

**Summary:**

# **Potential for container transports to and from North of Norway**

## **An analysis of alternative transport solutions**

### **Background**

Previous studies at the Institute of Transport Economics have shown that prices for freight transport to and from the northern part of Norway are around 20 per cent higher than prices for similar transport in other parts of Norway. Industry located in the northern part of Norway has longer distances to their main markets and this is a problem for the industry's competitiveness in this part of Norway.

The last decades containerisation has grown faster than freight flows at global level, in particular for oversea transports. Norway and especially the northern part of Norway has only taken a minor part of this development.

The rise in global trade increased the size of container vessels on overseas destinations. This leads to a decrease in the unit cost on overseas transport, with falling freight rates as a result.

This project surveys current transport solutions from the northern part of Norway with the purpose to investigate if the freight flows between the northern part of Norway and the Continent are dense enough to establish a frequent service containerline. A national network model for freight transport in Norway (NEMO) has been central in the analysis.

### **Freight flows to and from the area**

Industry in northern part of Norway is dominated of low value products. Natural occurrences of minerals and ores have been the main reasons for industry localisation. Fishing and fish farming are important industries and export sectors from the northern part of Norway, and are and have been leading premises for the scattered settling along the coast.

The heavy freight flows to and from this part of Norway are mainly connected to the low value industry. Export (in tonne) is higher than import, special for general cargo, because import in this freight segment mainly is coming via the central part of Norway i.e. the Oslo area.

**Table 1:** Import and export in sum and export of fish and fishing products from the northern part of Norway 1999. 1000 ton.

	Nord-land	Troms	Finn- mark	Northern Norway	Main trading countries
<b>Import</b>	2688,2	332,5	112,8	3133,5	Russia, South America, Germany, Sweden, Africa
<b>Export</b>	3349,3	219,5	457,6	4026,4	Germany, Sweden, Netherlands, Great Britain, North America
<b>Export of:</b>					
Fresh fish	114,4	55,8	63,3	233,4	Denmark, Russia, France
Frozen fish	84,8	58,6	37,3	180,7	Russia, Poland, Great Britain
Fishing products, not frozen	16,3	42,3	12,9	71,6	Portugal, Great Britain, Sweden

## Today's transport solutions

Seaborne transport dominates both in export and import: 87 per cent of production volume from the northern part of Norway is transported by vessel, 7 per cent by rail, 5 per cent by lorry, while 1 per cent is on ferry when crossing the border. Since ferry is only going from the east and southern parts of Norway, this means that transport is part of a transport chain where lorry or rail are used from the north to the eastern part of Norway, then ferry to Denmark or Germany, and finally lorry or rail to the destination.

Fresh fish, thermo beverages and machines are the main commodities where road transport is used in export (72 per cent of fresh fish is going on road or ferry when crossing the boarder). Export of fresh fish from the northern part of Norway is mainly going via terminal in Oslo. Denmark is the most important export country for fresh fish, but is mostly a transit country for other parts of the Continent.

Seaborne transport is even more used in import than in export: 93 per cent of directly imported commodities to this part of the country are coming by sea, 6 per cent by lorry and only 1 per cent by rail. There are mainly two commodities where modal split is different from the others, i.e. thermo beverages and wood on the rough. Thermo beverages are only transported by lorry, but are a very small commodity. Wood on the rough is mainly imported from Sweden and Russia, and 90 per cent is coming by lorry.

## Fish transports

Nordland County is largest on salmon farming in Norway, while northwestern parts of Norway is dominating traditional fishing (in volume). There is a main difference in fish export structure between the northern part of Norway and the rest of the country, which is the share of fresh fish. This leads to a higher use of road transport: 94 per cent of fresh fish exported from Troms and 97 per cent of fresh fish from Finnmark are going on road or by ferry when crossing the boarder. Seaborne transport is only used for fresh fish exported to Iceland and Russia, mainly from Nordland.

