table 1.1: Modalsplit of total amount of transported goods in 1000 tons.

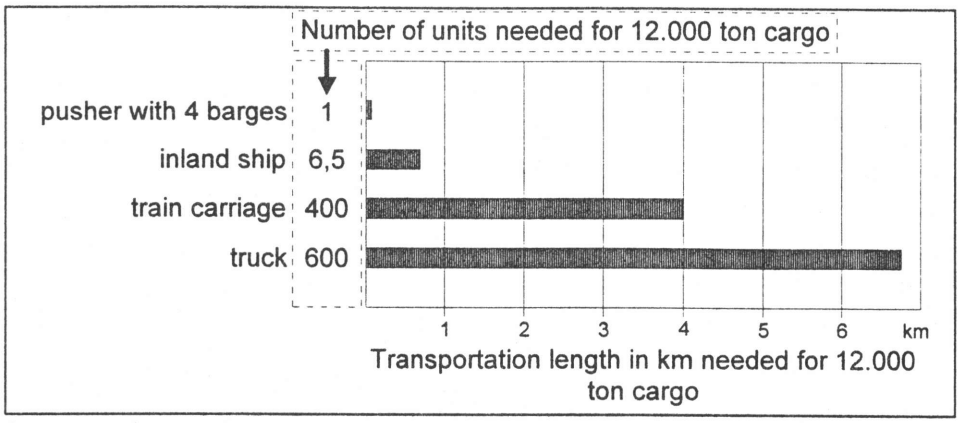


Source: Eurostat 1992, * data from 1990, ** estimated on data from 1991.

Figure 1.2: Modalsplit with data from table 1.1 in relation to Border crossing transport.

The development of the inland waterway transport is essential for a substantial transport infrastructure and to cope with the problems arising from saturation on other transport modes. As can be seen in figure 1.2 inland shipping has an important part in long distance transport.

Inland waterway transport has one major strategic advantage: the capability of transport of huge volumes with low environmental impact and high safety margins. Therefore optimal use of inland waterway transport has also positive aspects on the environmental protection policy of the EC. Figure 1.3 gives an indication on the importance of inland waterway transport for the environmental protection policy.



Source: Dutch Ministry of Transport, "De Binnenscheepvaart".
Figure 1.3: Space needed for the different transport modalities.

The capability of transport of huge volume implies that the optimal use of inland waterways requires a logistic organisation in which the inland waterway transport plays the role of main transport axis. Especially when seen in conjunction with short-sea shipping, the inland waterway can be developed as the future "backbone" of transport. In this way it differs significantly to other modes of transport.

The development of a "backbone" function requires further development of the logistic chain in such a way that an efficient multi-modal capability emerges in which rail- and inland waterway transport performs the long leg and road transport perform the requirements for the final delivery of the goods (short leg) to the consignee.

In the waterway transport infrastructure four main routes can be recognised as the most used and best extended operation areas:

- The Rhine link which connects the most important Dutch and Belgian ports to Germany, Switzerland and France.
- The East/West link which connects the Dutch and Belgian ports to North and East Germany (Berlin), Poland (Wroclaw) and Czechia (Prague).
- The North/South link which connects the Dutch and Belgian ports to the northern part of France.
- The South/East link by means of the Main-Danube canal, which has given the Central and Eastern European countries as far as the Black Sea access to German, Dutch and Belgian ports.

Table 1.4 presents on overview of the total length of navigable inland waterways.

	Belgium	Germany	France	Netherlands
Rivers and lakes	654	3032	2602	1301
Canals	860	1443	3807	3745
Total length	1514	4475	6409	5046

Table 1.4: Length of navigable inland waterways in km.

It has to be noted that there are also two important areas, outside the four EC-countries, which will have an increasing use in the future because of the economical development in Poland, Russia and the Baltic States and the increasing product exchange between Scandinavia and central Europe, but which at the time are less developed:

- The link from the ports in north-west Germany like Cuxhaven, Bremerhaven, Bremen and the others to the East.
- The link from the ports of Wismar or Rostock at the Baltic Sea to the South to Berlin and Prague.

In the inland waterway transport three sectors of importance can be identified:

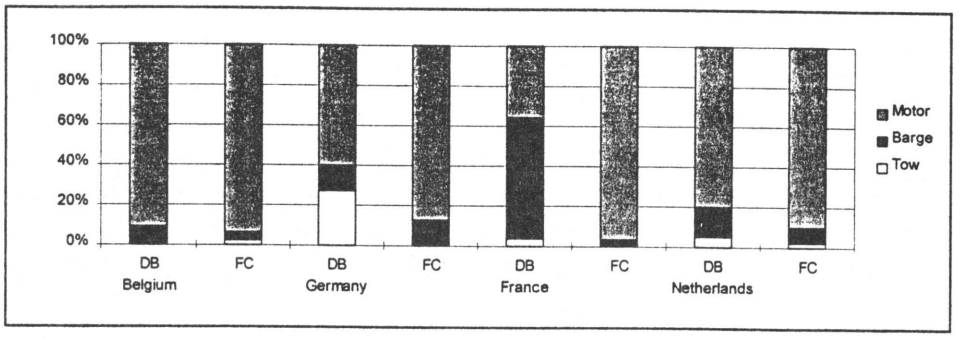
- Dry bulk: This is the transport of mainly raw materials like sand, gravel, ore, coal, cattle fodder, cereals, etc. The main operators are the private shipping companies that work for the same customers on a contract base. Private ship-owners are contracted for more specialised transport responsibilities.
- Fluids/chemicals: This is the transport of fuel, (crude) oil, gasoline, chemicals, etc. There are a number of specialised shipping companies operating in this sector. Private shipowners are brought in for more specialised transport.
- Container/swap bodies: This type of traffic has major links with Maritime transport. The sector is not very well developed at present (except the Rhine) and consists of a number of operators who run a regular service. Private ship-owners with vessels suitable for container traffic are sometimes contracted on a time-charter basis.

Table 1.5 and figure 1.6 give an overview of the number of available ships in the four EC-countries.

Capacity in tons	Belgium[1]	Germany[2]	France[3]	Netherlands[4]
- 250	36	183	-	2714
251-400	594	208	-	1221
401-650	292	774	-	1684
651-1000	191	703	-	1432
1001-1500	246	809	-	1171
1501-3000	178	591	-	995
3001-	67	14	-	141
Total	**1604**	**3282**	**2373**	**9358**

[1] Nationaal Instituut voor de Statistiek 1992. [2] Statistisches Bundesamt 1992
[3] Voies Navigables de France 1993. [4] CBS 1992

Table 1.5: Number of available ships per classes of carrying capacity.



Source: "Cinquièmes Entretiens Jacques-Quartier", C. Meistermann, 1992.
DB: Dry bulk ships, FC: Tankers.
About containerships are no numbers found, but it is known that they are relatively very small.

Figure 1.6: Distribution of available ships per type of ship.

General: There are many companies operating in more than one cargo sector. These companies will be addressed as general companies. Apart from the above mentioned sectors there are also various types of specialised transports (Ro-Ro, Piggy-back, car-transport, etc.).

The dry bulk and tanker traffic easily account for the greatest share of goods-transport operations. Container/swap bodies traffic in particular could play a important role in multi-modal transport in the future.

Each sector operates in a different logistic environment. Therefore it has to be foreseen that the requirements for optimal exploitation with respect to multi-modal transport of inland waterways also differs per sector.

The above presented overview implies that today the "backbone" will consist of four main transport axes and three different transport sectors.

Inland waterway transport can only operate effectively if this "backbone" is developed in such a way that it's distribution function of inland waterway transport is improved and more efficiently integrated with the other modes of transport.

1.2 OBJECTIVE OF THE STUDY

The aim of this study is to provide an analysis of the possibilities and conditions for an efficient integration of inland waterway transport into the logistics and multi-modal transport chain, taking into account the requirements of the participants.

The results of the study will provide valuable input for decision making and for the preparation of the 4th Framework programme. They will represent an important contribution to the efficient establishment of the Transeuropean Network (TEN).

1.3 CONTENTS OF THIS DOCUMENT

Chapter 2 provides an overview of the set-up of the study. It starts with an analysis of the objective and defines the scope of the study. Also the approach taken in the study is discussed and the method of analysis is presented.

Chapter 3 gives the results of the interviews held in the phase of the study. An identification of the participants is given. Then all important topics are discussed.

Chapter 4 presents the preliminary conclusions and discussed the validation of the preliminary conclusions.

Chapter 5 gives an overview on the results of the documentation survey in relation with chapter 3 and chapter 4.

Chapter 6 discusses the trend in the logistic organisation and presents possible logistical organisation developments in the near future.

Chapter 7 discusses the main conclusions of this study on the strategic level.

All annexes provide detailed information on the interviews, telephone-interviews and documentation survey.

2 SET-UP OF THE STUDY

2.1 ANALYSIS OF THE OBJECTIVE

The objective of the study implies that the present and future conditions and requirements have to be formulated on a tactical and strategic level by:

- identification of the *possibilities/opportunities* to exploit the logistics potential and the capabilities for integration of inland waterway transport (including short sea) in the total logistic chain.
- identification of the specific *requirements* for inland waterway transport resulting from changing logistics.
- identification of the *obstacles* hampering a full integration of inland waterway (including short sea) transport in the logistic chain.

2.2 SCOPE OF THE STUDY

For the identification of the above mentioned possibilities, requirements and obstacles the following *areas of investigation* can be defined :

a. The Logistic organisation:

   The way how transport is organised and what will be the impact due to developments in the logistic organisation (changing logistics). It has to be considered that there is an relation between logistics production methods and manufacturing.

b. The Infrastructure supporting the inland waterway transport:

   The current waterway- and port-facilities determine the capability of transport and greatly determine its (future) capabilities. This relationship between the different inland waterway areas and the structure of the fleet for inland waterways has to be investigated.

c. Information- and communication-technology:

   The logistic process is a highly complicated process requiring much co-ordination by many parties. Hence information and communication play a major role in the logistic chain.

d. Construction of ships (including sea-river vessels) and transshipment-equipment:

   Ship construction determines the type and amount of payload available for transport. The transshipment-equipment provides the interface to other modes of transport.

In each of the above mentioned areas of investigation the following *Areas of Interest* can be defined:

1. Present situation: the present situation.
2. Future situation: the assessment of the future situation based on the concept of multi-modal transport and inland waterway transport as a main transport axis.
3. Transport organisation: impact on transport organisations due to changing logistics according to item 2.
4. New developments: identification of new possibilities due to (technological) developments.
5. Law and regulations: the impact of law and regulations.
6. Competitiveness: the impact on the competitiveness of (inland) waterway transport.

These areas of investigation and the areas of interest define the scope of this study. Figure 2.1 presents the evolving matrix from the scope of this study.

Interview questions	Area's of investagation			
Area's of interest	a. Logistic organisation	b. Infrastructure	c. Information & communication	d. Shipconstr. & Transshipm.
1. Present situation	P,R,O	P,R,O	P,R,O	P,R,O
2. Future situation	P,R,O	P,R,O	P,R,O	P,R,O
3. Transport organisation	P,R,O	P,R,O	P,R,O	P,R,O
4. New developments	P,R,O	P,R,O	P,R,O	P,R,O
5. Law and regulations	P,R,O	P,R,O	P,R,O	P,R,O
6. Competitiveness	P,R,O	P,R,O	P,R,O	P,R,O

P,R,O: Possibilities, Requirements, Obstacles.

Figure 2.1: Matrix comprising the areas of investigation and the areas of interest.

2.3 APPROACH

2.3.1 Overview

As it was essential to involve the participants operating in inland waterway transport, this study used a practical approach of communication with participants. This approach provided a maximum of information "out of the field" in the available time. An overview of the used approach :

A. A basic logistic chain model was used for identification and mapping of the results and to support conclusions.

B. A comprehensive Questionnaire (1) was developed for the mentioned areas of investigation and interest, as shown in figure 2.1

C. A set of depth-interviews was held with carefully selected participants in Germany, France, Netherlands and Belgium covering all major areas of interest.

D. Also a documentation survey was held, based on the areas of interest to support the information gathered by the interviews.

E. Preliminary results and conclusions had been formulated. Based on this, a short second Questionnaire (2) was developed.

F. The second set of questions Questionnaire (2) was used as basis for telephone-interviews to verify the primary results and conclusions.

