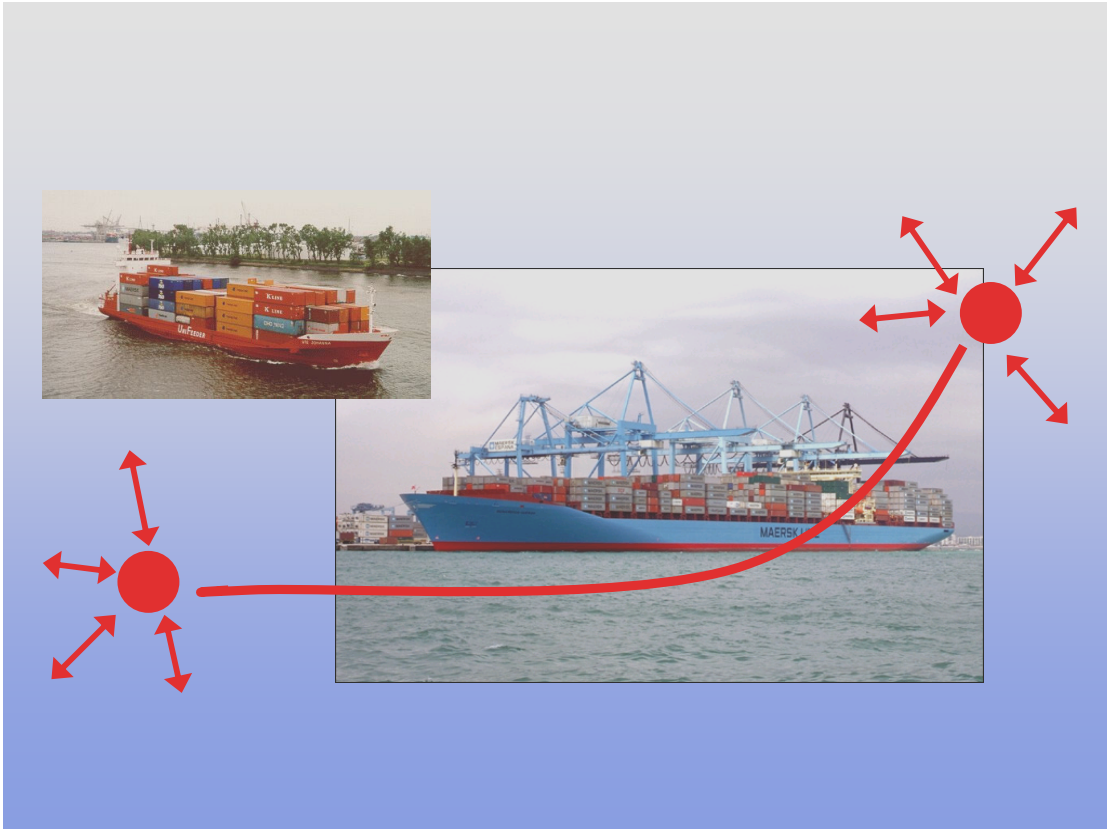
THE NORTH EUROPEAN MARITIME CONTAINER FEEDER MARKET



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THE NORTH EUROPEAN MARITIME CONTAINER FEEDER MARKET

THE PROJECT RESULT IS PRESENTED IN THE FOLLOWING REPORTS:

- *The North European Maritime Container Feeder Market*
- *General Business Environment, Economy, Trade, Transports and Container Market Characteristics*
- *Summary & Concluding Analysis*

Our reference: NEB Feeder Market

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Foreword

Previous research made by The Institute of Shipping Analysis (SAI) indicates a large potential for Short Sea Shipping container feeder systems in the future. That is why we have undertaken this research project - The North European Maritime Container Feeder Market". The objective is to define the driving forces behind the development of the Short Sea Shipping container market and transport networks, their strengths and hindrances.

The research was financed by the following organisations:

▪ Göteborgs Hamn	▪ Helsingborgs Hamn
▪ Copenhagen Malmö Port	▪ Smålandshamnar
▪ Gävle Hamn	▪ Vinnova
▪ SAI	▪ Swedish Maritime Administration

We are also convinced that everyone that reads this report will join us in warm thanks for their support, which has made it possible for us to conduct this research.

The result is presented in the following separate reports:

- *Summary & Concluding Analysis*
- *The North European Maritime Container Feeder Market*
- *General Business Environment, Economy, Trade, Transports and Container Market Characteristics*

Responsible for the project management have been Kaj Rehnström, Executive manager SAI, Jennie Thalenius, Manager Research SAI and Prof. Kenth Lumsden, Chalmers University of Technology, Department of Transportation and Logistics.

Jennie Thalenius has been responsible for the main report about the North European Container Feeder Market and the database development together with Per Olof Arnäs from Chalmers University of Technology, Department of Transportation and Logistics, who has worked with the database development. Kaj Rehnström has been responsible for the report on General Business Environment and Container Market Characteristics.

Finally, many thanks for your contributions - Barbro Wilén and Christopher Pålsson, SAI; Niklas Bengtsson, MariTerm and Erik Bastiansen, MSR Consultants.

We hope that this work will contribute to a better understanding of the economic welfare that Short Sea Shipping creates for all of us.
Göteborg, 2002-10-16

Kaj Rehnström

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The Feeder Market - Summary and Concluding Analysis

The main objective of this project is to enhance the knowledge about the structure, competitiveness and driving forces in the port and shipping market for containers within the North European and Baltic Region. But, since this market to a large extent is integrated in the global container transport market, we must also consider the global development of container transports and underlying driving forces.

At the same time, it was most urgent to develop more efficient and reliable methods to quantify market indicators in physical terms. Available statistics are fragmented, not compatible or lacking e.g. about the demand for transport capacity and its geographical distribution.

The report "*General Business Environment, Economy, Trade, Transports and Container Market Characteristics"* presents more detailed analyses of the global development of container transports and underlying driving forces. In this report about "*The North European Maritime Container Feeder Market*", we give comments about the research and methods including findings regarding port statistics, volumes and discrepancies between sources. Our findings about structures and driving forces in the regional feeder market are based on a supply and demand perspective together with a short briefing about the tendencies in general market characteristics. Here is also a description of the database tool and achievements regarding management of data for ship movements, fleet details and container volume development. Our findings about the global and regional container market, the tendencies and driving forces are condensed in the third report - "Summary and Concluding Analysis".

The Regional Maritime Container Feeder Market

The demand for container transports can have its origin in:

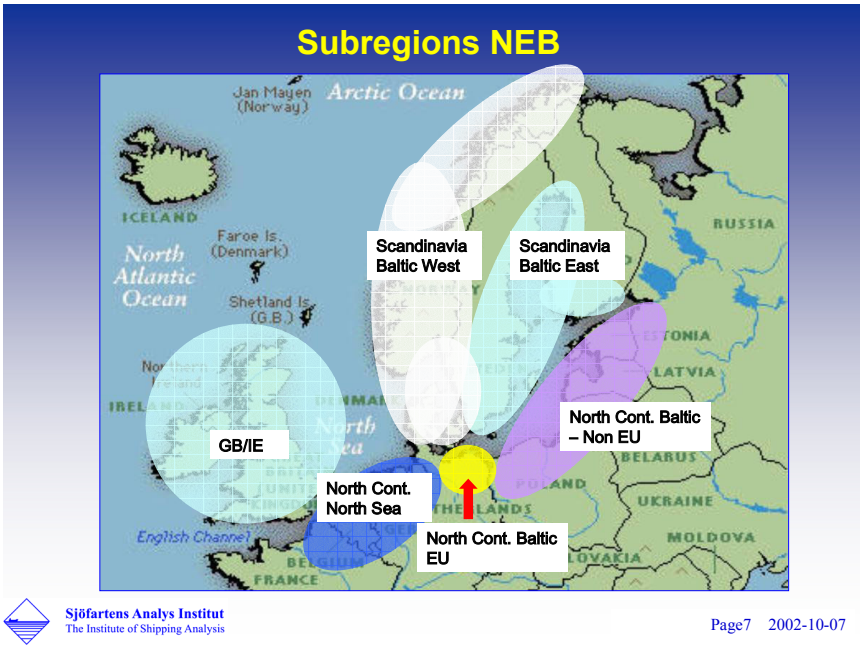
- Direct intra-regional maritime cargo, where the geographical cargo origin and destination is within a region. The region is in this report defined as the North European and Baltic (NEB) regions.
- Direct external cargo, where the cargo's origin or destination is outside the region and the cargo is shipped directly to destinations outside the region.
- Or, as a third possibility – transshipment cargo. The cargo origin and/or destination is outside the region, but the cargo is transshipped between successive maritime transport links within the regional boundary.

The feeder concept and its business are truly integrated and related to global transports of containers. But, within this business we prefer to include all containers shipped within the region by feeder systems or other concepts. The feeder system has its major business within the regional boundary, serving the trans-ocean liner traffic calling the very few large hub ports. But there is no strict business limitation – it is more a question of strategies and potential for further economies of scale. All container transports, also the true intra-regional, can be regarded as a potential also for feeder transport services, irrespective of mode. Therefore, in this report the sea feeder market includes maritime containers transshipped in the regional hubs and intra-regional units. Another aspect is that we cannot in the statistics separate transshipped from true internal units.

From a geographical point of view, the region is well defined. It also represents a market or operating region for Short Sea Shipping. At the same time, this region is not at all homogeneous when regarding frame components and characteristics of the shipping market.

North European and Baltic Region (NEB)

From an initial selection of 644 ports in the geographical region, we have identified 146 ports which handle containers during the period – these are our container ports. They are grouped per 15 countries and nine defined transnational subregions including Scandinavia, the North Continent and the entire NEB region. Iceland is included in NEB in the cargo database, but not yet in our ship movement data. If Eurostat data had been used instead, we would have been restricted to ports in the EU countries. This would have reduced the number of subregions, which in turn had restricted the possible analyses of differences in regional characteristics.



Defined subregions in NEB

The regional container transport system can be treated as one system, with equal conditions in a homogenous market. But we can very well suppose that there are several and partly different segments within the regional market, in geography and/or business differentiation. Such differences can be a basis for further development within different parts of the region – but the other way around is also possible, with a further expansion within the specific niche, which is to feed containers to hub ports for global services.

The fleet with capacity to carry containers in the region mirrors a mixture of factors, not only regarding commodities shipped and volumes but also frame components and qualitative aspects. Regarding the container segment it is probably the most standardised segment. The container unit itself is just a type of equipment - a cargo carrier unit, and it is not the commodity itself. But we usually regard containers as a commodity, which represents a shipment of any kind of box shaped cargo, partly because the cargo carried is not classified in the statistics. But we can assume that although the container unit is standardised, the demand for logistics and cargo care varies considerably between the specific commodities shipped.

The feeder service function is not transport mode specific – it can be performed entirely on land or with intermodal solutions depending on geographical, infra-structural and economic factors but the "feeder" concept is usually associated with the maritime part of the regional distribution of containers to and from hub ports where the units are transferred to the deep sea links. The project frame has not included analyses of land feeder transports, mainly due to lack of statistics.

Together, these conditions are underlying factors for wanting flexibility in analyses and database tools e.g. regarding regional aggregates – the North European and Baltic region (NEB) as an entity, parts of it or at port level.

Demand

In total, 31 million TEU [1] were handled by the 146 container ports or port companies in the region in 2000. 84% of the container volumes were handled in Germany, Great Britain, the Netherlands and Belgium.

In fact, the ten largest ports in these countries or 7% of the ports in the entire region, handled 80% of the container volumes. The concentration of volumes to a very few hub ports is obvious – but this is only one side of the coin. When considering the feeder market, the hubs are turning points in a dense feeder network connecting a large number of origin or destination ports with these hubs.

The Nordic countries and Great Britain have over 70% of the container ports - which together build the basis for the feeder network in the region. In Scandinavia, with over 50% of the ports, the volume share is just close to 10%. Port market and container distribution conditions are in this comparison very disparate between the different subregions in NEB.

At a port level, there are 13 ports of the 146 in the entire region that handle more than 1% each of the overall container throughput. Only two of these are located in Scandinavia – Göteborg and Helsinki.

Ports in Northern Europe and Baltic Region > 1% of the container lifts

All ports	1000 TEU	Av growth rate 97/00	Growth 99/00	Volume Share	Acc. volume share	Acc. no ports
Rotterdam	6 275	4.5%	-1.1%	20.2%	20.2%	0.7%
Hamburg	4 275	8.4%	14.0%	13.6%	34.0%	1.4%
Antwerpen	4 082	11.2%	13.0%	13.2%	47.2%	2.1%
Felixstowe	2 816	7.1%	3.0%	9.1%	56.3%	2.7%
Bremen/ Bremerhaven	2 752	17.3%	25.0%	8.9%	65.1%	3.4%
Dublin	1 380	7.6%	5.8%	4.5%	69.6%	4.1%
Southampton	1 298	13.1%	39.7%	4.2%	73.8%	4.8%
Zeebrugge	965	14.2%	13.5%	3.1%	76.9%	5.5%
London	748	13.9%	2.4%	2.4%	79.3%	6.2%
Liverpool/Mersey	732	16.6%	44.3%	2.4%	81.7%	6.8%
Göteborg	685	8.9%	9.7%	2.2%	83.9%	7.5%
Medway (incl. Thamesport)	509	8.8%	3.1%	1.6%	85.5%	8.2%
Helsinki	398	0.4%	23.8%	1.3%	86.8%	8.9%
Source: SAI Cargo Database						

[1] TEU: Twenty foot Equivalent Unit

The NEB region growth rate was 7.6% per year between 1997 and 2000 compared to the average growth rate for the 13 ports, which was 9%. This has resulted in an increased volume share from 84% 1997 to 87% in the year 2000. The average figure for the other ports was negative [2].

But, the volume figures and development vary to a large extent from port to port. Some ports have had a continuous and fast growth during the period, but from low or very low levels, especially in the Nordic countries. The ports showing a negative development include ports in almost all the countries, which can indicate a shift to other ports in these or other countries. It can also be a result of a large dependency on local industries - and their business cycles. This period also includes a general slow down of the economies and effects of the Asian recession. The upturn in the economy resulted in fast growth rates after 1999 measured in container lifts.

The concentration tendency or the dominance in volumes to a handful of ports does not mean a deterioration of the regional transport network. The network exists and is necessary to support the global lines with turning points in the hubs. But the rapid development in the North Continental hubs can indicate that land transport feeder has gained in market shares more than the maritime feeder concept.

In the Nordic countries, the availability of efficient sea links is and has always been a prerequisite to develop the trade to external markets. The Nordic container port market can be regarded as small in a European comparison, but it is an important part of the regional hinterland for the transshipment ports and for the feeder market, since the Scandinavian/Baltic market together with Great Britain are the main regions for maritime containers. Of the total volume reported in Swedish ports, close to 50% is coming from or destined to Germany, the Netherlands and Belgium, 17% to and from Great Britain/Ireland and trans-ocean regions represent 23%. In Finland, as much as 76% of the containers come from or are destined to North Continental ports, where the containers are transshipped.

The NEB maritime feeder market is estimated at 6.5 to 7 million TEU including empty containers (based on Eurostat figures). The importance of the flows between Great Britain/Ireland and Rotterdam and between Scandinavia and Hamburg, Bremerhaven and Rotterdam is obvious. But, we must remember that the units originated or destined to “end”

[2] Figures based on volume development between 1997 and 2000 for 103 ports, which together represented over 99% of the total volume in the region 2000.

ports in the region are also a part of the trans-ocean flows in the hubs. But, in the statistics for these hub ports, the container units are counted as import and export from these ports of transshipment (country of transshipment) and not from "end" ports.

It can be concluded that the Scandinavian countries are generating transshipment containers, especially for Germany. For the Netherlands, Great Britain/Ireland is the main generator besides the direct trans-ocean containers. Sweden has the largest part of trans-ocean direct volumes compared to the other Scandinavian countries, which is entirely due to the traffic in the port of Göteborg. Here the trans-ocean share is close to 30% according to Eurostat figures. In the largest North Continental and Great Britain ports, the share is varying between 60 and 90%. These conditions are also affected by the maritime feeder share versus land transport feeder to and from the transshipment ports. A larger share indicates that feeder by land transport modes is dominant.

Some words about the flows of empty units: We have data for 57 ports, representing 29 million TEU or 93% of the total volume in NEB. Of this volume, close to 5 million TEU are empty, which means an average share of 17% of the total number of TEU handled. The ports with a larger average empty share, handle 23% of the total number of empty units but only 14% of the total TEU volume. Does this indicate that the largest ports have more balanced cargo flows?

The tendency is that the larger the port, the more balanced the cargo flow, i.e. fewer empty units per total handled. The variations are considerable though. But this indicates that the positioning of empties within the region, estimated at more than one million TEU and two million lifts, is an important part of the feeder service market. It also indicates a potential to take care of the capacity for intra-regional cargo.

The long term development shows that the volumes in the major North Continental and Great Britain ports were doubled between 1990 and 1999. The western part of the Nordic Baltic region had a little slower development in the last part of the 1990s, but the most remarkable tendency was the break in the development in the Baltic region. The major reason was the decrease of transit units to Russia, which affected the Finnish ports. If we just make a short deviation, this development can be compared to that in Southern Europe, where the volumes tripled in the major Mediterranean ports. The main reason for this tremendous growth is their new role as transshipment hubs for interchange of units between links in the global services. Now back to the North of Europe.

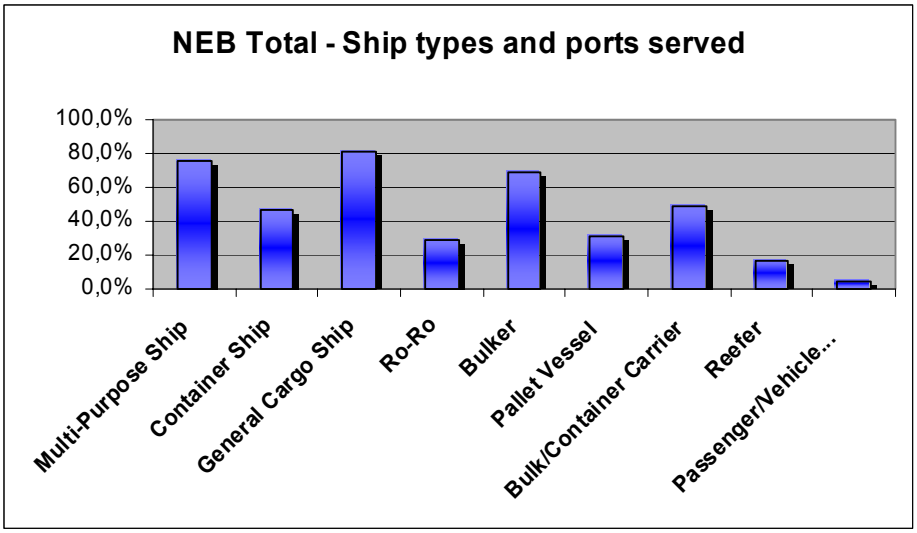
The last years in the 1990s are influenced by a general decline in the global economy, which has to be kept in mind when we want to

consider the expectations for the next ten years. We start from a quite low level. The expectations for the next ten years from 2000 to 2010 are in short [3]:

- A volume growth by close to 60% compared to a doubling of the volumes during the 1990s.
- Strongest growth from the deep-sea demand

Supply

Close to 650 ports in the region are served by a ship with TEU capacity. This fleet is much diversified and here we find e.g.multi-purpose, general cargo, roro besides pure container ships, i.e. with cellular cargo holds. The total number of port calls by these ship types amounted to 160 000 during 2000.



Ship types with TEU capacity and ports served (in % of the total number of ports in NEB)

Since we are focused on container ports, i.e. the ports in NEB region which handle containers, the number of ports was reduced to 146 ports or about 25% of the 650. Close to 4 000 vessels made 126 000 calls in these ports. Measured in calls and number of ships, the container ships represent about 25% of the container carrying capacity calling these ports. When measuring capacity in container units (slots), the container ships have a 60% share of the total capacity. In regions with major container hubs, the container ship share is even larger than this. In the other regions without such hubs, as the entire Baltic region, the container ships represent a carrying capacity that is smaller than 26%.

[3] Based on a prognosis from Ocean Shipping Consultants Ltd (OSC), *Containerisation in North Europe to 2015,* July 2002.

Considering the number of vessels, pure container ships have a surprisingly small part – between 5 and 11% except for the North Continent and Great Britain/Ireland regions, where the cellular capacity share is between 24 and 31%.

The dominant part of the vessels is in the smallest size range, i.e. smaller than 500 container units. The largest part of the big container vessels turn around in the hubs on the North Continent and Great Britain.

In total there are only 70 ports, or about 50% of the container ports, that have a call frequency of more than 51 calls by container ships during 2000. On the average, such a frequency represents at least weekly service in these ports; a characteristic for feeder services. The number of calls by container ships is closely related to the number of TEU handled in these ports. But, we can also find variations - some ports have relatively small volumes and are still frequently called by container ships. Many of these ports are located in Norway, Sweden or the Baltic States. This indicates that ports are served if the deviation from the routes connecting the major ports is not too large. It is probably also a part of the strategies – to be present on the market. There are also examples of ports with few or no calls by container ships although the TEU volumes could be larger than for ports served. Our conclusion is that operators with other ship types with container carrying capacity, like roro and multipurpose ships are a part of the container transport market.

Altogether, the key figures show a structure, which can be summarised by the following characteristics:

- Large differences between subregions concerning supply of transport capacity for containers, especially on pure container ships. This is natural due to the many and relatively small container ports in the Scandinavian and Baltic regions.
- The Scandinavian and Baltic regions are primarily served by a dense and highly frequent feeder service network. Ports incorporated in such a service have a certain volume (concentration) and suitable geographical position versus each operator's schedules and routes.
- Other ship types than pure container ships also serve the container transport market – a fleet with a large joint capacity, used for container transports or not.
- The presence of the different ship types with container capacity vary between subregions and countries though, e.g for Finland, roro ships supply 40% of the total slot capacity called. Also Sweden, Denmark and Estonia are examples of this. The frequent cargo ferries in short

sea operations are to the major part dedicated for transports of trailer units. But, the liner traffic with roro ships in both short and deep sea traffic have a flexible capacity for other commodities like break-bulk, containers etc.

- Multi-purpose ships seem to have a complementary role to pure container ships in regions without large hubs. General cargo ships, on the other hand are the most frequent ship type in the Baltic States and Russia. But, our conclusion is that the general cargo ships are probably dedicated for non-containerised cargo.

Prospects and driving forces, strengths and hindrances

Efficient feeder links to an increasing number of small and medium sized ports stimulate further growth of containerisation. More highly processed cargo, smaller shipment sizes combined with highly competitive service levels and economies of scale promote the penetration of ”new” commodities and further volume growth within the container system. One part of the “new” container volumes is also generated from flows that have been transported by other maritime operators engaged in other niches – referring to the major market segment, geographical coverage and/or capacity, like operators with roro, reefer, general cargo or even bulk commodities. For these operators, container cargo is probably a small but profitable segment in addition to the basic cargo. The extent of such substitution is hard to determine, since such information is strictly confidential.

The maritime system is diversified into several shipping segments, with different demand for logistical refinement. The container transport system is only one of these segments - there are also other segments with the same or even higher degree of refinement in adaptation to customer logistics. Operators and their services are in that case often more specialised regarding commodities shipped and customers. Regarding the container system, it is flexible for, in principle, all commodities not exceeding the physical restrictions of the container unit itself. An open global system, with high density in the networks, high frequency service, use of standardised cargo carrying units, ability to cope with customers who have small and irregular shipments – are some factors that make the container transport system so generally applicable and competitive. Combined with increased economies of scale, the freight level is on such a level that this system can penetrate other than traditional high value cargoes. On the negative side are the extra costs for empty units (handling and positioning) and need for a more complex control system.

Tendencies in the regional transport network

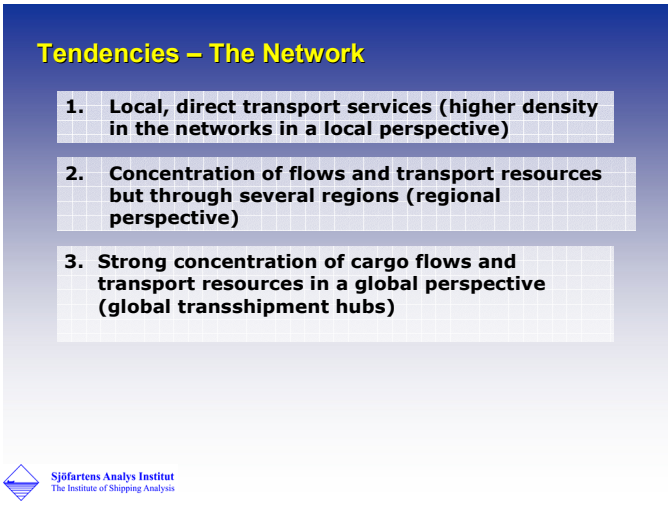
Tendencies within and prerequisites for the development of the regional transport system is also to a growing extent connected to the development within the globalisation of manufacturing and demand of a global supply chain perspective in transportation. The regional transport system is an integrated part of this. In the Nordic countries, the sea feeder concept as other shipping segments, has a strong market position due to geography, infrastructure and extensive external trade. Inland haulage to the ports is mainly performed by trucks.

We draw the following conclusions about the regional transport network:

- Increased density in the network in a local perspective, driven by the general development of the demand for container transports in the ports´ hinterland, combined with the capacity offered in the dense network of feeder links.
- In the regional perspective - increasing concentration of volumes to the transshipment hubs in the North Continent and Great Britain.
- In the EU and global perspective, mega hubs for interchange between deep sea links will continue to trigger the development in these hubs (e.g. in Southern Europe). We can expect this development to continue for further economies of scale in the global links combined with rationalisation in the global networks.
- The volume growth in the major hubs will be more rapid than the average volume growth, due to increases of transshipment and increased use of rail transports to these hubs.

These perspectives are complementary – and not exclusive since they are all connected to the development within the global transport system[4].

[4] Lumsden, K., Thalenius, J., Bottlenecks in a transport context - and in a North Sea Perspective, NTN



Tendencies in the transport network

We cannot foresee any severe constraints regarding the supply of sea transport capacity – the cargo flows will find their lanes. The major issue is to extract further economies of scale and improvements of the overall efficiency in the major regional hubs. This includes faster dispatch of the ships. Further concentration of transshipment units to a very few major hubs in combination with a general increase of volumes by probably 60% will strain the infrastructure and environment. A physical maximum related to environment and land use can be foreseen, partly due to the terminals´ location close to or within densely populated areas.

Despite the increased volume concentration to the very few hubs, we have not found any tendency showing that the number of ports handling containers is decreasing. Thanks to the efficient feeder services and dense networks in combination with the long term and general increase of container volumes, we would rather expect that the number of ports served by feeder services can increase.