The quality of fresh fish is fast decreasing with the temperature, which leads to strict request to transport time and quality. Containertransport would reduce the risk for break in the thermo chain connected to change of mode. There are research on different methods that can lead to an increase in the durability time for fresh fish (per example "super refrigerating", brash of ice and a method where the contents of CO<sub>2</sub> in transportation boxes is increased). If this research gives results, modes (e.g. rail or

seaborne transport) with a longer transportation time could be used for transportation in the future.

## **Containerisation**

Today there are hardly any containers in directly import or export to the ports in northern Norway. Land based CEN containers are dominating in the ports. The mean loads per container in the north are also lower than the mean for the country. Northern Norway also has a lower container ratio than the mean for Norway in total. We have therefore done an analysis which shows that lower container ratio is partly because northern part of Norway is trading with countries where the container ratio in Norwegian import and export in general are lower (Sweden, Russia and Denmark), but we also find regional differences beyond this.

Increasing requirements on food safety inside EC leads to stronger requirements on transport quality and documentation on where and when the food is produced. Such requirements could better be attained when containerised, because the food then are loaded in closed units from origin to destination.

## **Expected development in freight flows to and from northern Norway**

By general there is not expected any rise in export volume from northern part of Norway, except from the sea farming industry, where the optimism is high. Researchers at SINTEF and Akva-Niva have worked out forecasts for this industry where the development is from 100 per cent increase (in the most pessimistic) to 300 per cent increase (in the most optimistic scenario) over the next decade. The traditional fishery is not expected to increase until 2010. From 2010 to 2020 there is expected an increase in traditional fishing at around 4 per cent per year. If internal consumption of fishing products in Norway were rising with 2 per cent per year, total increase in export of fish and fishing products would rise with from 20 per cent in the most pessimistic scenario to 40 per cent in the most optimistic scenario from 1999 to 2010. Over the next two decades there is expected more than 100 per cent rise in total export of fish and fish products in the medium scenario and 70 per cent increase in the most pessimistic scenario.

There is not expected increase in import volumes above the increase in private consumption. Import of consumption products to the northern part of Norway is today going via the central part of Norway (the Oslo area). This transport pattern is expected to stay, but we have assessed effects of alternative logistics by transports directly to the area.

## **Alternative transport solutions**

We have analysed two alternative transport solutions. Alternative one is a seaborne direct line between the northern part of Norway and the Continent. Rotterdam is used as example, both because it is a hub for overseas destinations and because of its distance to the main fishing market. Amsterdam is also a hub for airborne transport (of fresh fish) to USA and Japan. In Norway we have studied five different places of departure (Mo i Rana, Bodø, Narvik, Tromsø and Alta). The alternative transport solution we have analysed is a direct train between Narvik through Sweden to Hamburg.

## **Analysis tool**

A statistical freight transport model (NEMO) is used in the analysis. In NEMO there are established matrices representing freight volumes divided into 11 commodity groups between Norwegian municipalities and 44 zones abroad, a network representing the infrastructure for freight transport, and cost functions representing operative and qualitative transportation costs.

Since the fishing industry is a very important export sector in the north, and fish is a product with very different demand for transport quality due to its preparation, fish is divided into three commodities in NEMO: Fresh, frozen and other fish products (not frozen). For fresh fish we have included degradation costs, representing decreasing commodity quality/value with transport time. By including degradation costs, modal split for this commodity group became reasonable, because fresh fish mainly use road transport, while frozen fish mainly use seaborne transport when exported from Norway.

NEMO is built on several assumptions, where the most important are:

- ❑ The demand for freight transport, in form of freight flows between zones, is fixed in the scenarios.
- ❑ There are not any capacity problems anywhere in the infrastructure network.
- ❑ All individuals have perfect information about different transport solutions, the chosen solution is therefore the alternative where generalised transport costs are minimized.
- ❑ Cost functions used for distributing the freight flows between modes and routes, are a simplification of real life. There will also be quality factors important for mode choice, not included in our costs functions, because of lack of relevant data.
- ❑ Data are in many ways coarsely, and mean values are used in lack of more detailed data.