G. The final results and conclusions were formulated after the verification through the interviews by phone.

As seen in the overview the study used three instruments for the collecting the information :

1. The Questionnaire (1);
2. The Questionnaire (2);
3. The Documentation Survey.

The survey is supported by a chain model identifying the most important players and highlighting the main interactions between them.

The following paragraphs will present an overview of the instruments indicated above.

2.3.2 The Questionnaire (1)

The first Questionnaire (1) was developed covering the areas of investigation and the areas of interest. These aspects form a matrix, filled with questions.

The questions were drawn up in three directions to identify the following aspects:

- The possibilities and opportunities for the participants emerging from the changing logistics;
- The requirements that have to be fulfilled to seize the opportunities;
- The obstacles that hampers full integration of inland waterway transport.

As can be recognised, these aspects reflect the analysis of the set-up of the study (see chapter 2). Annex [A] shows the questions for the first group of interviews.

2.3.3 The Questionnaire (2)

The purpose of the second Questionnaire (2) was to verify the preliminary conclusions, namely the possibilities, requirements and obstacles per sector level of transported goods.

The questions had been formulated as a set of statements so that they are suitable for telephone-interviews. The answers must show the level of agreement and priority assessment with the formulated statements. The results of this telephone-interviews were used to support or reject the preliminary conclusions. The level of agreement ad support is measured in the following way :

- Full rejection : 1
- Partly rejection : 2
- Partly agreement : 3
- Full agreement : 4

Annex [B] shows the statements used for the second group of interviews

2.3.4 Documentation survey

This part of the study should benefit from existing reports and studies on the same subject by executing a short documentation survey using the same matrix presented by figure 2.1.

After a search on documentation covering the areas of investigation a set of documents has been selected. These documents have been surveyed on possibilities, requirements and obstacles in the different areas of investigation.

Annex [C] shows the list of selected documentation.

2.3.5 The basic logistic chain model

2.3.5.1 Introduction

The basic logistic chain model is developed for the identification of the participants in the field of logistics and transport in inland waterway transport and in a later stage (Chapter 6) identify the consequences for the logistic organisation. Therefore the model has to give an insight in the following aspects:

- who are the important participants in the logistic chain?
- what are the activities of these participants?
- what is the function of the participants regarding the distribution and transport process or logistic chain?
- what kind of handling activities have to be undertaken by the participants in the logistic chain in transporting goods from one site to another by using inland waterway transport?
- how does the information flow look like regarding this type of transport?
- what are the different goods flows in the different models (dry bulk, fluids/chemicals, containers/swapbodies).

In the logistic chain model several participants with different functions in the chain can be found. They can be grouped as follows :

- *Transport modality related companies*

  These companies own or are in control of the transport equipment (vessels, barges, tugs etc.).

- *Harbour and terminals related companies and authorities*

  These organisations have in ownership or are in control of the terminals trans-shipment equipment and the services related to the infrastructure.

- *Goods or cargo related companies.*

  These companies are involved in the supply and demand of the cargo and are in control of the cargo flow.

- *Others.*

  All other companies, authorities, institutes etc.

In the figure 2.2 an insight is given about which participants belong to which category.

Not all of the participants involved deal with the physical goods flow. Only the goods or cargo related companies like the shipper, the stevedore and the ship-owner of the inland vessel and the consignee handle the goods. The rest of the participants deal only with the information about the organisation of the shipment, financial flows, customs and the co-ordination between the different participants.

The parties which are not dealing with the physical goods flow itself have other reasons for being involved in the transport process. Four co-ordination mechanisms can be identified:

- commercial information: information on shipments to be transported, price information, etc.
- traffic information: nautical information, weather information, waterway conditions of locks, bridges, etc.
- information on the co-ordination of the physical goods flow: information like estimated time of arrival, load and unload times and the allocation of vessel capacity.
- shipment information: information about the shipment itself on behalf of the different administrations like customs, tracking and tracing of dangerous goods, etc.

Transport modality related: - Cooperatives of Shipowners - Firms of Shipowners - Individual Shipowners - Shipbrokers	Harbour/Port and Transshipment related: - Inland waterway authorities - Port authorities - Stevedoors - Transshipment companies - Environmental inspection
Goods/Cargo related demand supply and co-ordination: - Shippers - Shipping agents - Consignees - Operators - Stevedoors	Others: - Insurance companies - Customs - Service providers - Pilot service - Coast guard - Research institutes - Shipbuilders

Figure 2.2: Grouping of organisations

2.3.5.2 Activities of the participants in the logistic chain model

The activities of these participants as well as a brief description of their function in the logistic chain is given:

Transport modality related participants.

- The ship-owner himself, corporations of ship-owners, operators and ship-brokers form together the group of participants related to the transport modality. For some of these participants additional explanations are necessary.

- Associations of ship-owners and ship-owner companies:

  The corporations of ship-owners or ship-owner companies exist in the maritime sector as well as in the inland waterway sector. These firms exploit a fleet of vessels. The fleet can be exploited in ownership in the case of a firm of ship-owners with the captains on the payroll or the firm can have individual ship-owners under contract (charters). Most inland waterway ship-owner companies have many individual ship-owners under contract in relation to the vessels in ownership.

- Ship-brokers or chartering broker or broker agent:

  Ship-brokers operate on behalf of shipowner companies, corporations, individual ship-owners and have an important role in the process of the `Tour de role` system. These participants make the deal and bring cargo and transport capacity together.

Harbour and terminals related companies and authorities.

Participants in this group are: (main) port and waterway authorities, terminal operators and stevedores :

- Inland waterway and port authorities:

  The inland waterway authorities are concerned about the safety on the waterways and in ports. They are responsible for general engineering works on waterways like ports, dikes construction, canals, shore stabilisation, locks, bridges etc. In the case of dangerous goods the authorities wants to know the position of the vessels and the characteristics of the shipment. Port authorities act as landlords in letting ground to stevedores, terminals, quays etc. in harbours to commercial enterprises who exploit these.

- Stevedore/transshipment company/container terminal:

  The stevedore loads and unloads ships (sea going vessels as well as inland waterway vessels). Stevedores normally operate on behalf of the shipping agent. The container terminal is responsible for loading and unloading the containers to or from the vessel, train or truck. It fulfils the role of the stevedore in the other two sectors.

Goods or cargo related companies.

The goods or cargo related organisations play a role in the real flow of goods while other parties are only involved in the information flow regarding the goods flow. There are:

- Shipper:

  The consignor or shipper is the manufacturer of the goods which have to be transported to the consignee. Transport doesn't belong to the core activities so in most cases the consignor contracts a shipping agent to arrange the transport of the goods.

- Operators:

  Operators are mostly active in the multi-modal transport business. Because of the fact that in container/swapbody transport a large number of participants take part an important role is fulfilled by the operators. The operators control the transport chain by co-ordinating and organising all the activities. They can work closely together with shipping agencies (they often belong to the same organisation) but they can also be part of a firm of shipowner companies who offer multi-modal transport as a separate service.

- Shipping agent:

  The business of a shipping agent is to organise or arrange the transport on behalf of the shipper or consignor. The shipping agent contacts all the other parties involved in the chain and makes operational arrangements as there are the attunement of the stevedore, the unloading of the sea going vessel, administration to the ship-broker (main port) and the planning of the availability of capacity of inland waterway transport. The agent organises all the formalities of vessels in a port like customs, location of unloading, shipping commission (bevrachtings-bemiddeling) and arranges the catering for the ships as well. They also intermediate between ship-owners and the firm of ship-owners. Sometimes the agent is responsible for the stevedore activities.

- Consignee:

  Consignees of cargo could be any industry. The consignees in dry bulk are mostly located near inland waterway ports or alongside the waterway with own port facilities for unloading. This accounts also for a large number of consignees in fluids and chemicals. In these case the services of the stevedores are not used for loading or unloading. When consignees are not located alongside waterways they have to make use of the services of stevedores. This accounts also for containers for which the consignees have to make use of transshipment and other types of transport to obtain or deliver the cargo.

Others

In this category a wide range of participants can be identified such as:

- customs, transport.
- insurance companies.
- environmental inspection institutes.
- vessel safety inspection organisations.
- research institutes.
- ship builders/shipyards.

The logistic (chain) models are different for the three sectors as there are dry bulk, fluids/chemicals and container/swapbodies. In chapter 6 of the analysis of the results, the different models will appear together with the expectations for change, developments and trends per sector.

2.4 METHOD OF ANALYSIS

All the answers of Questionnaire (1) have been put into a database for sorting and selection purposes. At the start of the analyses the answers were grouped into a table per area of investigation and sorted per area of interest. In this way common properties can be derived for each area of interest with respect to the area of investigation.

The next step of the analysis implies merging the results per transport sector as there are :

- Dry bulk transport.
- Fluids/chemicals transport.
- Container/swap bodies transport.
- General (in more than one sector operating companies).

Also user groups can be identified (identical with the chain mode, see paragraph 2.3.5) :

- Transport modality related companies (shippers).
- Harbour/terminals related companies and authorities.
- Goods and cargo related companies and authorities (Agency/shippers).
- Other (all other companies, institutes and authorities).

Preliminary observations and conclusions are drawn and transformed in a set of statements that had been used for verification.

The documentation search gives a set of conclusions, considerations and statements that are used for completing the results of the interviews and for supporting (or not) the conclusions of the interviews.

The final analysis is made on a strategic level identifying common aspects of possibilities, requirements and obstacles, taking into account the answers of the second interview and the document survey

3 RESULTS OF THE INTERVIEWS

3.1 THE PARTICIPANTS

The interviews have been held in accordance with Questionnaire ((1). In table 3.1 the distribution of interviews is given with respect to country, company type and cargo sector. Some interview participants cover more than one cargo sector as core business. This is displayed by the fact that the total amount of interviews therefore differ.

Country	# Inter-views	Company type	# Inter-views	Cargo sector	# Inter-views
Belgium	4	Shipping	13	Dry Bulk	12
France	2	Harbour/Terminals	6	Container/Ro-Ro	6
Germany	10	Agency/Shippers	3	Fluids/Chemicals	4
Netherlands	10	Other	4	General	7
Total	26	Total	26	Total	29

Table 3.1: Distribution of interviews

As can be seen, the emphasis of the interviews had been laid on the most important countries with respect to size of their fleets and on shipping companies as primary users of inland waterways.

The intention to cover a wide range of companies in size and business orientation has been successful as can be seen by the following :

- The interviewed shipping companies has an amount of ships in operation and/or under contract ranging from 4 to more as 900 and have (from a minimum of 5) up to 2000 employees under contract. The ratio between own vessels and chartered vessels differs in each company. However, a general tendency can be seen :
  - In the cargo sector "Dry Bulk" the vessels are mostly private owned. It has to be noted that the bigger companies are more operating as a contract agency on behalf of private owned motor vessels.
  - In the cargo sector "Container/Ro-Ro" the amount of own vessels in relation with chartered vessels is more balanced.
  - In the cargo sector "Fluids/chemicals" the chartered vessels are a minority.
  - The size and type of vessels vary over a complete range. Traditional motor vessels, pushing convoys, specialised tankers and container vessels, traditional motor vessels converted to container vessel, all ranging from 600T up to 4200T displacement. Some companies own in addition terminals, warehouses and cranes and have own road transport fleets.

- One question did refer to ownership of the private companies :
    - Independent company : 55%
    - Part of an organisation : 45%
- The interviewed harbour authorities differ with respect to size, location and orientation. The main ports like Antwerp and Rotterdam have been involved as some small and big inland ports. Usually the authorities do not exploit equipment as cranes etc. They only let the ground to companies and have the roll of equipment provider.
- The transported cargo varies widely. An anthology : coal, iron, coffee, general retail, heavy fuel, gas, containers, trucks, waste, scrap metal, cattle-fodder, sand and gravel, heavy equipment. etc.

The participants were not always able to answer all the questions. This had two main reasons :

- As the questionnaire was addressed for a wide range of topics not all the topic were applicable for the participant.
- As a participant had no opinion on the open question on a subject the most following questions elaborating more on this subject was meaningless.

Remark:

During the process of interviewing an overlap emerged between questions in the area of interests "Shipbuilding and transshipment" and "Infrastructure". This overlap concerned the transshipment and terminals. The questions addressing this topic are all grouped together in the area of interest "Shipbuilding and transshipment".