Short distances to several and efficient container ports served by frequent feeder traffic means a good access to gateways into the global container transport networks. The alternative is fewer gateways, longer distances and probably increased road haulage. The development of train shuttles is positive, because rail is regarded as a sustainable alternative to truck transports. Such solutions also have an impact on short sea shipping.

Strategical implications

First, a short briefing about some general tendencies global container transports [5]. The development during the next few years is influenced by the slowdown of the economic growth in 2001 and 2002. At the same time, the corresponding reduction of the growth rate in seaborne container trade combined with an upturn in the supply of slot capacity has sent the container market into a recession. It will take at least two years and an upturn in the economic growth for the market to recover. The German beneficial tax system once again stimulated the investors to order too many container ships in the short term. The turnaround of the market can be rapid due to the relatively high growth rates in the demand for container shipment, which could be expected during an upturn in the economy and a similar slowdown in the growth of capacity.

The large numbers of operators on the market and the reduced influence of price collaboration in conferences make it unlikely that the operators and charterers on the market can match the changes in demand by a corresponding adjustment of the capacity by adapting ordering of new capacity in time or by short-term reduction of existing capacity.

In the long term perspective, the strong growth of the use of containers has made it possible to take increasing advantage of the system's economies of scale. Above all, the share of cost of the sea leg of the door-to-door transport has decreased substantially. A total sea leg representing 20-25 % of the total cost for a door-to-door shipment of containers means a contribution of approximately 0.5 % per year of rationalisation in the total logistic cost. The average fall in the long term freight rate is due to the use of larger vessels, increased co-operation, alliances etc as well as rationalisation in the other parts of the logistic chain. We expect this rationalisation to continue in the future although at a somewhat slower pace.

The main question is whether the actors in the terminal and land based part of the chain can achieve a productivity growth sufficient to improve the overall productivity and thereby contribute to a further drop in world logistics cost per unit. We also must emphasise that the market structure is becoming more and more complex due to its characteristics as a net of services that could be combined in a very flexible way to achieve further economies of scale.

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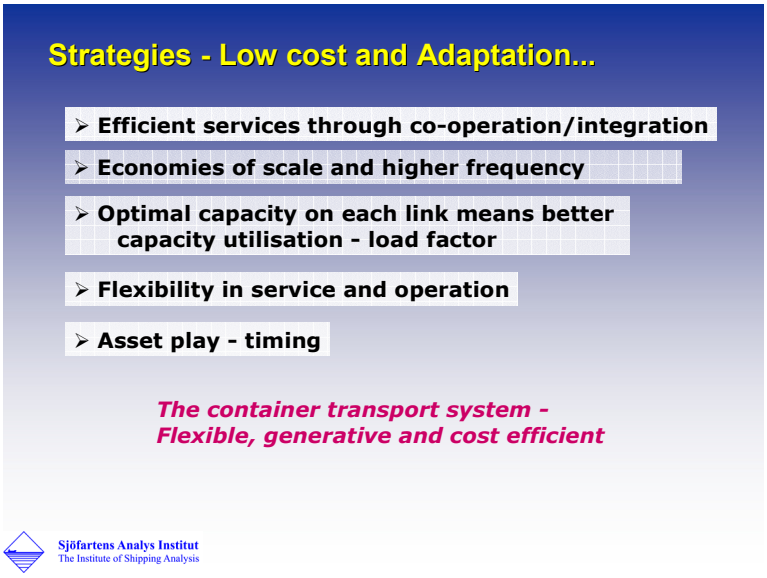
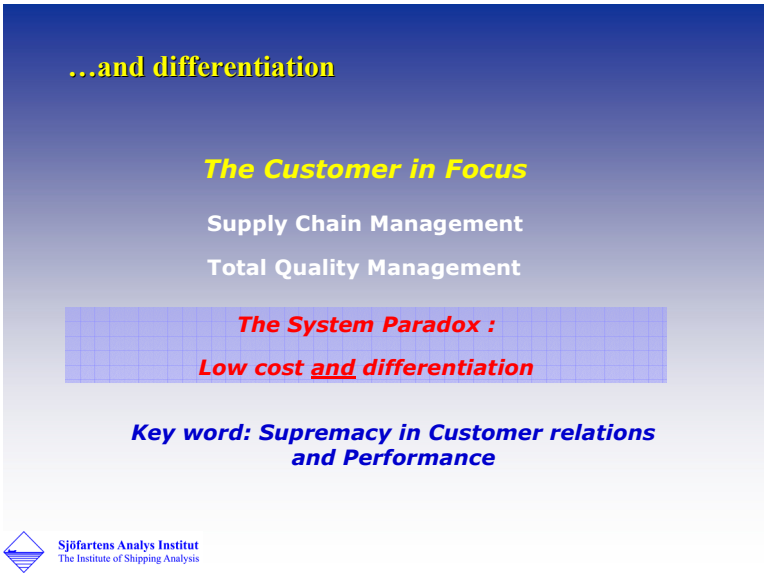
[5] From the report: *General Business Environment, Economy, Trade, Transports and Container Market Characteristics*

The feeder market and network strategies

The general strategies below can be implemented in various ways in the container transport market and its segments:

- Low cost. By using economies of scale and other means to achieve the lowest cost per unit.
- Differentiation. Market or product, e.g. far reaching development according to customer needs. Also building barriers against outside competition by customer integration or alliances.
- Adaptation, timing. To sell, buy or make other efforts to follow market cycles and changes of trends in the markets.
- A combinations of the above strategies i.e. low cost, high frequency, timing and easy access for the shipper to the services and information are the major criteria for future success.





A combination of strategies –low cost, adaptation and differentiation

A general conclusion is that the capability to implement a combination of the above strategies will determine the individual actors' competitiveness.

The perspectives we have to consider when discussing future strategy options for specific business segments or parts of these are:

- Business – scale and scope
- Time - medium, long term (short term not regarded when considering strategies)
- Geography (local, regional, global)
- Micro – meso – macro level i.e. individual players - the business/branch – the society

The general development of container volumes in the long term perspective is positive and nothing indicates a break in the trend. This could not automatically be regarded as guarantees for a safe and sound market development. The following factors have to be considered:

- A market adapted to the long term development with high growth rates in container volumes – a future with lower growth rates, but still a doubling of the volumes in absolute figures.
- Global and regional liner operators´ strategies and tactics – solutions for extracting productivity increases (costs/revenues) – the business has to be profitable in the medium and long term.
- Further investments in economies of scale combined with high expectations of results gained by this strategy.
- The container shipping segment works in no way in splendid isolation – players in other niches (shipping and/or logistic services) are also affected by /affecting the prospects for the dedicated container system capacity - increased complexity in evaluations of the dynamics and consequences of changes.
- Compromises needed for increased concern for public resources – and at the same time a society that is more and more depending on the transport system.
- Political and cultural systems, which have an increasingly penetrative power in the society.

The operators with capacity to carry containers in the region are numerous, but they are specialised regarding geography, service and capacity. Pure container transports is a liner traffic offering very high frequency, which necessitates volumes that are stable and large enough. The added value for the shippers is the availability of an open system -

irrespective of shipment size, with a continuous and well-defined service over time integrated in a global network of transport links.

The operators of feeder services are either dedicated to serve one specific shipping company or are open for any customer - but the primary customer for feeder services in both cases is the trans-ocean shipping lines, which offer a door-to-door transport to the shippers. Unifeeder and Team Lines are two of the largest feeder operators in Northern Europe and examples of independent operators – or so called common operators. Finnlines is through the acquisition of Team Lines a new part in this business, besides their well established European roro-traffic.

Unifeeder is specialised in container transports between all major North European ports as a feeder carrier and between European countries as an intra-European door/door operator. As a commercial feeder operator, UniFeeder offers comprehensive and efficient feeder services to all major container lines. The fleet amounts to about 30 modern container vessels with a capacity between 320 and 700 TEU.

Team Lines operates 22 container vessels with a capacity of 200 – 650 TEU per ship. Over 90% of the shipments are container traffic between the deepwater ports around the North Sea and ports in the Baltic and Norway. The Finnish traffic accounts for around one third of the Team Lines volume including transit traffic via Finnish ports for Russia. The majority of the ships are time-chartered, which provides the flexibility the company needs to adapt to variations in trade and demand for container carrying capacity over time according to Team Lines. Such flexibility is probably crucial due to the volatility in the Russian transit volumes.

Finnlines bought 68.2 % of Team Lines from its German owners in April 2001 and together with the former 31.8% ownership share, Finnlines now owns the company. According to Finnlines, the two organisations are kept separate since international feeder traffic and scheduled European traffic with roro services are such different businesses with different customers, cargo flow patterns and market situation. But, in monitoring the market situation and demand for transports and logistics from the Finnish industry, this in itself is regarded as a competitive advantage when marketing the feeder services to overseas lines.

The strategic goals are:

- Maintaining the market position in Finland-related liner services
- A stronger position in Russian freight traffic
- A stronger position in liner services connecting third countries in the North Sea and the Baltic area

The Finnlines group is also engaged in cargo handling and terminal operations for unitised cargo, i.e. trucks, containers and semi-trailers in Finland, St. Petersburg and Oslo.

Players on the same market – yes, but with several strategy options and ways of implementation.

We have put together some specific characteristics concerning strengths and weaknesses, threats and opportunities from the specific points of view in this project – to identify structures and tendencies in the North European container feeder market in the medium and long term perspective. That threats can also be opportunities is obvious.

In the short and medium term perspective, the individual players are stuck to the market. It takes time to alter the business concepts, especially in international liner traffic, which is open for all customers. International liner traffic demands a relatively large land organisation, a guaranteed stability in service over time to customers. It also demands more developed networks and communication links, more refined administrative systems etc. compared to other shipping segments that are more or less closed and dedicated to one specific customer or groups of customers with almost identical and very restricted demand for service beyond the port to port operation.

When finally characterising the maritime container feeder market and the general prerequisites for its players, we want to emphasise the following conditions:

Strengths

- Large volumes and a positive growth
- Frequent and reliable maritime links
- A dense transport network.
- Players as facilitators – enhancing the business opportunities for the customers and their customers i.e. the role as a trade motor.
- Closeness to the regional market – fast recognition of business opportunities
- Solutions for corrections of imbalances in container cargo flows.
- Flexible regarding ports of call - enhancing the network density.

- Rich supply of vessels for charter - flexibility in carrying capacity makes adaptation to variations in demand easier – cost control.

Weaknesses

- The role as a subcontractor to the global liner operators – certain loss of flexibility to act in the market.
- Dependency of the regional market and its fluctuations over time.
- Complex logistics – can also be treated as an opportunity.
- Limitations considering economies of scale.

Opportunities

- General trade growth with container friendly cargo and further containerisation.
- To find a balance between developing the regional container transport market without competing with the main contractors.
- More and local intermodal hubs with flows which are big enough to support a frequent feeder service and economies of scale.
- Fair competition between modes

Threats

- Problems in the long term to rely on a rich supply of ship capacity for charter, which has been stimulated by the German tax regulations for private investors. These regulations have been altered.
- Further concentration of flows at a regional level stimulated by national investments in land infrastructure.
- More and low cost players in the regional feeder market could result in deterioration of the market balance and loss of profitability.
- Concentration of flows to transshipment hubs outside NEB – need of redefining the business concept entirely.
- Development of fast and frequent rail feeder alternatives (cross border links) within NEB.
- Political measures that disturb the competition between transport modes e.g. non-harmonised charges for infrastructure use and environmental disturbances; investments in land infrastructure, which cause a substitution of maritime links to land transports (e.g. the Öresund fixed link with low charges and /or large scale rail infrastructure investments based on expectations to compete with maritime links).

Regarding the strategy options for the feeder market and its players in the future, we emphasise the need of a multi-strategy portfolio due to:

- Limited capability to use low costs as the main strategy because of the limitations in the scope of the business and also limited

economies of scale in the operation due to the focus on NEB regional transport of containers – the players have to adapt to variations in this market

- Increased pressure on productivity (costs and revenues) - as a service provider to the global liner operators
- Differentiation – to be a short sea logistic provider requires a highly customer oriented service regardless of the choice of intermodal solution
- Customer orientation and supply chain perspective – a promoter and a facilitator, develop marketing and communication, cooperation to achieve highly productive links with intermodal solutions.
- Further development of the port market – a port business that develops organisational structures and ownership conditions. The hubs attract supporting activities – clusters of large importance for the economic growth in the nations. These networks of services include layers of different supporting or related activities that are integrated in room and time, which demands knowledge, competence, perspectives and creativity.

The research in this project and comments on results

Regarding the limitations in this project, some are required because of the complex market structure, but others are not. Such unwanted limitations are related either to lack of data or the reverse – that the amount of data is huge.

Data about the ships engaged in the regional transports and their movements are available in different commercial databases, but these do not cover any information at all about the cargo. That is why we have built our own cargo database. Added to this is the absolute necessity to develop an efficient tool to be able to combine and analyse information from different sources with varying structures and regional coverage. A large part of the work with the database tool has therefore been focused on our needs to integrate data to be able to follow the development of the market and its characteristics in a consistent way over time.

At the same time, such a tool must be flexible and adaptable for varying purposes. For instance, we can now manage different regional aggregates in a flexible way – the entire region as an entity, parts of it or at port level. All this holds a growing complexity because of the large and rapidly increasing amount of data when different databases are to be combined. These have to be connected successively due to the huge amount of data and in a specific order to achieve correct figures.

But, we still have to live with the fact that we cannot follow transport chains and not actual capacity utilisation. Cargo information is deduced from port data i.e. loaded and discharged units, but such data are not connected to information about the specific transport capacity used for each shipment.

In a statistical context, the development within the port business reveals an increasing complexity. The "port" cannot any more be treated as a fixed entity and is not well defined by a geographical location. The business can in fact be distributed over a geographically quite scattered region. This implies also that variations in volume figures over time can be a result of e.g. organisational changes, which are not detectable in statistics.

In analysis of long-term structural changes, long time series and comparable data are crucial. The time period covered in this part of the report about maritime container feeder transports is limited by availability of reasonably comparable and complete data for the region. We cover the period from 1997 to 2000 with statistics mainly from ports and national statistical bureaus about the maritime container volumes. This is a rather short period, since a normal business cycle in shipping evolves over 6-7 years. This limitation is an example of unwanted restrictions but can be overcome in due time if the database can be updated continuously.

The region we cover includes 15 countries and in total about 850 ports included in Lloyd´s Voyage Record, ports that have been called by at least one ship during 2000. To be able to identify ports in the region with container handling, we have made an inventory of several sources as official statistics - national and Eurostat, port statistics, figures published by institutes and magazines and industry organisations. As a complement to the rather scattered figures we have sent questionnaires to 150 ports. The ports were selected either because they were not covered in national statistics at port level or that we missed volume figures for any of the years we wanted to cover.

None of these sources covers the whole region in a consistent way, which means that there is no check list, which can be used for evaluation of our result compared to the "real" truth of the matter. It has been surprisingly problematic to evaluate the total container volume in the region. The ports are a primary source for statistics about cargo volumes in maritime transports. Yet, the statistics from different secondary sources like national statistical offices, EU, industry organisations and associations etc. show severe discrepancies when comparing figures at port level.

For 103 of the 146 ports we have collected TEU-figures for the years 1997 – 2000, which together represent 99.7% of the total volume of 31 million container units in 2000 in the region. When comparing SAI´s with Eurostat´s data for 2000, we have found a discrepancy of in total 4.4 million TEU, whereof the Belgian ports represent 65%. In this calculation we have compared SAI figures from ports including empty units and Eurostat figures, which are said to exclude empty units. But when adding empty units, as they should according to Eurostat, the discrepancy *increases* to 6.7 million TEU. The number of ports, which show deviations, also increases. The total deviation represents about 20% of the total number of containers handled in the region.

Our initial conclusion was that the TEU figures varied due to the fact that some ports give figures including empty units and other excluding them. To be able to confirm this, we have been in further contact with the ports that represent the major deviation. No single and common cause could be found. The accounting of empty units is only one of several explanations. Others are differences regarding treatment of EU internal volumes, lift on/ lift off units versus roll on/ roll of units, conversion factors from units to TEU etc. But in some cases the ports could not find any other explanation than that some units seem to disappear in the transferring of figures between the statistical offices.

Further research

When we hear the statement – "the market forces manage it all, don't worry", we very much agree, but at the same time we also know that there is always a potential for doing things better. The complexity in the transport market and its underlying dynamics in combination with continuously changing conditions increase the demand for development of a range of tools and ways to identify market conditions and characteristics. In this context we have to remember that the transport market is segmented into a scale of different services, which in turn are more or less fragmented regarding specific activities performed as well as responsibilities. To this comes the society perspective, where we also have to consider the (total) dependency of a well functioning transport system – including an increasing concern for common resources.

In this context, our project findings contribute to the basis for all research – quantitative and qualitative methods and measures to analyse conditions in the shipping market from time to time. The work with the database tool developed here for handling and management of data also gives a generally applicable experience. Of course, such a tool can or shall never be entirely ready; there is always a need of continued work with maintenance (data), adaptation and completions e.g. for new regions.

As always, there is a never ending want list regarding better knowledge and methods for analysing the transport market from different perspectives as e.g. supply chains and underlying conditions and restrictions, capacity utilisation and recognition of inefficiencies – and the sooner, the better.

Structure and qualities

The maritime system is diversified into several shipping segments, with different demands on logistical refinement. The container transport system is only one of these segments, but regarding the container as a cargo carrier unit, it is flexible for all commodities and modes and there are in principle only physical restrictions for what is possible to containerise and not. A complementary qualitative approach to the market and the transport system as well as its bottlenecks would facilitate a comparison between different transport and logistical solutions in the region, which also includes intermodal options and network qualities.

Dynamics and potential for further rationalisation

It is important to analyse the transport system as a transport network, where links are alternative or complementary, connected in the hubs or other intermodal terminals. This structure is not in any way static and must be considered as dynamic, constantly driven by economical and qualitative considerations connected with a variety of transport demand and supply factors. The result is probably an even more diversified structure of transport chains and solutions, if the political or economical frame components are not disturbing the market forces. Tendencies within and prerequisites for the development of the regional transport system is also to a growing extent connected to the development within the globalisation of manufacturing and demand for a global perspective on transportation. The regional transport system can only to a certain degree be regarded as dedicated to transports within the region, when it includes a mixture of truly intra-regional transports and transport chains integrated in global systems.

Competition and/or inter-modality

In the Nordic countries, the sea feeder alternatives have a strong market position due to geographical conditions and infrastructure. Inland transport to the ports is mainly road haulage. Short distances to an efficient container port served by frequent feeder traffic means a good access to the global container transport networks since long distances for inland haulage are costly. The development of train shuttles is positive, because it is still regarded as a more sustainable alternative to truck transports. But it also implies an alternative to short sea shipping

in some transport relations. In a longer term perspective, freight freeways with rail in an east-westerly and north-southerly direction e.g. via south European transshipment ports, can become very efficient alternatives. This can result in new structures in the transport market in general and short sea shipping and the port market in particular, which is interesting to analyse further.

Conditions associated with railway system conditions and infrastructure includes a need of a further volume concentration to (very) few corridors and gateways. One question is if this results in an overall transport cost from shippers to the hubs that are in fact reduced. This should be compared with an already available efficient and dense network of maritime services connecting a multitude of nodes in the network. Also from a society perspective, this structure should be regarded as very flexible and cost efficient because it can relatively easily be adapted to variations in demand and last, but not least - without need of public investments.

Further development of the databases

A more specific issue for further work connected to this research project, is the adaptation of the databases also to other commodities and an enlargement of the region. This is not trivial due to the fast increasing amount of data and increasing complexity to connect and extract refined data from separate databases.

Briefing on the database tool and achievements

There are several purposes of the developed database tools:

1. Handle large amounts of data in a structured fashion
2. Provide a sound basis for complex analyses
3. Create a flexible environment that enables complex data extraction
4. Enable analysis of several domains like geographical regions, vessels, traffic and cargo flows.

The database tool is composed of several modules of different structure and origin. Some are commercially available databases and some are developed internally. The tool performs the following functions:

- It handles data from multiple sources:
  - An internal cargo handling database (SAI Cargo DB) with a separate interface for data maintenance.
  - Fairplay PC Register – a commercial database with detailed information on vessels
  - Ship movements from Lloyd´s Marine Intelligence Unit – a commercial database with data on vessel movements
- Processes the data separately for the domains listed above (geographical, vessels, traffic and cargo flows)
  - Each domain has its own data structure
  - All of the domains can be linked together through data relationships
- Generates several outputs where the domains are combined in different ways

Through this database tool, a number of achievements have been made:

- General solutions to specific problems
- Increased reliability
- Handles very large amounts of data. An analysis of this kind would be impossible to perform manually.

Today, the cargo database contains values for four years (1997 - 2000) and close to 150 ports. If the number of ports is increased to include other areas, such as the Mediterranean, or if more than one year is registered the number of rows in the database will increase significantly. For each activity value, a minimum of three rows is registered. The environment that is used (MS Access) can handle fairly large tables (0.5 million rows at least). The larger the tables, however, the longer it takes to process them.

Therefore, it may be advisable to do one or more of the following in the future:

- Keep separate databases for different years. This way, the size of each database will be kept to a manageable state.

- Convert to another database engine, like MS SQL Server or Oracle. A conversion to a high-grade professional database engine increases capacity and speed dramatically. The cost for introducing such an engine is however considerable.

This project is limited to container traffic in a specific region. However, the cargo database can handle any type of goods in any region. To run analyses on any domain, the query interface may need some small adaptations due to necessary delimitations. Some of the queries in the analysis database have conditions that are necessary to keep the number of rows in the set of results down. These conditions may change if the domain of analysis changes. An interface to easily change these conditions will be useful.

The management of data in the cargo database must be user friendly as well as flexible. There is a definite trade-off between these two properties. Because of this, two interfaces have been constructed:

- Batch interface.
    - The user defines an import filter that is used to import batches of data in another format, for instance Excel. The definition of the filter must be made once per import type.
    - The batch can be handled as one unit
    - The user can create a "template activity" for a region and then create a time series based on this template. Activity data for the whole time series can then be pasted from for instance Excel.
- Single item interface
    - Allows the user to add, edit and delete a single activity value. This interface is very flexible, but requires more knowledge from the user.

The development of the database tools (cargo database and query database) is not meant to stagnate. As the tools are used, needs for further enhancements will be identified. These needs will trigger new development cycles. Future development of the maintenance interface may include:

- Enhancements in defining import filters. A generic import function may be possible.
- More advanced batch-editing functions.
- Browsing and searching functions.

The maintenance interface is not intended to provide an advanced filtering mechanism, which is what the query database is for. There is, however, a need for basic navigation and search functions.

1 Introduction

1.1 Background

Previous research made by The Institute of Shipping Analysis (SAI) indicates a large potential for Short Sea Shipping container feeder systems in the future. One of the findings was that the rapid growth in trans-ocean container transports in combination with structural changes in the market has created economies of scale and a gradual lowering of costs per unit transported. This has caused the containerisation also of goods of lower value. Another effect is that container transport has become an economical alternative even for regional transportation within Europe. If the development continues, it is reasonable to assume that the economical competitive position of container and maritime feeder systems will improve in relation to trailer, train, RoRo and ferry based transports. This could lead to a strengthening of the Short Sea Shipping.

The rapid growth of road transportation with capacity problems and negative environmental impacts makes Short Sea Shipping a high priority research field within the EU. This has made manifest a lack of data and information, which has created a need for considerable work to build up knowledge about this market. At the same time, the strong growth of transportation within Europe necessitates continual rationalisation. This must be done in such a way that environmental effects can be contained in order to achieve the overriding EU goal of sustainable development.

The result is presented in three separate reports. The report "*General Business Environment, Economy, Trade, Transports and Container Market Characteristics"* presents detailed analyses of the global development and underlying driving forces.

This report about "*The North European Maritime Container Feeder Market*" includes a summary and concluding analysis about structures, tendencies and strategical implications. This is supported by the more detailed analyses in the following chapters comprising the specific research aspects, port statistics and discrepancies between sources (chapter 2); a short briefing about the tendencies in general market characteristics (chapters 3) followed by analyses of structures and tendencies in the regional feeder system based on a supply and demand perspective (chapter 4); and finally a presentation of the database tool and achievements regarding management of data for ship movements, fleet details and container volumes (chapter 5).

In the third and condensed report "Summary and Concluding Analysis", our findings about the global and regional container transport market, structures, tendencies and driving forces are put together.

The main objective in the project was to enhance the knowledge about the structure, competitiveness and driving forces in the port and shipping market for containers within the Northern Europe and Baltic regions. At the same time, it was most urgent to develop more efficient and reliable methods to quantify market indicators in physical terms. Available statistics are fragmented, not compatible or lacking e.g. about the demand for transport capacity and its geographical distribution.

The project goals therefore also include to:

- Evaluate data acquisition methods and sources together with quality aspects regarding statistics.
- Build a network of contacts as a valuable source of more information and basis for further development.
- Develop a cargo database for the region on a port level.
- Develop a database structure integrating cargo, ship movements and fleet data to be able to follow the development of market structures and trends in a consistent way over time. Such a tool is necessary to be able to combine data from different sources with varying structures. At the same time it must offer flexibility. This holds a growing complexity due to the large and rapidly increasing amount of data when different databases are to be combined.
- Develop indicators for identifying structures.

1.2 Methodology and limitations

Analytical methods have been the basis for identifying and evaluating structures in the maritime container transport market. This is of course a result of the main objective with the project - to develop quantitative measures and a database structure for management of such data.

The level of analysis lies between company and society level, i.e. micro and macro level. We have preferred to view the regional maritime feeder concept, from a general demand/supply perspective. The micro-perspective, or looking at the market from specific actor's perspectives, could not have given us enough quantitative data to support general conclusions about the market structure. But still, it can be a way for further deepening of the analysis to include also logistics and strategies for different players in the market.

The fact that we have delimited the region to northern Europe does not mean that it is treated as an isolated market. The regional container feeder system is a true part of the global one. The feeder system has its major business within the regional boundary, serving the trans-ocean liner traffic calling the very few large hub ports. But there is no strict geographical limitation – it is more a question of strategies and economies of scale.

The regional feeder system could be treated as one system, with equal prerequisites in a homogenous market. But we can very well suppose that there are several and partly different segments within the regional market, in geography and/or business differentiation. These differences can be a basis for further development within different parts of the region – but the other way around is also possible, with a further expansion within the specific niche, which is to feed containers to hub ports for global services.

Regarding the limitations in the project, some are wanted because of the complex market, but others are not. Such unwanted limitations are related either to lack of data or the reverse – that the amount of data is huge. In chapters 2.2 and 5, this is penetrated further.