## **Assumptions and results from the seaborne scenario**

Fresh fish is a product which strongly require short transport time. If seaborne transport should be competitive to road transport there is a strict requirement that total transport time is very close for the two transport alternatives. Different scenarios are run with NEMO with different assumptions about the mean speed. In the first scenario we assumed an average speed for the seaborne alternative at 15 knots. In all scenarios we assumed one departure per week and 25 per cent lower transshipment time and costs for containers versus general cargo. With 15 knots average speed did not any fresh fish get transferred to the seaborne alternative in either of the alternative destinations in northern Norway. Fresh fish is the main commodity group who is transported on road in export, and therefore the main benefits could be gained in social economics terms. We also run a scenario where the average speed were set to 20 knots. The main difference between the results from these two scenarios were the transfer of fish and fish products to the seaborne alternative. For other commodity groups there are only marginal differences between these two scenarios.

In all alternatives tonne km by seaborne transport is increasing, while the use of rail and ferry is decreasing. Road transport is also decreasing in all alternatives unless the two alternatives where Mo i Rana or Bodø are the destinations. This is because the feeder and distribution transport on road is increasing in this two alternatives, because freight flows from destinations north of Rana or Bodø is transferred to the alternative route, where seaborne transport was used also in the initial situation with shorter feeder distances.

## **Results from the rail scenario**

In the rail scenario tonne km is decreasing both for road and seaborne transport, while it is increasing for rail transport. In the alternative where Hamburg is the destination, the decrease in road transport is relative larger than the alternative with Malmö as destination.

## **Transferred traffic**

In the analysis we find that there is a potential for a direct container line between the northern part of Norway and the Continent in export, with weekly departure. Irrespective of which of the five ports in the North of Norway that is served, we find freight potential in the size of a container line up to 200 TEU and a weekly service with today's freight flows. There is also predicted an increase in export of fish and fishing products from this part of Norway in the coming years. The problem is the distortion between import and export, where the export is much larger than the import. Service at two ports in the northern part of Norway gives some benefits in the form of less use of distribution transport with lorry. On the other side transferred traffic is much lower than the sum of freight flows when each port is arrived separately.

Alternatively we find there is freight potential for a direct rail connection between Narvik and Malmö or Hamburg with two departures a week. Transferred freight flows are nearly equivalent when Malmö or Hamburg is arrived.

Destination in Narvik gives the best balance between import and export, but even there the balance is not better than 20 per cent, which means for each tonne in through Narvik port there are going 5 tons out. We have therefore also analysed the effects of alternative logistics for import of consumption commodities, where the import is taken directly to the northern Norway instead of via the Oslo area. Either of these logistics will lead to significant better balance.

Even in the long term there is expected a significant improvement in the import volume. The reason is that both export and import to this part of Norway are mainly bulk products from and to the industry, and there is not enough people living there to give import of general cargo a reasonable volume to improve the balance between import and export in this freight segment. If the petroleum production in the Barents region is starting up, it is expected that freight flows to Finnmark County will increase. But the origins of the freight flows will be unknown.