The following paragraphs will discuss the results of the interviews on each area of investigation. Detailed information is provided in the annexes [L], [M] and [N].

3.2 LOGISTIC ORGANISATION

3.2.1 Origin and destination of goods

3.2.1.1 Imported goods

The current stream of imported goods in Europe by inland waterway shipping come from the whole world and is transhipped in the well known seaports. As the inland waterway shipping companies in majority only are active in the transport itself from and to a seaport they have generally no good insight in the origin and destination of the goods. Only slight differences can be noted between the various cargo sectors.

As seen in table 3.2 the cargo sector Dry Bulk has a preference for countries round the Atlantic ocean. In the cargo sector Container a preference for the far East is visible. The transport of fluids and chemicals is usually from a seaport (where usually refineries etc. are located) to an inland destination.

General	- No specific area, all countries are named.
Dry Bulk	- Near East - Scandinavia (Cellulose) - England - North America (coal) - South America - Europe (internal)
Container	- Far East - Middle America - Europe (internal)
Fluids/Chemicals	- Intern Europe from deep sea ports

Table 3.2: Origin of imported goods

3.2.1.2 Exported goods

The current stream of exported goods from Europe has a wide range of destinations. No specific patterns in distribution can be recognised.

However there is a slight indication that the nature of transported goods differ between the cargo sectors :

- The cargo sector Dry Bulk is more involved with import.
- The cargo sector Containers is more involved in export.
- Transport within Europe is limited in relation with the import- and export stream.

  (except Dry Bulk : sand etc.)

The cargo sectors have a different role in distribution. This is a well known fact and is confirmed in the interviews :

- In the sector Dry Bulk and Fluids/Chemicals the consignee-address is usually located near an inland waterway and hence can be reached by the ships directly. Intermodality does not play an important role. Transport is triggered by individual contracts with shippers, many times on a regular basis.
- In the sector Containers no consignee addresses are located near an inland waterway and hence intermodal transport is a necessity. The ships operate in a tight time schedule, not depended on individual contracts.

3.2.2 The organisation in inland waterway transport

The main logistic functions performed by the participants are centred round the distribution functions :

- transport.
- transshipment.
- storage.
- co-ordination.

If door to door transport is offered, it is usually performed by subcontracting activities as transshipment, road haulage and even transport itself, by chartering a ship. The ability to offer door to door service requires access to (more or less) fixed relationships with other companies in the logistic chain. However in general the companies do not have a total transport philosophy as business strategy.

The different natures of transport reflect the different relationships as can be seen in table 3.3.

General	- Agents
Dry Bulk	- Corporations of private owned ships - Storage companies - Transshipment companies - Charters (private owned ships)
Container	- Freighters - Carriers - (Road) haulage - Charters (private owned ships)
Fluids/Chemicals	- No specific relations, more direct relations with shipper

Table 3.3: Relationships in inland waterway.

The choice with modality (or intermodality) is done by the shipper of the goods. All participants consider price and time(speed) as the most important factor for the choice of modality.

As there is a strong competition between shipping companies the price plays the major role in the decision who will gain the contract. In table 3.4 the order of importance is given. Although the same factors are named there seems to be a slight difference in order of importance depending on the nature of the cargo sector.

Remarks:

- The meaning of service is mostly the correct and timely providing of information.
- It is questionable if many participants understand the JIT concept. The usually "translate" it literally, i.e. to be exactly on time.

General	- Price, Price, Price
Dry Bulk	1 Price 2 JIT (time) 3 Reliability/service
Container	1 JIT (time) 2 Price 3 organisation/service/ISO-9002
Fluids/Chemicals	1 Price 2 JIT (time) 3 organisation/flexibility/service/ISO-9002

Table 3.4: Important conditions for attracting demand of transport.

As seen in table 3.4 the strong competition forces the companies to maximise the load factor. This means that it is a matter of survival to have the vessel loaded to its maximum, i.e.. the shipping companies use the concept of full load (This is in conflict to a certain extend with the concept of JIT). Also it is not clear if the market will develop in the direction of carrier-haulage or merchant-haulage.

The inland waterway transport system as a whole works like a transport system on demand. The shippers are not very active in the cargo market, because a system of agents, freighters, brokers and ship-owner corporations manage the cargo acquisition and handling/co-ordination.

It was remarkable how many participants addressed the topic of quality assurance and named ISO-9002 (service) as being increasingly important. Many companies were in a process of getting the ISO-certificate in the coming years. This has impact on the way the internal organisation operates. There are problems how to develop a quality assurance system based on ISO-9002 as not much experience is available.

3.2.3 The opportunities and obstacles.

In general all participants do not see many new possibilities for new products and services. They see some possibilities to group additional services around their core activities as more co-ordination activities for combined transport or value added services.

The specific developments mentioned can be related to the different nature of the various cargo sectors (see table 3.5):

- The cargo sector Containers/Ro-Ro see a growth of the economy of scale and the emerging of more and bigger (shipping) companies, covering more and more complete transport solutions, door to door transport in which inland waterway transport is only a part. The concept of value added logistics seems to be only applicable for this sector. In reality this means that the contents of containers are stuffed and restuffed. The priority of needed investments reflects the developments : more bigger and faster ships, more and cheaper terminals and related facilities and more telematics.
- The cargo sector Fluids/Chemicals sees the enhancement on regulations to protect the environment. The needed investments relates to new modern ships that are extremely safe and possibly faster.
- The cargo sector Dry Bulk expects a heavier requirement on JIT. The needed investments must be in bigger and more efficient ships and better and faster transshipment equipment.

  A new market emerges in the sector dry bulk. The transport of waste is a growing market with its own characteristics. Also there is a movement to adapt the vessels and shift to the container sector.

General	- no new (innovative) products and services, only enhancement in quality
Dry Bulk	- Heavier requirement on JIT - Bigger, more efficient ships - The transport of waste and construction debris - Transfer to the container sector
Container	- growth and economy of scale - more bigger shipping companies, covering whole chain - Value added logistics will grow but slowly
Fluids/Chemicals	- More regulations for environment protection - Safer and faster ships for JIT

Table 3.5: Important developments and opportunities in transport.

About the obstacles hampering the development of organisation most participants have more or less the same opinion. The obstacles mentioned can be grouped in (see table 3.6):

1. Obstacles emerging from the internal organisation of inland waterway transport.

   Many participants refer to the low organisation degree, the accent on individual interests and therefore the lack of co-operation in inland waterway transport.

2. Obstacles emerging on unwillingness to invest.

   The unwillingness to invest is also partly due to the organisation in inland waterway transport. The many private shippers have to do all the investments by themselves and are in need of high financial support. This makes the investment a very high risk activity. If the expectations are not fulfilled complete and fast, bankruptcy is near. Also the investments in new terminals is slow. Many things have to fit (including successful negotiations with many local authorities) before the actual building can be started.

3. Obstacles emerging form the functioning of the market.

   The lack of a free market (no cabotage), creating different conditions for inland waterway transport in Europe and the complex administration needed (sometimes enforced by law) hampers full development of successful companies. Also the structural over capacity in the Dry Bulk sector, including all national regulations, hampers free development.

4. The current system of cargo acquisition and handling

   The system of agents, freighters, ship-owner-associations managing the cargo handling is inefficient and is apart from transshipment costs a major cost factor.

General	- Low organisation degree. - Individual interests. - Lack of co-operation. - Current system of cargo acquisition and handling
Dry Bulk	- Unwillingness to invest - Private shippers, high financial burden - Lack of free market. - Structural over capacity.
Container	- Slow investments in new terminals - More bigger shipping companies, covering whole chain - Value added logistics will grow, but slowly
Fluids/Chemicals	- (none identified)

Table 3.6: Important obstacles in transport.

3.2.4 Impact on the logistic organisation and competitiveness

The search for developments on the logistic organisation was grouped around important topics as :

- integration of logistic activities.
- change in modal split.
- consequences for the companies involved.

The opinions of the participants on integration of logistic activities and modal split were mixed. No specific trend could be identified in this survey.

About the developments of the companies and the relationships between companies most participants expects a more dominant role of the bigger companies as deep sea shipping companies, expediters operating on world wide scale and the bigger corporations. It is not clear why this trend exists. Table 3.7 gives a selection of the response.

Container	Dry Bulk	Fluids/Chemicals
- Shipping companies will take over logistical functions - More control over road transport - More corporations will be active - Expediters and maritime companies will organise the whole chain	- More co-operation between companies - More corporations will be active - Bigger corporations will be leading	- Co-ordination now done by shipper will transfer to shipping company - More all-round companies will dominate

Table 3.7: Opinions on development companies and relations

3.3 SHIP CONSTRUCTION AND TRANSSHIPMENT

3.3.1 Ship construction

There is a big variety of ships in operation differing in size and construction. One chooses the available ship that is suited for the route to be navigated for a specific cargo and contract. Generally there is not a dedicated company strategy for specialising in deliberately chosen routes and for this route optimally adapted ships.

The opinion of the participants regarding the future and new developments on ship construction are summarised in table 3.8.

General	- Bigger (motor)ships without the need of bigger crews, small ships will attend niche-markets - Optimising current ship design, optimising energy consumption and new propulsion systems - Improvement of exhaust gasses, clean engines/propellers - Short Sea/Sea river ships with two propellers for improvement of navigation - Pushing convoys/barges related to stock function - In general no application of new materials in construction is expected (although ships with lowered own weight is needed)
Dry Bulk	- New design (manoeuvrable) pushing convoys - Wider ships with less draught for special waterways - Sea-river barges
Container	- Catamaran type ships for Ro-Ro for higher speed (sea river only) - Specialised/optimised ships for small canals/rivers - Ships that can operate economically on higher speed - Sea-river ships for dedicated transport and routes (England) - Sea-river ships less sensitive for unbalance of cargo
Fluids/Chemicals	- New propulsion concept for dynamic positioning - Tanker push barges - Optimised ships for different operation areas

Table 3.8: New developments and innovative ideas on ship construction

It is expected that the organisations of ship-owners or ship operators will not change significantly their fleet in the near future. There is too much active load capacity (especially in the dry bulk sector) in the market.

3.3.2 Transshipment

Transshipment is done by standard equipment as (container)cranes, grab and bobcat and conveyor belts and pump installations. No transshipment equipment is located on board except the tankers. Some have pumps installed. Only in one case there was an integrated concept of shore-ship transshipment equipment.

The opinion of the participants with respect to the future and new developments on transshipment are summarised in table 3.9.

General	- No many possibilities for integrated ship/shore transshipment equipment - Cranes on board of the ship
Dry Bulk	- Bigger and faster cranes - More powder/transshipment/suckers - Cranes on ship to attend very small ports with little infrastructure - Indirect techniques: grabs and bobcats together with conveyor belts and bulldozers - Direct transshipment from deep sea ship to inland waterway vessel. - Special containers for dry bulk and waste transport.
Container	- Co-operating cranes to increase maximum capacity on rush hours - One man operated terminal (reducing amount of personnel needed) - Transshipment robot systems, unmanned - Floating cranes as temporary solution (some years) - Floating cranes for reducing amount of calls in seaport - Retractable cranes on ships for unloading containers - Optimised Ro-Ro dock facilities for transfer from deep sea to inland waterway - Special inland container terminal serving seaports.
Fluids/Chemicals	- Equipment (pumps/valves) on board of tankers - Indirect transshipment of fuels etc. less direct transshipment from deep sea vessel to inland waterway vessel.

Table 3.9: New developments and innovative ideas on transshipment

Many of the addressed topics in table 3.9 are triggered by the consideration that in comparison with the cost of the actual transport, the transshipment costs and needed time are too high. Especially in the main ports Rotterdam and Antwerp the collecting of containers for inland waterway transport is very inefficient.

3.3.3 Bridge/Control equipment

Bridge/Control equipment for monitoring and control of ships/transshipment equipment usually consists of radar, steering automation and engine monitoring. In some cases monitoring equipment was used for economising fuel consumption. In one case GPS was applied for this. However, this does not apply to container transport. They have to meet a tight schedule with more interest in punctuality than in fuel consumption.

In general bridge/control equipment was not a topic high on the list of interest. There were not many benefits foreseen by upgrading this equipment. Table 3.10 gives an overview of the most important answers of the participants.

