

Benchmarking of Ports

- *possibilities for increased efficiency of ports*

English Summary

October 1996

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The project "Benchmarking of ports - possibilities for increased efficiency of ports" has been completed by a project team comprising PLS Consult A/S, LGC-Consult ApS, Kollberg & Co., and RAMBØLL, with PLS Consult as project managers. The project has been carried out on behalf of the Danish Transport Council.

The project has been followed by a group of representatives from The Danish Transport Council, The Ministry of Transport, The Association of Danish Ports, Danish Shipowners Association, Danish Shipowners Association of 1895, The General Workers Union in Denmark, Danish Environmental Protection Agency, and the ports of Copenhagen, Århus, and Aalborg.

Project purpose and methodology

The purpose of the project has been to "analyse factors that seem to determine the usage of the ports (attractiveness) and efficiency"- The analysis leads to an assessment of the possibilities for increasing the ports' efficiency , and outlines recommendations for achieving this.

The concrete aspects that have been addressed by the project can be summarised as:

- Why should ports increase efficiency - is there a reason, and is there anything to compete for?
- Which factors influence the users' choice of port?
- Are there real differences between the ports' efficiency and is there a relationship between efficiency and market position?
- Do the differences between the ports reflect a potential possibility for increasing the efficiency of the ports?
- What characterises "best practice"?
- What are the key challenges in relation to increasing the efficiency of ports and what recommendations can achieve this goal?

Efficiency is in this context regarded as time and price or more explicitly the external efficiency in relation to users of the port. In some cases the internal efficiency or

"internal performance" of the port has been assessed. Internal efficiency covers aspects such as financial standing, capacity utilisation etc.

Methodology:

Methodologically the project has been carried out through a benchmarking of 8 Danish ports. Benchmarking can be described as a method of analysis where an outline of factors and parameters pertaining to "good practice" and success within a given sector are compared. The purpose of the project has not been to identify the "best port in Denmark".

The main activities in the project have been:

- A mostly *quantitative comparison* of the ports in Copenhagen, Århus, Aalborg, Randers, Køge, Nyborg, Vejle, and Svendborg
- Completion of *case-studies* in the ports of Sundsvall and Helsingborg (Sweden)
- *Qualitative analysis of the ports involved* - with which the purpose has been to analyse possible explanations for differences in efficiency and to form the basis for a description of characteristics of "best practice" ports.

Good arguments for increasing the efficiency of ports

In a number of cases the ports are perceived as bottlenecks on the transport chain in relation to costs and logistics. This is one reason for focusing on the ports' efficiency.

Furthermore there are good arguments for strengthening the ports' efficiency and competitiveness when looking at the future market potentials of the ports. These are generally related to:

- Competition between the ports on existing cargo volumes
- Competition to secure the greatest possible share of the general increase in transport volumes
- The ports' and maritime transport's competitiveness in relation to other modes of transport

Even though a major part of the current cargo turnover in ports is determined by structural aspects such as localisation of buyers' production facilities etc, it seems that around 10-20% of the actual short term volumes can be moved between the

ports. This represents for the Danish ports a cargo turnover of 15 mill. tonnes, and it is as such an attractive potential for the most successful ports.

On an aggregated basis cargo volumes in Danish ports are growing, even though growth has been more significant for other modes of transport. Based on a simple forecast of cargo turnover in the ports, volumes will have increased by 10 mill. tonnes in 5 years. Which of the ports will secure a share of this growth will depend on the individual port's competitiveness and efficiency.

Finally, there are from several sides objectives to move greater cargo volumes from land-based to maritime transport through an increased efficiency and reduced cost of maritime transport. But based on previous studies it can be concluded that the potential of strengthening maritime transport in relation to other modes is limited to approximately 0.5 mill. tonnes. Seen from a port perspective this is much less interesting than the competition among ports and the possibilities of strengthening the integration of transport modes.

Factors determining the users' choice of port

Interviews have uncovered the factors determining transport buyers' choice of port, and what the requirements are to an efficient port.

The most important criteria are on one hand the ports' location, infrastructure, and technical equipment and on the other hand the total perceived efficiency in the port.

The total perceived efficiency is a combination of several factors, where special weight is placed on price and transportation time. Other important factors are experienced quality and service levels and flexibility in the cargo handling.

In relation to both price, time, and service human resources are an important issue, and therefore the ports' contractual aspects have an important role to play. Equally, a major part of the ports' efficiency is influenced by the availability of technical equipment and the co-operation between the transport users and the key stakeholders of the port.

