

Road freight transport across a fixed Fehmarn Belt link

Per Homann Jespersen¹

Draft version

Introduction

A fixed link between Denmark and Germany was agreed upon by the Danish and German governments on June 30 2007. The bridge (probably preferred to a tunnel) will cross the Fehmarn Belt between Rødby in Denmark and Puttgarden on the island of Fehmarn, in Schleswig-Holstein in Germany, a span of 20 kilometres. The bridge will be finished by 2017.

The agreement was reached after more than 10 years period of investigations and negotiations on technical, environmental and not least financial aspects. Different models from private financing and ownership over a number of PPP's (Public-Private Partnership) were reviewed until a full state financed model was agreed upon – a model where the Danish State will pay, build and operate the bridge. The German contribution will be the land connections on the German side – around 40 kilometres of highway to connect the bridge with the 'Autobahn'-system and the upgrading and electrification of the 90 kilometres of single rail track from Puttgarden to Lübeck. If railway traffic seven years after the opening of the bridge (i.e. 2024) exceeds a certain limit (80 trains a day has been mentioned) the Germans will start constructing a second rail track.

On Danish soil the construction will mainly be an upgrading of the rail from Copenhagen to Rødby. Between Copenhagen and Ringsted new track is already being planned, and from Ringsted to Rødby the existing single, non-electrified track has to be doubled and electrified. However, across the old 3,5 kilometre Storestrømsbro there will only be single track.

The decision to build a fixed link is of course founded on thorough traffic forecasts (Wätjen 2003) and economic calculations (Sund & Bælt Holding A/S 2003) and has by the Danish government been characterised as a 'very good business investment', that will not burden the public finances (Prime Minister Anders Fogh Rasmussen at a press briefing, February 20, 2007).

In this paper the impacts of a fixed link on road freight transport has been studied. The results differ somewhat from what has been found in the traffic forecast studies, and this divergence is being discussed.

Learning from Øresund

The present study was initiated by a curiosity to find out how a finished fixed link would actually influence logistics in general (Drewes Nielsen et al. 2003) and especially the routing decisions made by the hauliers. This curiosity came from the

¹ FLUX – Center for Transport Research, Roskilde University, house P7, P.O.Box 260, DK-4000 Roskilde, Denmark, phj@ruc.dk.

observations made after the opening of the fixed Øresund connection between Denmark and Sweden in 2000. The traffic forecasts had overshoot actual road traffic by more than 40% (Øresundsbro Konsortiet 2001) and for years a bankruptcy was feared. First in 2005 the actual traffic exceeded the initial forecast. Now, however, the increase in road traffic is very significant with annual increase of around 15%.

The explanation to this phenomenon is that the bridge potentially accommodates two types of road traffic, namely regional traffic between the metropolitan areas of Copenhagen and Malmö, and international transport between the European continent and Sweden, Norway and Finland.

Whereas there is no competition for the regional traffic, the international traffic has several options, the most important one being the ferry connection between Elsinore and Helsingborg (4 kilometres, 20 minutes), north of the Øresund fixed connection. This connection was regarded as threatened by the fixed link, and in the agreement between Denmark and Sweden on the Øresund fixed link there actually is an obligation to uphold this ferry for reasons of local development.

However, what actually happened was, that the two car ferry companies operating on Elsinore-Helsingborg adjusted their prices, so that they were competitive to the fixed connection.

In the map (Figure 1) the blue dotted line designates the iso-time curve for trucks, the points on the curve being accessible in the same time by the fixed connection and the ferry connection if the starting point is south and west of Copenhagen². Of the major population centres in Sweden, only Malmö is faster accessible by the fixed connections. The two main road freight arteries of Sweden, E4 to Stockholm and E6 xxx to Gothenburg have faster connection by the ferry route.

Looking at costs for the hauliers, the adjustment of the ferry prices, including the extra reimbursements given to large customers³ have resulted in an iso-cost⁴ curve very similar to the iso-time curve.

This explains the development in the road freight traffic across the Øresund fixed connection – for the international long-distance traffic it was neither economically feasible nor was it attractive for express types of delivery. The same thing is probably true for passenger transport, even though this has not been documented.

² Measured by Microsoft Autoroute, taking into account the expected waiting time by the ferry if random arrival time.

³ These rebates are not public, but have been revealed to the author to be up to 50% of the official list price.

⁴ Costs have been calculated on the TransIT-system of the Danish international hauliers' association, ITD, for a truck with a non-refrigerated trailer, www.itd.dk. TransIT is offered to hauliers to help them calculate costs. The numbers used are from 2004. Since then there have been no fundamental changes in the price structure except for a 20% price reduction at the Great Belt connection.

Thus the traffic across the fixed connection is thus mainly regional and local traffic, and the growth rates of this transport thus demonstrates the potentials of the integration of Copenhagen and Malmö.