General	- Automation to enable optimal operation (fuel reduction) - Cargo tracing and tracking - Monitoring system for empty barges - Standardised Man-Machine Interface on bridge control equipment
Dry Bulk	- none
Container	- Video camera's for monitoring - Integrated computer control for bridge
Fluids/Chemicals	- Dynamic position monitoring and control to enable fast fuel transshipment to/from maritime ships. - Control of transshipment from bridge

Table 3.10: Suggestions on bridge control equipment

3.3.4 ISO Containers

In general standard containers are used. Not all ships transporting containers are specially constructed for this. Also ships with one cargo-chamber are used. The containers are stacked in the cargo-chamber and held in position with cables.

The following remarks have been noted on the introduction of the new ISO-standard :

- In general most current cranes are not capable of handling full load 45 ft containers.
- The new standard will cause a loss of transport capacity, containers will not fit optimally in vessels, this is especially the case with the adapted dry bulk ships for handling containers.
- The 45/48 ft containers are only interesting for light (high value) goods.
- Many ships will need adaptation to accept the new containers to improve the load factor.

3.3.5 Impact on logistic organisation and competitiveness

An important issue is how to express opinions for the future and the new ideas mentioned. They will have influence on the logistic organisation and the competitiveness of inland waterway transport. When evaluating the given answers as displayed in the tables above the following trends emerge:

1. There is a strong efficiency strive (cost reduction). This is displayed by ideas for bigger and faster ships, optimising current ship design, bigger and faster cranes and more ship automation-systems. This will support the concept of the inland waterway as main transport axis.
2. There is also a strive for a more fine grained distribution. This is supported by ideas for retractable cranes on board of the ships, robotised transshipment and one man terminal operation. This reduces the cost of transshipment and make small terminals economically feasible (more terminals possible).

3. Expansion of inland waterway transport can be possible by developing specialised ships for dedicated routes to cope with the obstacles on a certain route as is indicated by ideas as sea-river ships and less draught ships. Also these ships are interesting for reducing the amount of transshipment operations.
4. New services are possible with the following ideas :
   - The exploitation of the ISO standard by introducing special containers for dry bulk and waste transport. This creates the possibility to attract relatively small cargoes.
   - The introduction of new push barges for a combination of transport and temporary storage facility.
   - A floating crane can support a temporary transshipment facility. This enhances the flexibility and can attract more customers who prefer middle term solution and avoiding by this the high investments that must operate for many years to be cost-effective.

3.4 INFORMATION AND COMMUNICATION

3.4.1 Developments in technology

As was expected, the telephone is of major importance. All participants (shore offices) use the telephone intensively. In addition the fax is used very frequently. Nearly all inland waterway ships use mobile telephones (C, D networks, GSM, ATF1,2,3, etc.). The information which is given by the shippers, freighters or dispatchers are mostly very short. Normally the shipper announces his arrival some time in advance so the loading/unloading can be prepared. On tour between two destinations there is normally not much contact. In some cases satellite communication is used. Digital data exchange (E-Mail DE etc.) is sparsely used.

The telephone has two main functions. It is used for acquisition purposes to call (and been called) clients for possible orders and to negotiate the price. It is also used for operational purposes. Important information as arrival time (ETA), position, navigation instructions, situation on board and trouble shooting.

The use of the fax reflects the telephone. It is mainly used for conformation of agreements and appointments and for the transmission of operational information such as cargo information container lists, administration papers, stow plan etc.

The employment of computer systems is still limited. Standard PC's are usually used in offices , not all connected with a PC-LAN. In one case a IBM-mainframe was used for mainly administrative purposes. There are nearly no PC's on board of the ships, certainly not as part of a communication and information system with land based offices and other vessels.

The functions that are performed are mainly very basic :

- word processor for editing letters, contracts, cargo lists.
- spreadsheets for cost calculations.
- administration and billing.

In some cases more advanced functions as planning utilities were performed.

It was not remarkable that no specific requirements on computer systems and software had been named. Generally available, off the shelf products are (until now) sufficient. In general information and telecommunication technology was a topic that is clearly in its infancy. The opinion of the participants with respect to the future and new developments on information technology are summarised in table 3.11.

General	- Special board computers - Traffic information - Traffic control to navigate under all circumstances - Digital images (charts) - Automatic ship identification - Multi functional standard interfaces - Better digital mobile telephone networks - Office networks - Coupling of different information systems
Dry Bulk	- Tracing and tracking of push barges
Container	- EDI - European wide VTMS system, - Guaranteed ETA
Fluids/Chemicals	- CD-ROM to replace voluminous books with regulations, directions and list of dangerous goods - Anti collision equipment

Table 3.11: Suggested improvements on information and telecommunications.

Remarkable was the fact, that most participants are reluctant in investing in information an telecommunication technology. They do not see a direct business potential and have a fear that systems cannot be used commonly by lack of acceptance, standardisation, harmonisation and training . They feel that success of this type of equipment depends on the level of penetration. Until now the market is considered too small.

In general the participants operating in the Container and Fluids/Chemical sector have given this subject more thought. The participants in the Dry Bulk sector do not give this subject much attention and some even feel enhancement of the information exchange capability is not necessary at all as it may even put the competition into a better business position.

The same diversion in opinion is found on the use of (integrated) VTM systems. The participants in the Container and Fluids/Chemical sector see some benefits (traffic information, anti collision, guaranteed ETA) as the participants in the Dry Bulk sector see no direct advantages in vessel operation.

Most participants foresee problems when introducing advanced information technology. The following topics were addressed :

- The lack of knowledge, skills and training.

  There is general lack of knowledge. It is feared that in new developments the private ship-owners will lag behind.

- Flexibility and standardisation.

  It is feared that there will be several systems that cannot be adapted sufficiently to the specific situation and that the lack of standardisation (protocols etc.) will hamper common use of these systems

- Safety and security.

It was questioned how the safety and security aspects will be handled.

- Information providing.

  It was expected that there will be a lack of information and on incoming goods and (too) much data-entry work has to be done.

3.4.2 Impact on logistic organisation and competitiveness

It is difficult to indicate how information and telecommunication will influence the logistic organisation and the competitiveness of inland waterway transport. When evaluating the answers given the following trend seems to emerge :

1. Efficiency strive (cost reduction).

   It is expected that information systems will reduce all kinds of overhead costs. This is illustrated by the expectations that less and shorter telephone calls are necessary and that the work flow in the shore-based office can be systematised/optimised. The automation of vital logistic functions will take place in planning, cost calculation, cargo information exchange and billing. It is foreseen that better planning systems will improve the load factor.

2. Distribution.

   It is expected that introduction of EDI will support the JIT concept. Guaranteed ETA supported by VTM systems can facilitate JIT. This accounts especially for the container cargo sector. Also the co-ordination of vessels with port facilities and terminals will improve by the use of well organised data communication.

3. Expansion of inland waterway transport.

   In general no expansion of inland waterway transport (new cargo streams and new routes) is expected by introduction of advanced telematics. There is one exception however : if the communication facilities to Eastern European countries improves this will facilitate considerable the business development to and with these countries.

4. New services.

   In general no new services are expected to be developed by the introduction of new information- and communication systems.

3.5 INFRASTRUCTURE

3.5.1 Overview

In this case, the meaning of the word infrastructure is the inland waterways themselves (canals en rivers), including the bridges and locks, and the ports with the related services. Terminals and transshipment in ports is discussed in paragraph 3.3.

All participants operate through all inland waterways in Europe on the four main axes as discussed in chapter 1. However, there is a certain distinction to be noticed :

- The main area served is the area where the company is located.
- The dominance of the Rhine is clearly visible.

The seaports and inland ports served are well known:

- Seaports mentioned for instance : Antwerp, Bremen, Gent, Hamburg, Rotterdam,
- Inland ports mentioned for instance : Liege, Hannover, Magdenburg, Berlin, Oldenburg, Duisburg Basel, Strasbourg, Thionville, Metz
- In addition numerous smaller ports and terminals are served.

The questions on the services offered by port authorities (electricity, drinking water, waste collecting, load/unload private, licences) did not reveal much useful information for this study. In general the relations with the authorities are good. In many cases (except the Fluids/Chemicals cargo sector) not much operational contact was needed with the authorities.

3.5.2 Obstacles in infrastructure

The used infrastructure of waterways is more or less fixed and removal of many obstacles will require a considerable number of sized budgets. In general the obstacles in the inland waterways mentioned are well known. On European scale most major obstacles named were :

1. The connection of the Mittelland and Elbe-Havel canal and crossing over the river Elbe near Magdeburg (now under construction)
2. The part of the Elbe river between Magdeburg and Prague.
3. The North-South link in northern France (Seine-Schelde).
4. The connection of the Twenthe-Mittelland canal (feasibility studies have been made).
5. The Rhine-Rhone Link (now -slowly- under construction)
6. Hinterland connection Wismar or Rostock in Southerly direction

In addition to this well known obstacles table 3.12 gives an overview of other obstacles.

General	- 24 hours, 7 day operation of bridges and locks necessary (not for tankers) - not enough berth, resting places, not good organised - more places for private car unloading
Dry Bulk	- In many locations maximum allowed draught prevents maximum loading and reduces the capability of the whole route - More berthing places for push barges
Container	- Many bridges are too low to have 3 layers of container, - Not enough Container- and Ro-Ro terminals - Ports not optimised for transshipment from inland waterway ship to other modalities, resulting in loss of time and higher transshipment costs. - Development of new container bridges/cranes.
Fluids/Chemicals	- (none identified)

Table 3.12: Mentioned obstacles in infrastructure (additional)

3.5.3 Impact on logistic organisation and competitiveness

The current obstacles hamper the logistic organisation and the competitiveness of inland waterway transport. When evaluating the answers given the following trends emerge :

1. Efficiency (cost reduction).

   The organisation in the (sea) ports of the transshipment (too many locations for cargo collecting calls to load one ship and terminals not built for optimal transshipment to inland waterway ships) needs improvement to lower the transshipment costs and reduce the needed time for transshipment relative to the actual sailing time. This is especially important for container transport.

2. Distribution.

   The high cost of the organisation of transshipment now prevents the realisation of developments of new terminals. If terminals are better organised and new transshipment equipment is used that reduces cost, the size of economically operating ports and terminals will be smaller, hence more ports and terminals can be put into use, causing a more fine grained distribution capability.

3. Expansion of inland waterway transport

   The problems on the less important transport axes (too small etc.) are severed by the fact that in many places in this routes locks and bridges are not operating 24 hours/day and 7 days a week and are even not harmonised. New ships that are build with the obstacles in mind on specific routes cannot be operated cost efficiently by the loss of time. On the other hand there is a personal gap to operate 24 hours, because of the immense personal cost part.

4. New services

   No new services are expected to be developed by removal of the obstacles. But better organised resting places with better services can enhance safety.

3.6 LAWS AND REGULATIONS

Rivers, lakes, channels and all other inland water areas, which cross or are surrounded by more than one country, are waterways of international interests. In general every country possesses the part of the inland water he bordered on or which passes through the country. But the sovereignty for the inland waters is relative and depends also on the interests of all other neighbours.

In the years before the beginning of the European internal market the Commission saw no need to enact laws and regulations for the whole inland transportation market. The Commission and the European Council defined the internal European transportation market as a national market of the member states. Only the external connections of the seaborne-shipping have been regulated by the European administration.

Till 1968 all prescriptions and regulations in connection with the articles 85 and 86 of the treaty for the European Economic Community and the regulations of the European Council in connection with article 87 have been excluded from application in the field of inland transportation. In 1968 and 1969 the European Commission enacts the first base documents for the transportation field and for inland waterway transport in particular.

At the end of the 60'th the transport capacity of the inland waterway ships was very much higher than the demand for shipping space. To balance the shipping space and the cargo opportunities the European Commission worked out a regulation (68/335/EEC) to reorganise the structure of the inland waterway transport market. The method to reorganise the inland waterway market was a programme to break up elder and unprofitable ships. This programme has been changed several times till today (1101/89; 1102/89; 3572/90;3690/92). The structure has changed only a little bit, because today there is still enough shipping space for a decreasing cargo demand and in addition the freight rates are still going down..

A second base document of the Commission (1191/69 EEC) defines the possibility of the member states to designate the public interests in all modes of the transportation market. This means the government of a member state is able to define the public interests in regions with bad market requirements for transportation in all modes. In the year 1991 this regulation has been changed. Now the document (1893/91) defines also the cancellation of unprofitable operation areas and the different pricing between services of public interests and a commercial business management. With this regulation the governments reserve services for the public and their rights to intervene in the market.