Therefore the most attractive ports are the ones perceived as "well functioning systems" working efficiently and flexibly. Thus good and bad past experiences should not be underestimated as a parameter determining the users' choice of port.

Benchmarking of the Danish ports' efficiency and attractiveness

One component of the quantitative benchmarking includes a comparison of the ports' "external efficiency" in relation to the ports' market development and the ports' efficiency in relation to time and price. This component has been completed to assess if there is a potential for increasing the efficiency of ports through a greater dissemination of "best practice". Furthermore, an analysis of the relation between the ports' efficiency and market position has been completed. Finally, a comparison of the ports' "internal efficiency" has been completed covering aspects such as financial standing and capacity utilisation.

Efficiency of Danish ports compared to other European ports

Even though the quantitative comparison only includes Danish ports, there are indications based on the interviews that Danish ports are considered to be relatively cheap, efficient, and flexible compared to other European ports. But this does not preclude the possibility that Danish ports can increase efficiency or learn from other European ports.

The ports' market development

The ports' market share measured in cargo volumes and number of calls is a good basis for measuring the ports' attractiveness. It is not possible to identify a unique trend in the market development, due to relatively significant fluctuations on an annual basis. But there are certain patterns indicating a structural development and increased specialisation among ports. The smaller ports' attractiveness is typically illustrated in specialisation in certain types of cargo (even though specialisation also occurs with the larger ports). It is also seen that the larger ports have grown in certain areas.

There is a fair degree of correlation between the ports' efficiency in time and price, and the market development of the different cargo- and vessel types.

The ports' efficiency measured in time:

There are significant differences between the individual ports on the amount of cargo that can be handled per vessel hour. In other words there are significant differences from port to port in the time it takes to handle one vessel. Part of the explanation for this lies in the differences between the available handling equipment in the ports,

where there are economies of scale in some ports. But the technical equipment is far from the only explanation of the differences in efficiency.

The individual ports' efficiency measured in time for comparable vessel- and cargo types generally fluctuates +/- 25-30% around average levels. This general variation is calculated as a weighted average where consideration has been given to absolute shares of cargo volumes for different vessel- and cargo types. See illustration below.

Fluctuations in ports' efficiency for selected cargo- and vessel types:

(Examples based on completed registrations)

Cargo type	Fluctuations in relation to average efficiency for different vessel types (handled tonnes per port hour)			
	< 2000 GT	2.-10.000 GT	> 10.000 GT	All calls
Container goods	-----	+/- 26%	-----	+/- 24%
Limestone/Cement	+/- 47 to 33%	-----	-----	+/- 67 to 56%
Grain	+/- 85 to 48%	-----	+/- 5%	+/- 80 to 61%
Foodstuffs	+/- 55 to 31%	-----	-----	+/- 98 to 48%

Source: Actual records of approximately 320 calls in participating ports. Note: Fluctuations have not been calculated for vessel types where records have been limited. The category "all calls" includes registrations for the vessel types not illustrated.

On the basis of the completed records it can be concluded that the larger ports have some degree of economies of scale. The efficiency also increases with the vessel size - which seems only natural. The larger ports efficiency advantages are not unambiguous, since the economies of scale decrease with smaller vessel types. There are also several examples of smaller- and medium sized ports being more efficient with some cargo- and vessel types. Finally it is seen that the largest relative fluctuations are seen in the smaller vessel category (less than 2000 GT).

The ports' efficiency measured in cargo dependent costs (cargo fees and stevedoring)

Since the comparison is based on figures before the implementation of the new legislation for commercial ports, there are only minor variations in the ports' cargo fees.

There are on the other hand significant differences in the levels of stevedoring fees, which is a major part of the total costs of shipping. In the case of shorter distances the stevedoring fees are much larger than the direct shipping costs (time charter) and account for approximately 75% of the total maritime transport costs (excluding feeder transports on land).

Based on the cargo fees and stevedoring the ports' efficiency fluctuates approximately +/- 20 - 25% around average level as seen below:

Fluctuations in the ports' price efficiency - measured in cargo dependent costs for selected cargo types:

Cargo type	Fluctuations in relation to average levels for cargo dependent costs (sum of cargo fees and stevedoring)
Container goods	+/- 5 to 7%
Grain	+/- 19%
Limestone	+/- 25%
Coal etc.	+/- 27 to 28%
Foodstuffs	+/- 32 to 23 %
Rocks, sand, gravel	+/- 51 to 42%

Source: Registration of actual transport assignments in participating ports.