Potentials of the Fehmarn Belt fixed connection

The same methodology for cost estimation was used to evaluate the potentials of a Fehmarn Belt fixed connections. In the process up to the decision, it has been assumed that the prices for crossing the fixed connection should be the same as the prices for using the present ferry connection.

The competition situation on the Baltic Sea is, however, quite complex. In addition to a number of ferries Denmark/Sweden to Germany/Poland there is also the option of going across the Great Belt fixed connection through Jutland to Germany.

For the further investigation the six routes shown in Table 1 have been taken into consideration.

Route	Length / Sailing time
Fehmarn Belt fixed connection	19 kms
Great Belt fixed connection	18 kms
Trelleborg (S) – Sassnitz (D) ferry	3½ hrs
Trelleborg (S) – Rostock (D) ferry	5½ hrs
Gedser (DK) – Rostock (D) ferry	2 hrs
Rødby (DK) – Puttgarden (D) ferry	¾ hr

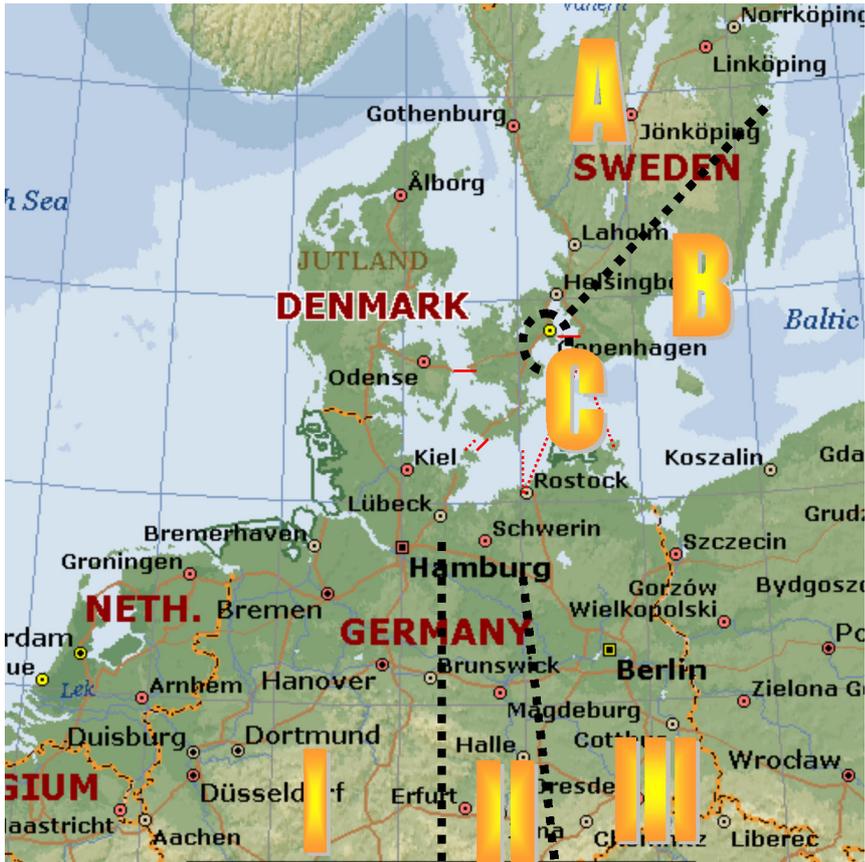
Routes to Poland as well as a number of smaller routes have not been regarded. The Rødby-Puttgarden ferry is included in the study in order to see if a continuation of the ferry operations would be suitable even with a parallel fixed connection⁵. To give a more complete picture also the Øresund fixed connection (Øresund B) and the ferries Elsinore-Helsingborg (Elsinore-Helsingborg F) must be taken into account. The routes are shown in the map of Figure 2.

The results can be categorized as shown in the map of Figure 3. Both the origins and destinations fall in three categories – in Scandinavia most of Sweden and Norway (A), the South Eastern part of Sweden (B) and the Copenhagen area (C), in continental most of Western Europe (I), the central corridor of Nuremburg, Munich and Brenner (II) and Eastern Europe, including Eastern Germany (III).

Two scenarios have been made – the first assuming that all prices for using ferries and fixed links are constant (using 2004 prices), the second that de facto prices of ferries can be reduced 50%.



⁵ After the opening of the Great Belt fixed link connecting Denmark internally, a ferry operation parallel to the bridge targeted toward the truck segment continued. It was however closed down after a few months.



In the first scenario, the *Full price scenario*, the cheapest overall costs are obtained for the origin-destination combinations shown in table 2, which also shows the advantage of using the fixed connection with respect to distance, time used and cost.