The regulation 1107/79 is the third important base document which regulates the granting of subsidies for the whole transportation field. This document has been changed and added to combined traffic in 1982. The last version is the regulation 3578/92 which should be implemented till 1995. The idea is to change the regulation from a subsidy for the operation to an aid for investments in transport units for the combined traffic.

The discussions to prepare a common internal European market in the years before 1992 lead to more regulations about the market itself, the entry to the market, the admission of training and education for shippers and the admission of documents of the member states. Since 1980 all member states are obligated to collect statistical data about the usage of their inland waterways and the amount and sort of cargo which is transported on these ways.

Only in this way the Commission was able to get an impression on the market situation in the field of inland waterway transport systems. But to this time the Commission was only reacting with prescriptions and regulations on situations of European interests. The inland waterway transport market and the problems around still remain under national command.

The base instrument for the admission of training and education of shippers in all member states is the regulation 91/672/EEC from 16.12.1991. With this regulation all shippers from the member states can operate a ship in one of the other countries of the EU. The regulation 91/672/EEC was established on 1st of January 1993. Because of the definitions of coasting trade („cabotage") in this regulation the member states Netherlands, France and Germany have got a transition period till 1995 to implement the regulation. Germany decided suddenly in 1993 to resign the period. Therefore the German shippers have been unprepared for this very new situation and could not react on the now liberal market and the very fast decreasing freight rates.

The regulation 91/3921/EEC is very important, because under this title the definitions of market entry, ratings and other problems which come up by passing a boundary. The regulation should be implemented till the end of 1995, but there are transition periods for the Netherlands, Belgium and France. As mentioned before Germany has resigned its period and implemented this regulation at once, too.

Beside the named base regulations the European Commission worked out a lot of regulations which handle special problems in the field of safety, technical equipment, transportation of dangerous goods in different operation areas, pricing by usage of national infrastructures and the future of inland waterway transport systems in context with the transeuropean networks.

Since the beginning of the internal common market the Commission built up a lot of influence in the field of inland waterway transport. Now the Commission understands the transportation sector as an European task. The national influence especially for market entry and freight rating is now decreasing. But there are enough problems to guarantee the total liberalisation of the inland waterway transportation market.

Competition without trouble requires harmonisation of performance conditions as there are:

- Equal technical requirements for identical services within the waterway industrry as well as between transport modes;
- Equal regulations concerning working circumstances (working hours, safety regulations, etc.);

- Efficient control of standards and regulations;
- Fiscal burdens which will not discriminate any supplier of transport services.

The objective from the EEC-Treaty (article II) to secure social welfare to all people in Europe has to be considered in evaluating all proposals aiming at optimising allocation of resources or guaranteeing equality of chances. All proposals have to ensure that social and economic conditions of all individuals involved in inland waterway transport from the demand side will remain on an acceptable level.

4 PRELIMINARY CONCLUSIONS AND VALIDATION

4.1 PRELIMINARY CONCLUSIONS

The depth interviews discussed in the previous chapter generated a lot of information. As expected, participants are not fully in conformity with each other. Never the less some preliminary conclusions can be made (for consistency reasons with the Questionnaire (2) the numbers used for the identification of the preliminary conclusions starts at number 9) :

On logistic organisation :

9 Inland Waterway Transport will be mainly based on the concept of full load and transport on demand, not scheduled transport.
Explanation:

In the current logistic organisation of inland waterway transport most transport orders are based on individual contracts (although they can be valid for a long period of time). This means that transport and ship-movement is triggered by the specific order. The drive for efficiency calls for full loaded vessels. This in fact contradicts with the JIT (Just In Time) concept. JIT means not only to be accurate in time of arrival - which inland waterway transport is capable of - but also reduction of warehouse-capacity on location of the (end)consumer. This requires regular and many relative small shipping of goods, hence high frequency and scheduled transport.

10 Integration of the logistic chain will proceed. Best situated for this are the big shipowners and big expeditions, not the relative small transport-companies.
Explanation:

As the requirements of the shippers increases, more control over the total chain is needed. Not all companies are suited for this. This will force in the long run a change of the way organisations will develop. It is expected that relatively small companies will have a disadvantage in this development and will act more and more as a (sub)contractor. The major players in the future will be the bigger firms as well as the big ship-owners and expediters.

11 With increasing importance the quality standard ISO9002 (Service) will be the required standard by shippers.
Explanation:

Quality assurance is an important topic in the coming years in the world of transport. More and more shippers will require from the transport-companies a certified quality standard such as ISO 9002 as a obligation before they are willing to contract.

On ship construction :

12 Sea-river ships will be only effective on dedicated routes and will never be a common means of transport.
Explanation:

The development of sea-river ships have certain advantages: it enables short-sea transport and reduces the transshipment cost. It is not clear if this type of ships can be used as a common means of transport or will have only restricted use for special cargoes and dedicated routes.

13 Only Container and Ro-Ro transport will require ships that can operate with higher speed.
Explanation:

Speed, hence travel time is a factor of importance. However this is not the case for all transport. Only the container/swapbodies and Ro-Ro transport will have significant benefits if travel time can be reduced by faster ships. For the other transport the current needed travel time is acceptable. Only timely arrival is important.

14 More special constructed ships are needed for specialised routes and cargo to maximise the use of the current available infrastructure.
Explanation:

In the current situation the Rhine-region is the most important transport axis. The other routes (see also 22) have obstacles that reduces the capability of inland watertransport. To exploit this capability to the maximum, special ships for specific routes needs to be developed to be cost-effective. In this way inland waterway transport can be expanded to new area's.

15 The introduction of the new ISO container/swapbodies standard will implicate a reduction on efficiency for inland waterway vessels because of a reduced optimal fit in the available ships.
Explanation:

The introduction of the new ISO standard on containers and swapbodies will have consequences. It is envisages that the new type of containers can not be stacked optimally in the vessel, so less containers will fit in the vessel, hence there is a loss of efficiency.

16 Economic feasible ships must be as big as possible.

Explanation:

The pressure to be more competitive and to offer better prices creates the need for bigger ships. Due to the current available technology it is stated that this must be possible.

On transshipment :

17 Transshipment is a relatively costly and time-consuming process.
Explanation:

In the total chain the total door-to-door delivery time and total transport costs can be divided in :

- *general overhead (organisation, acquisition, co-ordination, fees, taxes).*
- *transshipment.*
- *actual transport.*
- *Transshipment cost and -time is a significant part of the total cost and time relative to the total costs and transport time.*

18 New developments on transshipment, that reduces costs and time considerably, are of major importance for the development of inland waterway transport and enhance the competitiveness to other transport-modalities (rail/road).

Explanation:

If it is possible to have transshipment facilities, that reduces cost and required time considerably, the competitiveness (w.r.t. road and rail) of inland waterway transport will raise significant and will enable a extended and more fine-grained distribution capability.

On infrastructure :

19 Terminals are needed that are optimised in efficient transshipment from inland waterway vessel to rail/road. This is not the case in the present situation.
Explanation:

Many terminals and ports now in operation are not optimised for transshipment form/to inland waterway vessels to rail/road modalities. This means that transshipment cost is now relative high and can be reduced if transshipment is organised with respect to inland waterway transport.

20 Inland waterway transport needs a 7 days/24 hours operation of locks-/bridges to support the JIT concept.
Explanation:

Now many locks and bridges (specially on the less important routes) are not operated 24 hours/7 days. To enable JIT (Just In Time) and enhance inland waterways transport 24 hours/7 days operation is required. Especially the less important routes, that have other obstacles hampering cost-effective inland waterways transport, will benefit from this.

21 Other routes than the Rhine must have priority for the removal of obstacles. Inland waterway will benefit the most of this.
Explanation:

By investing in infrastructure it is arguable whether inland waterway transport in general will be most benefited from investments in the less important routes (hence have relative high benefits because new routes will be opened) or in the main transport axes, hence Rhine/Donau.

22 For my company the removal of obstacles in the following axes have the highest priority:

a. The Rhine/Mosel

b. The East/West Axis (Mitteland/Elbe/Berlin/Poland/Czechia)

c. The South/East axis(Main/Donau)

d. The South axis (Netherlands/Belgium/North-France/Paris)

e. The Mediterranean axis (Rhine-Rhone)

f. Other routes

Explanation:

Infrastructure work have to be done to enhance the capacity of inland waterways. In addition to statement 21 the question is which transport axis will be most interesting for you and gives the most new opportunities and hence must have priority for you.

On information and communication :

23 The general level of knowledge on information systems and its applications must be improved to benefit from its possibilities.
Explanation:

Nowadays the most used ways of communication is the (car)telephone and the fax. The fast developments on information systems give many new possibilities. However it is nearly impossible to be well informed on this topic. Hence it is difficult to see how this developments can support inland waterway transport by dedicated applications and what the benefits will be.

24 New developments on information systems must facilitate the interchange of messages between companies.

Explanation:

To provide valid information in time (on cargoes, addresses, co-ordination, authorities, etc.) is a major concern. If information systems will be developed they must facilitate this in particular.

25 Standardisation of functions and messages is a requirement for full use by all companies.

Explanation:

As more and more companies are starting to use telematics the situation develops that each company or group of companies develops their own systems and standards. This means that with every new client it must be agreed upon the way information is exchanged. Standardisation of functions and messages will enable a more flexible logistic organisation of transport as information exchange will not be hampered by lack of inter-operability between companies.

26 Benefits of VTS-systems will only be applicable in combination with general message systems.

Explanation:

Vessel traffic management systems (VTS) are now mainly used by the authorities for safety and pollution reasons (dangerous goods, etc.) Inland waterway transport companies do not benefit directly from this systems but pay for it indirectly via taxes and fees. However, a (government owned) telematic infrastructure is now emerging and the question is if inland waterway transport companies can benefit directly from these systems by making them available for private use. It is stated that this will be only the case if these systems support information exchange as stated in 24 and 25.

4.2 THE VALIDATION BY THE TELEPHONE-INTERVIEWS

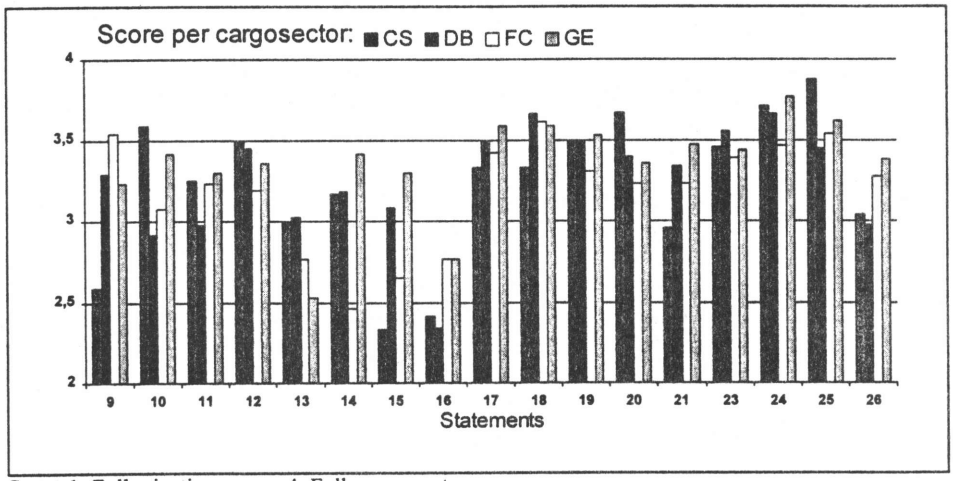
The stated conclusions in paragraph 4.1 were subject for validation by the telephone-interviews.

For the questionnaire see Annex [B]. In table 4.1 the distribution of interviews is given with respect to country, company type and cargo sector. Some interview participants cover more than one cargo sector.

Country	# Inter views	**Company type**	Inter-views	**Cargo sector**	Inter-views
Belgium	18	Shipping	20	Dry Bulk	19
France	2	Harbour/Terminals	9	Container/Ro-Ro	12
Germany	25	Agency/Shippers	27	Fluids/Chemicals	13
Netherlands	17	Other	5	General	17
Total	62	Total	62	Total	62

Table 4.1: Distribution of telephone-interviews.