It is seen from above that the price variation is smallest for container goods and largest for bulk goods such as rocks, sand, and gravel. The data that this illustration is based on also show that relatively high cargo fees are offset by low stevedoring costs and vice versa.

Furthermore there are examples of smaller- and medium sized ports being the most competitive in relation to price. It seems that the smaller ports are cheaper for the cargo type "grain" while the larger ports are more competitive in relation to the cargo type "foodstuffs".

The ports' efficiency measured in vessel related costs (tonnage, clearing, piloting, and towing etc.):

Differences in piloting obligations and clearing fees are the main reasons for the relatively large differences in the vessel related fees in the ports. The aggregated vessel related fees fluctuate approximately +/- 20-25% around average levels. The difference between the cheapest and most expensive port of call is greatest for the smallest vessel types (under 1500 GRT), see table below:

Fluctuations in the ports' price efficiency - measured in vessel dependent costs:

Vessel size	Differences in DKr per GRT between the cheapest and most expensive port
Under 1.500 GRT	approximately DKr. 4,- per GRT
1.500 - 10.000 GRT	approximately DKr. 3,- per GRT
Over 10.000 GRT	approximately DKr 2,- per GRT

Source: Registration of actual payments from transport assignments in the participating ports.

When measured in actual costs the differences of 24 DKr per GRT are quite significant.

The relationship between efficiency and market position:

There is no perfect relationship between the ports' efficiency and their attained market position, but there are some overall patterns.

In over half the cases of a port strengthening its market share within a certain cargo type, there are indications of price competitiveness on cargo related costs (sum of cargo fees and stevedoring). There are also increasing market shares for those ports showing high efficiency (measured in relation to handled cargo volumes per unit of time).

There is also a strong relation between on one side the business priorities and initiatives in the individual port and on the other side the port's market development. Finally there are examples of ports that are not very competitive but who have strengthened their market position through a high degree of flexibility. This flexibility is illustrated in flexible contractual agreements and a high degree of service from several elements in the service chain.

Potentials for strengthening the ports' role in transport

It can be concluded that there are significant potentials for increased efficiency if "best practice" could be secured a greater impact in the individual ports. Average efficiency fluctuations of +/- 25-30% in relation to time and +/- 20-25% in relation to price seem to underline this fact.

On the basis of average variations and an assessment of cost allocation in two actual maritime transport examples, an assessment of the potentials for a reduction of total costs in maritime transport has been completed. This assessment has been completed solely on the basis of reductions in time usage and costs of ports. This assessment indicates that a greater impact of "best practice" in ports could yield a 10% reduction in time usage and a cost reduction of 15% for maritime transport.

It therefore seems not only relevant but also realistic to aim for a further increased efficiency of the Danish port system.

The ports' internal efficiency - "internal performance":

A comparison of factors such as the ports' finances, profitability, solidity, and capacity utilisation is less interesting seen from an external user's perspective, but nevertheless these are all important elements in the ports' long term development potentials.

The comparison shows that the involved ports are significantly different with regards to business and finances, and thus they have also generated different economic results. The ports' rates of return fluctuate from 2% to 10%, and the ports' solidities fluctuate from 20% to 95%. It has furthermore been illustrated that it is more profitable to operate real estate administration and fund management than actual transport activities. Finally, the analysis shows that there are relatively large fluctuations in registered levels of capacity utilisation in relation to quays, cranes, and other port equipment. The capacity utilisation of quays fluctuates from 6% to 34%.

Characteristics of the most efficient ports - "best practice"

It has not been the purpose of the completed benchmarking to point out the "best port", nor has it been to point out all characteristics of the ideal port. It has however based on the comparison and the individual analyses, been possible to point out some important characteristics of "best practice" in port operations.

Four of the participating ports have performed significantly better in selected areas of the comparison, and they have therefore been chosen as the actual "best practice" ports. But it can not be concluded that the other ports are inefficient and had focus been placed on other cargo types and port activities in this study, then the picture might have been different.

The choice of the ports that form the background for the "best practice" description has been based on the following aspects:

- The interviewed customers' perception of the port
- The port's market development - measured in market shares
- The port's efficiency measured in time for different cargo types and vessel sizes
- The port's efficiency measured in cargo and vessel dependent costs

Except for a requirement for positive net results and positive net capital, the ports' finances have not been used as a criterion in this analysis.