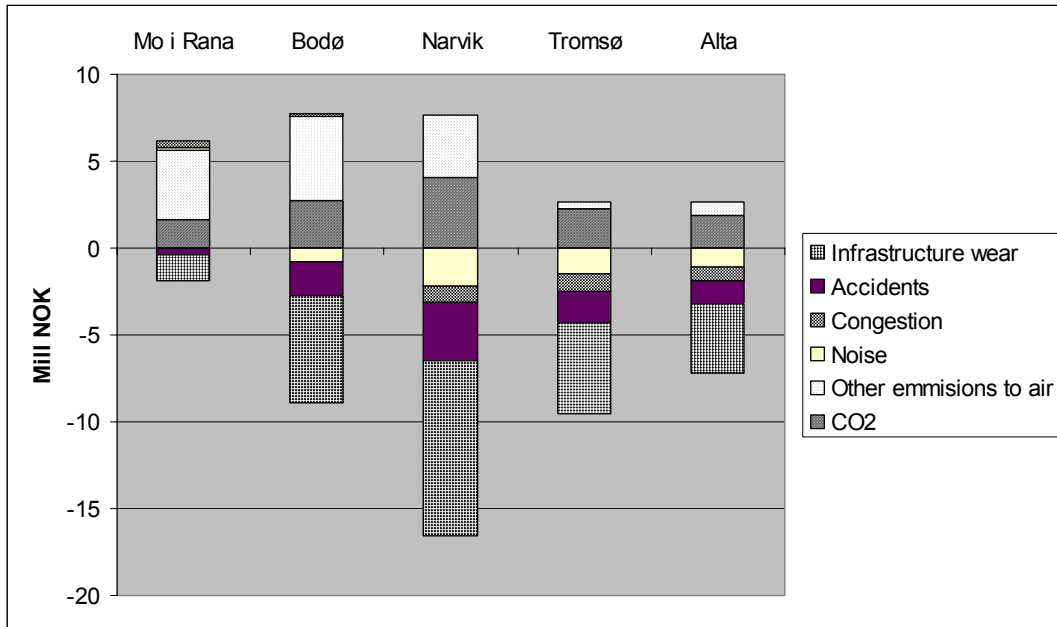
## **External costs and benefits**

We have calculated the external costs and benefits related to a container line between Rotterdam and five alternative destinations in the northern part of Norway, based on the mode specific tonnekm compared to the initial situation.

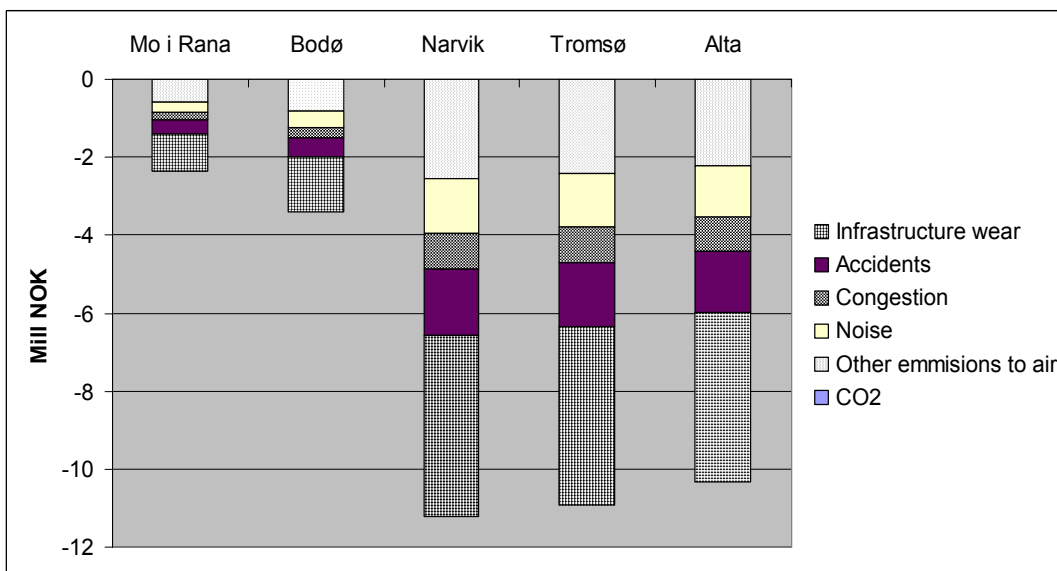
All the alternative destinations in the seaborne alternative would lead to social surplus, unless the Rana alternative, who already has a seaborne connection to Rotterdam. The reason is freight transferring from road, rail and ferry to seaborne transport, and external costs connected to sea transport in sum are lower than for each of the other modes.

To illustrate that benefits are mostly connected to transports of fresh fish, we have calculated the external costs related to this commodity group alone. The benefits for this group exceeded the benefits in sum for all commodities. The reason is that fresh fish

transferred to the seaborne alternative is only coming from lorry, while other commodities also used seaborne transport in the initial situation and when switching to the container line use of feeder or distribution transport on road would increase. The benefits due to transferring fresh fish to the seaborne alternative are most related to destination in Narvik, Tromsø or Alta. The reason is that the export of fresh fish is most voluminous there, but additionally the haulage is given an effect.



**Figure 1:** Annual external costs and benefits (Mill NOK) related to a container line from northern Norway to the Continent, for alternative places of departure. The calculations are related to the distance from origin to destination.