Corridor	I	II	III
A	Elsinore F + Great Belt B +154 kms +2,0 hrs -14 €	Trelleborg- Sassnitz F -144 kms +2,3 hrs -40 €	Trelleborg- Sassnitz F -225 kms +1,4 hrs -83 €
B	Øresund B + Great Belt B +157 kms +2,1 hrs -13 €	Trelleborg- Sassnitz F -190 kms +2,4 hrs -31 €	Trelleborg- Sassnitz F -274 kms +1,5 hrs -75 €
C	Great Belt B +157 kms +2,0 hrs -13 €	Great Belt B +165 kms +2,2 hrs -8 €	Fehmarn Belt B 0 kms 0 hrs 0 €

Only for the corridor between Copenhagen and Western Europe, the lowest trucking costs are obtained by using the Fehmarn Belt fixed link, so in this scenario none of the traffic between Sweden and Germany would have the new bridge as its preferred connection. Of course, if time values of the freight increases e.g. due

to express deliveries or delays, the fastest route will in all cases be the Fehmarn Belt fixed link, but in normal preplanned operations this will look different.

In the second scenario, the *Competitive pricing scenario*, it is assumed that the ferry companies – or actually the ferry company, as *Scandlines* at present operate by far the most of the routes – are able to maintain profitability, even though they reduced the prices to 50% of the present list prices for high volume customers.

In this case the most cost effective corridor of the nine corridors is as seen in Table 3:

Corridor	I	II	III
A	Elsinore F + Fehmarn Belt F -19 kms +0,9 hrs -86 €	Trelleborg- Sassnitz F -144 kms +2,3 hrs -147 €	Trelleborg- Sassnitz F -225 kms +1,4 hrs -190 €
B	Øresund B + Fehmarn Belt F -19 kms +0,9 hrs -64 €	Trelleborg- Sassnitz F -190 kms +2,4 hrs -158 €	Trelleborg- Sassnitz F -271 kms +1,5 hrs -201 €
C	Fehmarn Belt F -19 kms +1,0 hrs -64 €	Gedser-Rostock F -143 kms +1,3 hrs -121 €	Gedser-Rostock F -155 kms +0,8 hrs -130 €

In this scenario it seems as if a continued ferry connection between Rødby and Puttgarden with tickets at half price would be able to offer the lowest cost solution for all connections west of the old Iron Curtain. The time difference between using the bridge and the parallel ferry (15 minutes versus 65 minutes) cannot justify the price difference of 60 €.

Whether this competition will actually take place is anybody's guess. The parallel to the situation when the Great Belt fixed link was opened is not too obvious. The ferry company that operated on Great Belt was a small company with few resources. Scandlines is a large company operating many routes and being able to put large resources into the competition if they think they can reach a long term profit.

Conclusion

It seems that the expected attraction of the fixed connection over Fehmarn Belt stipulated in the official reports is somewhat overestimated. The fixed connection will apparently not be the main connection between Scandinavia and Germany. The cost-benefit analysis made (COWI & Danmarks Transportforskning 2004) uses a methodology where transport costs are taken into account, and time values

of freight is not because of lack of knowledge, which would be less detailed than the approach used here, but should not fundamentally differ in its outcome.

However, in assessing the potential of the competing ferry companies the report says (p. 134):

This follows an assumption that the ferries operate under full competition and that the ferry companies cannot earn more than normal profits, and that this will not change by the establishment of a fixed connection over Fehmarn Belt. Effects of a reduced monopolistic pricing of the ferries is thus not considered⁶.

This seems like a rather questionable assumption. The immediate observation is that Scandlines actually has a very dominating position in the ferry operations of the Western Baltic Sea – of the regarded ferries only on the Trelleborg-Rostock route, Scandlines is in competition with another operator.

Lessons from Øresund (and also the Channel Tunnel) should advice caution. Even if the profits of Scandlines would not be monopolistic, the abilities of the company to align service level and market segment to keep a profitable service is probably substantial, and has to be looked upon much more thoroughly.

References

COWI & Danmarks Transportforskning 2004, *Samfundsøkonomisk vurdering af en fast forbindelse over Femern Bælt*, Trafikministeriet, København.

Drewes Nielsen, L., Jespersen, P. H., Petersen, T., & Hansen, L. G. 2003, "Freight transport growth - a theoretical and methodological framework", *European Journal of Operational Research*, vol. 144, pp. 295-305.

Øresundsbro Konsortiet 2001, *Årsberetning 2000*.

Sund & Bælt Holding A/S 2003, *Fehmarnbelt Fixed Link - Financial Analysis Copenhagen*.

Wätjen, W. D. 2003, *Fehmarn Belt Forecast 2002 - Final Report*, Carl Bro Intelligent Solutions, Copenhagen.

⁶ The Danish wording is: "Dette følger af en antagelse om, at færgerne opererer under fuldkommen konkurrence og, at færgeselskaberne derfor ikke kan tjene overnormale profitter, samt at dette ikke ændres ved etablering af en fast forbindelse over Femern Bælt. Der ses således bort fra eventuelle effekter af en reduceret monopolistisk prissætning hos færgerne."