Furthermore, it should be noticed that ports have only been compared where relevant. It is therefore not a default conclusion that larger ports operating within all cargo types are the best. Therefore "best practice" is a relative term and an expression of the aggregated assessment of the ports' ability to utilise their market and operational options as efficiently as possible. Thus "best practice" ports are found within both small, medium sized, and large ports.

The characteristics of "best practice" ports which are described in chapter 4 can be roughly categorised into the following:

1. The port's structurally determined situation
2. The port's business orientation
3. The port's technical condition and logistic aspects
4. The port's finances and contractual aspects

Best practice in relation to the ports' structurally determined situation:

A geographically central location and the presence of large consignors or consignees in the region of the port are important factors in relation to the port's market development. It is not the default conclusion that ports that are characterised as above are the most efficient and attractive.

What characterises "best-practice" ports is that they have been able to utilise their structurally dependent advantages to attract a relatively *large volume of cargo* within certain areas. Furthermore they have been able to achieve financial and technical economies of scale within these areas. Those "best-practice" ports with a less central location have through a successful specialisation, been able to achieve economies of scale.

Another important characteristic of "best-practice" ports is that they have made investments in modern handling equipment within areas where it has been feasible to quickly achieve a high capacity utilisation of the equipment.

A third and important characteristic of the most successful ports is that there are a number of *loyal users and stakeholders* who through their investments and through dialogue with the port highlight this loyalty. Furthermore, there exists in these ports a strong tradition of *co-operation, constructive dialogue, and co-ordination of activities and initiatives etc.*

Best practice in relation to the business orientation of the port:

The study shows great differences in the ports' business strategy, attitude towards own efficiency, customer perception, and organisation and control.

What seems to characterise the "best practice" ports is that *transport and the terminal role* is seen as the port's primary business and is given top priority in relation to investment decisions.

Secondly, these ports are characterised by seeing themselves as *service organisations*, and they exhibit a high degree of *consciousness of competitive factors* and prerequisites for their own success. This is also seen by the fact that the ports to a relatively large extent have considered which problems and weaknesses are "there to stay" and therefore should not disturb the other decisions of the port.

Thirdly, it is characteristic that the "best practice" ports have *shown courage and proactive behaviour* in relation to investments and formulation of *visionary but well founded goals* in dialogue with the users. These ports are also good at *listening to the users* but are also not afraid to make demands on their users. *Negotiations and dialogue* is made on both port and user initiative.

A fourth characteristic of the more successful ports is that there are *well co-ordinated* market initiatives, where the port's management in co-operation with key stakeholders have been able to promote interest in the port for selected cargo types and activities. A positive characteristic is also that external (first time) users can limit the number of contact points in the port to get a total proposal for a given service. In other words the port functions as *one system*.

A fifth and important characteristic of "best practice" ports is a relatively *high degree of focus on "own efficiency"* and attempts to "*quantify*" these aspects. This is illustrated by a high degree of detail in the port's registrations and collection of experiences. When the term "relatively high degree" is used on this characteristic it is because most ports could strengthen their efforts in this field and learn from the case ports in Sweden.

A sixth characteristic is that the most efficient ports are characterised by a *real but not destructive competition* between businesses on the port. The competition can be

illustrated in the existence of several stevedoring companies supplying the same service and/or the users having the option of supplying these services themselves.

A seventh characteristic of the “best practice” ports is that they are characterised by a *small organisation or a big and strong organisation with well defined responsibilities* but a high degree of insight and co-ordination horizontally between the individual functions of the port’s administration. The latter is very important since big organisations can also be very heavy and inflexible.

Finally, there are some determinant characteristics in relation to the division of responsibilities of the port’s operational management and the “port committee”. What seems to be most sensible in relation to the above is that the port committee acts as a board of directors and sets demands on but also shows confidence in the operational management. The next best seems to be the situation where the port committee is neutral and is therefore neither a part of the team nor an opponent in relation to the port’s development potential.

Best practice in relation to the ports’ technical facilities and logistical aspects:

The study has shown that the technical equipment is important, but is not the key efficiency factor. Two of the four “best practice” ports are highly ranked in relation to technical equipment.

In relation to the “best practice” ports it should be noted that there is a sufficient supply of equipment with varied capacity, such that it is possible to employ *the correct equipment for the tasks at hand*.

Secondly, it is characteristic that the port owns most of the equipment or that the key players of the port co-operates on *mutual utilisation of equipment*. Both situations result in a relatively high degree of capacity utilisation and limits the amount of “sub optimisation” in the use of own (and at times wrong) equipment for a given task.