Data about the ships engaged in the regional transports and their movements are available in commercial databases, but these do not cover any information about the cargo. Information about the transport links from origin to destination, volumes and capacity utilisation is also lacking. Cargo volumes and cargo characteristics must therefore be deduced from port data about containers handled. Such data are not connected to information about the capacity used for the cargo transports.

Data and statistics about cargo volumes and the existing transport capacity have been collected from national statistical bureaus and the EU combined with data from commercial publications and databases. As a complement we have sent questionnaires to a selection of ports. We have not been able within the project frames to make a detailed analysis of the principles for container volume reporting in each port, but for ports representing the largest differences between sources, we have made extra enquiries to find out possible causes (chapter 2.2.5).

The port market is normally differentiated regarding cargo segments handled, which mirrors the local industry and hinterland structure. Very few ports are dedicated for container handling only. We have not further penetrated other cargo segments in the “container ports” or the large number of ports in the region handling other cargo segments. But these segments also imply a potential for further containerisation, which is

discussed in the report "General Business Environment, Economy, Trade, Transports and Container Market Characteristics".

Container transports in the global networks are intermodal, which means movement of goods in one and the same loading unit, which uses several modes of transport successively without handling of the goods itself when changing modes. [6] Unfortunately, we still have to reject the ambition to introduce more refined aspects regarding the capacity and concepts used due to lack of consistent public data. The focus here is on the maritime capacity – in a global and regional perspective. For further regional studies, it is of interest to find ways to characterise also the existing transport network for containers and the dynamics behind its development.

2 Research and comments on results

2.1 A general research concept/model

Through the years, SAI has developed a concept/model for the strategic business environment and shipping markets; a model that is valid for any shipping market research field (Figure 1). The model works as a general checklist for the research work; it includes several dimensions, which have to be considered before any further analysis can be made:

- *Research conditions*
  - Geography/Distance/Cargo type
  - Time perspective
  - Methodology and data collection
- *The transport system delimitations and parts* with influence areas; all determinants of the development of the general or specific transport market.

[6] Definition according to ECMT (European Conference of Ministers of Transport) and the European Committee for standardisation (CEN).

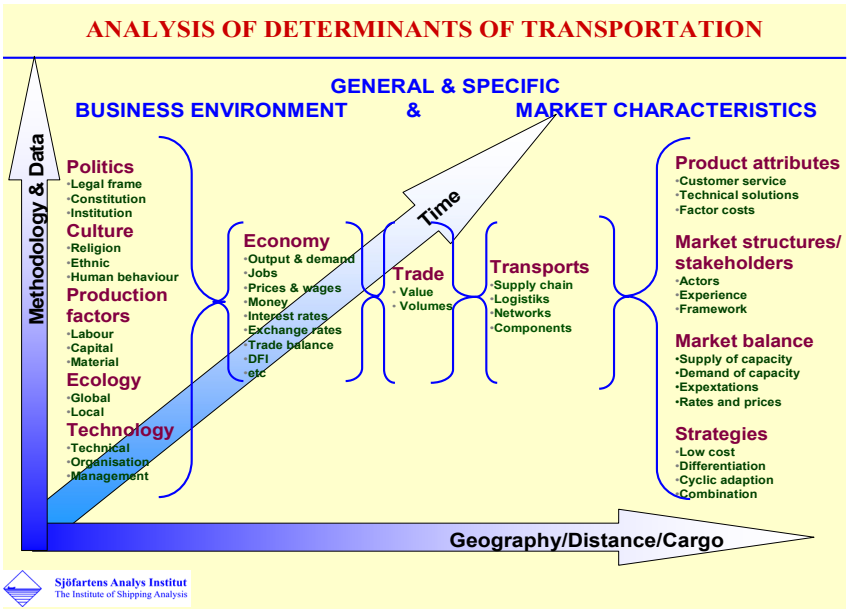


Figure 1: SAI Research Model: Determinants of Transportation

The concept takes into consideration the dynamics and dependency relations within this research field, which means that changes in any part of the system also affect other parts.

2.2 This specific project – approach and comments on the research

The general research model is also the basis for the approach and contents in this project. But in details, we have to accept an adaptation of our goals to the specific characteristics and limitations in this project. These are partly due to restrictions in statistics, but also economical frames. The project design as in Figure 2, is built up by the following parts:

- Identification of research premises and concept.
- A database structure allowing a mix of data from external and internal databases such as:
  - Databases over ship movements and port calls from LMIU [7]
  - Databases with detailed information about the world fleet from Lloyd´s Register - Fairplay.
  - A new cargo database with data about container volumes at port level, which required:

[7] LMIU - Lloyd´s Marine Intelligence Unit (former LMIS – Lloyd´s Maritime Information Services)

- Identification of data structures and management routines for integration of data as well as for handling of different regional aggregates – the entire region as an entity, parts of it or at port level.
- Successive tests of the database function as well as the data validity and reliability. Determination of the specific queries - data search functions for quantifying demand for and supply of container transport capacity in the region.
- Analyses of the business environment - the global trade and container transport development as driving forces for the regional container transport system (in a separate report).

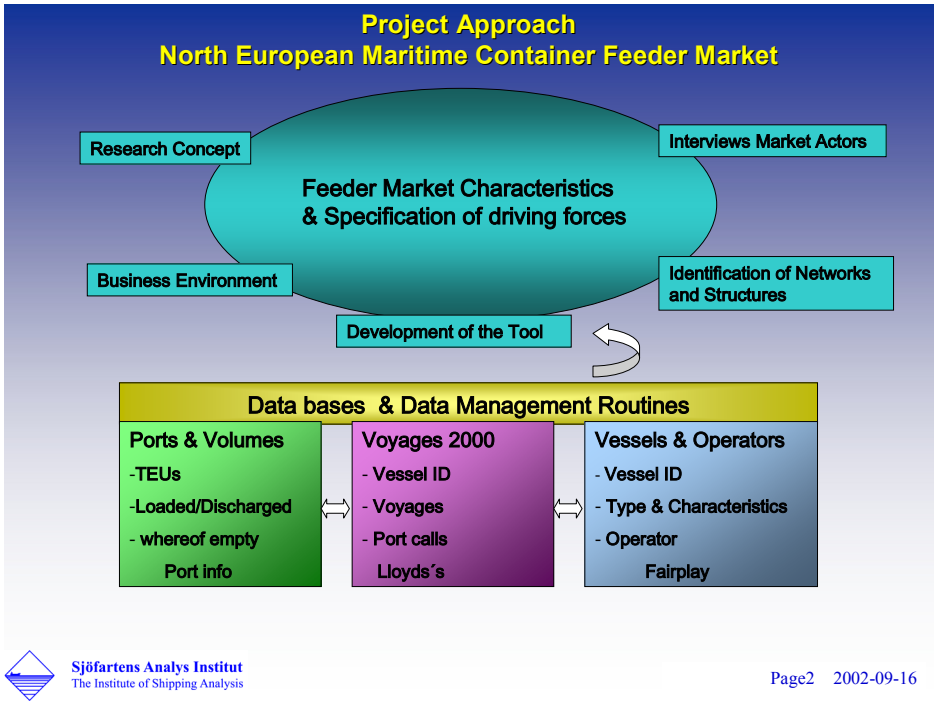


Figure 2: Project approach

The need of well functioning database structures and data management routines is due to the fact that we have to integrate totally different databases (on cargo, ship movements and fleet details). We also had to solve the problems connected with management of different kinds of data and that these had to be connected successively and in a specific order. The reasons are the huge amount of data and that data have to be combined in a specific order to achieve correct figures. When analysing the number of vessels engaged in the traffic on the different subregions, we also have to manage the possibility that a vessel is moving between different subregions. It is therefore not correct to aggregate the number of vessels over regions – every vessel has to be identified.

2.2.1 The region surveyed

From a geographical point of view, the region we have defined is North European and Baltic region (NEB region) with 15 countries (Figure 3). This region is well defined as to geographical boundary and it also represents a market or operating region for Short Sea Shipping. At the same time, this region is not at all homogeneous when regarding frame components and characteristics of the shipping market.

Figure 3: North European and Baltic Region (NEB)

We have preferred to keep a high flexibility in the database structure regarding choice of different subregional levels – i.e. the entire region as an entity, transnational subregions (Figure 4) and at country or port level.

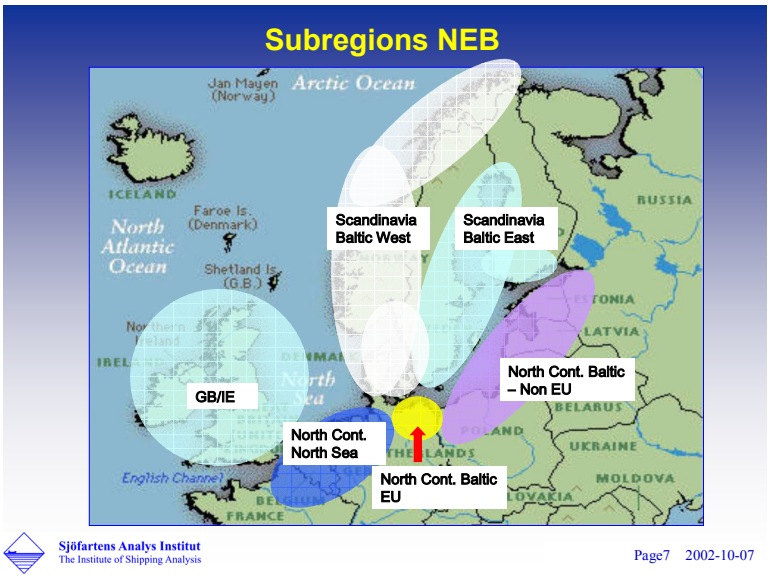


Figure 4: Defined subregions in NEB.

In Table 1, the number of regions and aggregates are specified per source. These have to be perfectly matched to be able to allow combinations of data from different sources. Some of the variables are possible to aggregate and others are not, since it would result in double-counting errors.

In total, the database structure now allows analyses of cargo, ship movements and fleet for 146 container ports and 25 different regional aggregates. If Eurostat data had been used instead, we would have been restricted to ports in the EU countries. This would have reduced the number of subregions, which in turn had restricted the possible analyses of differences in regional characteristics.

Table 1: Regions in the different databases

Regions	**Regions and subregions**	**No. of regions**		
		LMIU 2000	**SAI Cargo Database**	**Eurostat**
Regions - port level				
Ports [1)]		***(644)***	***146***	***92***
Regions - country level				
BE	1	1	1	1
NL	2	1	1	1
DE (North Sea / Baltic Sea)	3 (3.1/3.2)	1	1	1
GB or UK	4	1	1	1
IE	5	1	1	1
DK	6	1	1	1
SE (Baltic West / Baltic East)	7 (7.1/7.2)	1	1	1
FI	8	1	1	1
NO	9	1	1	
IS	10		1	
RU Baltic Non-Eu	11	1	1	
EE Baltic Non-EU	12	1	1	
LT Baltic Non-EU	13	1	1	
LV Baltic Non-EU	14	1	1	
PL Baltic Non-EU	15	1	1	
Total regions - country level		***14***	***15***	***8***
Regional aggregates				
A Scandinavia	6, 7, 8, 9	1	1	1
- A1 Scand/ Baltic West [2)]	6, 7.1, 9	1	1	1
- A2 Scand/ Baltic East	7.2 , 8	1	1	1
B North Continent	1, 2, 3, 11, 12, 13, 14, 15	1	1	
- B1 North Sea [3)]	1, 2, 3.1	1	1	1
- B2 Baltic EU [4)]	3.2	1	1	1
- B3 Baltic Non-EU	11, 12, 13, 14, 15	1	1	
C UK/IE	4, 5	1	1	1
D North Europe and Baltic Region (NEB)	All countries			
- D1 NEB	excl. Iceland	1	1	
- D2 NEB	incl. Iceland		1	
Total regional aggregates		***23***	***25***	***14***

[1)] From LMIU database: The total number of ports and terminals in the north European and Baltic Region 2000 defined as north of latitude 47, longitude less than 32 east and 12 west).
SAICargo data: Ports in the region with container handling 2000.
EUROSTAT database: According to Directive 95/64/EG, statistics are collected for ports handling more than one million tonnes or 200 000 passengers.
[2)] Scandinavia - Baltic West/Baltic East (A1/A2): Border line between the Swedish south coast ports Ystad and Trelleborg.
[3)] North Continent North Sea - German North Sea coast ports
[4)] North Continent Baltic EU - German Baltic Sea coast ports

2.2.2 The time period

The time period covered in this report is limited to 1997 – 2000. This is a rather short period, since a normal business cycle in shipping evolves over 6-7 years. In analysis of long-term structural changes, long time series and comparable data are crucial. Another situation is e.g. if the purpose is to find turning points in the development, where the added value can be gained if the processing of data is more or less on-line with the development. But this needs a lot of home-work also with the historical development to be able to separate short term fluctuations from true turning points.

The limitation is an example of unwanted restrictions, but can be overcome if the database is continuously updated.We initially had the goal to collect consistent data per port and year from at least 1995 to 2000, but decided to start 1997 after having studied the available sources. We expected that too many ports would be falling off from the selection otherwise due to our wish to have detailed and comparable data over time and between ports. The maritime statistics in the EU-countries has been going through a transition period during these years and this affects the possibilities to compare figures before and after the implementation of the EU-directive.

For 2000, we have also included port statistics from Eurostat to be able to check our own figures, but also regarding functionality i.e. if Eurostat can offer reliable and more frequent data already today.

2.2.3 Defining the "feeder" concept

The feeder concept is a diffuse market, without a sharp delimitation to other shipping segments, geographical regions or transport modes. The concept is a result of the development within the global liner network into a hub and spoke structure, mainly to achieve benefits from economies of scale in the deep sea links but probably also in terminal handling. This means a concentration of calls and volumes to fewer ports combined with a network of regional feeder links for distribution/consolidation of volumes to the hubs and deep sea links. This system is therefore an integrated part of the transport chain from door-to-door.

The feeder function is not transport mode specific – it could be performed entirely on land or with intermodal solutions depending on geographical, infra-structural and economical factors but the feeder concept is usually associated with the maritime part of the regional distribution of containers to and from hub ports. We have not had the

goal to quantify feeder volumes by land transport modes, since this part of the market is in almost total darkness regarding statistics.

The commodity shipped can and is mostly regarded as the container itself. But, we would prefer to separate the container function as a type of equipment from the specific cargo carried – if we could. The fact that we treat the container as the "commodity", which represents a shipment of any kind of box shaped cargo is related to the availability of data; today about unit size, cargo weight if loaded and at best also empty units handled. The specific cargo stuffed in a container is not identified with other characteristics than a ton figure. So, we cannot yet connect data about specific commodities to the use of cargo carrier units. The same is the case with commodities and transport capacity used. This means that measurement of the actual capacity utilisation and changes over time is a non-reachable goal today.

The feeder system has its major business within the regional boundary, serving the trans-ocean liner traffic calling the very few large hub ports. But there is no strict business limitation – it is more a question of strategies and potential for further economies of scale. All container transports, also the truly intra-regional, can be regarded as a potential also for feeder transport services, irrespective of mode. Therefore, in this report the sea feeder market includes maritime containers transshipped in the regional hubs and intra-regional units. Another aspect is that we cannot separate intra-regional from transshipped units in the statistics.

Therefore, the demand for container transports can have its origin in:

- Direct intra-regional cargo - truly intra-regional maritime cargo, where the geographical cargo origin and destination is within the region. The region is in this report defined as the North European and Baltic (NEB) region.
- Direct external cargo, where the cargo's origin or destination is outside the region and the cargo is shipped directly to destinations outside the region.
- Or, as a third possibility – transshipment cargo. The cargo origin and/or destination is outside the region, but the cargo is transshipped between successive maritime transport links within the regional boundary.

The goal, although adapted to data restrictions, is to connect container volumes in the region and parts of it with the fleet engaged in container transports (Figure 5).This includes to:

- Identify the ports in the NEB Region handling containers, the volumes handled and the development over time.
- Measure vessel movements, capacity and frequency to and from these ports by vessels with container carrying capacity and more specific - vessels dedicated for container transports (cellular vessels).
- Identify other characteristics of these vessels in different regions (capacity, size, operator, flag etc.).
- Analyse regional structures, i.e. aggregations of indicators for different parts of the region.

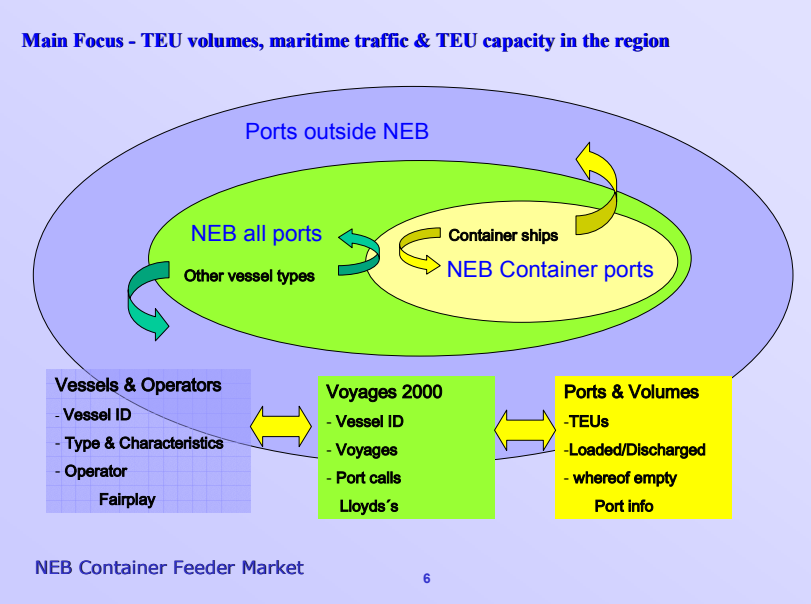


Figure 5: Main focus - Regional maritime container flows and transport capacity in NEB.

The subregions we have chosen to work with are based on our experience from earlier studies. We know that the regional shipping market is differentiated into several segments, each with somewhat different characteristics depending on the specific subregion analysed. The fleet engaged mirrors a mixture of factors, not only the mix of commodities shipped and volumes but also frame components and more qualitative aspects. Regarding the container segment, it is probably the most standardised one, but the delimitation to other shipping segments is not sharp and statical. The segmentation is also influenced by the market forces and underlying dynamics which is the major reason for development of better tools to identify structures.

2.2.4 Lots of data but also black holes

The development within foreign trade, seaborne trade, port throughput, transport activity or demand for transport capacity is closely related, but neither models to correlate these factors nor measurements are in any way generally applicable, standardised or compatible.

More reliable and efficient ways to follow the development of physical cargo flows and the consequent demand/supply of transport capacity is therefore most wanted. Depending on cargo characteristics and trade relations, the demand for a specific transport capacity differs. So, we also want to identify differences in the demand for more qualitative properties regarding this capacity and especially to follow the development over time.

The structure of flows based on cargo values can show large differences compared to the one measured in cargo tonnes. The value of trade is affected not only by the degree of refinement of the products traded or the productivity increases (or losses) but also currency relationships and inflation. To be able to identify the demand for transport capacity and its qualitative properties, it is necessary to develop more refined indicators.

If we accept total port figures as indicators of cargo flows, we also have to accept that aggregations include a certain part that is double counted. The export from one country to another in a trade relation is accounted for as export in the first country but also as import in the second country. So, cargo volumes handled in the ports cannot be considered equal to demand for transport capacity. This is relevant only in analyses of the port business, since the cargo is actually handled at least twice – when loaded in one port and unloaded in another port. If the cargo is in transit via a third country in the region e.g. transhipped between maritime links, the total regional port throughput can be even bigger than twice the cargo quantities actually transported.

Another example is how transit and domestic volumes are treated. Figures for the value of foreign trade do not include transit or domestic cargo, but figures for cargo volumes can. Transit volumes are sometimes specified and in other cases not.

So, accumulated regional port throughput figures do not measure demand for transport capacity and should be at least halved for this purpose. This will be a very rough estimate though, since the external cargo i.e. passing the regional boundary has to be separated from the intra-regional one. Cargo volumes, for which the port of destination or port of origin is outside the region, are not double counted, since

volumes handled in external ports are not included. But such a division is not available in the statistics and that is why we cannot derive a true figure for the share that is truly intra-regional maritime, external cargo and transshipped cargo.

The port statistics according to the EU-directive published by Eurostat could offer a substantial improvement in the capability to undertake more detailed research in structures and tendencies within Short Sea Shipping. The only obvious limitation today is that only EU countries are reporting. But the problem to map the cargo flows, i.e. the real cargo origins and destinations and the links connecting these is not solved yet. Statistics about the physical transport chain is still lacking entirely.

In Sweden, SIKA and SCB are developing statistics, where the transports are followed up via a questionnaire to a selection of shippers. The result of this project will be published in October 2002. The statistics will give information about the real origin and destination for the cargo together with information about the commodity, if unitised or not as well as the transport mode. This will bring us a large step forward but not entirely to our goal, since information about the maritime link structure (for transshipment cargo) is not available. This would of course be of particular interest in analyses of the demand for maritime transport capacity, capacity utilisation and port capacity.

Such analyses have to be either estimated or deduced from a variety of different sources, which means a growing problem with compatibility and reliability. The demand for transport capacity has to be based on a range of assumptions regarding modal split, commodity characteristics, origin /destination, capacity used (days of operation, distance, speed, load factor, port/terminal time, idle time etc) balance of flows, price and cost factors etc, all varying from time to time and from flow to flow. This reveals the complexity behind every attempt to analyse the demand for transport capacity in a general context.

2.2.5 The Match Game – Find the right port and the right volume

To be able to identify ports in the region with container handling, we have made an inventory of several sources as official statistics - national and Eurostat, port statistics, figures published by institutes and magazines and industrial organisations. None of these covers the whole region or individual countries in a consistent way, which means that there is no “check list”, which we could use for evaluation of how much of the real volumes we have found.

To derive a gross list of ports, which could possibly have handled containers, we have also searched ports called by container vessels

according to Lloyd´s (LMIU). But a number of ports with container handling according to the port statistics have not been recorded with calls by container ships. This is probably due to the great number of other ship types calling the ports (i.e. non-cellular, but equipped with capacity to carry containers). We have also found ports without container handling being called by ships with container carrying capacity.

The region we cover comprises 850 ports in Lloyd´s, ports which have been called by at least one ship during 2000. Of these ports, 644 are reported with calls by a ship with container carrying capacity and 320 of these calls by a pure container vessel. But which of these ports have actually handled containers? We can not identify the vessels which have carried containers, since available data do not include any information about this. The port list was therefore compared with container statistics from several sources and we were down to 219.

2.2.6 Final port collection

2.2.6.1 Questionnaire

As a complement to the rather scattered figures we selected 150 ports to which we sent a questionnaire. These ports were selected since figures were lacking in national statistics or we had not complete volume figures for the years we wanted to cover. The variables we have collected information about are outbound and homebound TEU [8], tonnes in containers, empty containers and distribution on 20 feet, 40 feet and other unit sizes.

We are now down to 146 ports, which have handled containers during 2000. Eurostat statistics comprise in all 92 ports with container handling. 62 of these ports we had covered in the database, but not the other 30, which we have incorporated into the cargo database. To these we have figures for another 10 EU-ports not represented in Eurostat plus 45 non-EU ports. Some of the Eurostat ports recorded with container handling can hardly be classified as container ports, since the container volumes are insignificant, but are represented in Eurostat due to the criteria regarding total tonnes or passenger throughput (commented in 2.2.6.2). For instance, large bulk ports with one container handled are represented, but not ports with less than one million tonnes irrespective of number of containers.

[8] TEU: Twenty foot Equivalent Unit

Table 2: Ports covered in SAI Cargo database – and questionnaire ports

Port collection	No. of potential ports	Quest. ports	Quest. answer quantities	Quest. answer "qualitative"	Ports with cont. handling
SAI and Eurostat ports	62	53	26	24	61
SAI EU ports (not Eurostat)	10	8	6	6	10
Eurostat ports	30	14	4	1	30
SAI: Non-EU ports (not Eurostat)	70	40	12	9	45
Other potential container ports [9]	47	35	16	1	0
Total collection	219	150	64	41	146

64 ports have answered with volume figures. 41 of these have also answered the more qualitative questions about hinterland and existing projects and plans. The form is enclosed in Supplement 1: Questionnaire form.

For 103 of the 146 ports we have collected TEU-figures for the years 1997 – 2000. These ports together represent 99.7% of the total volume of 31 million container units (including empty) in 2000 in the region [10]. For each of the other years, this selection represents at least 99.2% of the volumes. The 34 ports, for which we miss figures, together have a maximum share 1998 of 0.8% or 200 000 units, whereof 120 000 are handled in the German ports Kiel, Sassnitz and Emden and another 17 000 units in Kaliningrad. The rest is distributed over 30 ports.

2.2.6.2 Eurostat

The statistics we have requested from Eurostat, the statistical office of the European Commission, cover container volumes for the year 2000 for ports in eight North European countries (Table 1, page 32). According to the EU Directive [11], the Community collects quarterly reports from ports with a total throughput of at least one million tonnes or 200 000 passengers. Ports with less volume leave yearly figures for total cargo gross weight and/or number of passengers. In total, 92 of the ports are exceeding these limits and have reported container handling during 2000.

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[9] Total collection and "potential" ports: Described in 2.2.5

[10] According to SAI figures

[11] Council Directive 95/64/CE of 8 December 1995 on statistics relating to the carriage of goods and passengers by sea.

Variables covered are homebound and outbound number of loaded and empty TEU, cargo gross weight as well as country of "origin" and "destination". We can also identify export port combined with country of discharge and vice versa for import. Port-to-port figures are not public. It is important to notice that the origin for homebound cargo is the country of loading (destination is the country of discharge for outbound cargo), which is not the same as the true cargo origin and destination. In global container transport systems for example, the container units are to a certain and increasing extent transferred between different sea links during the transport. This means that a container loaded in Helsinki destined to Japan but feedered via Hamburg, is counted as export from Finland to Germany in the statistics. When the container later on is loaded on the trans-ocean vessel destined to Japan, this is counted as export from Germany to Japan. This means that we cannot separate containers with their true origin in Germany from containers originating in other countries.

According to Eurostat, the figures for 2000 are more reliable than for earlier years due to the three-year period allowed for adaptation to the directive. Therefore, we have only collected statistics from Eurostat for this single year.

The statistics are a valuable source for deeper analysis of cargo flows in the future, but there still remain some question marks, that we have to leave to the national statistical offices.

2.2.7 Comments on sources and reliability

It has been surprisingly problematic to evaluate the total container volume in the region. The ports are a primary source for statistics about cargo volumes in maritime transports. Yet, the statistics from different secondary sources like national statistical offices, the EU, industry organisations and associations etc. show severe discrepancies when comparing figures on a port level – if available at all.