The results of the telephone-interviews are presented in figure 4.2 (score per cargo sector), figure 4.4 (score per country) and figure 4.5 (score per user group). Detailed information is presented in annexes [H], [I], [J] and [K].



Score 1: Full rejection, score 4: Full agreement.
Figure 4.2: Score per cargo sector

Considerations on figure 4.2 with respect to logistic organisation (conclusions 9 to 11) :

- The concept of full load/transport on demand (9) is strongly supported by the companies operating in cargo sectors Dry Bulk and Fluid/Chemicals.
- The integration of the logistic chain (10) is strongly supported by the cargo sector Containers and less supported by the other cargo sectors.
- The increasing importance of ISO 9002 (11) is strongly supported by the cargo sectors Containers and Fluids/Chemicals.

- Taking into account the different nature of the cargo sectors the addressed considerations are not surprising.

Considerations on figure 4.2 with respect to ship construction (conclusions 12 to 16):

- The conclusion that sea-river ships are only effective on dedicated routes (12) is supported by everybody.
- The idea that speed is only important for Container and Ro-Ro transport (13) only weakly supported. This means that the other sectors also feel the need for higher speed.
- The conclusion that special ships are needed for specialised routes and cargo (14) is strongest supported by companies operating in more then one cargo sectors. Only the cargo sector Fluids/Chemicals does not support this conclusion.
- The identified problems with the new ISO-standard (15) are supported by all sectors except Fluids/Chemicals (as could be expected, as they have nothing to do with containers).
- The statement that only big ships are economically feasible (16) does not have real support. This means that the companies see possibilities to use smaller ships.

Considerations on figure 4.2 with respect to transshipment (conclusions 17 and 18) :

- All companies in all cargo sectors support the conclusions that transshipment is costly and time-consuming and that new developments are necessary.

Considerations on figure 4.2 with respect to infrastructure (conclusions 19 to 22) :

- All companies in all cargo sectors support the conclusions that optimised terminals (vessel-road/rail) (19) and 7 days/24 hour operation of locks and bridges (20) are needed.
- All companies also support the conclusions that for the removal of obstacles (21) the emphasis must be laid on the other routes than the Rhine.
- In the removal of obstacles (22) there is a slight priority on the East/West axis (Mittelland, Elbe/Berlin) over the other axes (see annex [K]).

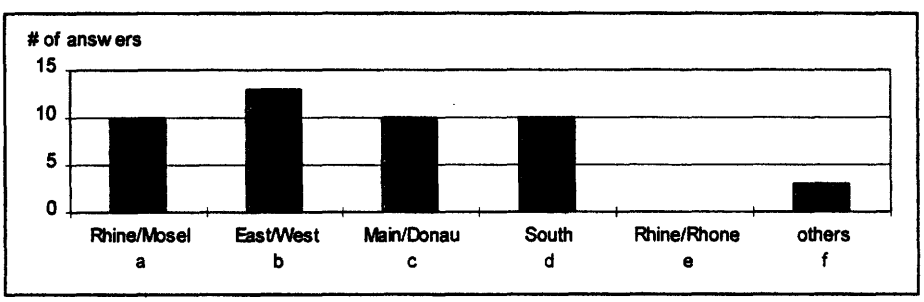
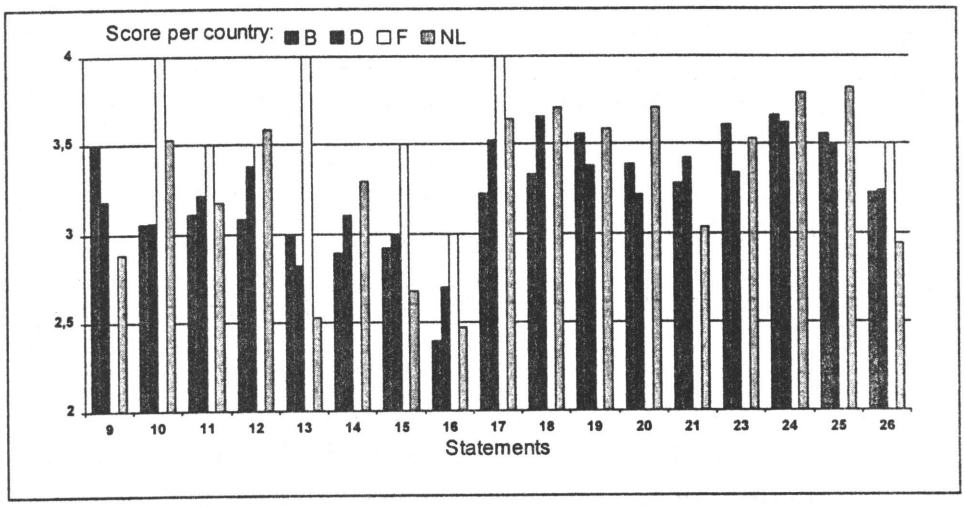


Figure 4.3: Scores for question 22. Distribution of the answers per axis.

Considerations on figure 4.2 with respect to information and communication (conclusions 23 to 26) :

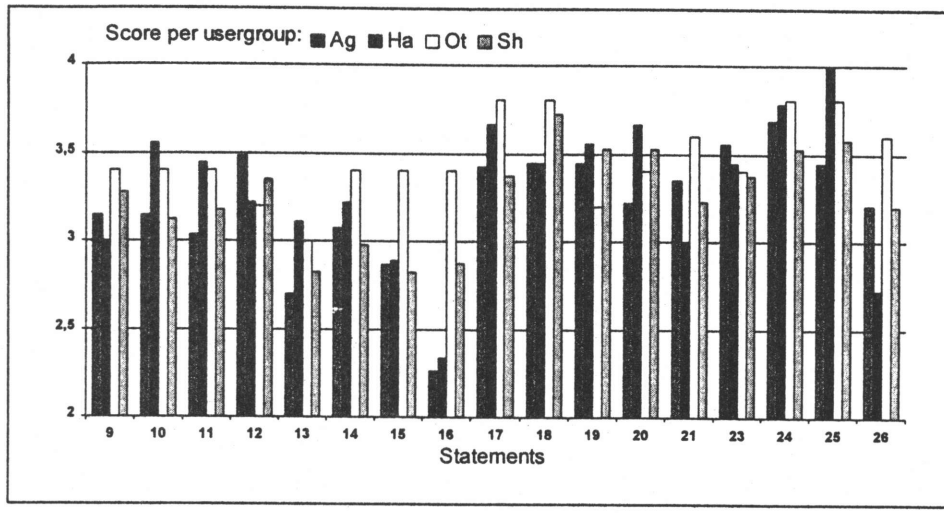
- All companies in all cargo sectors support the conclusions. This indicates that there is a need for an telematics infrastructure that can be used by all companies. This infrastructure must facilitate the interchange of standardised messages.
- In the use of VTS systems the companies are only interested if it supports the telematics infrastructure.



Score 1: Full rejection, score 4: Full agreement.

Figure 4.4: Score per country

As seen in figure 4.4 the score per country does not differ much. This was expected as nearly all companies operate international.



Score 1: Full rejection, score 4: Full agreement.
Figure 4.5: Score per user group

As seen in figure 4.5 the score per user group does not differ much also. However there are two exceptions :

- The idea that only big ships are economically feasible (16) gives a wide range of opinions. It is not clear why this difference emerge.

  The harbours/terminals user group thinks slightly different on the use of VTS systems (26) as the other user groups. This could be expected as authorities are placed in this group. They see of course more benefits from their VTS systems.

5 THE CHANGES IN LOGISTIC ORGANISATION

5.1 INTRODUCTION

In the following for each cargo sector two different models will be discussed. The first model identifies the situation within the chain nowadays bases on information from the interviews. The second model forecasts the future situation and provide some expectations as emerged from the interviews and been addressed in chapter 3.

5.2 DRY BULK

5.2.1 The dry bulk logistics model nowadays

Dry bulk consists mainly of sand, gravel, ore, coals, coal, cattle fodder, cereals, etc. A characteristic of the consignees of these goods is that they are mostly situated nearby inland waterway ports or alongside waterways. The dry bulk is transhipped from sea going vessels in the main ports like Rotterdam, Hamburg, Antwerp, Amsterdam, Stettin and Le Havre into inland waterway vessels. The model for this kind of goods consists therefore of the following participants:

- shipper
- shipping agent
- insurance company
- customs
- (main)port authorities
- ship-broker
- stevedore/transshipment company
- ship-owner/firm of ship-owners/shipping conference for inland waterway transport
- (inland) waterway authorities
- consignee

In this example bulk is chosen for goods that are shipped from overseas to one of the main ports. Gravel, rocks and sand are mostly transported from one inland waterway port to another. Short legs in road or rail transport are used. Storage or warehousing of the cargo is done by the shipper and after being transported by the consignee.

In figure 5.1 the model dry bulk model in its most basic form as it is today is presented, the different functions as well as the information flow between the participants and the goods flow is given.

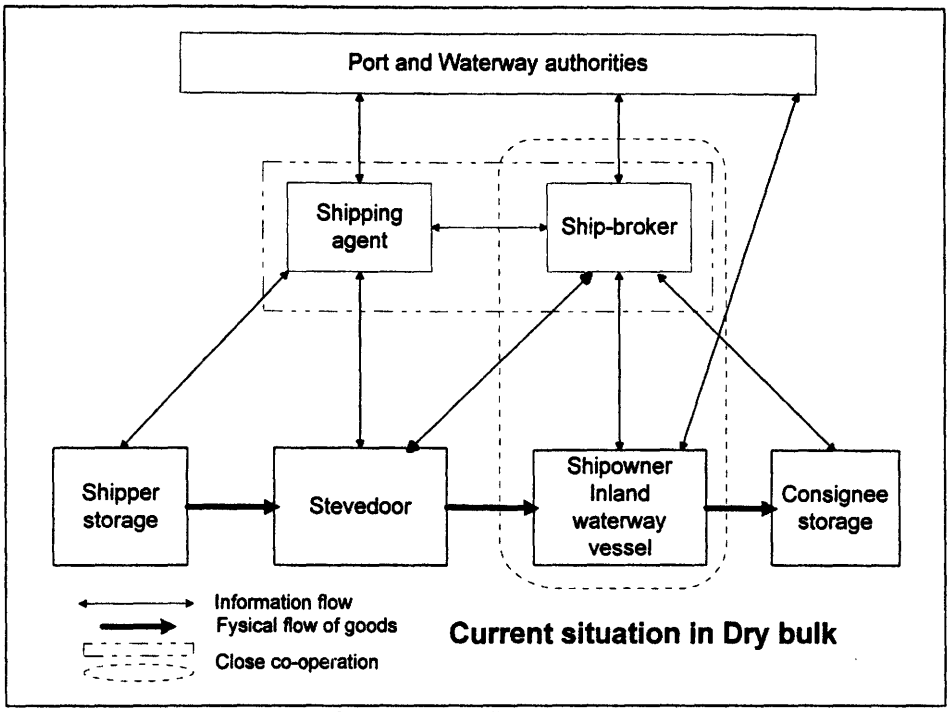


Figure 5.1: Current situation in the cargo sector Dry Bulk.

The figure gives an insight in the relationships between the different participants in the transport chain. It is simplified and therefore it gives no insight in the specific information which is being communicated between them.

5.2.2 The dry bulk logistics model in the future

Some conclusions, trends or developments mentioned in the interviews have to be taken into account for the future organisation for the dry bulk transport sector. They are as followed:

- The firms of ship-owners or the corporations of ships will play a more dominant role in the transport process. This will cause a concentration of power within the sector, which is nowadays highly divided by all the individual owners.
- Through the resistance against the highly regulated system of cargo acquisition (beurtvaartsysteem) on main traffic links (except the Rhine) and the wish for free cabotage in all of Europe there is a need for a real European Transport Policy (harmonisation of rules). If this succeeds an over-capacity in dry bulk will appear. A shake-out in the dry bulk sector will take place.
- The shipping agents are loosing ground in favour of ship-owner companies and corporations. Through modern communication facilities it isn't necessary to have agents all over Europe in the inland waterway ports.
- To achieve just-in-time production storage of the cargo by the stevedores instead of storage by the shipper could save time.

- Trend to transport more often smaller amounts of cargo to one consignee. Therefore more scheduled transport is necessary, the ships must be able to make more calls on one tour (more different cargo in smaller amounts result in more consignees). This will enhance the need for ships with own loading cranes onboard and/or specially developed containers in combination with shore based transshipment equipment.