Thirdly, concrete bottleneck problems in transport buyers’ *shipping capabilities* or the *port’s physical areas* seem less frequent in the ports that have done well in the comparison. Factors that are considered important in relation to above are availability of loading and holding areas near the quay, good traffic conditions and a relatively good integration of transport modes, and last but not least the fact that the cargo recipient employs sufficient capacity such as trucks.

Best practice in relation to the ports' finances and contractual aspects:

The ports' price and investment policy and their contractual relations between employers and employees can generate substantial fluctuations in the price and efficiency competitiveness of the port. Generally both financial and contractual aspects are areas that can be improved.

There are though in this area some common factors of the "best practice" ports. The first is that they *deliberately use price policy* to create competitive advantages for selected cargo and vessel types. It is here of utmost importance that the ports have built in incentives for users to use the port as much as possible. Furthermore, it is important that the price policy is co-ordinated with the other actors in the port's service organisation such that a price reduction in one area is not offset by an increase in another area of the transport chain.

In relation to contractual relations there are two identified characteristics of the "best practice" ports.

One ideal situation seems to exist in the ports with the presence of *flexible contractual relations with no professional borders* and where there is a tradition for borrowing human resources in peak periods. Such a system can be created through a silent acceptance or a mutual will among employers and employees to solve problems as they occur.

The other ideal situation seems to be present in ports where there is a combination of *permanently employed staff in key areas* and a smaller number of temporarily employed workers. The relatively high share of permanently employed staff generates a good continuity in operations and forms the basis for investments in education and development.

Key challenges, recommendations and perspectives in relation to increasing the efficiency of the ports' role in the transport chain

The basis for the key challenges and recommendations described below is that it *is* possible to increase the ports' efficiency in transport operations. The illustrated comparison points to significant differences between the participating ports, and that a increased usage of "best practice" in the ports could result in relatively big improvements of time and cost efficiency event though Danish ports are considered

efficient. Furthermore, a number of factors that can be influenced have been identified. These factors seem to characterise the most efficient ports, and they underline the fact that ports can influence and improve their role in transport operations.

In relation to this 4 key challenges seem to be central:

1. Exploitation of the possibilities of competition or co-operation between and in the ports
2. A sharpened business focus of the ports and better co-operation with the users
3. A reorientation of the ports finances and control in order to focus on the ports' role in relation to transport
4. To make the port system flexible and well co-ordinated

The recommendations in relation to these challenges are outlined below. A more detailed description can be found in chapter 5 of the report.

Recommendations in relation to challenge 1: Exploitation of the possibilities of competition or co-operation between and in the ports:

In relation to the possibilities of competition or co-operation between and in the ports it is recommended:

- *To politically consider a further liberalisation of the port laws - both in relation to a tightening of the requirements to ports in some areas and more liberties in others.*
- *That the ports in their long term development plans consider possible advantages of strategic alliances with other ports and a more formal co-operation with the other actors of the port.*
- *That especially the financially troubled ports do not preclude a total or partial privatisation as a possible option.*
- *That the ports see the competition between the ports businesses as a way of increasing efficiency.*

Recommendations in relation to challenge 2: A sharpened business focus of the ports and better co-operation with the users:

In relation to the ports business focus it is recommended:

- *That the ports move away from the administrative orientation to a more service and market oriented business strategy which could be based on the service management principles.*
- *That the ports actively take initiative and participate in the dialogue with the users both in formal and non formal forums.*
- *That the ports actively use goals and measurement of performance, efficiency and customer satisfaction.*
- *That the ports through recruitment and training policies seek an up-qualification in the commercial area.*

Recommendations in relation to challenge 3: A reorientation of the ports finances and control in order to focus on the ports' role in relation to transport

In relation to the ports finances and control it is recommended:

- *That the ports in their financial records and administrative procedures separate port related and non port related activities - and that this is divided into as many business areas as possible.*
- *That the ports - based on activity based costing principles - create the basis for a more detailed and deliberate price policy.*
- *That a more business oriented approach is taken to the division of responsibilities of political and operational management of the ports.*

Recommendations in relation to challenge 4: To make the port system flexible and well co-ordinated

In relation to co-ordination and flexibility in ports it is recommended:

- *That the ports take the initiative to a higher degree of co-ordination of market initiatives*
- *That the ports focus on the areas where day to day co-ordination between the actors can be strengthened and systematised.*
- *That the actual importance of contractual problems are identified locally and are adjusted according to more recent principles.*