Table 3 shows the ports connected with the major part of the discrepancy between SAI and Eurostat figures. Eurostat has recorded a TEU figure, which is said to be containers with cargo i.e. empty containers are not included. This means that the figure for total handled TEU should be derived through adding empty containers to the TEU figure.

When comparing SAI figures with Eurostat´s, we have found the following discrepancies:
- SAI figures *including* empties compared to Eurostat figures *excluding* empties; results in a discrepancy of in total 4.4 million TEU, whereof

the Belgian ports represent 65%. That the SAI figures are larger is natural.
- However, when empties were added to the Eurostat figures, as they should according to Eurostat, the discrepancy *increased* to 6.7 million TEU. So do also the number of ports, which show deviations. For six of the specified ports, the discrepancy decreased. But at the same time, 10 other ports showed deviating figures. The total volume deviation represents about 20% of the total number of containers handled in the region.

Table 3: Comparison – SAI figures versus Eurostat

Ports		SAI minus Eurostat figures Diff. TEU	Share of tot. diff.		Diff. TEU (empty added)	Share of tot. diff.
Antwerpen	+	2 342 949	52.4%	+	1 841 694	27.4%
Zeebrugge	+	552 912	12.4%	+	426 401	6.3%
Bremen/Bremerhaven	+	108 888	2.4%	-	266 069	4.0%
Duisburg	+	168 337	3.8%	+	147 593	2.2%
Hamburg		0	0%	-	542 340	8.1%
Aarhus		0	0%	-	82 954	1.2%
Felixstowe		0	0%	-	528 257	7.9%
Liverpool		0	0%	-	109 428	1.6%
London		0	0%	-	149 490	2.2%
Medway		0	0%	-	89 267	1.3%
Southampton		0	0%	-	302 196	4.5%
Dublin	+	930 679	20.8%	+	618 068	9.2%
Cork	+	91 781	2.1%	+	68 941	1.0%
Rotterdam	+	21 233	0.5%	-	858 862	12.8%
Goteborg	+	33 131	0.7%	-	129 165	1.9%
Helsingborg	+	75 760	1.7%	+	75 586	1.1%
Total +	+	4 325 670	96.8%	+	3 178 283	47.3%
Total -	-	0	0%	-	3 058 028	45.5%
Total difference 16 ports (absolute		4 325 670	96.8%		6 236 311	92.7%
Comparison 61 ports						
Totalt difference - SAICDB values higher	+	4 457 682	99.7%	+	3 236 526	48.1%
Total negative = SAICDB values lower	-	12 135	0.3%	-	3 489 628	51.9%
Total gross diff.		**4 469 817**	**100%**	+	**6 726 154**	**100%**

Our initial conclusion was that the accounting of TEU figures varied because some ports give figures including empties and other excluding. To be able to confirm or reject this as the whole explanation, we have been in further contact with the ports that represent the major deviation. Their explanations are described in short.

- Antwerp - Figures from Eurostat come from Statistics Belgium. The basis is an attachment to a customs form (for ro-ro and containers), which is only for statistical purposes. This means that nobody is obliged to fill out that form, which can explain a great deal of the

difference. But the direct effect is that these figures do not include intra-European volumes (e.g. the feeder volumes). When national borders disappear within the European Union, very important documents are abandoned. Good for the trade - but a valuable source for statistics is lost.

- Zeebrugge – Similar answer is expressed as by Antwerpen; an informed guess from the port is that the difference is caused by a lack of the intra-European trade.
- Duisburg – Contacted Eurostat after our call; confirmed that Eurostat only has figures for one of a large number of traffic connections. The rest of the figures have disappeared somewhere in the communication via the German national statistics authority to Eurostat.
- Dublin - The discrepancy is most likely due to the fact that Eurostat figures for this port only include containers by lo-lo vessels. If containers handled to and from ro-ro vessels are included, the figures are nearly identical.
- Cork - Delivers statistics electronically to the national statistics authority for onward transmission to Eurostat. But container volume figures from Eurostat statistics are still less than 50% of the official statistics and this of the port. No explanation like for Dublin can be found.
- Helsingborg – No explanation is found. Helsingborg delivers statistics electronically from the invoicing system to the Swedish Central Bureau of Statistics for onward transmission to Eurostat. Swedish Ports´ Association also gets figures from Statistics Sweden, but these figures are almost identical to the port's own.

We must conclude that there are several and totally different reasons for the discrepancies we have found. But in some cases, the transmission of data, irrespective of means, seems to fail somewhere in the link between the statistical offices.

2.2.8 Port indicators – yes, but are ports true fix-points?

When summarising the result we can conclude that although the ports are the primary source for all these statistics, there are large discrepancies between the secondary sources. The total container volume for the 62 EU ports, which we can compare with Eurostat figures, is about the same, but on a port level we have found a total deviation of close to 7 million TEU or 22% of the total regional volume according to SAI figures from the ports. Besides the problem with empty containers, there are also other sources of discrepancies, which

we found out together with some of the ports – but for other ports no explanation was found at all. This means that a more thorough penetration of sources of errors is necessary.

The work that has to be done to update the cargo database continuously could be limited when the basis for Eurostat statistics is truly harmonised between the reporting ports. If it is possible to solve the problems, Eurostat can provide statistics that is very suitable for deeper analysis of the major container flows in the region. Of course, the limitations to include only EU ports will remain until the external ports in the Baltic region are incorporated in the Eurostat statistics.

It is not obvious that the value of correct statistics for different stakeholders is large, but we can assume that the value of incorrect statistics is much less. The accumulated costs for the supply of statistics, all links included, could motivate a temporary checking procedure to reach the goals behind the harmonisation of statistics. The EU-directive is quite clear in defining the variables, which should be reported and yet there are deviations that are considerable. It seems to be necessary to try a temporary feed back process of data back to each port from Eurostat via national statistical offices to solve the problems.

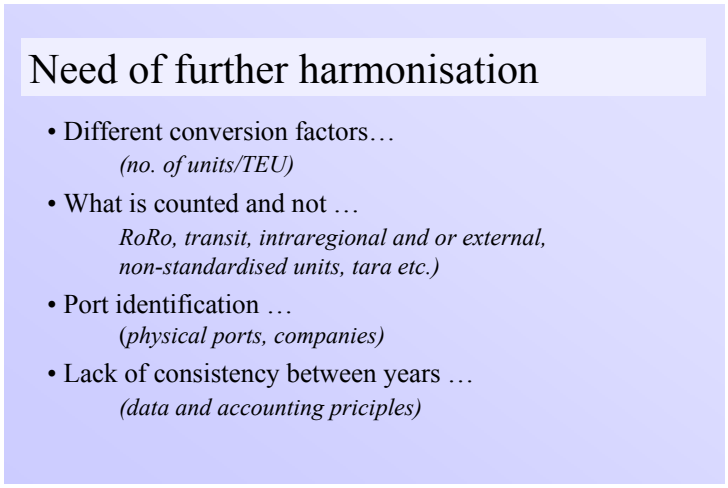


Figure 6: Need of further harmonisation

Figure 7: New challenges

Another type of complications in a statistical context is that a "port" cannot any more be treated as a fixed entity and is not well defined by a geographical location. The port business develops, which means that a port could include a mixture of organisations and ownership conditions. The business itself can in fact be distributed over a geographically scattered region and the service can be differentiated in several ways. This implies that variations in volume figures over time can hold also other aspects like e.g. organisational changes, but this is hard to deduce from public statistics. If the port names (and their geographical position) are not identical over time, they will show up as "new" ports.

Container feeder transports could be carried out by each transport mode – as a single operation or as an intermodal solution, where at least two modes are used. In the port statistics on maritime cargo, a cargo unit is counted when loaded on and discharged from a ship, but not from rail- or road cargo carriers. When comparing the two alternative link solutions in Figure 8, it is obvious that when there is a shift e.g. from sea feeder to land "feeder", two units "disappear" from the regional transport market (one in the port of loading and one in port of discharge) in the statistics.

When looking at variations over time in the demand for maritime transports, we can not really know if this is caused by a shift to land transport modes or a true change in the general transport demand. Thus, if every cargo unit handled in a port was counted and registered with at least the transport mode and not as today only when loaded/discharged from a ship; we can follow the dynamics in this sense in a better way. If we escalate our ambitions also to include data about transport chains, every container and its contents (commodity) must be registered with a unique identity together with information about the successive activities from door to door (transshipments, mode, place, date etc). (Figure 9)

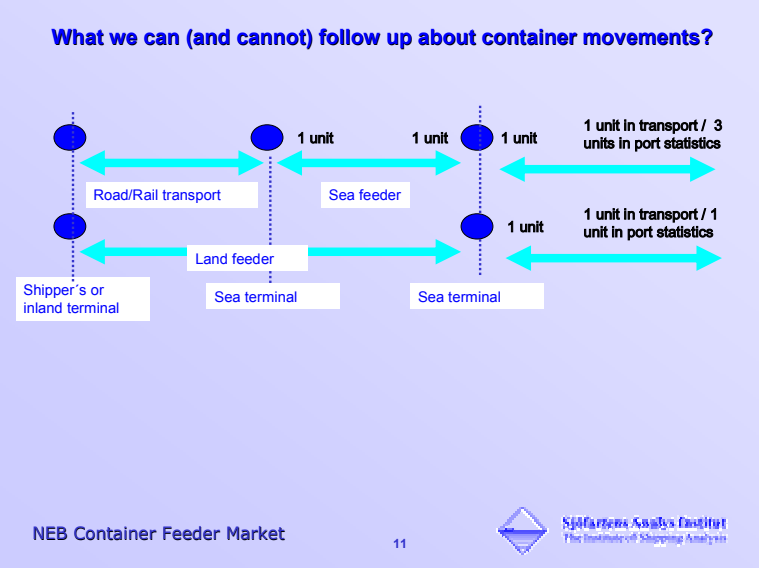


Figure 8: Measurement of container movements today

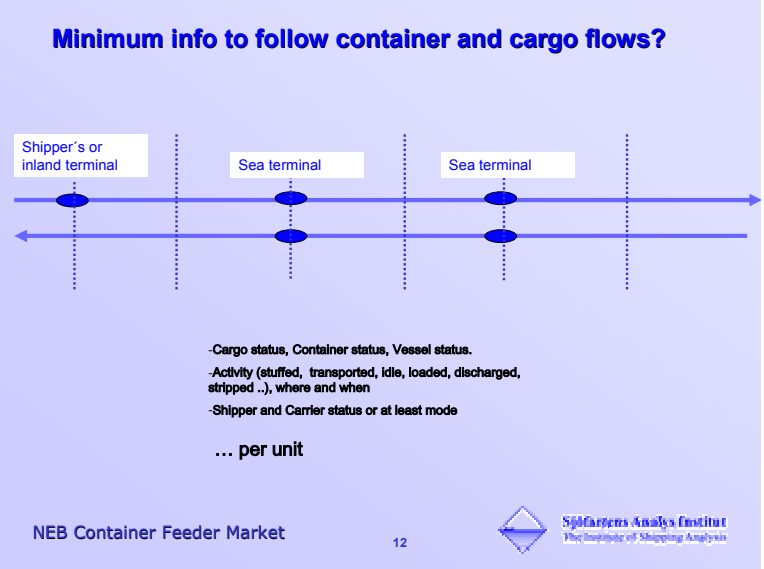


Figure 9: … and what we want.

The dynamics of the transport market are for such reasons still too complex to let anyone measure it in a generalised way.

3 The Container Market and the General Tendencies

3.1 Business Environment

This brief analysis comes from the general report on the container market characteristics (published separately).

The containerisation of the container friendly goods has reached a level where the process only gives a minor contribution to the over all growth in the container trade. However, the containerisation of the non-container friendly and often heavier cargoes has started and the share is increasing.

Behind these structural changes lie:

- Increases in volume for Latin America, the Mediterranean-Middle East, India and the non-OECD Far East.
- Reduced container freight rates due to the use of larger vessels, increased co-operation, alliances as well as rationalisations in the other parts of the logistic chain. The cost for the sea leg in a door-to-door transport has decreased substantially.

These factors will have an influence also in the future, but the following forces will play a larger role:

- Development of Information and Communication Technology (ICT).
- Globalisation of economic activity and greater free trade.
- Conditions underlying political frameworks; environmental and social considerations.

These driving forces will lead to considerable changes, which the industry must be prepared to meet. A primary conclusion is that, irrespective of the driving forces to which one attaches the greatest weight, the relevant skills and know-how will increasingly become the key competition parameters of the future. Combined, these factors will have a major influence on how companies configure their logistics solutions, which in turn affects shipping in several respects.

3.2 Economy and trade

The international economy is undergoing increasing economic and political integration, leading to growing global trade. Shipping is ahead of other industries in this process of change and the emergence of an internationally mobile labour market for seafarers has resulted in changes in competitive terms for players in the shipping industry. At the

international level, environmental policies, as well as financial, security and trade policies have major potential implications.

With a favorable productivity development during the next 10 years and a good supply of production factors there should be no risk of inflation. If no geopolitical disruptions occur during the next 10 years the basis for relatively good economic growth is there. If we assume about 2% growth of GDP per annum and an average growth of trade in container friendly goods during the period 2000-2010 of 7% per annum, trade will grow from 1 904 billion USD to 3 700 billion USD.

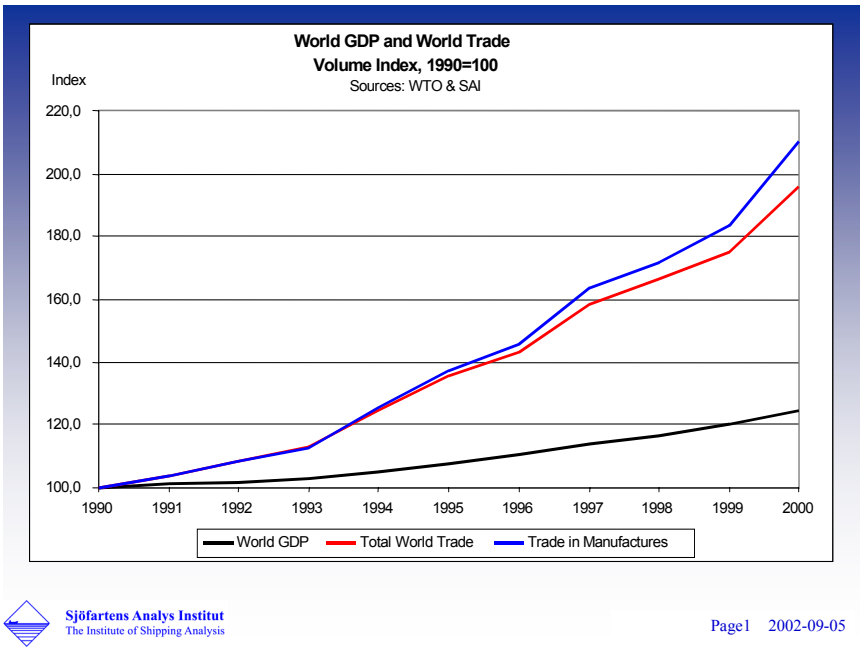


Figure 10: World GDP and World Trade, index 1990 - 2000

A relation between GDP growth and container friendly goods of 3.5 compared to a little over 4 during the 1990s means an increase of 94%. If we assume that the value per unit remains unchanged, the volume of container friendly goods will also increase by 94% during the next 10-year period. This is not a prognosis, only an arithmetical example. We can not see any reason today, why trade in container friendly goods should not grow considerably during the coming years. In addition to this come the growth and increasing market shares for transporting non-container friendly goods in containers.

In Table 4, economic key figures for the NEB countries are presented. The countries show huge differences in population and GDP per capita, especially the Baltic States and Russia. The figures for trade of goods as a share of GDP also show that some of the countries have an economy heavily dependant on trade like the Netherlands, Sweden, Ireland, Estonia and Lithuania.

Table 4: Economic key figures – NEB countries (2000)

Economic key figures	Denmark	Sweden	Finland	Norway	Iceland
Population, total	5.3 million	8.9 million	5.2 million	4.5 million	281.0 th.
Population growth (annual %)	0.3	0.1	0.2	0.7	1.3
GNI, Atlas method (current US$) [12]	172.2 billion	240.7 billion	130.1 billion	155.1 billion	8.5 billion
GNI per capita, Atlas method (current US$)	32,280.0	27,140.0	25,130.0	34,530.0	30,390.0
GDP (current $)	162.3 billion	227.3 billion	121.5 billion	161.8 billion	8.5 billion
GDP growth (annual %)	2.9	3.6	5.7	2.3	5.0
Trade in goods as a share of GDP (%)	57.9	70.3	65.5	58.4	52.7
Exports of goods and services (% of GDP)	42.4	47.4	42.5	46.6	..
Imports of goods and services (% of GDP)	37.0	42.1	32.4	30.4	..
Economic key figures	**Germany**	**Netherlands**	**Belgium**	**UK**	**Ireland**
Population, total	82.2 million	15.9 million	10.3 million	59.7 million	3.8 million
Population growth (annual %)	0.1	0.7	0.3	0.4	1.1
GNI, Atlas method (current US$)	2.1 trillion	397.5 billion	251.6 billion	1.5 trillion	86.0 billion
GNI per capita, Atlas method (current US$)	25,120.0	24,970.0	24,540.0	24,430.0	22,660.0
GDP (current $)	1.9 trillion	364.8 billion	226.6 billion	1.4 trillion	93.9 billion
GDP growth (annual %)	3.0	3.5	4.0	3.1	11.5
Trade in goods as a share of GDP (%)	56.3	112.5	..	43.9	139.3
Exports of goods and services (% of GDP)	33.4	..	88.1	27.2	..
Imports of goods and services (% of GDP)	33.0	..	84.7	29.1	..
Economic key figures	**Estonia**	**Latvia**	**Lithuania**	**Poland**	**Ru. Fed**
Population, total	1.4 million	2.4 million	3.7 million	38.7 million	145.6 million
Population growth (annual %)	-1.3	-1.6	-0.1	-0.0	-0.5
GNI, Atlas method (current US$)	4.9 billion	6.9 billion	10.8 billion	161.8 billion	241.0 billion
GNI per capita, Atlas method (current US$)	3,580.0	2,920.0	2,930.0	4,190.0	1,660.0
GDP (current $)	5.0 billion	7.2 billion	11.3 billion	157.7 billion	251.1 billion
GDP growth (annual %)	6.4	6.6	3.9	4.0	8.3
Trade in goods as a share of GDP (%)	149.5	70.7	81.9	51.1	60.0
Exports of goods and services (% of GDP)	83.7	45.8	45.2	27.4	45.9
Imports of goods and services (% of GDP)	88.5	54.3	51.6	34.4	24.8

Source: World Bank

[12] Definition: GNI (Gross National Income, formerly GNP) is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad. Data are in current U.S. dollars. GNI, calculated in national currency, is usually converted to U.S. dollars at official exchange rates for comparisons across economies, although an alternative rate is used when the official exchange rate is judged to diverge by an exceptionally large margin from the rate actually applied in international transactions. To smooth fluctuations in prices and exchange rates, a special Atlas method of conversion is used by the World Bank. This applies a conversion factor that averages the exchange rate for a given year and the two preceding years, adjusted for differences in rates of inflation between the country and the G-5 countries (France, Germany, Japan, the United Kingdom, and the United States).

4 The feeder market

4.1 The product

The container transport business is global. The services include a commitment and a responsibility for every part of the transport from door to door. As a liner service, the shipping line guarantees a regular service on a defined set of ports according to a fixed and published schedule. In fact, any customer thereby has access to the defined market region, a defined capacity and frequency irrespective of each shipper's specific volumes.

Figure 11: The product

This service can only in a very narrow perspective be seen as a transport work or movement of cargo from one point to another. The fast growing and underlying complexity in global transports, the variety of conditions in different regions as well as coordination of activities required, means that the "movement" of cargo is not in any aspect a standardised work. It demands specific qualities and resources to manage flows of physical resources, information, capital and responsibilities.

Offering of an open and increasingly competitive global transport network demands continuous productivity increases in the entire transport chain through e.g.:

- Economies of scale in operation, administration and management
- Efficient coordination of activities in time and place
- Value adding to other service requirements and presence in all the markets served – including customer care.

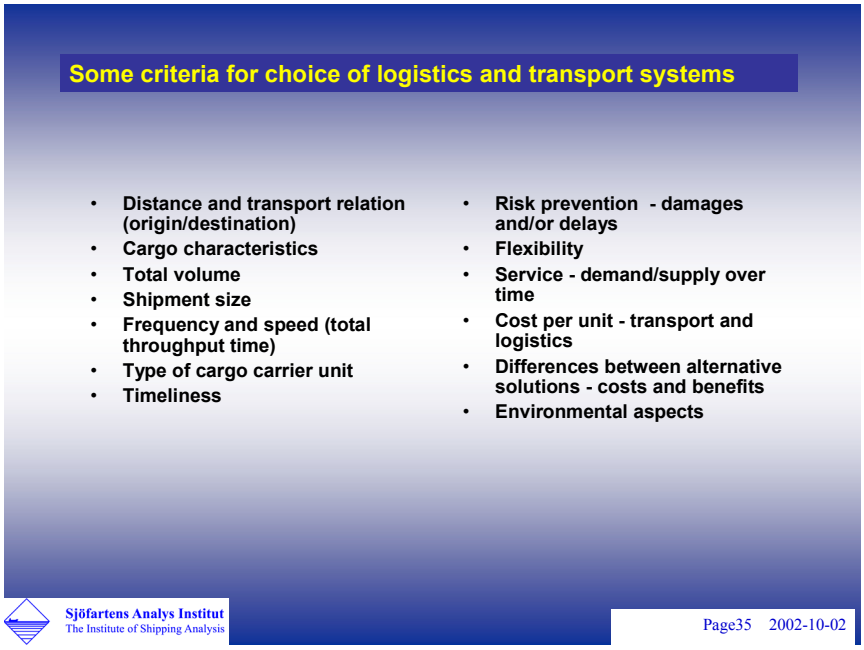


Figure 12: Some general criteria for choice of logistic and transport systems

The market demands a global transport network with a standardised, highly productive and qualitative service, but at stable (and low) prices in spite of all non-predictable factors included in a global business. Inefficiencies in the transport system have a direct impact on the customer's supply chains. However, undertakings by shippers have not been more extensive or long-term. Instead goods owners have greater flexibility and more options within open transport networks. Thus, the development is characterised by the growing structural complexity of the transport network.

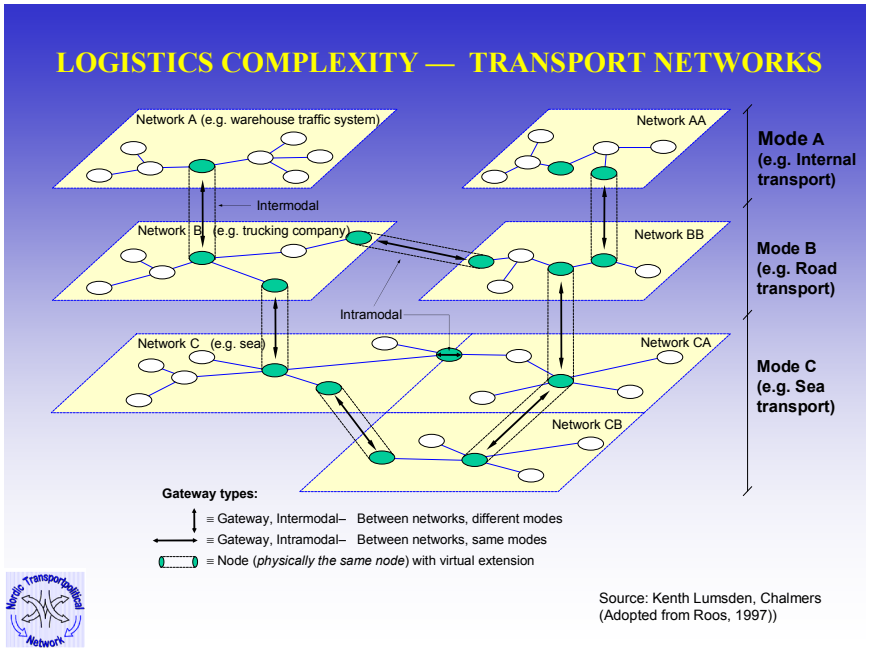


Figure 13: Logistics complexity – Transport networks

The "feeder" system is the regional part of the global container transport system, and is as such an integrated part of the transport chain from door-to-door. This function is not transport mode specific – it could be performed entirely on land or with intermodal solutions depending on geographical, infrastructural and economic factors. The feeder links are connecting a large number of medium sized and small ports in the region with the very few large hub ports. Due to this, a range of ports in the region can work as gateways into the global container systems, if the volumes are big enough to carry a frequent service on competitive conditions.

Feeder services are either dedicated to serve one specific shipping company or open for any customer - but the primary customers in both cases are the trans-ocean shipping lines, which offer the door-to-door transport to the shippers.

The density in the network can be exemplified by the number of feeder links connecting ports in NEB region with one of the big hubs in Northern Europe (in this example Hamburg Container Terminal Burchardkai). The feeder traffic to this container terminal connects close to 30 ports in the region with a frequency between one and three calls per week (except for Belgium and France).

In total there are more than 200 liner services calling Hamburg, including over 100 container and numerous RoRo traffics.

Table 5: Example – The feeder network in a hub port

COUNTRIES	PORTS OF CALL	LINE	FREQUENCY
Iceland	Reykjavik	Eimskip	weekly
Great Britain	Felixstowe	Euro-Feeder	weekly
		Port-Link	weekly
Belgium	Antwerp	Teamlines	if required
		Unifeeder Container Service	if required
Netherlands	Rotterdam	Unifeeder Container Service	weekly
		Team Lines	if required
France	Rouen	Unifeeder Container Service	if required
	Le Havre	Unifeeder Container Service	if required
Denmark	Copenhagen	Team Lines	weekly
		Unifeeder Container Service	3 times a week
		Eimskip	weekly
	Aarhus	Team Lines	weekly
		Unifeeder Container Service	3 times a week
		Team Lines	weekly
Sweden	Gothenburg	Team Lines	twice a week

		Unifeeder Container Service	3 times a week
		Eimskip	Weekly
	Malmö	Team Lines	twice a week
		Unifeeder Container Service	3 times a week
	Norrköping	Team Lines	weekly
		BML Line	weekly
	Helsingborg	Team Lines	twice a week
		Unifeeder Container Service	3 times a week
		Eimskip	weekly
	Stockholm	Team Lines	weekly
	Gävle	Team Lines	weekly
	Västeras	BML Line	weekly
Norway	Oslo	Unifeeder Container Service	weekly
		DFDS	weekly
		Team Lines	twice a week
	Fredrikstad	Unifeeder Container Service	weekly
		Eimskip	weekly
	Bergen	BWL	weekly
		Norcargo	weekly
	Aalesund	ECL	weekly
	Haugesund	North Sea Container Lines	weekly
Finland	Helsinki	Unifeeder Container Service	twice a week
		Team Lines	twice a week
		Hacklin Seatrans	twice a week
	Mäntyluoto	Team Lines	twice a week
		Hacklin Seatrans	twice a week
	Hanko	Team Lines	twice a week
	Turku	Team Lines	twice a week
	Oolu	Polaris	weekly
Baltic Sea	Gdynia	Team Lines	weekly
		Baltic Container Lines	weekly
		IMCL	weekly
	Riga	Latvian German Service	weekly
		Baltic Container Lines	weekly
		Teamlines	weekly
		OOCL	weekly
		Kursiu	weekly
	St. Petersburg	OOCL	weekly
		Kursiu	weekly
		Containership	weekly
		Team Lines	weekly
	Kaliningrad	Latvian German Service	weekly
Estonia	Tallin	Estonia Shipping	weekly
Source: Hamburg Container Terminal Burchardkai, web			

4.2 Market Balance

4.2.1 Demand

4.2.1.1 Regional distribution

In total, 31 million TEU were handled in 146 ports or port companies in the region in 2000 (including empty units). 84% of the container volumes were handled in Germany, Great Britain, the Netherlands and Belgium (Table 6).