In figure 5.2 the change in organisation in the cargo sector Dry Bulk are presented.

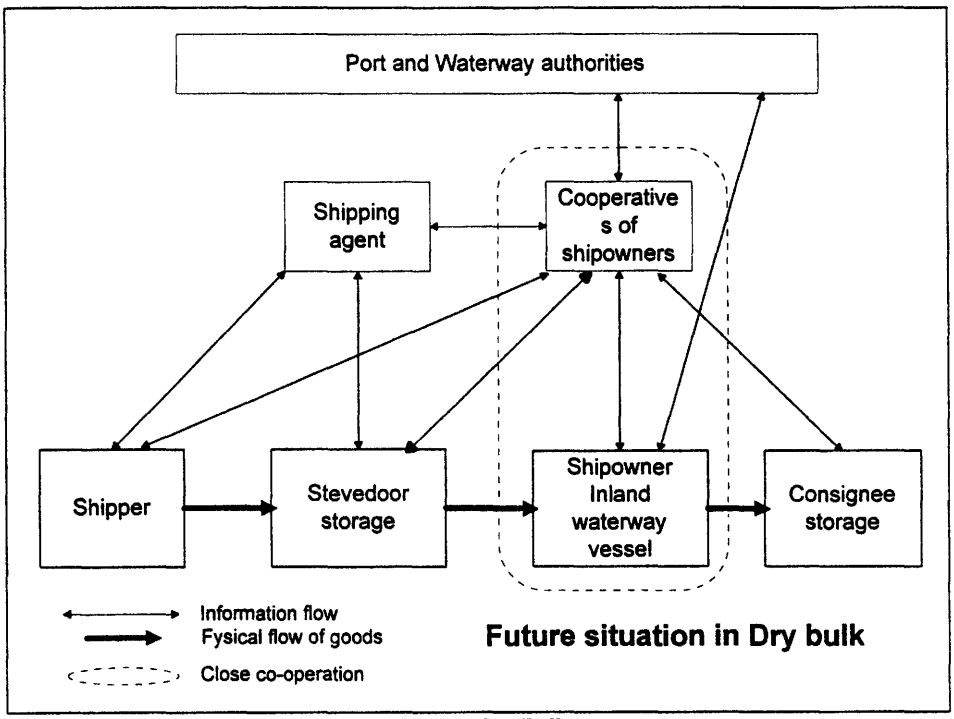


Figure 5.2: Future situation in the cargo sector Dry Bulk.

5.3 FLUIDS / CHEMICALS

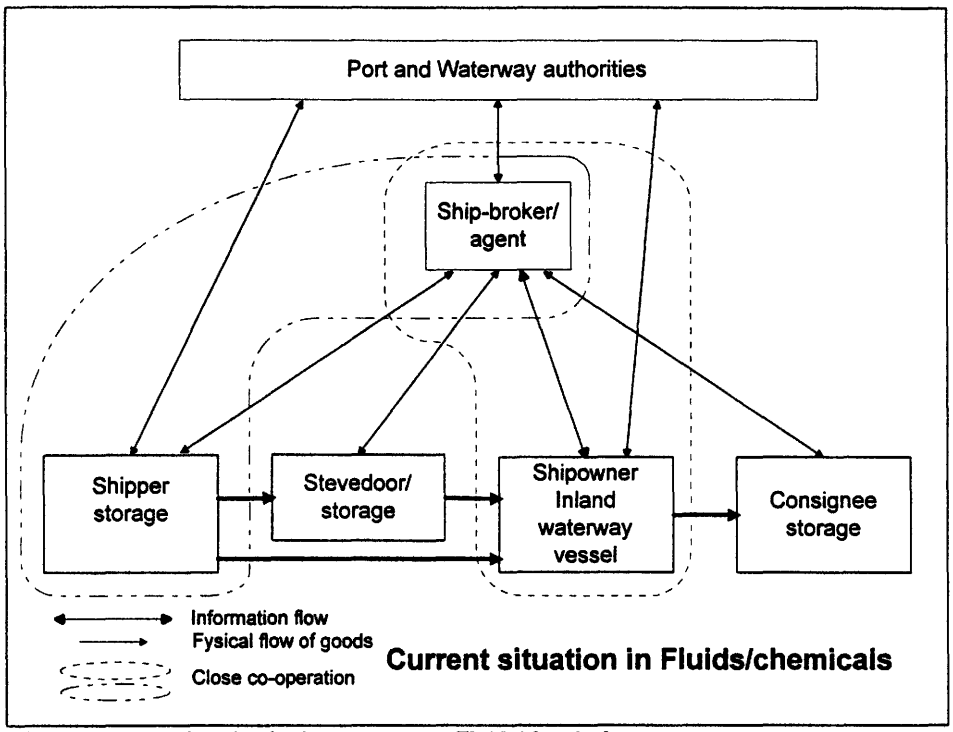
5.3.1 The Fluids/chemicals logistics model nowadays

Fluids/chemicals consist mainly of mineral oil, fuel, chemicals etc. There are number of specialised shipping companies operating in this sector. Private captains are brought in for more specialised transport on demand. A lot of companies which have Fluids/chemicals to be transported have their own arrangements with ship-brokers and do not operate 'on the market'. Therefore the shippers have relatively more power than those in the other two sectors dry bulk and container/swapbodies.

A characteristic of the consignees of fluids/chemicals is that they (like dry bulk consignees) are mostly situated near inland waterway ports or alongside waterways. The fluids are transhipped from sea going vessels in the main ports like Rotterdam, Hamburg, Antwerp, Amsterdam, Stettin and Le Havre into inland tankers. The model for this kind of goods consists of the following participants:

- shipper.
- insurance company.
- customs.
- (main)port authorities.
- broker.
- stevedore/transshipment company.
- ship-owner/firm of ship-owners/shipping conference for inland waterway transport.
- (inland) waterway authorities.
- consignee.

In figure 5.3 the different functions as well as the information flow of the participants are presented:



5.3: The current situation in the cargo sector Fluids/chemicals

A significant difference is that the shippers play a more important role and often have their own agency. They are more powerful in this sector than in the other two (dry bulk and container/swapbodies).

In many the cases of mineral oil and fuel the ship-owner and the broker commonly belong to the same firm. The tankers for chemicals mostly are private owned vessels which have no permanent arrangements with brokers.

Environment and safety play an important role in this kind of transport. So communication of shipment information during transport (tracking and tracing of dangerous goods) is important.

5.3.2 The fluids/chemicals logistics model in the future

Some conclusions, trends or developments have to be taken into account for the near future for the fluids/chemicals transport sector. They are as followed:

- The close relation between shippers and (their own) ship agent will become less close in favour of the relationships between the firms of ship-owners/corporations and the ship-brokers.
- More diversification within the sector fluids/chemicals will take place, more all-round companies will emerge. This matches with the trend towards concentration of power in the corporations or firms of ship-owners.
- Port and waterway authorities play an increasingly important role in the field of fluids and chemical cargo transport for the fulfilment and observance of the comprehensive safety rules for this type of transport.
- The storage of the cargo can be done by the shipper himself or by the stevedore. No evident trends or developments in the changing of the logistical concept were noticed.
- The traffic of fluids and chemical is under strict control of the authorities and has to fulfil expensive safety measurements and equipment. Therefore these types of vessels are expensive and the needed capital will still grow.

In figure 5.4 the different functions as well as the information flow of the participants are presented:

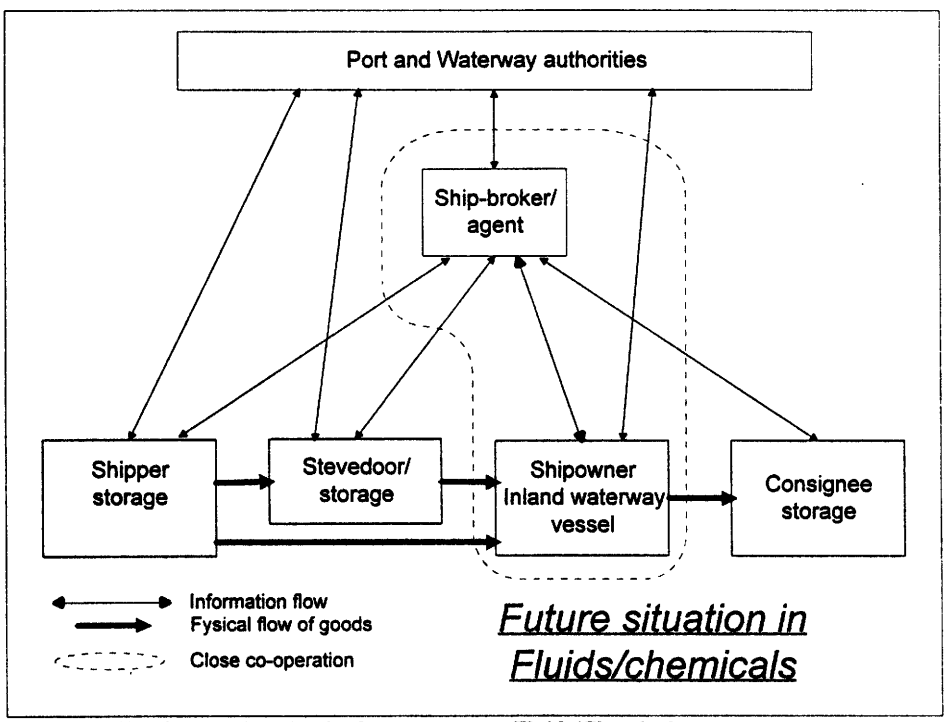


Figure 5.4: The future situation in the cargo sector Fluids/Chemicals

5.4 CONTAINER/SWAPBODIES

5.4.1 The container/swapbodies logistics model nowadays

A characteristic of container transport is that a lot more participants are involved in the transport chain. Because of the use of more transport modalities more partners are involved and more and more complex information should be exchanged. Attunement of the different modalities asks for accurate information on loading and unloading times etc. The sector is not well developed yet. A number of operators run a regular service. Private captains with vessels suitable for container traffic are sometimes brought in on a time charter basis.

Because of the kind of goods which can be transported within containers the factor time, speed and flexibility is important. In this sector road transport is the main competitor because of the fact that road transport doesn't need transshipment of containers to other modalities and goes directly from consignor to consignee.

Instead of the other two sectors of inland waterway transport (dry bulk and fluids/chemicals) in the container transport it is not possible to characterise the goods transported. Generally the consignees of these goods are not situated alongside inland waterways. So transshipment to another modality like train or truck is necessary. The containers are brought in from overseas to the main ports and are transhipped from the sea going vessels to inland waterway vessels or other transport modalities. After the inland waterway leg, the containers are transhipped to road hauliers or a trains to fulfil the last transport leg to the consignee.

It is clear that in this kind of transport a large number of participants take part in the transport chain. These participants in the logistic and multi-modal transport chain are:

- shipper
- warehouse in country X
- shipping agent
- road or railway transport company in country X
- multi-modal transport operator in country X
- insurance company
- customs
- (main)port authorities
- container terminal/stevedore/transshipment company in country X
- (inland) waterway authorities
- ship-owner/firm of ship-owners/shipping conference
- multi-modal transport operator in country Y
- container terminal/stevedore/transshipment company in country Y
- road or railway transport company in country Y

- consignee

Some participants in this model need a more detailed description because of the fact that they are relatively new and they don't exist in dry bulk and/or fluids transport.

Shipper of containerised cargo:

The shipper is of a different kind than in the other two sectors. The shipper of containerised cargo is in general a manufacturer of high value end (or consumer) products. Shippers of fluids/chemicals or dry bulk are manufacturers or merchandisers of (in general relatively low value) raw material. Therefore the factor time and speed is for the shippers of high value goods a very important factor.

Warehouse:

Warehouses can be extra participants in the transport chain. They are commonly used in this kind of transport because transport and warehousing doesn't belong to the core activities of the manufacturers. Warehouses can also work closely together with the shipping agencies. The warehouses are responsible for all the logistical activities of the manufacturers (shippers). Warehouses are responsible for the stuffing of the containers.

Multi-modal transport operator:

Because of the fact that in container/swapbody transport a large number of participants take part an important role is fulfilled by operators. The operators control the whole transport chain by co-ordinating and organising all the activities from shipping to unloading by the consignee. They can work closely together with shipping agencies (they often belong to the same organisation) but they can also be part of a association of ship-owners which offer multi-modal transport as a separate service.