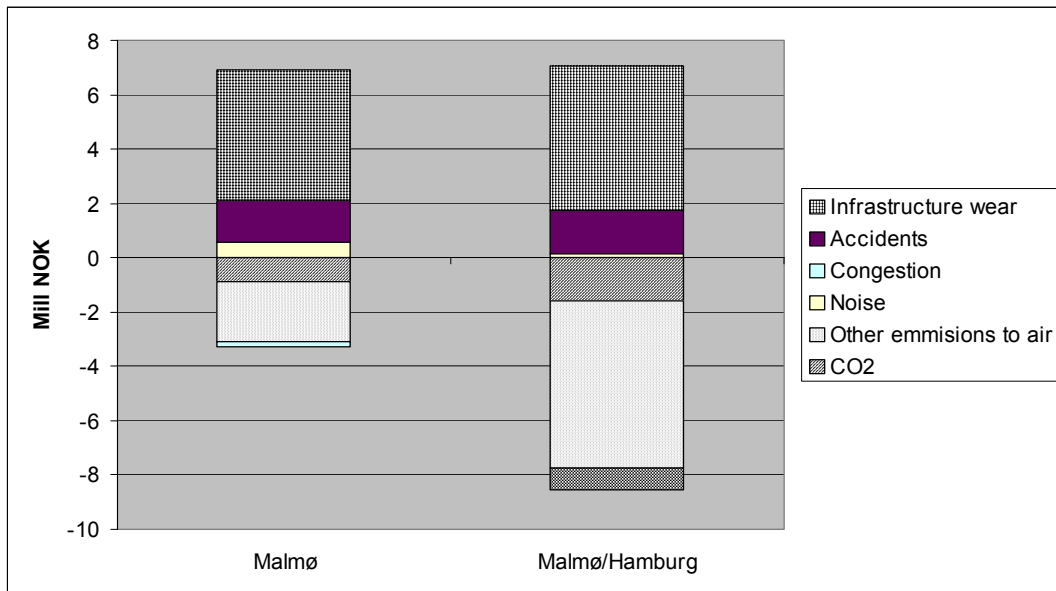


**Figure 2:** Annual external benefits (Mill NOK) by transferring fresh fish from northern Norway to the Continent from road to seaborne transport, for alternative places of departure. The calculations are related to the distance from origin to destination.

In figure 3 we have presented the results from the scenario direct rail connection between Narvik and Malmö or Hamburg. In this scenario there will both be costs and benefits

compared to the initial situation, and in sum they are close to zero. This is because the main part of transferred freight is going by sea or rail in the initial situation, and the marginal external costs per tonnekm is higher in value for infrastructure wear, accidents, congestions and noise connected to rail than to seaborne transport.

**Figure 3:** Yearly external costs and benefits related to a container line from northern Norway to the Continent, for alternative places of departure. The calculations are related to the distance from origin to destination.



## Uncertainty

All calculations in this study are based on official statistics, and the results could never be better than the data they are based on. The main data in the study is based on annual freight flows, and we didn't have any information about seasonal variations. The study is not a market survey. If the actors actually would do the same adjustments of their behaviour are not answered. External costs and benefits are calculated with basis in mode specific tonnekm and thus contain the same level of uncertainty.

## Conclusions

This analysis has given the result that the freight flows from northern Norway is large enough to establish a frequent container line. In all alternative places of departure from northern Norway we find sufficient freight flows in export, but there are big differences between imports and export volume. This obliqueness is different in the rail and seaborne alternative, because in the rail alternative we find that the import volume is higher than the export volume.

External benefits exceeds external cost in all alternatives unless in the example where the localisation is Rana, because Rana already have a seaborne connection to Rotterdam and the Malmø alternative. The benefits are mainly connected to commodities that in the initial situation are transported on road (i.e. mainly fresh fish, thermo commodities or machine products). The fresh fish volumes are larger in the ports from Narvik and north, but the freight volumes are less in the north than in e.g. Bodø and Rana. Therefore,

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commercial interests would differ from the most optimistically alternative in socio economic terms.