Table 6: North European and Baltic Ports - Container lifts 2000 (Source: SAI)

Country	No. Ports	Share no. of ports	TEU	Share TEU
DE	12	8.2 %	7 435 950	23.6 %
GB	27	18.5 %	7 296 692	23.2 %
NL	8	5.5 %	6 361 452	20.2 %
BE	3	2.1 %	5 049 339	16.0 %
IE	3	2.1 %	1 530 865	4.9 %
SE	23	15.8 %	1 032 238	3.3 %
FI	19	13.0 %	935 219	3.0 %
NO	36	24.7 %	488 523	1.6 %
DK	6	4.1%	479 601	1.5 %
PL	3	2.1%	228 774	0.7 %
IS	1	0.7 %	228 106	0.7 %
RU	1	0.7 %	195 733	0.6 %
LV	2	1.4 %	88 371	0.3 %
EE	1	0.7 %	76 692	0.2 %
LT	1	0.7 %	39 955	0.1 %
Tot	146	100 %	31 467 510	100 %
Sorted by no of TEU share				
Ports TEU>0 2000				

In fact, the ten largest ports in these countries or 7% of the ports in the entire region, handled 80% of the container volumes. If we add 10 ports more in order of size, we come up to 90%. The concentration of volumes to a very few hub ports is in this sense obvious – but it is only one side of the coin. When considering the feeder market, the hubs are turning-points in the dense feeder network connecting a large number of origin or destination ports with the hubs.

The Nordic countries and Great Britain have together over 70% of the container ports - which is the base for the feeder market in the NEB region.

In Scandinavia, with over 50% of the ports, the volume share is just close to 10%. In this comparison, the port markets and prerequisites for container distribution are very disparate between the different subregions in NEB.

On a port level, there are 13 ports or 9% of the 146 in the entire region that handle more than 1% each of the overall container throughput in the NEB region (Table 7). Only two of these are located in Scandinavia – Göteborg and Helsinki. Port of Göteborg has direct calls by trans-ocean container vessels.

Table 7: Ports in Northern Europe and Baltic Region > 1% of the container lifts

All ports	1000 TEU	Av growth rate 97/00	Growth 99/00	Volume Share	Acc. volume share	Acc. no ports
Rotterdam	6 275	4.5%	-1.1%	20.2%	20.2%	0.7%
Hamburg	4 275	8.4%	14.0%	13.6%	34.0%	1.4%
Antwerpen	4 082	11.2%	13.0%	13.2%	47.2%	2.1%
Felixstowe	2 816	7.1%	3.0%	9.1%	56.3%	2.7%
Bremen/ Bremerhaven	2 752	17.3%	25.0%	8.9%	65.1%	3.4%
Dublin	1 380	7.6%	5.8%	4.5%	69.6%	4.1%
Southampton	1 298	13.1%	39.7%	4.2%	73.8%	4.8%
Zeebrugge	965	14.2%	13.5%	3.1%	76.9%	5.5%
London	748	13.9%	2.4%	2.4%	79.3%	6.2%
Liverpool/Mersey	732	16.6%	44.3%	2.4%	81.7%	6.8%
Göteborg	685	8.9%	9.7%	2.2%	83.9%	7.5%
Medway (incl. Thamesport)	509	8.8%	3.1%	1.6%	85.5%	8.2%
Helsinki	398	0.4%	23.8%	1.3%	86.8%	8.9%
Source: SAI Cargo Database						

The average NEB region growth rate was 7.6% per year between 1997 and 2000 compared to that of the 13 ports with 9%. This has resulted in an increased volume share for the 13 largest - from 84% 1997 to 87% in the year 2000. The other ports together, showed a negative growth rate on the average [13].

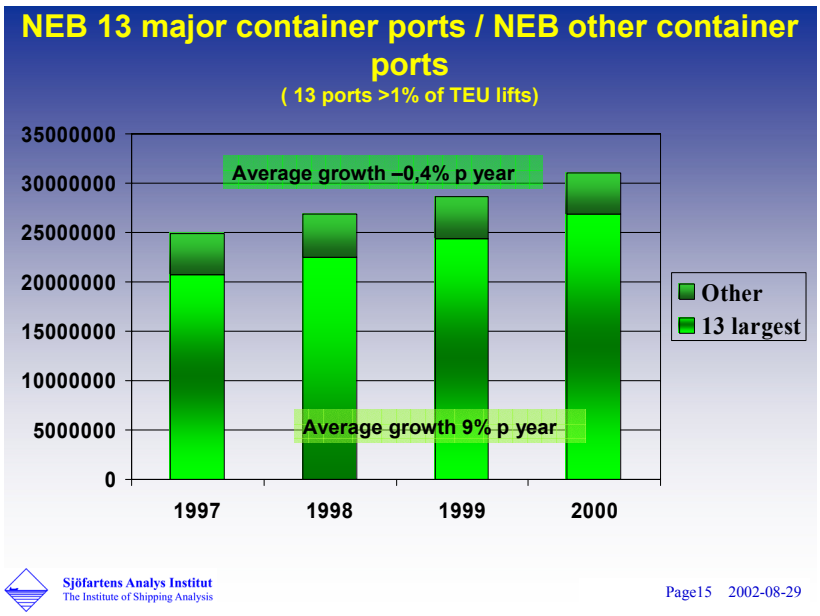


Figure 14: Development of container volumes handled in the NEB container ports.

[13] Figures based on volume development between 1997 and 2000 for 103 ports, which together represented over 99% of the total volume in the region 2000.

But the volume figures and development vary to a large extent from port to port. Some ports have had a continuous and fast growth during the period, but from low or very low levels, especially in the Nordic countries. The other ports showing a negative development includes ports in almost all the countries, which can indicate a shift between ports in the same country or other. It can also be a result of a large dependency on local industries and their business cycles.

We must remember that this period includes a slowdown of the economies and also effects of the Asian recession. The upturn in the economy resulted in fast growth rates after 1999 measured in container lifts. The yearly growth rate differs also to a large extent between the 13 largest ports. Rotterdam saw a decline and had a negative rate from 1999 to 2000. Rotterdam was the only one of the major container hubs, which had such a decline of the container turnover. The reason is partly due to the loss of Maersk Sealand, which shifted a number of its streams because the capacity in Rotterdam was insufficient. The GB hubs in general seem to have taken back parts of the volumes during this period, volumes earlier transhipped in Rotterdam.

That the degree of concentration of container volumes increased does not mean that the regional feeder transport market is disturbed. The feeder network is necessary to support the global lines with container units from the many and smaller end ports in the network. This development will continue as long as the deep sea vessels enter hubs in the North European region. No tendency can be found showing that the number of ports in the feeder network is decreasing. The dense feeder network in combination with the long term and general increase of container volumes can further increase the number of ports served by feeder traffic. But the rapid development in the North Continental hubs can indicate that land transport "feeder" has gained in market shares more than the maritime feeder concept.

4.2.1.2 Demand indicators and implications

In the Nordic countries, the availability of efficient sea links is and has always been a prerequisite to develop trade with external markets. Norway, Sweden and Finland have long coastlines and the manufacturing industries are located on - or close to - the coast with access to ports and maritime transports. This explains the competitiveness of maritime transports in general. We cannot foresee any radical changes in this, but in certain flows, especially of standardised cargo carrier units, the competitive situation between maritime and land based alternatives is quite sensible. On the North Continent on the other hand, with in this comparison short distances and

well-developed land infrastructure combined with the central position to the European market – concentration of flows to a very few mega-hubs is natural. Feeder on road has gained market shares due to the flexibility and availability of this concept.

The concentration of volumes to these mega-hubs has also made it possible to develop economies of scale in the port market, which in turn attracts more traffic and cargo as well as related transport and logistics services. Together, this cluster of organisations and activities has become of great importance for the national economy.

Although the Nordic container port market can be regarded as small in a European comparison, it has developed to be an important part of the regional hinterland for the transshipment ports, since the Scandinavian/Baltic market together with the UK are the main regions for maritime containers. The port market prerequisites are very much the same in the Nordic countries, but we have to rely on our own volume development i.e. the potential transshipment market for containers is smaller. The prospects for further exploitation of this market will need much more research and an X-ray examination of the "non-transparent" cost/price structures of today.

Table 8 shows the distribution of containers handled in each of the EU countries per "origin/destination". If the cargo has been transshipped, as with feeder containers, the "origin" or "destination" is referring to the country where the cargo unit has been transshipped (as defined in the EU statistics). This is the part which we identify as feeder cargo, if we accept that it can hold some units that really stay within the region.

Table 8: Origin – Destination regions per reporting country in % of TEU (based on Eurostat figures)

	DE/ NE/ BE	Scandi-navia	GB/IE	Baltic S & Baltic Russia	Other Europe and Med.	Trans-ocean regions	Total	Tot TEU lifts (1000)
SE – to/from	49%	4%	17%	0,4%	7%	23%	100%	813
FI – to/from	76%	4%	13%	5%	2%	0.1%	100%	880
DK – to/from	43%	20%	14%	5%	8%	11%	100%	487
IE – to/from	59%	0%	28%	0%	13%	0%	100%	478
GB – to/from	19%	4%	10%	1%	13%	54%	100%	7289
NE – to/from	2%	6%	18%	1,5%	10%	63%	100%	6339
DE – to/from	7%	18%	4%	5%	6%	61%	100%	7146
Regional sum								23432
BE – to/from	710 (not incl. est. 2896 EU-internal)					1443		2153
Total incl. BE								25585
Source: Eurostat. Belgian EU internal units not included (see also chapter 2.2.7)								

The table shows the NEB-internal volumes (transshipment and intra-regional) and direct external share per import/export country. Due to the problem we have recognised with the accounting of empty units (in some ports included and others excluded) when comparing our figures from the ports with Eurostat statistics, we prefer to record empty units separately in this table. Eurostat figures can be used to indicate volumes in the regional feeder market though.

Of the total volume reported in Swedish ports, close to 50% is coming from or is destined to Germany, the Netherlands and Belgium; 17% to and from Great Britain/Ireland and trans-ocean regions represent 23%. For Finland, as much as 76% of the containers come from or are destined to the North Continental ports, where the containers are transshipped. The North Continental ports, as well as the ports in Great Britain, show a totally different distribution pattern due to the large share of trans-ocean containers. Belgian volumes are not further analysed due to the missing intra-EU volumes in the Eurostat statistics.

It can be concluded that the Nordic countries are generating containers, especially for Germany. For the Netherlands, Great Britain/Ireland are the main generators besides the trans-ocean containers. Sweden, due to port of Göteborg and the role as the major port in the Nordic countries for trans-ocean direct volumes, has a trans-ocean share of close to 30% according to Eurostat figures. In the largest hubs in the North Continent and Great Britain, the trans-ocean share is varying between 60 and 90%. These conditions are also affected by the maritime feeder share versus land transport feeder to and from the transshipment ports. A larger share indicates that feeder by land transport modes is dominant.

This implies the large dependency on transshipment through the North Continental ports.

The feeder flows

In Table 9, the total volume of close to 26 million TEU lifts reported in the eight EU countries is divided into direct external 16.4 million TEU and "internal" volumes 9.2 million TEU [14]. The internal volumes are the basis for the feeder traffic today.

We would like to add the Belgian ports´ EU internal flows, which are estimated by us to about 2.9 million TEU in total (not reported to

[14] Bases on Eurostat statistics, since these include data per each reporting port about origin and destination for import/export containers (further comments in chapter 2.2.7). Such information has not been collected by SAI in the questionnaires to the ports.

Eurostat). Of these a certain part of the volumes is not internal NEB, but if we disregard this fact, we end up with 12.1 million internal units.

Irrespective of the true internal part versus transshipment, the figures indicate that the short sea demand – for feeder or other concepts is 6 million TEU. We have in this case assumed that true internal containers and transshipment units are potential feeder flows. But all internal units are accounted for twice, when loaded and discharged within the same region – that is why we only count half of the total figure for container lifts.

To this should be added empty units which are handled and transported within the region. In total, the number of empty units is 4.8 million TEU. About 50% are internal, which indicates that up to 2.4 million TEU are transported in regional maritime relations. But we cannot include all these since some ports include empty units in the TEU-figures – and other ports do not. If we estimate the amount to about 1 million TEU, the regional maritime feeder volume calculated in this way is about 7 million TEU.

Table 9: Containers handled in NEB EU- ports – origin and destination regions

	DE to/from	NE to/from	UK/IE to/from	Scandi-navia (DK,SE,FI) to/from	BE* to/from	Tot TEU %	Tot TEU ´000 to/from
Following NEB origin/destinations:							
SE	57%	19%	14%	10%	(0%)	100%	638
FI	63%	11%	14%	5%	(7%)	100%	770
NO	56%	28%	14%	2%	(1%)	100%	358
DK	62%	13%	9%	16%	(0%)	100%	333
GB/IE	10%	43%	31%	12%	(4%)	100%	2703
BE, DE, NE	14%	3%	46%	35%	(2%)	100%	3624
Baltic S., B.Ru	54%	15%	11%	11%	9%	100%	637
Iceland	22%	39%	14%	25%	0%	100%	156
Sum NEB origin/destinations							***9219***
Per NEB external origin/destinations							
”S. Cont”	14%	29%	47%	4%	(6%)	100%	1421
E. Med	16%	15%	34%	2%	34%	100%	861
S. Med	22%	31%	13%	0%	34%	100%	102
Transocean	31%	29%	28%	2%	10%	100%	13983
Sum NEB external origin/destinations							**16367**
Total NEB TEU lifts							***25586***

Source Eurostat. Belgian figures for TEU to and from EU-countries are not complete according to the ports.
External regions: “South continent”: South of NEB region and west from Greece.
E. Med.: Greece – Egypt; S. Med.: N. Africa - west of Egypt

For our region, we also should include volumes exported and imported in non-EU countries including Norway. The volumes, which are transshipped in any of the specified EU countries, will be included, but not direct external units to and from non-EU countries. These volumes are probably small in this context though.

We can indicate the major feeder lanes on a port/country level. Port-to - port figures are not public. Table 10 below includes all EU ports which have more or equal to one percent of the total number of container lifts in the region. That non-EU ports are missing is in this case of less importance - the container throughput in the Baltic Sea ports are below this criterion. The total number of lifts is 27.6 million TEU including empty according to the Eurostat statistics. Empty units are included here, since we have made a check with our own figures from the ports specified in this table and the correspondence is satisfactory.

The port list is not including the large hubs in Belgium - Antwerp and Zeebrugge, since the EU-internal volumes are not accounted for in a harmonised way in the Eurostat statistics. Port – country relations with less than 100 TEU per week on the average are just marked. The figures are based on TEU lifts. This means that the figures cannot be treated as flows or traded number of units, but they are relevant for indicating the heaviest trade lanes in the regional feeder market.

The importance of the flows between Great Britain and Rotterdam - and between Scandinavia and Hamburg, Bremerhaven and Rotterdam is obvious. We must not forget that the units originated or destined to "end" ports are also a part of the trans-ocean flows, but here counted as import to or export from the transshipment country.

Table 10: TEU volumes in the major container ports in 2000 – "origin/destination" countries

Total TEU (TEU+empty)	DK	NO	SE	FI	BE/DE/ NE	Baltic	UK/IE	ICEL.	S.Cont	E.Med	S.Med	Transoc.	ALL
Rotterdam	53.1	127.2	143.1	108.1	117.9	109.7	1 345.0	77.9	457.9	140.5	41.0	4 412.1	7 133.4
Hamburg	113.5	140.7	255.1	330.0	297.1	263.3	160.2	27.9	112.4	129.6	22.4	2 964.7	4 816.9
Felixstowe	36.1	22.0	78.0	71.1	345.7	51.2	72.0	<	460.1	205.4	9.3	1 992.9	3 343.9
Bremerhaven	117.1	98.3	138.1	184.7	233.6	126.0	104.0	11.5	130.8	23.5	<	1 808.6	2 976.4
Southampton	<		<	<	96.4		29.4		62.1	<	<	1 402.2	1 600.2
Medway	<	<	<	<	61.3	5.9	41.9		31.5	<	<	451.1	598.7
Liverpool		<	<	<	11.3	<	318.8		92.3	58.9		357.5	841.0
London		3.0	<	11.8	562.3	<	<		29.0	14.7	<	272.1	897.1
Goteborg	6.5	1.7	<	14.9	356.6	<	144. 7	6.4	49.9	6.1	<	226.2	814.1
Aarhus	18.8	<	42.6	27.9	148.8	34.4	56.1	34.0	<	<	<	<	374.1
Helsinki	13.7	<	18.0		287.9	50.4	71.7		<			<	444.1
Dublin			<	<	428.9	<	226.5		96.4	9.1		<	762.0
Sum 12 major	360.0	394.1	683.4	749.0	2 947.9	641.9	2 573.2	158.0	1 529. 0	599.4	74.2	1 3891.9	24 602.0
Other 77 ports	40.0	50.6	92.5	114.5	1 528.8	71.7	792.4	46.5	83.2	12.7	11.0	182.6	3 026.7
Tot. excl. Belgium	400.1	444.7	775.9	863.5	4 476.6	713.6	3 365.6	204.5	1 612.2	612.1	85.5	1 4074.5	2 7628.7

< : volumes less than 5 200 TEU (100 TEU per week in average)

Total TEU (TEU+empty)	DK	NO	SE	FI	BE/DE/N E	Baltic	UK/IE	ICEL.	S.Cont	E.Med .	S.Med	Transoc.	ALL
Rotterdam	0.19%	0.46%	0.52%	0.39%	0.43%	0.40%	4.87%	0.28%	1.66%	0.51%	0.15%	15.97%	25.82%
Hamburg	0.41%	0.51%	0.92%	1.19%	1.08%	0.95%	0.58%	0.10%	0.41%	0.47%	0.08%	10.73%	17.43%
Felixstowe	0.13%	0.08%	0.28%	0.26%	1.25%	0.19%	0.26%	<	1.67%	0.74%	0.03%	7.21%	12.10%
Bremerhaven	0.42%	0.36%	0.50%	0.67%	0.85%	0.46%	0.38%	0.04%	0.47%	0.09%	<	6.55%	10.77%
Southampton	<		<	<	0.35%		0.11%		0.22%	<	<	5.08%	5.79%
Medway	<	<	<	<	0.22%	0.02%	0.15%		0.11%	<	<	1.63%	2.17%
Liverpool		<	<	<	0.04%	<	1.15%		0.33%	0.21%		1.29%	3.04%
London		<	<	0.04%	2.04%	<	<		0.10%	0.05%	<	0.98%	3.25%
Goteborg	0.02%	<	<	0.05%	1.29%	<	0.52%	0.02%	0.18%	0.02%	<	0.82%	2.95%
Aarhus	0.07%	<	0.15%	0.10%	0.54%	0.12%	0.20%	0.12%	<	<	<	<	1.35%
Helsinki	0.05%	<	0.07%		1.04%	0.18%	0.26%		<			<	1.61%
Dublin			<	<	1.55%	<	0.82%		0.35%	0.03%		<	2.76%
Sum 12 major	1.30%	1.43%	2.47%	2.71%	10.67%	2.32%	9.31%	0.57%	5.53%	2.17%	0.27%	50.28%	89.05%
Other 77 ports	0.14%	0.18%	0.33%	0.41%	5.53%	0.26%	2.87%	0.17%	0.30%	0.05%	0.04%	0.66%	10.95%
Tot. excl. Belgium	1.45%	1.61%	2.81%	3.13%	16.20%	2.58%	12.18%	0.74%	5.84%	2.22%	0.31%	50.94%	100.00%

< : volumes less than 5 200 TEU (100 TEU per week in average)

Transportation of empty units is a necessity – even though it is a non-desired effect in systems based on cargo carrier units. Some underlying reasons for this are in short [15]:

- A general situation from time to time with imperfect cargo balance between regions – such imbalances result in a demand for repositioning of empty units to the heaviest legs.
- Demand for specific types of container units - can increase the imbalances if these are preferred by shippers in one direction, but not the other. This is a service to the shippers.
- Fragmentation of the market can result in even bigger losses in capacity utilisation (equipment and other resources) than motivated by imbalances in the overall demand.

The shipping lines´ service includes positioning of empty container units to their customers when demanded. But the cargo flows to and from the shippers are seldom balanced. There are strong economic reasons for the shipping lines to minimise the costs related to this positioning, since the costs are not invoiced.

We find no reason to suppose, that costs for transports of empty units differ from fully loaded units - so any cargo balancing the flows can give a contribution, if the marginal cost for accepting the shipment is covered.

We have data about empty units handled in 57 ports, which together represent 28.9 million TEU or 93% of the total TEU volume in the NEB region. Of this volume, 4.9 million TEU are empty units, which means an average share of 17%. The share varies between ports though. Table 11 shows that 34 of the NEB ports have an average empty share of 27% of the total volumes handled in these ports. For the other 23 ports, the average empty share is 15%.

Table 11: Empty share of total TEU volume (Source SAI)

Empty analysis	No. Ports	Tot. TEU	whereof empty	Average empty	Share TEU	Share empty
Ports empty/ tot.TEU >20%	34	4 152 698	1 108 472	26.7%	14.4%	22.5%
Ports empty/ tot.TEU <=20%	23	24 772 164	3 808 910	15.4%	85.6%	77.5%
Sum	57	28 924 862	4 917 382	17.0%	100%	100%
Share region tot	50.0%	93.3%				

[15] Thalenius J., 1990, *Cargo Carrier Flows and Utilisation*

The ports with a larger average empty share handle 23% of the total number of empties but only 14% of the total TEU volume. Does this indicate that the largest ports have more balanced cargo flows?

Figure 15 shows number of TEU loads and the empty share per port. A tendency is that larger ports have more balanced cargo flows, i.e. less empty units per total handled. The variations are considerable though. It indicates that feeder operators also have a role to position empty units, to find ways to take care of unused capacity in intra-regional transports and to search for cargo that can balance the flows.

The large imbalance in certain ports can be due to customers, which have export (or import) containers only. But when exceeding 50% empty, this also indicates that the shipments take other ways out. The reasons for this can be that other transport solutions or links are more cost efficient. In such cases, the ports are called for positioning of empty units to the customers in the region.

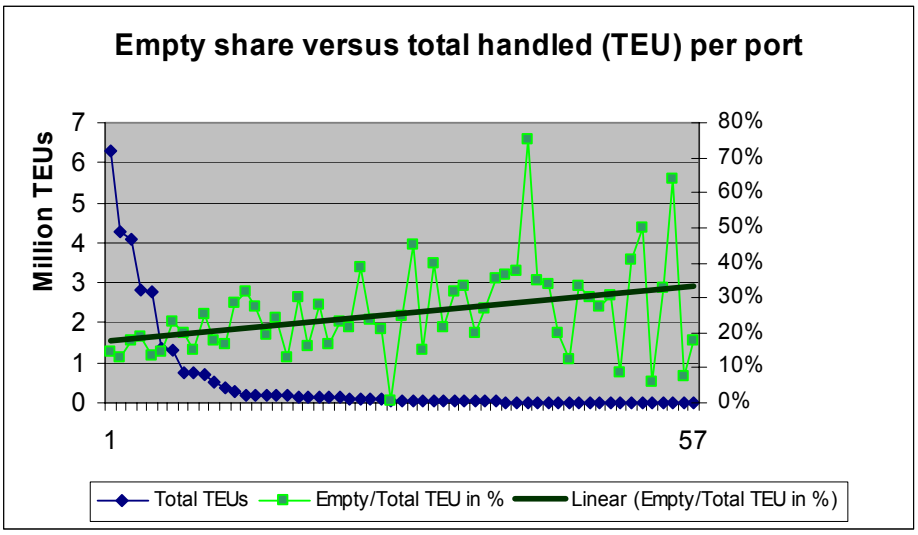


Figure 15: Balance - Empty share of total handled TEU per port

Long term development

The long term development shows that the volumes in the major North Continental and Great Britain ports were doubled between 1990 and 1999 (Figure 16). The western part of the Nordic Baltic Sea region had a little slower development in the last part of the 1990s, but the most remarkable tendency was the break in the development in the Baltic. The major reason was the decrease of transit units to Russia, which affected the Finnish ports. If we just make a short deviation, this development can be compared to that in Southern Europe, where the volumes tripled in the major Mediterranean ports. The reason for this tremendous growth from 1995 and onwards is their new role as

transshipment hubs for interchange of units between links in the global services [16].