Road or railway company:

The road transport company is responsible for the transport from the manufacturer to the warehouse and from the warehouse to the container terminal for transshipment. Therefor the shipper hands over the consignment to the road haulier who stuffs the cargo in a load unit and transports it by road to the warehouse or container terminal. There is no business relation between the road haulier and the consignor in case of using a shipping agent.

Container terminal:

The container terminal is responsible for loading and unloading the containers to or from the waterway vessel, train or truck. It fulfils the role of the stevedore in the other two sectors. Sometimes an operator has a container terminal as its base.

In figure 5.5 the different functions as well as the information flow of the participants are presented.

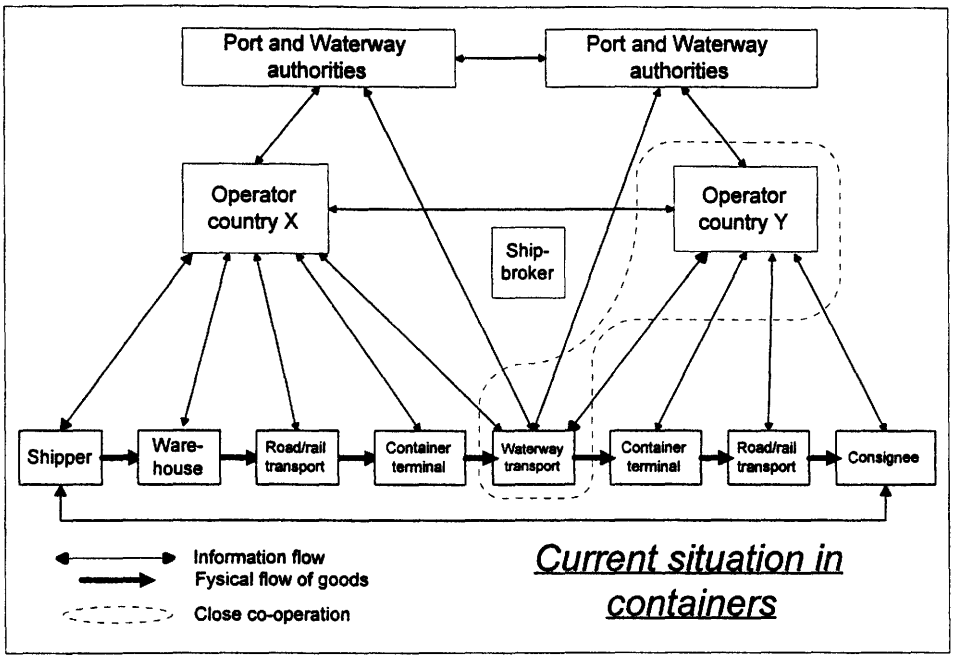


Figure 5.5: The current situation in the cargo sector Containers

5.4.2 The container/swapbodies logistics model in the future

Some conclusions, trends or developments have to be taken into account for the near future in multi-modal transport of containers, swapbodies or Ro-Ro transport. They are as follows:

- New combinations of companies working together will emerge and will function like the operators. One of the most critical aspects of this kind of business is to achieve accuracy and flexibility in offering a highly reliable way of transport which is necessary. Because of its complexity the operators wish to control the whole chain. It is a form of integration of different transport modalities within one organisation.
- Operators can emerge from the companies in inland waterway transport like derivatives from inland container terminals, co-operation between ship-owner companies and a road haulier or railway company. The other operators emerge from the maritime transport sector. The maritime ship-owner companies wish to play a more important role in the final distribution and delivery of their containers brought into the main ports. These maritime operating companies will take over inland waterway transport organisations to get a foothold. The choice of which party actually plays the role as operator doesn't affect the logistical model.

- The concept of Value Added Logistics (VAL) will have impact on the logistics model and has effects on the way of manufacturing. The final assembly and packing which is different for each market is done in the target country itself. It can be done at different stages in the model, the first warehouse, the main port container terminal or the inland container terminal or in the last warehouse. The shippers will be the definite participants in the chain who will decide if VAL will occur on a large scale.
- The appearance of more inland waterway terminals will evolve in the possibility for a new logistic concept. Nowadays inland waterway vessels have to make a large number of calls to the maritime ports to collect the containers which is a time consuming and costly affair. When collecting large numbers of containers by one vessel for one rough destiny at once and leaving for the nearest inland container terminal for regrouping and tranship the containers to their final destiny over more inland waterway vessels maybe cost reduction could be obtained.
- The concept of floating container terminals in the main ports to decrease the internal port circulation or enable direct transshipment: sea going vessels on one side, inland waterway vessels on the other. In figure 5.6 the future organisation of the participants is presented.

In figure 5.6 the future organisation of the participants is presented.

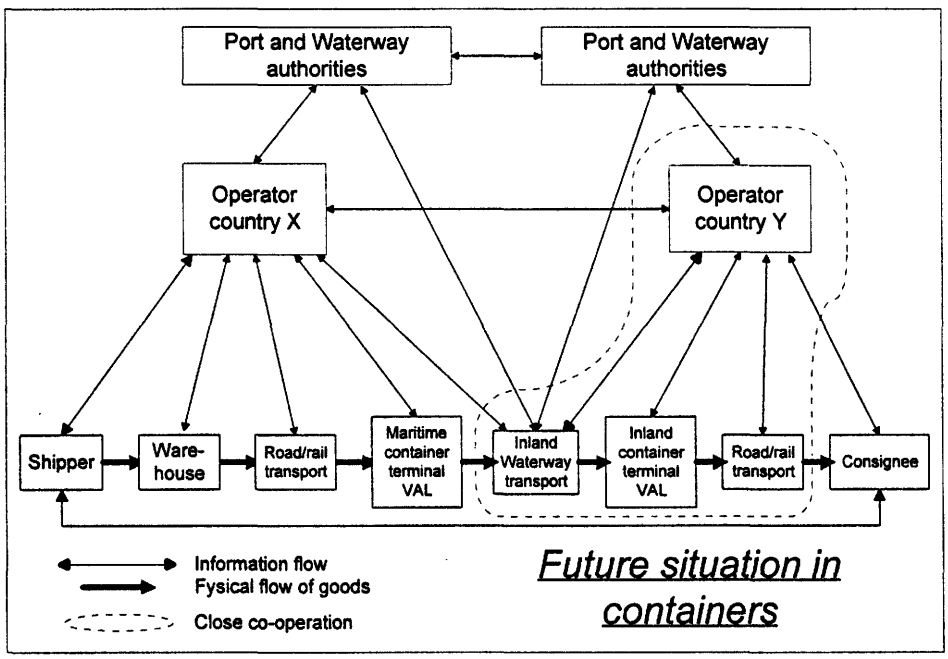


Figure 5.6: The future situation in the cargo sector Containers

6 RESULTS OF THE DOCUMENTATION SURVEY

The documentation survey was held to support the preliminary conclusions and find (eventually) additional information on the areas of investigation. In annex [C] a list of surveyed documentation is incorporated. The annexes [E], [F] and [G] contain all the detailed information on the identified possibilities, obstacles and requirements. In the following part the results will be discussed in the line of the areas of investigation and the preliminary conclusions.

On logistic organisation :

Generally the documentation supports the conclusions as formulated in paragraph 4.1. Some address the possibly to have a modal split shift towards inland waterway transport. This possibility however is limited due to the obstacles in organisation, transshipment and infrastructure, and of course the nature of inland waterway itself (low speed and flexibility).

On ship construction :

The surveyed documentation identifies a number of new ship designs to cope with the various obstacles in the infrastructure and sea-river combinations. This is in the line of the conclusions 12 and 14. Although the topic of safety was addressed in Questionnaire (1) not much response was registered. The documentation survey has given valuable additional information on the safety aspect in ship design and construction. A sample of the measures identified :

- Standardisation of steering systems and all other monitoring and control systems with respect to the Man-Machine interface.
- Introduction of a tachometer (as by trucks) to protect the crew from over hours and hence from concentration loss
- Bridge constructions that give a low rate on noise and vibrations to reduce fatigue of the crew.
- More and regular inspections on the steering systems and propulsion systems
- Installation of bow thrusters enforced by law.

On transshipment :

The conclusions on transshipment (Nr 17 and 18) are supported. Also the possibilities for on board cranes are explored. The problems on transshipment with respect to cost and duration are also addressed.

On infrastructure :

The documentation survey reveals some additional obstacles as :

- More waste disposal locations are needed for inland waterway vessel to protect the environment.
- More harmonisation is needed on shore facilities/ship facilities especially for dangerous goods.

- With respect to safety also additional possibilities emerge.
- Navigation on the wrong side of rivers in curves is common practice. For safety reasons this should be forbidden. Most ships today have enough power to overcome the problem of strong currents.

On information and communication :

The documentation addresses the inefficient and inadequate information exchange and points to EDI applications to enhance the information exchange. This supports the conclusions Nr. 23 to 26. More attention has been placed on the use and limitations of VTS systems. Possibilities are identified to enhance reliability and safety of transport. For safety reasons it is suggested to introduce a "standard" language to prevent misunderstandings. The need for this is grown as nowadays more vessels from non-EC (East European) countries are active on the inland waterways.

7 CONCLUSIONS

The primary conclusions emerging from the collected information can be formulated as follows :

On logistic organisation :

The logistic organisation will see a further development in integration of the total chain. Bigger companies and corporations will evolve taking command over the total chain. Specially in the container transport sector this will happen.

The main *obstacle* is the way inland waterway transport is now internally organised. The low organisation degree hampers innovative initiatives as it is not clear how investment and risk management must take place. The process of logistic integration will therefore have a slow pace. Apart from this, inland waterway transport has some strategic disadvantages with respect to other transport modalities: speed and a coarse grained distribution profile. This limits the capability of a modality shift to inland waterway transport.

The most important *requirement* for a growth of inland waterway transport is the harmonisation of regulations. Although this is already reached to a certain degree further developments are needed to develop a free market. Also the time needed for new licences and agreements with authorities when new initiatives are developed (e.g. the building of new terminals) must be reduced.

On ship construction :

Ship design (and integrated transshipment equipment) dedicated for optimising the transport capability and taking into account the obstacles on the intended routes of operation must provide a more economic feasible ship for operations in not well developed inland waterway areas. In this way, together with new transshipment equipment the total distribution will be more fine-grained, enabling more multi-modal transport.

The main *obstacle* is the unwillingness to invest due to the over capacity in Dry Bulk and the internal organisation of inland waterway.

The most important *requirement* to be fulfilled is the re-evaluation of the now existing regulations for ship construction in the view of new innovative ideas on ship construction.

On transshipment :

The key to success in multi-modal transport is transshipment. New transshipment concepts, methods and -equipment, operating much faster and cheaper is an essential condition for an efficient integration of inland waterway transport into the logistics and multi-modal transport chain.

The main *obstacle* is the slow pace of the planning and negotiations for the development of new terminal and transshipment equipment. The feasibility studies needed are expensive and hamper the willingness to invest in new concepts and ideas.

The most important *requirement* to be fulfilled is a better functioning internal organisation in inland waterway.

On information and communication :

The capability of information and communication technology is now sparsely used. There is a need for integrated telematics systems for message handling and relative simple functions. Especially the midsize and smaller companies will benefit from this. The big companies already take reasonable care of their own.

The main *obstacle* is the low level of knowledge on the capabilities of information systems. Also the initial investments are relative high.

The most important *requirement* is the standardisation and harmonisation of messages, protocols etc. to enable free exchange of information.

On infrastructure :

The infrastructure is more or less fixed. By investment in removing obstacles priority must be given to the other transport axes than the Rhine. The East-West axis has in this priority a slight preference.

The main *obstacle* is the huge investment needed for removing obstacles in inland waterways and the way it is now financed (by local/national government). However, the removal of important obstacles has a bigger than local effect on inland waterway transport.

The most important *requirement* is, that the inland waterways can be used 24 hours/ 7 days a week. Especially the smaller waterways will benefit from this.

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(1) EURET (European research on transport, 1991-93) was one of the specific programmes of the second framework programme of Community research and technological development (RTD).

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Transport research — APAS — Inland waterways transport systems

Luxembourg: Office for Official Publications of the European Communities

1996 — 64 pp. — 17.6 x 25 cm

ISBN 92-827-7334-5

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