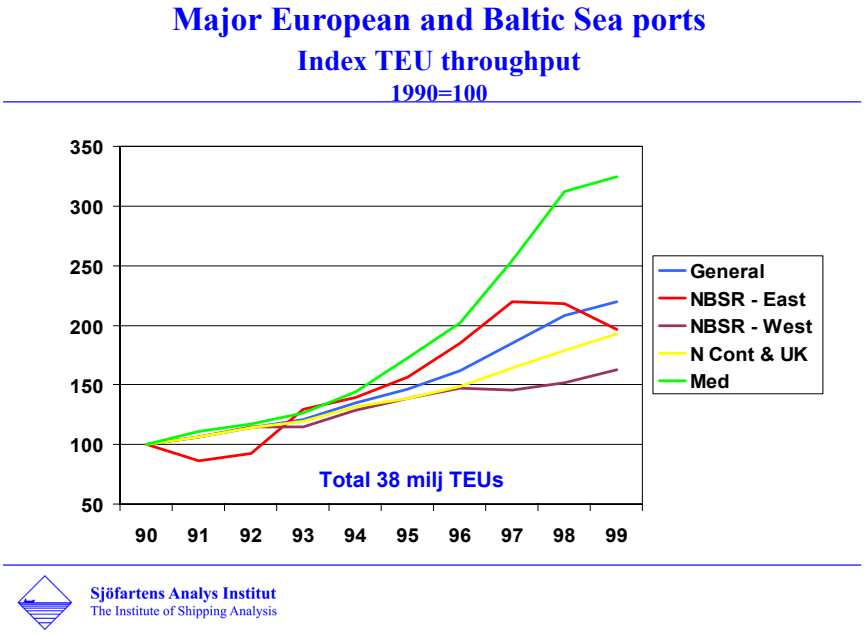


Figure 16: Major European and Baltic Sea Ports - Long term development (index 1990 – 1999 in TEU lifts)

Now back to the North of Europe. The last years of the 1990s are influenced by a general decline in the global economy, which has to be kept in mind when we want to consider the expectations for the next ten years - we start from a quite low level. The total volumes we have aggregated from the SAI Cargo Database correspond satisfactory with the figures published by Ocean Shipping Consultants (Table 12). The region covered in our NEB region is compatible with OSC´s at a country level, except for France that is included in the OSC figures. We cannot confirm the level of correspondence at a port level though.

Table 12: Volume development in the Northern Europe 1990 - 2001

	Mill. TEU 1990	Mill. TEU 2001	Share 1990 %	Share 2000 %	2000/1990 Yearly growth rate in %
Direct Deep Sea	6.7	14.0	45.3	44.6	7.8
Transshipment	2.2	6.7	14.5	21.3	11.6
Direct Short Sea	6.3	10.7	40.2	34.1	5.5
Total	15.2	31.4	100	100	6.7
Source: OSC					

[16] The volume figures are based on the major ports; distribution 1999: 3 mill. TEU in the Nordic Baltic Sea Region, 23 mill. TEU in ports in the North Continent and 12 mill. TEU in the western Mediterranean. In SAI Cargodatabase, the number of ports is extended.

Their expectations for this region and the period between 2000 and 2010 are in short:

- A volume growth by close to 60% compared to a doubling of the volumes during the 1990s.
- Strongest growth from the deep-sea demand

4.2.2 Supply

4.2.2.1 Introduction

The classifications or definitions of ship types are not standardised between different sources. The purposes and applications vary – from statistics, shipping market analyses, ship design and technology to matters concerning insurance, classification, law and safety.

A container ship is a dry cargo ship designed to carry containers only, i.e. with box shaped holds fitted with cell guides. The cargo handling mode is lift on/lift off. But there are also several other dry cargo ship types, with capacity for carrying containers as e.g. [17]:

- General cargo ships, multi-purpose ships, single or multi-decked, for carriage of break-bulk cargo, containers and other diverse cargo where certain cargo holds can be equipped with container securing arrangements.
- "Deck cargo ships", palletised cargo ships etc, which have capacity for carriage of containers on the weather deck.
- Roro cargo ships with a multi-deck hull for carriage of road and/or rail vehicles and cargo units as pallets, containers etc.
- Bulk carriers, where certain holds are equipped for carriage of containers (container securing arrangements).

We have consequently used the categorisation of ships by type according to Fairplay´s PC Register, since this database is very detailed concerning the ship categories and their capacity to carry containers. Fairplay has grouped all major ship type categories further into a large number of sub-groups reflecting the main cargo and/or mix of cargo types that the ships are build or equipped for. For some ports we have noticed a difference between the categorisation of ships in different sources. E.g. for Port of Västerås, with 33 000 TEU lifts in 2000, but no calls by container ships at all - only by general cargo and multi-purpose

[17] Lloyd´s Register, A categorisation of ships by type and their definitions for statistical purposes, April 1998 and Fairplay, November 2001.

ships according to Lloyd´s (LMIU). According to Fairplay, some of the ships are container ships.

This also means that there is no strict delimitation between shipping segments and their business. Several other factors have to be considered when we want to separate feeder services from other regular liner services with capacity to carry containers. One main difference is the customer – feeder services "feed" the global container lines. Other liner services offer transports directly to shippers (cargo owners and forwarders). Their capacity is used mainly for other commodities, but container shipments can be a profitable and complementary segment, even if the volumes are marginal in this context.

4.2.2.2 Regional distribution

644 ports in the region are served by a ship with TEU capacity, which can be a multi-purpose, general cargo, RoRo or pure container ship (i.e. with cellular cargo holds). These are the most frequent ship types of the ones classed with container carrying capacity and the total number of port calls by these ship types amounted to 160 000 during 2000.

The figures below (Figure 17, Figure 18), show the most frequent ship types in the region and their "degree of presence". The first figure indicates presence based on the number of ports served per ship type during 2000 (in % of the 644 ports in the region); the second figure is based on call frequency in the ports (in % of the total number of calls in the 644 ports).

The multi-purpose and general cargo ships serve about 80% of all the ports - the container ships about 40%. But, since the container ships are very frequent, the presence measured on call frequency shows that they are the second most frequent ship type in the ports. Together with multi-purpose ships and general cargo ships, these ship types account for over 60 % of the port calls in the region.

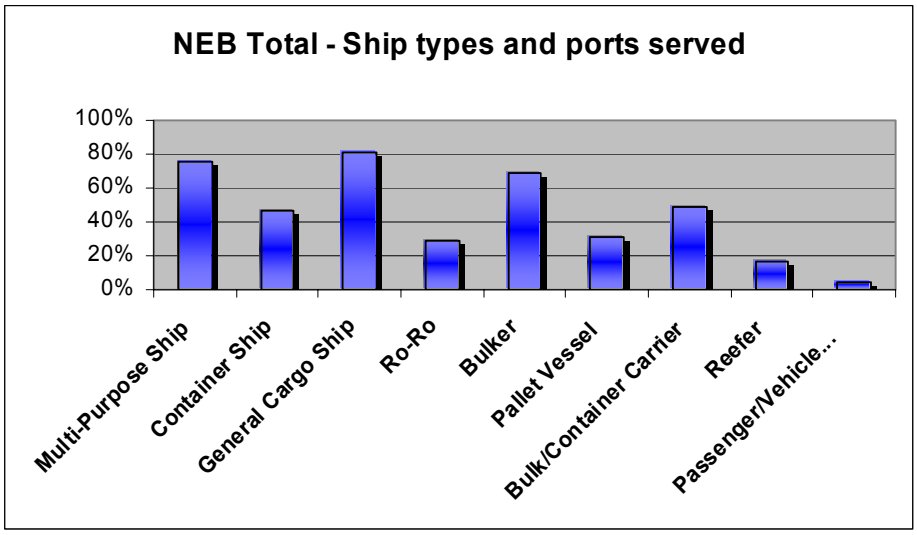


Figure 17: Ship types with TEU capacity and ports served (in % of the total number of ports in NEB Region)

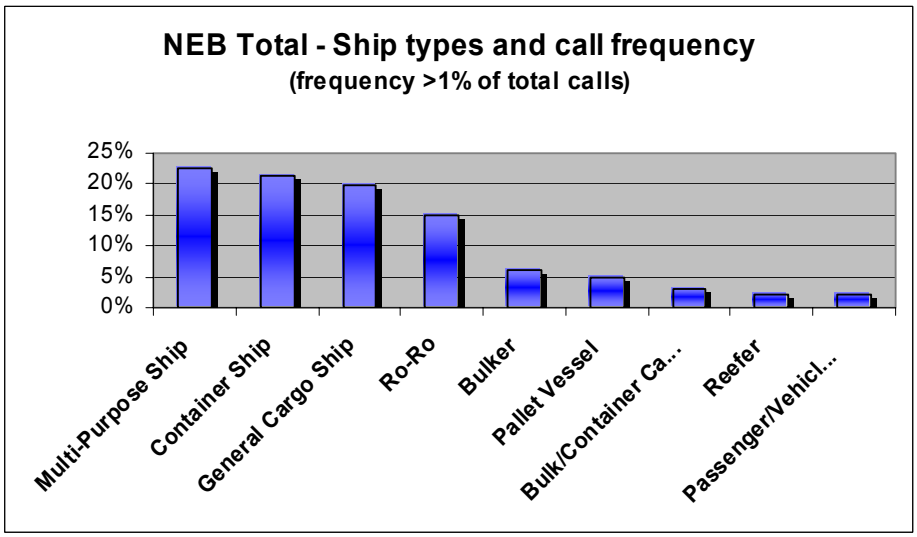


Figure 18: Ship types with TEU capacity and frequency (in % of the total number of calls in NEB ports)

Since we are focused on container ports, i.e. the ports in NEB region which handle containers, the number can be reduced to 146 ports, or about 25% of the 644. We are quite certain there could be more ports with container handling, but if they are not represented in any of the public sources we have used, they have probably not more than marginal and/or irregular volumes. A list of ports is enclosed in Supplement 3.

Close to 4 000 vessels made 126 000 calls in these container ports. Measured in calls or number of ships, the container ships represent between 23 and 25% of the container carrying capacity calling these ports. When measured in container units (slots), the container ships have a 60% share of the total capacity called. In regions with major container

hubs, the container ship share is even larger than this. In the other regions without such hubs, as the entire Baltic region, the container ships represent a significantly lower carrying capacity.

Table 13: Key figures per region – calls, number of ships, capacity (slots) and TEU lifts 2000

Capacity/Region	***All ships with TEU capacity***			***whereof Container ships***			***Cont. ships - share per region***			Region TEU lifts (SAI Cargo Database)
Region	Calls	Ships	SumSlots	Calls	Ships	Slots	of calls	of ships	of slots	
GB/IE	28 082	2 517	18 722 801	7 712	770	12 047 326	27%	31%	64%	8 800 296
North Cont North Sea	48 962	3 597	38 127 977	16 061	868	26 793 995	33%	24%	70%	18 767 097
Scand Baltic West	21 075	1 302	6 423 880	3 755	143	2 341 346	18%	11%	36%	1 772 250
Scand Baltic East	13 327	925	4 463 490	1 842	70	989 851	14%	8%	22%	1 118 067
North Cont Baltic EU	3 262	548	907 336	119	25	19 966	4%	5%	2%	79 640
North Cont Baltic Non-EU	11 283	1 589	2 708 882	1 653	98	717 853	15%	6%	26%	629 525
NEB	125 991	3 981	71 354 366	31 142	910	42 910 337	25%	23%	60%	31 166 875

4.2.2.3 Supply indicators and implications

On the average, 85 000 containers per day were handled in the region to and from a ship corresponding to 345 port calls by a ship with container capacity, whereof 85 by pure container ships. The distribution of TEU handled in the ports and slot capacity of vessels calling these ports, shows that close to 90% of the volumes come through the North Continent North Sea and Great Britain ports and further 6% comes through the Scandinavia Baltic West region, primarily through the port of Göteborg. (Table 14.)

For the Scandinavia Baltic East region, the figures indicate that the capacity on container ships is under-represented compared to the container volumes. This implies that also other ship types are used for container transports.

Table 14: Key figures per region – average number of calls, slots and TEU lifts per day (Source: SAI)

Region	Cont.ships Calls/day	All ships Calls/day	Cont.ships Distr.	All ships Distr.
GB/IE	21	77	24.8%	22.3%
North Cont North Sea	44	134	51.6%	38.9%
Scand Baltic West	10	58	12.1%	16.7%
Scand Baltic East	5	37	5.9%	10.6%
North Cont Baltic EU	0	9	0.4%	2.6%
North Cont Baltic Non-EU	5	31	5.3%	9.0%
NEB	85	345	100%	100%
Region	Cont.ships Slot/day	All ships Slot/day	Cont.ships Distr.	All ships Distr.
GB/IE	33 006	51 295	28.1%	26.2%
North Cont North Sea	73 408	104 460	62.4%	53.4%
Scand Baltic West	6 415	17 600	5.5%	9.0%
Scand Baltic East	2 712	12 229	2.3%	6.3%
North Cont Baltic EU	55	2 486	0.0%	1.3%
North Cont Baltic Non-EU	1 967	7 422	1.7%	3.8%
NEB	117 563	195 491	100%	100%

Region	Region TEU/day	Distr.
GB/IE	24 110	28.2%
North Cont North Sea	51 417	60.2%
Scand Baltic West	4 855	5.7%
Scand Baltic East	3 063	3.6%
North Cont Baltic EU	218	0.3%
North Cont Baltic Non-EU	1 725	2.0%
NEB	85 389	100%

In Table 15 below are calculated:

- Average number of calls per ship during 2000
- Average slot capacity (ship capacity in TEU) per call
- Port TEU lifts/call
- TEU lifts per slot

All key figures are presented per region distributed on pure containerships versus all ship types with container carrying capacity.

Table 15: Key figures related to capacity and utilisation - container ships versus the entire fleet with TEU capacity (2000)

Region	Cont.ships Calls/ship	All ship types Calls/ship	**Frequency – calls per ship with container capacity 2000** Each container ship makes 34 calls in the NEB container ports on the average. The Scandinavia/Baltic region has a high call frequency, because the fleet is characterised by small and very frequent ships. The same characteristics are valid also for the entire fleet with container capacity calling the Scand/Baltic region, but the call frequency is significantly lower.
GB/IE	10	11	
North Cont North Sea	19	14	
Scand Baltic West	26	16	
Scand Baltic East	26	14	
North Cont Baltic EU	5	6	
North Cont Baltic Non-EU	17	7	
NEB	34	32	
Region	**Cont.ships Slots/call**	**All ships Slots/call**	**Slots per call (ship capacity in TEU)** This key figure is measured as the entire capacity per ship for every call. To be correct, we must also consider each vessel's available capacity when calling several ports for loading containers during the one and same voyage to the final port of discharge – since the available capacity is decreasing for every call. But there are no such public data. Therefore - the key figure does not measure available capacity. The container ships have a much larger TEU capacity per call compared to the other ship types. But these can very well have a total cargo capacity that is larger (DWT), but are only to a certain degree adapted to carry containers. The average slot capacity per ship is significantly larger for the container ships calling North Continent North Sea ports compared to the other subregions, due to the fact that these regions to a large extent are served by feeder systems.
GB/IE	1 562	667	
North Cont North Sea	1 668	779	
Scand Baltic West	624	305	
Scand Baltic East	537	335	
North Cont Baltic EU	168	278	
North Cont Baltic Non-EU	434	240	
NEB	1 378	566	
Region	**Cont.ships TEU lifts /call**	**All ships TEU lifts /call**	**TEU lifts per call** In average for the region, about 1000 containers are handled per container ship call if we assume that every container is carried on pure container ships. Number of TEU per call is between two and three times larger for the North Continent and GB compared to the other subregions. The figure for Scandinavia Baltic West is low due to the fact that port of Göteborg is called by large capacity deep sea vessels. The other ports are served by smaller feeder vessels.
GB/IE	1 141	313	
North Cont North Sea	1 168	383	
Scand Baltic West	472	84	
Scand Baltic East	607	84	
North Cont Baltic EU	669	24	
North Cont Baltic Non-EU	381	56	
NEB	1 001	247	
Region	**Cont.ships TEU lifts/slot**	**All ships TEU lifts /slot**	**TEU lifts per slot** This key figure can only indicate capacity utilisation for the reasons mentioned under TEU lifts per slot. This key figure indicates that containers are carried also on other ships than pure container ships, especially in the Scandinavian and Baltic region. To what extent is hard to measure, since data about capacity utilisation per ship is lacking entirely. For regions where the TEU lifts per slot are over one (probably over 0.7), as for Scandinavia and Baltic, this can either be due to that: - Containers are carried also by other ship types than pure container ships and/or - the container ships are calling more ports per voyage in this region, than in the other regions (smaller container flows) .
GB/IE	0.7	0.5	
North Cont North Sea	0.7	0.5	
Scand Baltic West	0.8	0.3	
Scand Baltic East	1.1	0.3	
North Cont Baltic EU	4.0	0.1	
North Cont Baltic Non-EU	0.9	0.2	
NEB	0.7	0.4	

In supplement 4, key figures are also presented at country level.

In Figure 19, the 4 000 vessels that are engaged in transports on our container ports are distributed per region and size class. It is a surprisingly small part of the vessels with container capacity that are pure container ships – between 5 and 11% except for the North Continent and Great Britain regions, where the cellular capacity is on the level 24 – 31% calculated on number of ships.

Another thing to notice is that the major part of the vessels is in the smallest size range, i.e. smaller than 500 container units. The very large container vessels are turning around in the hubs in the North Continent and Great Britain, except for the trans-ocean traffic in Port of Göteborg.

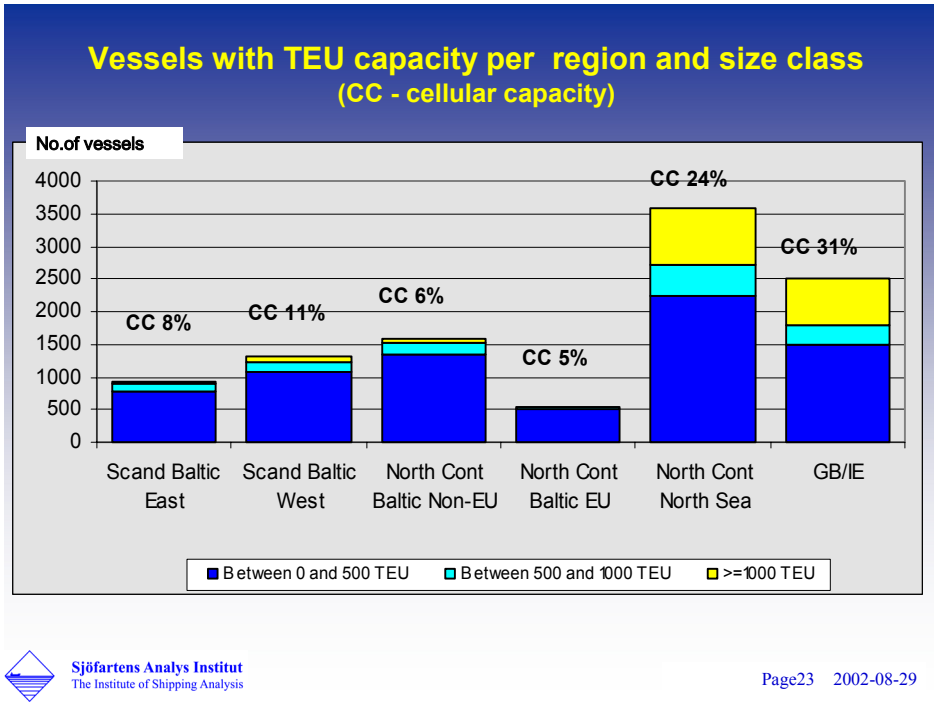


Figure 19: NEB container ports – size classes of container vessels calling each region (number of vessels)

In total, we have found 70 ports with a call frequency of more than 51 calls by container ships on the average during 2000. This frequency represents at least a weekly service in these ports, a frequency that characterises feeder services. The dotted line in Figure 20 represents 1 000 TEU handled in each of the ports and the bars number of calls. Please observe the logarithmic scale. There are seven ports with more than one million TEU lifts, close to 20 between 100 000 and one million TEU and the remaining ports are varying between 3 000 and 100 000 TEU.

Ports with less than 52 calls by container ships during the year are not represented in the figure.

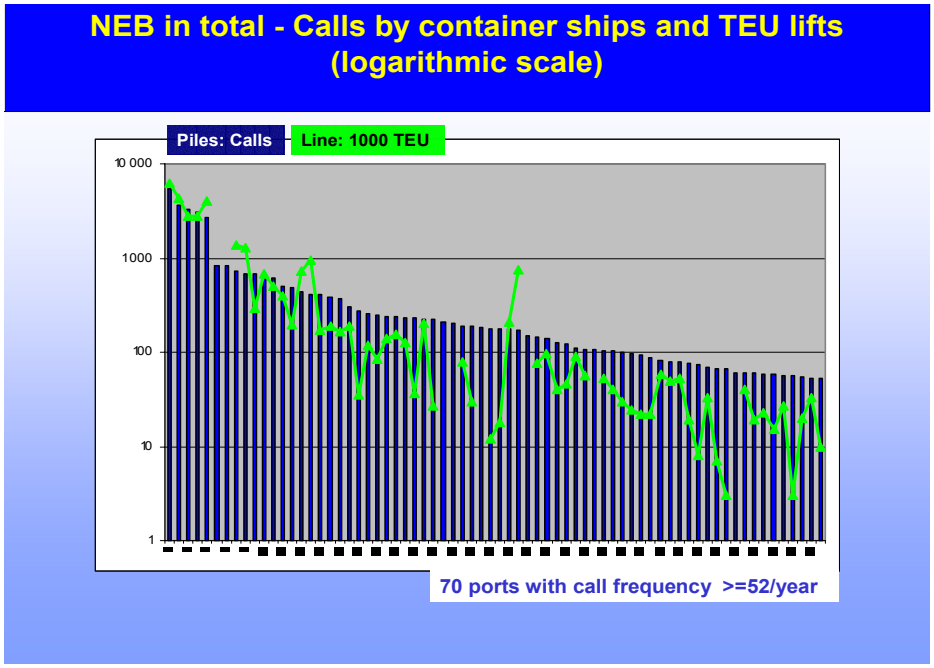


Figure 20: Ports with calls by container ships – number of calls and TEU handled (1000 TEU)

The ports with fewer calls by container ships can very well have quite large TEU volumes as can be seen in Table 16. But these ports have none or very few container ship calls registered in the database.

Table 16: Examples of ports with containers but no or few container ships

Port	Status	TEU ´000	Calls cont. ships	Most frequent ship types
Forth	No Cont. Ships and few calls	144		Tank, Bulk
Portsmouth	No Cont. Ships	60		Pass/Vehicle, Reefer
Lübeck		60	21	RoRo,GC,MP
Aberdeen		58	17	RoRo,Pallet,GC,Pass/Vehicle
Cardiff		43	42	GC,MP
Grenland	Not found in LVR	34		
Drogheda		30	14	GC
Wilhelmshafen		29	3	Bulk/Cont, GC
Clydeport	No calls	26		
Florö		24	13	
Kemi		22	8	RoRo,GC,MP
Oulu		20	8	RoRo,GC,Pallet
Turku		19	10	RoRo,GC,MP
Ipswich		14	5	RoRo, GC,MP
Harwich		12	7	RoRo,GC,Pass/Vehicle
Sundsvall		12	4	GC,MP
Södertälje		12	4	RoRo,GC,MP
Bodö	No Cont. Ships	11		Pallet,GC

So, although the correlation between number of TEU in the ports and calls by container ships is good [18], we find interesting variations. Some ports have relatively small volumes and are still frequently called by container ships; many of these ports are located in Norway, Sweden or the Baltic States. This can indicate that ports are served if the deviation from the routes connecting the major ports is not too large. It is probably also a part of the strategies – to be present on the market. There are also examples of ports with few or no calls by container ships although the TEU volumes could be larger than for other ports served. Our conclusion is that operators with other ship types and container carrying capacity, like roro and multipurpose ships are a part of this market with a small mental reservation – the risk of statistical noise when dealing with figures at port level.

Altogether, the key figures show a structure, which can be summarised as:

- Large differences between subregions concerning supply of transport capacity for containers, especially on pure container ships, which are natural due to the many and relatively small container ports in the Scandinavian and Baltic region.
- Feeder services support the Scandinavian and Baltic region with a dense and highly frequent service. Ports incorporated in the feeder services have a certain volume (concentration) and suitable geographical position versus each operator's schedules and routes.
- Other ship types than pure container ships probably serve the container transport market – a fleet with a large joint capacity, used for container transports or not.
- The presence of different ship types with container capacity vary between subregions and countries though, e.g for Finland, roro ships supply 40% of the total slot capacity called. Also Sweden, Denmark and Estonia are examples of this. The frequent cargo ferries in short sea operations are to the major part dedicated for transports of trailer units. But, the liner traffic with roro ships in both short and deep sea traffic have a very flexible capacity for other commodities like break-bulk, containers etc.
- Multi-purpose ships seem to have a complementary role to pure container ships in regions without large hubs. General cargo ships, on the other hand are the most frequent ship type in the Baltic States

[18] Correlation 0.94 based on 62 observations; x: number of TEU; y: number of calls by container ships

and Russia. But, our conclusion is that general cargo ships to a large extent are dedicated for non-containerised cargo.

4.3 Players on the market – some examples

The operators with capacity to carry containers in the region are numerous. They are to a certain extent niched regarding geography, service and capacity. This is quite understandable, since a specialisation on pure container transports demands liner traffic and high frequency, which necessitates volumes that are stable and large enough. The added value with liner traffic for the shippers is that it is open for all; it is a continuous and well-defined service over time and integrated in a global network of transport links - irrespective of shippers´ volumes.

Unifeeder and Team Lines are two of the largest feeder operators in Northern Europe. Finnlines is through the acquisition of Team Lines a new part in this business, besides their well established European roro-traffic.

Unifeeder [19]

UniFeeder Container Service A/S is one of the divisions within United Shipping Agencies A/S (UniShip). The UniFeeder Division specialises in container transport between all major North European ports as a feeder carrier and between European countries as an intra-European door/door operator.

The company UniFeeder Container Service A/S was established in 1977 in Aarhus and Copenhagen and its main activity is based on short sea traffic in Northern Europe.

As a commercial feeder carrier UniFeeder serves container ports in: Germany, The Netherlands, Belgium, United Kingdom, Denmark, Sweden, Norway, Finland, Russia and Estonia.

Intermodal door/door transport in containers is carried out between the Nordic countries/Russia/Estonia and Germany/Benelux/France/Italy/the United Kingdom/Ireland.

As a commercial feeder operator, UniFeeder offers comprehensive and efficient feeder services to all major container lines.

[19] Information from Unifeeder Container Service, home page

Figure 21: The ports served by Unifeeder

Unifeeder in short:

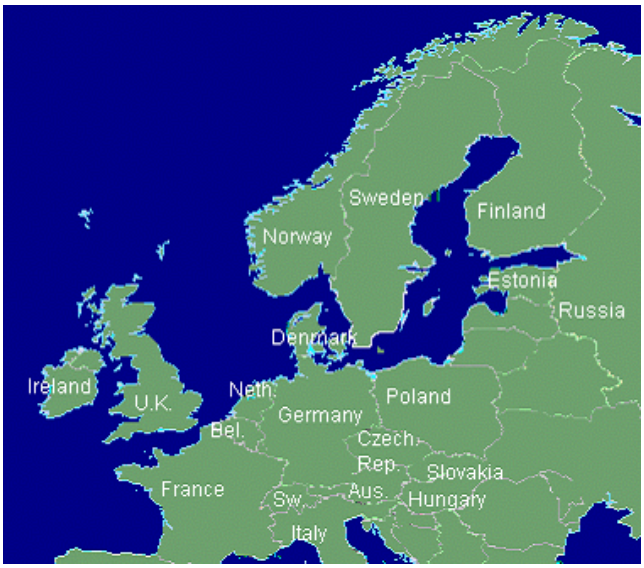
- Annual carryings 800,000 TEU involving more than 6,500 port calls
- 30 modern container vessels with a capacity between 320 and 700 TEU
- Vessels with highest Finnish ice class
- All kinds of IMDG cargo (cargo classified according to International Maritime Dangerous Goods Code [20])
- Project cargo
- Temperature controlled transport of reefer and tank containers
- 21 ports served in fixed weekday schedules
- Additional ports called subject to inducement
- UniFeeder offices and agents are linked to an online - real-time IT network
- Fast and efficient cargo and information flow; EDI links established with customers, terminals and authorities

European traffic - door-to-door

As a separate division within UniFeeder Container Service A/S they have since 1985 been offering full load door-to-door transport in containers all over Europe.

[20] The IMDG Code is intended to provide for the safe transportation of hazardous materials by vessel and to prevent marine pollution. Today at least 150 countries whose combined merchant fleets account for more than 98% of the world's gross tonnage use the IMDG Code as a basis for regulating sea transport of hazardous materials. Source: IMO (International Maritime Organisation).

The door-to-door service makes full use of a combination of transport by rail, by road and by sea. Trading areas are most destinations within the countries shown on the map below:



- Environmentally friendly transport solutions
- Agents in most European countries
- Large capacity
- Full load specialists
- Just in time transport
- Operating own vessels
- Individual customer solutions
- Performing more than 26,000 transports per year

Source: UniFeeder Container Service A/S web

Figure 22: Unifeeder- trading areas for the door-to-door services

Team Lines [21]

Team Lines was founded in 1991. It was owned by four well-known German shipping companies: Johannes Ick, Mathies Reederei, Ernst Russ GmbH & Co., and Finnlines' German subsidiary Finnlines Deutschland AG. Team Lines is now one of the biggest feeder lines in Northern Europe. Team Lines´ fleet consists of 22 container vessels with a capacity of 200 – 650 TEU per ship. The majority of the ships are time-chartered, which provides the flexibility the company needs to adapt to variations in trade and demand for container carrying capacity over time. These can be allocated to different routes in a flexible way.

There are regular scheduled transport services from the ports of Hamburg and Bremerhaven to Norway, Denmark, Sweden, Finland, Russia, Lithuania and Poland. Over 90% of the shipments are container traffic between the deepwater ports around the North Sea and ports in the Baltic and Norway. Their customers are overseas shipping lines.

The Finnish traffic accounts for around one third of the Team Lines volume including transit traffic via Finnish ports for Russia.

[21] Information from Team Lines, home page

Figure 23: Team Lines – trading area and ports served

Finnlines [22]

In April 2001 Finnlines bought 68.2 % of Team Lines from its German owners. Finnlines´ former ownership in the company was 31.8 % and after this deal Finnlines owns the company to 100 %. This deal is said to be a strategic move to strengthen Finnlines' position in the southern part of the Baltic Sea and in services between third countries.

Besides the Team Lines service, The Finnlines Group offers regular ro-ro liner services in the Baltic Sea between Finland and Sweden (FinnLink), Poland (PolFin Line), Germany and Scandinavia as well as in the North Sea between ports in Finland and Great Britain, Belgium, the Netherlands and the Bay of Biscay (Finnlines Cargo Services). Under the name TransRussia Express, the company also operates two times a week from Kiel (Germany) directly to St. Petersburg (Russia). Nordö-Link maintains a scheduled freight liner service between Sweden (Malmö) and Germany (Trawemünde).

The Finnlines and Team Lines are kept separate since international feeder traffic and scheduled European traffic are such different businesses with different customers, cargo flow patterns and market situation. But, in monitoring the market situation and demand for transports and logistics from the Finnish industry, this in itself could be

[22] Information from Finnlines, home page

a competitive advantage when marketing the feeder services to overseas lines.

According to Finnlines, their strategic goals are:

Maintaining the market position in Finland-related liner services

- Satisfying the organic growth, continuous development of services and efficient provider of information services

A stronger position in Russian freight traffic

- Efficient marketing and sales of transport services for freight in transit via Finland to and from Russia, development and marketing of transport services between Continental Europe and Russian Baltic ports

A stronger position in liner services connecting third countries (other than Finland) in the North Sea and the Baltic area

- New routes and acquisitions

Increased profitability through higher productivity

- Routing of freight traffic together with customers to achieve a better vessel utilisation rate
- Continuous development of the fleet in respect of age and structure
- Optimising operating costs

Increased profitability through better management and information

- Deployment of the latest information technology throughout the transport chain, in operational management, customer service and marketing

Increased profitability by efficient management of environmental and safety issues

- Systematic development of environmental and safety issues to generate financial added value, taking into account safety aspects and the principles of sustainable development

Increased result performance through personnel training

- Continuous development of the expertise and skills of Finnlines employees.

Finnlines Group maintained an average of 85 vessels in service during 2001, consisting mainly of ro-ro freight vessels, ro-pax vessels and container vessels. At the beginning of 2002, the total capacity of the vessels in liner service was approximately 77,000 lane metres. The fleet has an average age of about 11 years. Finnlines' main operating areas are the Baltic Sea and the North Sea. The Group's route network covers all major Finnish ports as well as some 30 ports abroad. It offers more than 100 weekly departures from ports in Finland. The Group's main Finnish liner traffic ports are Helsinki, Turku and Naantali. These ports are so-called unitised cargo ports and they mainly serve lorry and semi-trailer traffic. Their cargo flows are optimally balanced between export and import traffic. The Group's other main ports in Finland are Kotka, Hamina, Hanko, Rauma, Uusikaupunki, Mäntyluoto, Oulu and Kemi. These ports predominantly serve the product export trade and consequently have a lesser flow of imported goods.

In the Helsinki Metropolitan Area, the Finnlines Group engaged in port operations under the name Finnsteve in the Sompasaari harbour, the West and South harbours of Helsinki, and in the Port of Kantvik in Kirkkonummi. The Helsinki harbours are Finland's most important harbours in terms of imports, and they are also significant for the country's exports.
Port operations are based on the handling of unitised cargo, i.e. trucks, containers and semi-trailers. The Sompasaari harbour focuses on serving the Baltic Sea traffic, while the West harbour mainly provides feeder services for overseas cargo. Due to its wide range of liner connections, the Port of Helsinki has a competitive advantage over all other Finnish ports, with an average of 10 vessels calling at the port every day.
During the year under review, the Group engaged in port operations in Turku and Naantali both under the name Finnsteve and under the auxiliary name Turku Shipping. In Turku, the Group operated in the Port of Turku and the Pansio rail ferry harbour.
The Group was also engaged in cargo handling and terminal operations in the Port of St. Petersburg, Russia, in co-operation with a Russian party operating through a company by the name of RosEuroTrans Ltd. The Finnlines Group owns 50 per cent of the company in question. The port operations revenue also includes the Group's stevedoring and terminal operations in the port of Oslo, which are carried out under the name Norsteve A/S.
SOURCE: FINNLINES ANNUAL REPORT 2001

Players on the same market – yes, but with several strategy options and ways for implementation. Herby, we have enough details for the Concluding Analysis presented in the first part of this report.

5 The databases – structure and function

5.1 Introduction

Information about ship movements are collected and updated daily by Lloyd's Marine Intelligence Unit (LMIU) by their agency network. They record details and recent voyage history of over 22,000 vessels in commercial service.

Today, the Agency System is comprised of some 400 prinicipal agents and over 500 locally appointed sub agents, who assist in representing the LMIU at some 2,000 ports/cities around the world.

In addition LMIU collects information from Port Authorities, coastguards, pilots, customs and other trusted sources to provide true global coverage. The database covers a collection of 3 million vessel movements per annum for a fleet in excess of 60,000 vessels above 100 GT.

SAI has collected data from LMIU for the year 2000 for the North Sea and Baltic Sea Region (NBSR) including 14 countries. Iceland is not included here. The database is extended in time and geography compared to the one used for analyses in the report for the Swedish Maritime Administration "Baltic Maritime Outlook 2000" [23], which contained 10 countries in the Nordic Baltic Sea Region for the second half of 1998.

Fairplay Register has been designed for use by the shipping industry. Fairplay was an independent international publishing, information and computer software organisation specialising in and dedicated to the marine industries. The register has export facilities to many leading software packages and it adheres rigidly to standard Microsoft Windows™ user interfaces combined with powerful search functions.

During 2001, Lloyd's Register - Fairplay Limited, formed a new joint company. This is the world's largest independent supplier of maritime information services. Lloyd's Register - Fairplay maintain the largest and most comprehensive database of the world's merchant fleet comprising over 90,000 sea-going merchant ships, together with details of over 50,000 ships either totally lost or broken up.

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[23] Baltic Maritime Outlook 2000

None of these databases contain any data about cargo shipments and that is the reason for building up the SAI Cargo Database. This is also built in Microsoft Access environment, since this makes it possible to search and combine a huge amount of data about cargo, ship movements and data about the fleet in any of the regions we have defined.

Through connecting the separate databases, it is possible to extract container volumes per port or regions, ship capacity used, ship types, frequency in port calls, ship movements together with details about the fleet in the specified region(s). But, we cannot derive the capacity utilisation, because such analyses must include also detailed information about the distribution of cargo on specific vessels and such information is confidential.

The SAI Cargo Database for container volumes covers container ports in the defined region. The ship movement database includes a geographical region that covers 14 countries in the region – including all of Russia. From these movements we can extract data about the traffic to, from and between container ports as well as calls in the other ports. Since Eurostat includes EU countries only, we can only use the data when analysing eight countries (and their major ports). The possibilities to make regional aggregates on the basis of Eurostat are also restricted due to this.

In the following part of the chapter is a comprehensive description of the database tool that is used to process the data analysed. The tool is a combination of several modules, each contributing data, functionality or both.

There are several purposes with the developed database tools:

5. Handle large amounts of data in a structured fashion
6. Provide a sound basis for complex analyses
7. Create a flexible environment that enables complex data extraction
8. Enabling analysis of several domains:
   - Geographical
   - Vessels
   - Traffic
   - Cargo flows

5.2 Function

The database tool is composed of several modules, of different structure and origin. Some of the modules are commercially available databases, and some are developed internally. The tool performs the following functions:

- It handles a very large amounts of data, from multiple sources:
  - An internal cargo handling database (SAI Cargo DB) – this database has a separate interface for data maintenance. This interface is not used in the analysis, but is critical for the entering and classification of the data.
  - A database of vessels – a commercial database that contains detailed information on vessels
  - A database of ship movements – a commercial database containing data on vessel movements
- Processes the data separately for the domains listed above (geographical, vessels, traffic and cargo flows)
  - Each domain has its own data structure
  - All of the domains can be linked together through data relationships
- Generates several outputs where the domains are combined in different ways

All of the databases are presently in Microsoft Access-format.

5.3 Structure of data

This chapter describes the data structures for the different modules. The different databases are accounted for separately as well as when they are linked.

5.3.1 The databases

SAI Cargo DB

The central table in this database is the table containing the regions. A region can be comprised of one or more ports. Examples of regions used in this study are:

- Göteborg – the port of Göteborg
- Sweden – all ports in Sweden
- Bremen-Bremerhaven – the two ports are not separated in the reply from the ports and must therefore be treated as one region
- North Continent Baltic EU – all ports in EU countries that are situated in the Baltic Sea region in the North Continent.
- NEB – all container ports included in this study

The composition of a region is completely arbitrary and a port can be part of several regions. The focus on regions instead of ports carries some interesting implications:

- It becomes possible to encapsulate several ports into one "black box" that can be treated as a single port for all purposes.
- The ports of a region do not have to be geographically adjacent. It is possible to group, for instance, all ports that a certain shipping line operates against as a separate region for further analysis

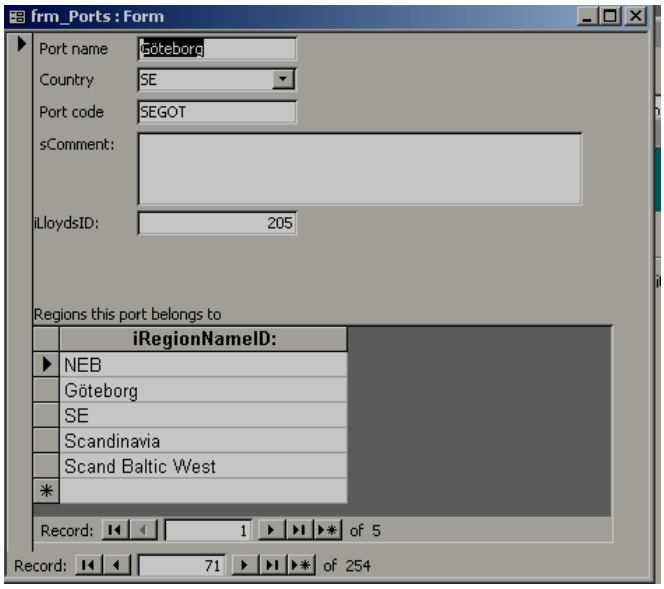

Figure 24: Each port can belong to multiple regions

The second important table in the SAI Cargo DB is the table of activities. An activity is in essence a number specifying a quantity that has passed through the system boundary of a region. The activity value is classified in several ways:

- The name of the region
- The activity type
  - Loaded
  - Discharged
  - Total handling (Loaded + discharged)
- The quantity (the activity value itself)
- The load type e.g.
  - 20 ft TEU
  - 40 ft TEU
- The vessel type (if avalible)
- The origin/destination (if available)
- The goods type (explained below)
- The source – where the data come from
- Several different dates e.g.
  - Start of period
  - End of period
  - Registered date

Each activity value is, as shown above, therefore classified in a number of ways. The actual entering of data into this structure is fully automated from the different sources (mainly spreadsheets). For this analysis, 27000 separate activities have been registered.

Figure 25 shows the interface for registering an activity.

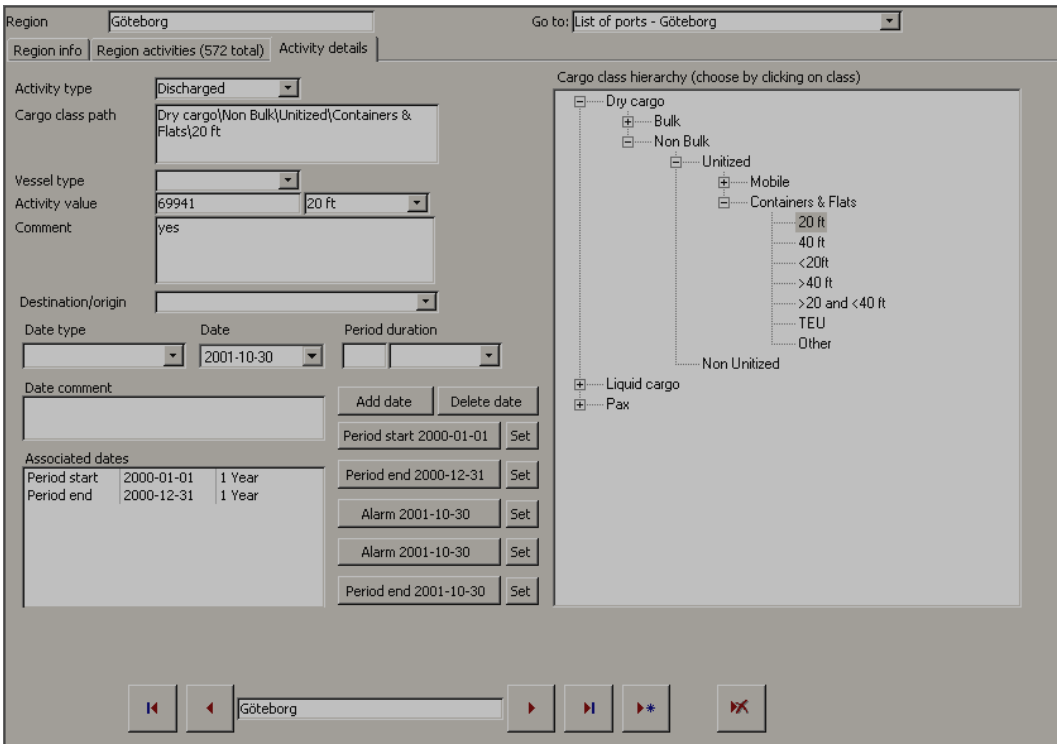

Figure 25: The interface for registering an activity.

Note the goods type hierarchy to the right in the figure. The hierarchy can be seen in full in Supplement 2: Goods type hierarchy.

A more formal representation of the data relationships can be seen in Figure 26 below.

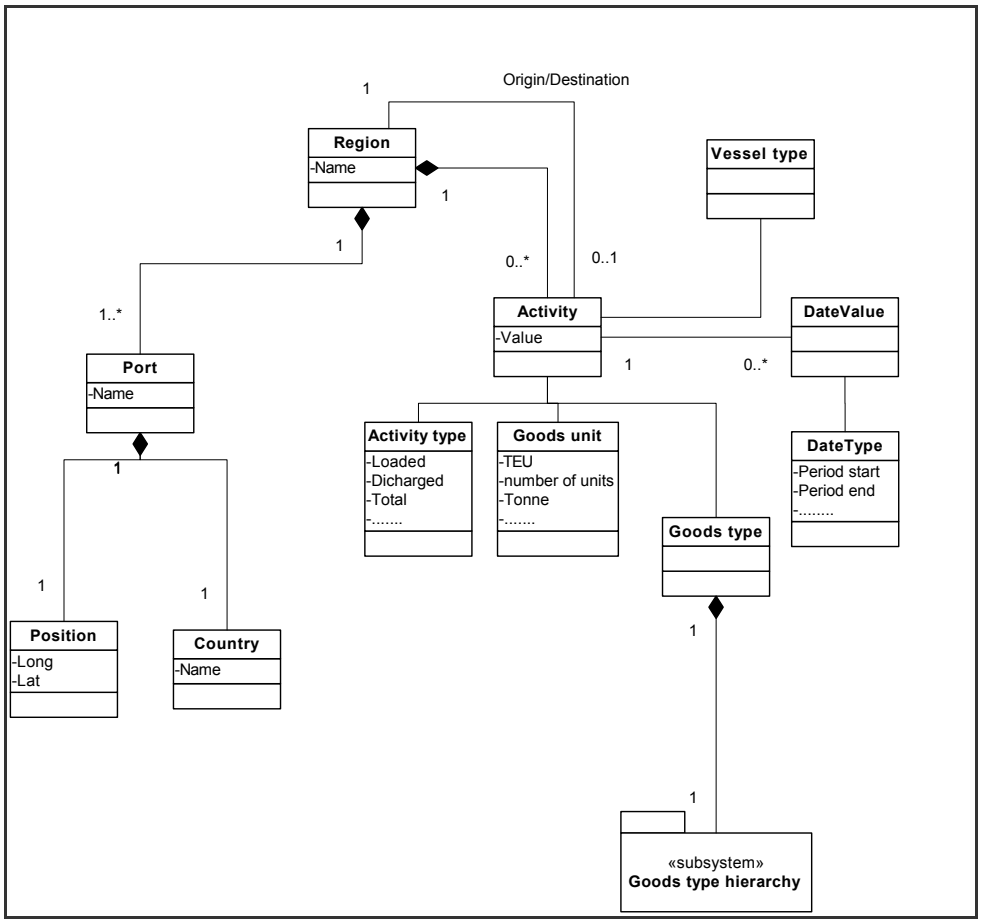

Figure 26: The data relationships in SAI Cargo DB

The subsystem of goods types is left out of the figure due to its size. For each activity, the goods type can be specified to a very high degree. The hierarchy consists of dry cargo, liquid cargo and passengers (pax). The three top levels are broken down into as much as four sub levels. The hierarchy in full can be seen in Supplement 2: Goods type hierarchy.

Lloyd's - Fairplay –fleet data

From this comprehensive register of vessels, one table in particular has been used. The table (tblShip) contains around 230 fields that are used to describe each vessel in great detail. Some examples of fields are:

- IMO number
- TEU capacity
- Information about operator, owner and other actors
- Engine data
- Physical specifications

The IMO number is unique for each vessel and can be used to relate the data to other databases, such as Lloyd's ship movement record.

Lloyd's ship movement database

This database consists of a number of interesting tables:

- Vessels – this table is less comprehensive than Fairplay PC Register, but it contains the IMO number of each vessel, which facilitates linking of data
- Places – consists of ports along with additional data such as geographical position (longitude and latitude) and country. Each place can be linked to a port in SAI Cargo DB
- Movements – is a time series where each call for each vessel in each port is registered with dates

5.3.2 Linking the databases

It is possible to link the three databases together, so that:

- For each region in SAI Cargo DB a number of ports in Lloyd's ship movement database are identified, also a number of activities are identified
- For each port in the ship movement database, a number of calls are identified
- For each call, a vessel is identified
- For each vessel, a link to Fairplay can be established so that comprehensive data can be obtained

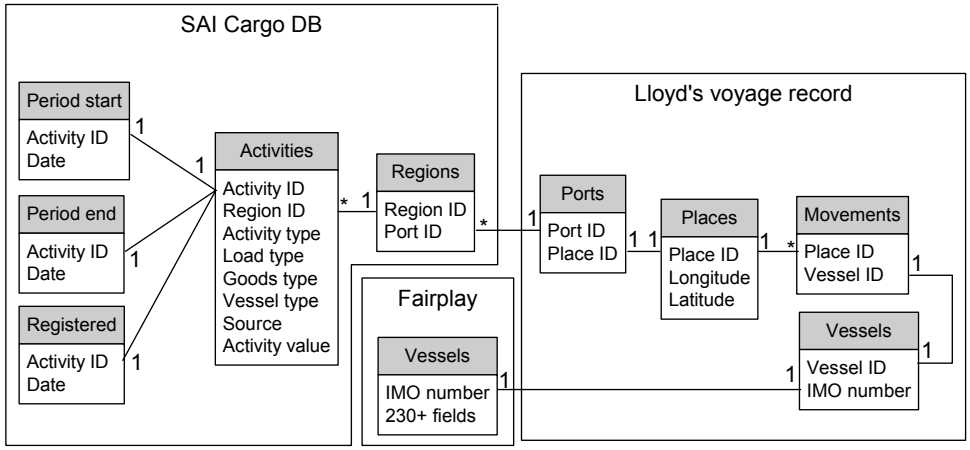

Figure 27: The relationships between the databases

5.4 Complexity of data

5.4.1 Exploding relationships

In Figure 27 above, an asterisk (*) means that there can be multiple rows in the table that corresponds to the related field. It is not hard to imagine the amounts of data that can be extracted just by allowing all regions. A quick example:

- One region contains seven ports.
- Each port has 35 activity values.
- Each activity value has three dates
- Each port has an average of 3500 calls (movements) per year

This gives a total number of rows in a result table (if all fields are included) of:

7 * 35 * 3 * 3500 = 2 572 500 rows

It is therefore crucial to limit the number of fields for each analysis to the absolute minimum; otherwise, the sets of results will be too large to comprehend.

5.4.2 Complex hierarchies

Since there is a many-to-many relationship between ports and regions, hierarchical data are difficult to extract. One port can be part of many regions and one region can contain many ports. Also, when summarising the number of vessels and calls for a region, caution must be exercised. The system boundaries have effects on the total number of unique vessels (Figure 28).

The number of calls for a region is always equal to the sum of the number of calls for its sub regions. The number of unique vessels to make calls in a region is not the sum of unique vessels to make calls in sub regions. Vessels that travel between sub regions will be counted once for each region they visit. The sum will therefore be too high if these duplicates are not removed.

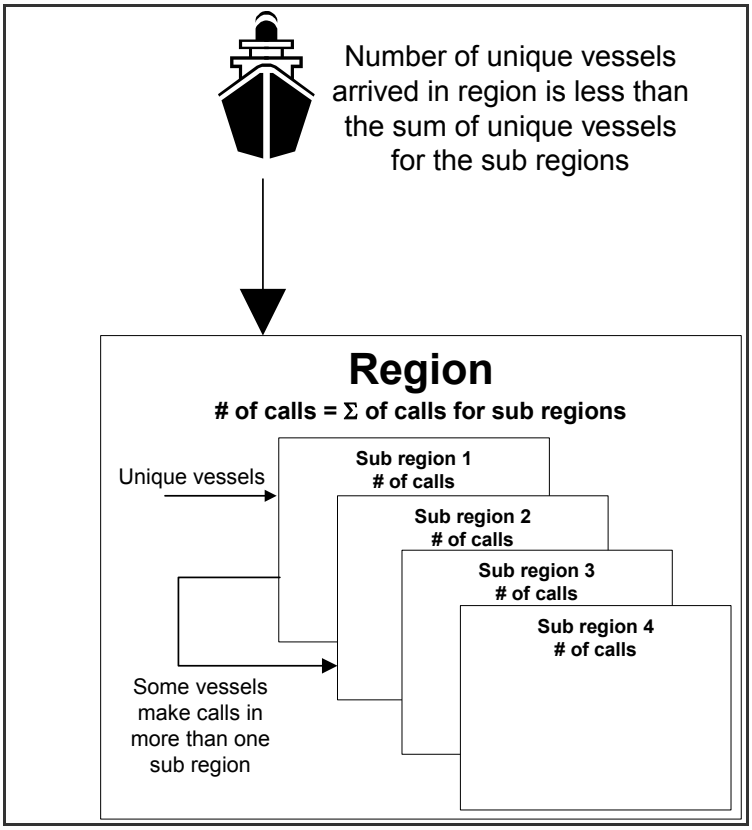

Figure 28: The system boundaries have effects on the number of vessels and calls

5.5 Method

The method used can be described in two stages:

- Relate the data domains in the database environment
  - Create relationships between the different databases
- Mould the data into the desired form by aggregating, grouping, summarising, extracting or combining. For the desired end result to be achieved, several manipulation steps might be needed
  - Aggregating – Arranging hierarchical data so that data "lower" in the hierarchy is merged with data from a "higher" level, for instance a main (geographical) region that contains several sub regions.
  - Grouping – Removes duplicate rows in a table. By including/excluding columns, the effects of grouping can vary drastically. For two rows to group into one, all their fields must be equal.
  - Summarising – performs a calculation for a field. This could for instance be the sum of a field value for all rows. One common summarising method is the count-method. The count-method performs a grouping, but allows one field to differ between rows. The function counts how many rows there are for each field value.

- Extraction – The extraction of data from a database is, in most cases, a matter of formulating filters and constraints.
- Combination – The combination of data means that the contents of one field is merged with the contents of another field, like the two fields *Qty* and *Load unit*, where the values "20" and "TEU" are combined in a new field as "20 TEU".

Data manipulation stages

To achieve a result set like the one below, 32 separate data manipulation stages are executed. Each of the four domains is represented in Table 17. Since the domains have their own internal structure, the task of combining them in one table is complex. Each of the stages produces an intermediary table that can be used to create other results as well.

Table 17: Example of result table and the domains that are combined

Region	Number of calls	Unique vessels	Activity type	Qty	Load unit	Vessel type	TEU class	Dwt class
NEB	205	8	Total handling	31166875	TEU	Ro-Ro /General Cargo	Between 500 and 1000 TEU	Between 5000 and 10000 ton
Geographical domain	*Traffic domain*	*Traffic domain*	*Cargo flow domain*	*Cargo flow domain*	*Cargo flow domain*	*Vessel domain*	*Vessel domain*	*Vessel domain*

5.6 Achievements

By constructing this database solution, a number of achievements have been made.

General solutions to specific problems

Since the data manipulation steps are saved, they can be reused on any data matching the same relationship structure. By changing certain conditions in the extraction, different areas altogether can be analysed using the same tool. The number of conditions that is specific to the completion of this project has been kept to a minimum, keeping reconfiguration efforts for future analyses down.

Increased reliability

Since the tool is standardised, the human factor involvement has been kept to a minimum. Traditional analyses of this magnitude have been laden with

human interaction and manual elements, affecting the reliability and repeatability.

Handles very large amounts of data
An analysis of this kind would, due to the amount of data, be almost impossible to perform manually. The task of counting unique vessels, for instance, requires that vessels are identified individually for each region. It is not possible to aggregate the results from sub regions, as explained above, leading to a new count for each new region that is added (some of the regions are very large, like NEB).

5.7 Future development of the database tools

The development of the database tools (cargo database and query database) is not meant to stagnate. As the tools are used, needs for further enhancements will be identified. These needs will trigger new development cycles. This chapter gives examples of areas that may be addressed in future versions of the tools.

Database size

Today, the cargo database contains values for four years (1997 - 2000) and 150 ports. If the number of ports is increased to include other areas, such as the Mediterranean, or if more than one year is registered the number of rows in the database will increase significantly. For each activity value, a minimum of three rows is registered. The environment that is used (MS Access) can handle fairly large tables (0.5 million rows at least). The larger the tables, however, the longer it takes to process them. Therefore, it may be advisable to do one or more of the following in the future:

- Keep separate databases for different years. This way, the size of each database will be kept to a manageable state.
- Convert to another database engine, like MS SQL Server or Oracle. A conversion to a high-grade professional database engine increases capacity and speed dramatically. The cost for introducing such an engine is however considerable.

Generality

This report is limited to container traffic in a specific region. However, the cargo database can handle any type of goods in any region. To run analyses on any domain, the query interface may need some small adaptations due to necessary delimitations. Some of the queries in the analysis database have conditions that are necessary to keep the number of rows in the result set down. These conditions may change if the domain of analysis changes. An interface to easily change these conditions will be useful.

Maintenance interface

The management of data in the cargo database must be user friendly as well as flexible. There is a definite trade-off between these two properties, however. Because of this, two interfaces have been constructed:

- Batch interface.
    - The user defines an import filter that is used to import batches of data in another format, for instance Excel. The definition of the filter must be done once per import type.
    - The batch can be handled as one unit
    - The user can create a "template activity" for a region and then create a time series based on this template. Activity data for the whole time series can then be pasted from for instance Excel.
- Single item interface
    - Allows the user to add, edit and delete a single activity value. This interface is very flexible, but requires more knowledge from the user.

Future development of the maintenance interface may include:

- Enhancements in defining import filters. A generic import function may be possible.
- More advanced batch-editing functions.
- Browsing and searching functions. The maintenance interface is not intended to provide an advanced filtering mechanism, which is what the query database is for. There is, however, a need for basic navigation and search functions, especially when working in the single item interface.

Supplement 1: Questionnaire form

Container Handling
- Nordic Baltic and North Sea Range (NBNSR) -

Research made by The Institute of Shipping Analysis (SAI) indicates a large potential for Short Sea Shipping container feeder systems in the future. That is why SAI has decided to undertake a deeper research, involving app. 250 working days within the project "The North European Container Feeder Market".

The research is financed by government funds through the Swedish research board Vinnova together with actors within the shipping cluster. The objective is *to define the driving forces behind the development of the Short Sea Shipping container market and transport networks, their strengths and hindrances*. In this context transport networks are competing with as well as complementing each other.

We hope you will find it positive to participate in this study, which means that we will inform you about the research result when it is finalised in April 2002.

In the meantime, we are also very pleased to offer our report "Early Opportunity and Warning" free of charge for six months upon completion of the questionnaire below. We enclose our latest reports "World Trade 2000" and "Sweden-Freight Transport Delegation Final Report – summary of main findings" to give you an idea of the different analyses conducted on behalf of our members. *You can read more about the Institute in a separate attachment and by visiting* http://www.sai.se/.

An example of SAI's previous analyses - "Baltic Maritime Outlook 2000", conducted on behalf of the Swedish Maritime Administration, can be found as a full text report on the same home page as wells as a case study of the container development in The Port of Gävle. (Click Reports then Theme, then choose Baltic or Container respectively.)

In order to carry out the research we need to collect some basic data that will only be used for research purpose. Our databases are in principle open to universities and schools, but the researchers will have to adhere to well defined rules regarding use and publishing of data and analyses.

The questionnaire consists of four parts:

Container port throughput figures: For some ports, we have been able to collect more or less complete data from official statistics. But please, help us with the empty boxes and – we appreciate any corrections or comments on the figures already collected.

Shipping lines: Please list the most frequent shipping companies calling your port to load or discharge containers, frequency and approximate annual TEU-figures for each operator. Our target is shipping companies with traffic within the Northern European region.

Hinterland: We would also be very pleased for an indication on your port's hinterland regarding container cargo.

Plans and projects: We would like for you to share with us your plans for and views on your future container handling. If you fill in the form digitally, just use the tabular key to move between the fields.

Please fax the form to SAI +46 31 156965 or mail it to barbro.wilen@sai.se

Container Port

Name	

Contact Information

First name		*Office Phone*	
Last name		**Office fax**	
Job title		**Cell phone**	
Company		**e-mail-address**	
Business Address		**Web page**	

Container Port throughput 1997-2000

Year 1997	**Discharged TEU**	**Loaded TEU**	**Total TEU**	**Total Ton**
Container, TEU				
-whereof empty				

Year 1998	**Discharged TEU**	**Loaded TEU**	**Total TEU**	**Total Ton**
Container, TEU				
-whereof empty				

Year 1999	**Discharged TEU**	**Loaded TEU**	**Total TEU**	**Total Ton**
Container, TEU				
-whereof empty				

Year 2000	**Discharged TEU**				**Loaded TEU**			
	20 ft	40 ft	Other units	Tot.TEU /tonnes	20 ft	40 ft	Other units	Tot.TEU /tonnes
Container, no								
-whereof empty								
Tonnes in containers								

Shipping Companies

Which shipping companies call your port regularly for loading and/or discharging containers?
Our target is shipping companies with regular traffic within the NBNSR region.

Shipping Company	**Frequency (e.g. once a week etc.)**	**Approximate TEU loaded+discharged /operator –Yr 2000**

Do you also have trans-ocean direct traffic?

Shipping Company	**Frequency (e.g. once a week etc.)**	**Approximate TEU loaded+discharged /operator -Yr 2000**

Hinterland

Please indicate the geographical area that you consider to be your port's dominating hinterland for containerised cargo. Please rank the alternatives below 1-3 where 3 is the largest proportion and 1 the smallest.

Outbound containerised cargo/exports	**Today**	**In 5 – 10 years**
Local domestic origin up to 100 kilometres		
Regional - more than 100 kilometres but domestic origin		
Origin in other countries/transit		
Inbound containerised cargo/imports	**Today**	**In 5 – 10 years**
Local domestic destination up to 100 kilometres		
Regional - more than 100 kilometres but domestic destination		
Destination in other countries/transit		

Ongoing Projects, Existing Plans and Views in 5 – 10 years

We would like for you to share with us your plans and views for your future container handling. Please use the defined ranking alternatives below.

No interest: 0, Would like to explore: 1, In our plans for the future: 2, Ongoing project: 3	
Type of measure/activity	***Ranking 0/1/2/3***
Investments in "hard" infrastructure	
--- road transports	
--- rail	
--- fairways	
Investments in Information and Communication Technology (hardware/software)	
Increased cost efficiency – port call costs ***If your ranking is over zero, please explain below under 1)***	
To differentiate the supply of port services	
To increase the supply of transport alternatives through your port	
Partnerships and alliances	
--- with other ports (horizontal integration)	
--- with other actors (vertical integration)	
Other measures. If your ranking is over zero, please explain below under 2)	

If increased cost efficiency is prioritised, please indicate three categories of costs or charges – internal or external, that you believe are crucial for your future competitiveness.

A

B

C

If other measures are prioritised, please indicate which sector or type of measure:

Thank you very much for your assistance.

Supplement 2: Goods type hierarchy

Level 1	Level 2	Level 3	Level 4	Level 5
Dry cargo		Major	Bauxite & Aluminia	
			Coal	Coking
				Steam
			Grain	
			Iron Ore	
			Phosphate	
	Bulk	Minor	Agri. Prod	Oil-cakes
				Raw Sugar
				Refined Sugar
				Rice
			Cement	
			Coke	
			Fertilisers	
			Forest Prod.	Chips
				Paper&Paper Board
				Roundwood
				Sawnwood
				Wood Pulp
			Gypsum	
			Limestone	
			Manganese Ore	
			Non-Ferrous Ores	
			Oil-Cakes	
			Petroleum Coke	
			Pig Iron	
			Potash	
			Quarts and Silica Sand	
			Salt	
			Scrap	
			Steel prod.	
			Sulphur	
			Tapioca	
	Non Bulk	Non Unitized		
		Unitized	Containers & Flats	<20ft
				>20 and <40 ft
				>40 ft
				20 ft
				40 ft
				Other
				TEU
			Mobile	Animals
				Buses
				Caravans&carriages
				Ind. Cars
				Pax cars&combinations
				Railway waggons
				Trailers
				Trucks&combinatons
Liquid cargo	Agriculture	Fruite Juice		
		Vegetable oils		
		Wine		
	Chemical	Inorganic		
		Organic		
	Crude oil			
	Gas	LNG		
		LPG		
		NGL		
	Petroleum Prod.	Gasoil		
		Gasoline		
		Jet Oil		
		Kerosene		
		Naptha		
Pax	Cruise			
	Ferry			

Supplement 3: Container ports SAI Cargo Database

61 SAI and Eurostat ports		SE	Malmö	NL	Velsen/Ijmuiden
BE	Antwerpen	SE	Norrköping	NL	Vlissingen
BE	Zeebrugge	SE	Nynashamn	SE	Karlskrona
DE	Brake	SE	Smålandshamnar	SE	Pitea
DE	Bremen/Bremerhaven	SE	Oxelösund		
DE	Duisburg	SE	Sundsvall	**45 SAI Non-EU ports**	
DE	Hamburg	SE	Stockholm	EE	Tallinn/Muuga
DE	Lübeck	SE	Uddevalla	LT	Klaipeda
DE	Wilhelmshafen	SE	Umeå	LV	Liepaja
DK	Aalborg	SE	Varberg	LV	Riga
DK	Aarhus	SE	Västerås	PL	Gdansk
DK	Copenhagen				Gdynia
DK	Esbjerg	**10 SAI EU ports**		PL	Szczecin-Swinoujscie
FI	Helsinki	DK	Odense	RU	St. Petersburg
FI	Hanko	FI	Lappeenranta	NO	Aalesund
FI	Hamina	FI	Raahe	NO	Alta
FI	Kemi	FI	Rahja	NO	Bergen
FI	Kokkola (Ykspihlaja)	FI	Tornio	NO	Bodo
FI	Kotka	IE	Drogheda	NO	Borg Hbr.
FI	Oulu	SE	Åhus	NO	Brönnöy
FI	Pori	SE	Lysekil	NO	Drammen
FI	Pietarsaari	SE	Södertälje	NO	Egersund
FI	Rauma	SE	Wallhamn	NO	Florö
FI	Rautaruukki			NO	Grenland
FI	Turku	**30 Eurostat EU ports**		NO	Hadsel
FI	Vaasa	BE	Ghent	NO	Halden
GB	Aberdeen	DE	Brunsbuettel	NO	Hammerfest
GB	Belfast	DE	Cuxhaven	NO	Harstad
GB	Bristol	DE	Emden	NO	Havösund
GB	Forth	DE	Kiel	NO	Karmsund
GB	Felixstowe	DE	Nordenham	NO	Kirkenes
GB	Harwich	DE	Rostock	NO	Kristiansand S
GB	Hull (ABP)	DK	Fredericia (Og Shell-Havnen)	NO	Kristiansund N
GB	Immingham/Grimsby (ABP)	FI	Finland Inland Ports	NO	Larvik
GB	Liverpool/Mersey	FI	Naantali	NO	Molde
GB	London	GB	Trent River	NO	Moss
GB	Medway (inkl. Thamesport)	GB	Boston	NO	Målöy
GB	Tees & Hartlepool	GB	Cardiff	NO	Narvik
GB	Southampton (ABP)	GB	Clydeport (208)	NO	Nordkapp
GB	Tyne	GB	Dundee	NO	Oslo
GB	Warrenpoint	GB	Dover	NO	Sandnes
IE	Dublin	GB	Goole	NO	Sauda
IE	Cork	GB	Ipswich	NO	Sortland
NL	Amsterdam	GB	Kirkwall	NO	Stavanger
NL	Rotterdam	GB	Milford Haven	NO	Stord
SE	Göteborg	GB	Portsmouth	NO	Tromso
SE	Gävle	GB	Stranraer	NO	Trondheim
SE	Halmstad	NL	Dordrecht	NO	Tönsberg
SE	Helsingborg	NL	Delfzijl/Eemshaven	NO	Vaagan
SE	Karlshamn	NL	Moerdijk	NO	Vikna
SE	Köping	NL	Terneuzen	IS	Reykjavik
In total : 146 ports with container handling y2000 in NEB region					

Supplement 4: Key figures, supply of TEU capacity/country/ship type

Calls							
Vessel Type	All	Cont	GC	MP	RoRo	Bulk	Other
DE Total	20 037	7 319	2 216	4 942	2 797	1 383	1 380
GB Total	25 245	6 712	3 480	4 136	6 630	1 865	2 422
NL Total	17 865	5 698	3 274	3 667	1 959	1 655	1 612
BE Total	14 322	3 163	2 712	2 589	3 693	941	1 224
IE Total	2 837	1 000	509	832	23	385	88
SE Total	9 478	1 755	1 998	2 569	1 641	827	688
FI Total	8 839	1 163	1 482	1 896	3 307	413	578
NO Total	11 270	1 635	1 225	2 437	842	675	4 456
DK Total	4 815	1 044	671	1 150	1 191	464	295
PL Total	3 549	653	838	921	398	448	291
RU Total	2 813	487	968	678	171	305	204
LV Total	2 595	268	821	791	125	324	266
EE Total	968	142	285	242	196	91	12
LT Total	1 358	103	398	365	154	207	131
NEB Total	125 991	31 142	20 877	27 215	23 127	9 983	13 647

Calls							
Vessel Type	All	Cont	GC	MP	RoRo	Bulk	Other
DE Total	100%	36,5%	11,1%	24,7%	14,0%	6,9%	6,9%
GB Total	100%	26,6%	13,8%	16,4%	26,3%	7,4%	9,6%
NL Total	100%	31,9%	18,3%	20,5%	11,0%	9,3%	9,0%
BE Total	100%	22,1%	18,9%	18,1%	25,8%	6,6%	8,5%
IE Total	100%	35,2%	17,9%	29,3%	0,8%	13,6%	3,1%
SE Total	100%	18,5%	21,1%	27,1%	17,3%	8,7%	7,3%
FI Total	100%	13,2%	16,8%	21,5%	37,4%	4,7%	6,5%
NO Total	100%	14,5%	10,9%	21,6%	7,5%	6,0%	39,5%
DK Total	100%	21,7%	13,9%	23,9%	24,7%	9,6%	6,1%
PL Total	100%	18,4%	23,6%	26,0%	11,2%	12,6%	8,2%
RU Total	100%	17,3%	34,4%	24,1%	6,1%	10,8%	7,3%
LV Total	100%	10,3%	31,6%	30,5%	4,8%	12,5%	10,3%
EE Total	100%	14,7%	29,4%	25,0%	20,2%	9,4%	1,2%
LT Total	100%	7,6%	29,3%	26,9%	11,3%	15,2%	9,6%
NEB Total	100%	24,7%	16,6%	21,6%	18,4%	7,9%	10,8%

Calls							
Vessel Type	All	Cont	GC	MP	RoRo	Bulk	Other
DE Total	15,9%	23,5%	10,6%	18,2%	12,1%	13,9%	10,1%
GB Total	20,0%	21,6%	16,7%	15,2%	28,7%	18,7%	17,7%
NL Total	14,2%	18,3%	15,7%	13,5%	8,5%	16,6%	11,8%
BE Total	11,4%	10,2%	13,0%	9,5%	16,0%	9,4%	9,0%
IE Total	2,3%	3,2%	2,4%	3,1%	0,1%	3,9%	0,6%
SE Total	7,5%	5,6%	9,6%	9,4%	7,1%	8,3%	5,0%
FI Total	7,0%	3,7%	7,1%	7,0%	14,3%	4,1%	4,2%
NO Total	8,9%	5,3%	5,9%	9,0%	3,6%	6,8%	32,7%
DK Total	3,8%	3,4%	3,2%	4,2%	5,1%	4,6%	2,2%
PL Total	2,8%	2,1%	4,0%	3,4%	1,7%	4,5%	2,1%
RU Total	2,2%	1,6%	4,6%	2,5%	0,7%	3,1%	1,5%
LV Total	2,1%	0,9%	3,9%	2,9%	0,5%	3,2%	1,9%
EE Total	0,8%	0,5%	1,4%	0,9%	0,8%	0,9%	0,1%
LT Total	1,1%	0,3%	1,9%	1,3%	0,7%	2,1%	1,0%
NEB Total	100%	100%	100%	100%	100%	100%	100%

Vessels							
Vessel Type	All	Cont	GC	MP	RoRo	Bulk	Other
DE Total	2 476	711	473	575	180	335	202
GB Total	2 464	770	492	529	182	297	194
NL Total	2 620	687	530	631	151	381	240
BE Total	2 569	523	526	716	181	387	236
IE Total	460	44	163	131	13	85	24
SE Total	1 069	119	308	304	95	158	85
FI Total	578	44	171	187	78	75	23
NO Total	636	47	194	167	38	113	77
DK Total	676	92	204	171	52	112	45
PL Total	963	60	279	303	41	176	104
RU Total	664	48	155	184	33	134	110
LV Total	566	38	186	167	22	123	30
EE Total	315	27	122	89	18	49	10
LT Total	537	28	170	165	10	113	51
NEB Total	3 981	910	707	980	307	608	469

Vessels							
Vessel Type	All	Cont	GC	MP	RoRo	Bulk	Other
DE Total	100%	28,7%	19,1%	23,2%	7,3%	13,5%	8,2%
GB Total	100%	31,3%	20,0%	21,5%	7,4%	12,1%	7,9%
NL Total	100%	26,2%	20,2%	24,1%	5,8%	14,5%	9,2%
BE Total	100%	20,4%	20,5%	27,9%	7,0%	15,1%	9,2%
IE Total	100%	9,6%	35,4%	28,5%	2,8%	18,5%	5,2%
SE Total	100%	11,1%	28,8%	28,4%	8,9%	14,8%	8,0%
FI Total	100%	7,6%	29,6%	32,4%	13,5%	13,0%	4,0%
NO Total	100%	7,4%	30,5%	26,3%	6,0%	17,8%	12,1%
DK Total	100%	13,6%	30,2%	25,3%	7,7%	16,6%	6,7%
PL Total	100%	6,2%	29,0%	31,5%	4,3%	18,3%	10,8%
RU Total	100%	7,2%	23,3%	27,7%	5,0%	20,2%	16,6%
LV Total	100%	6,7%	32,9%	29,5%	3,9%	21,7%	5,3%
EE Total	100%	8,6%	38,7%	28,3%	5,7%	15,6%	3,2%
LT Total	100%	5,2%	31,7%	30,7%	1,9%	21,0%	9,5%
NEB Total	100%	22,9%	17,8%	24,6%	7,7%	15,3%	11,8%

Vessels (presence)							
Vessel Type	All	Cont	GC	MP	RoRo	Bulk	Other
DE Total	62,2%	78,1%	66,9%	58,7%	58,6%	55,1%	43,1%
GB Total	61,9%	84,6%	69,6%	54,0%	59,3%	48,8%	41,4%
NL Total	65,8%	75,5%	75,0%	64,4%	49,2%	62,7%	51,2%
BE Total	64,5%	57,5%	74,4%	73,1%	59,0%	63,7%	50,3%
IE Total	11,6%	4,8%	23,1%	13,4%	4,2%	14,0%	5,1%
SE Total	26,9%	13,1%	43,6%	31,0%	30,9%	26,0%	18,1%
FI Total	14,5%	4,8%	24,2%	19,1%	25,4%	12,3%	4,9%
NO Total	16,0%	5,2%	27,4%	17,0%	12,4%	18,6%	16,4%
DK Total	17,0%	10,1%	28,9%	17,4%	16,9%	18,4%	9,6%
PL Total	24,2%	6,6%	39,5%	30,9%	13,4%	28,9%	22,2%
RU Total	16,7%	5,3%	21,9%	18,8%	10,7%	22,0%	23,5%
LV Total	14,2%	4,2%	26,3%	17,0%	7,2%	20,2%	6,4%
EE Total	7,9%	3,0%	17,3%	9,1%	5,9%	8,1%	2,1%
LT Total	13,5%	3,1%	24,0%	16,8%	3,3%	18,6%	10,9%
Vessel pr. *	4,2	3,6	5,6	4,4	3,6	4,2	3,1
NEB Tot.no.vessels	3 981	910	707	980	307	608	469

* "Presence" - The individual ships have been calling ports in 3 up to 6 regions in average, varying by ship type. This is also the explanation of why the number of vessels engaged in each region (on a port, country or other sub-level) cannot be aggregated to a fleet figure for a larger region.

SumOfSlots							
Vessel Type	All	Cont	GC	MP	RoRo	Bulk	Other
DE Total	15 613 029	11 362 611	420 373	1 670 221	1 234 456	503 473	421 895
GB Total	17 752 796	11 564 722	610 571	1 112 430	3 194 633	416 510	853 930
NL Total	12 757 824	9 157 564	509 191	1 042 943	1 026 945	490 322	530 859
BE Total	10 664 460	6 293 786	588 598	874 363	2 053 460	443 036	411 217
IE Total	970 005	482 604	73 916	289 394	11 817	81 124	31 150
SE Total	3 493 829	1 208 397	330 028	750 564	903 282	136 491	165 067
FI Total	3 394 634	713 371	327 522	718 570	1 318 697	128 742	187 732
NO Total	2 253 541	764 292	144 188	544 135	353 847	89 660	357 419
DK Total	1 745 366	645 137	76 088	357 504	516 352	88 173	62 112
PL Total	892 571	279 609	116 653	235 753	129 247	100 417	30 892
RU Total	734 141	229 773	161 680	183 708	58 181	73 602	27 197
LV Total	621 924	134 267	151 220	162 295	32 696	52 834	88 612
EE Total	196 911	45 962	35 824	50 962	47 467	14 144	2 552
LT Total	263 335	28 242	59 068	80 495	41 496	36 633	17 401
NEB Total	71 354 366	42 910 337	3 604 920	8 073 337	10 922 576	2 655 161	3 188 035

SumOfSlots							
Vessel Type	All	Cont	GC	MP	RoRo	Bulk	Other
DE Total	100%	72,8%	2,7%	10,7%	7,9%	3,2%	2,7%
GB Total	100%	65,1%	3,4%	6,3%	18,0%	2,3%	4,8%
NL Total	100%	71,8%	4,0%	8,2%	8,0%	3,8%	4,2%
BE Total	100%	59,0%	5,5%	8,2%	19,3%	4,2%	3,9%
IE Total	100%	49,8%	7,6%	29,8%	1,2%	8,4%	3,2%
SE Total	100%	34,6%	9,4%	21,5%	25,9%	3,9%	4,7%
FI Total	100%	21,0%	9,6%	21,2%	38,8%	3,8%	5,5%
NO Total	100%	33,9%	6,4%	24,1%	15,7%	4,0%	15,9%
DK Total	100%	37,0%	4,4%	20,5%	29,6%	5,1%	3,6%
PL Total	100%	31,3%	13,1%	26,4%	14,5%	11,3%	3,5%
RU Total	100%	31,3%	22,0%	25,0%	7,9%	10,0%	3,7%
LV Total	100%	21,6%	24,3%	26,1%	5,3%	8,5%	14,2%
EE Total	100%	23,3%	18,2%	25,9%	24,1%	7,2%	1,3%
LT Total	100%	10,7%	22,4%	30,6%	15,8%	13,9%	6,6%
NEB Total	100%	60,1%	5,1%	11,3%	15,3%	3,7%	4,5%

SumOfSlots							
Vessel Type	All	Cont	GC	MP	RoRo	Bulk	Other
DE Total	21,9%	26,5%	11,7%	20,7%	11,3%	19,0%	13,2%
GB Total	24,9%	27,0%	16,9%	13,8%	29,2%	15,7%	26,8%
NL Total	17,9%	21,3%	14,1%	12,9%	9,4%	18,5%	16,7%
BE Total	14,9%	14,7%	16,3%	10,8%	18,8%	16,7%	12,9%
IE Total	1,4%	1,1%	2,1%	3,6%	0,1%	3,1%	1,0%
SE Total	4,9%	2,8%	9,2%	9,3%	8,3%	5,1%	5,2%
FI Total	4,8%	1,7%	9,1%	8,9%	12,1%	4,8%	5,9%
NO Total	3,2%	1,8%	4,0%	6,7%	3,2%	3,4%	11,2%
DK Total	2,4%	1,5%	2,1%	4,4%	4,7%	3,3%	1,9%
PL Total	1,3%	0,7%	3,2%	2,9%	1,2%	3,8%	1,0%
RU Total	1,0%	0,5%	4,5%	2,3%	0,5%	2,8%	0,9%
LV Total	0,9%	0,3%	4,2%	2,0%	0,3%	2,0%	2,8%
EE Total	0,3%	0,1%	1,0%	0,6%	0,4%	0,5%	0,1%
LT Total	0,4%	0,1%	1,6%	1,0%	0,4%	1,4%	0,5%
NEB Total	100%	100%	100%	100%	100%	100%	100%

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