

# Trans-baltic transport structures up to 2035

### How the Fehmarnbelt Fixed Link will shape traffic flows

WP 2, Activity 1

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# Introduction

The Fehmarnbelt Fixed Link (FBFL) will considerably reduce travel times for road traffic between Puttgarden and Rodby, one of Europe's busiest international ro-ro links. By this, it will make road transport more attractive and deviate cargo from existing ferries. Traffic studies indicate that this may not only affect the current ferry link between Puttgarden and Rodby, but also other ferry links in the south-western Baltic Sea. At the same time, direct rail cargo services currently routed via the Great Belt may use the new link and reduce the travel distance between Hamburg and Copenhagen by around 160 km.

Existing studies have focused on the traffic shift between the ferry and rail routes and the new fixed link. The present study builds on this work and extends it in two ways. First, the European origins and destinations (O/D) of cargo and the hinterland modal split are identified. This allows separating the O/D relations which are affected from those which are most likely not affected by the Fehmarnbelt Fixed Link. Second, building on the O/D analysis, the change of cargo flows in the hinterland can be analysed as well. Not only the ports and ferries, but regions all along the relevant transport corridors will face changing cargo flows.

In line with the main aim of the TENTacle project, namely "capitalising on TEN-T core network corridors for prosperity, growth and cohesion", we will zoom in on the map of changing cargo flows to analyse their impact on three selected regions, namely the Guldborgsund municipality, the Rostock region and the city of Hamburg. For each of these regions, different scenarios are developed as a basis for discussion with stakeholders.







# 1. Methodological approach

The estimation of traffic flows in present study is based on a four-step approach. First, trade structures between the relevant countries north of the south-western Baltic and the relevant countries on the main European continent are analysed. Second, based on an analysis of existing data and transport modelling, regional origin/destination pairs and the routes used are estimated (see chapter 2 for detail). This includes the full transport chain from each origin to each destination including modes. The volumes are calibrated to match the trans-Baltic transport volumes on the different ferry links in the base year 2016.

Third, a demand forecast for trans-Baltic traffic volumes is developed based on existing studies. Finally, the impact of the Fehmarnbelt Fixed Link on transport is modelled based on assumption on its impact on travel time and costs (see chapter 3)







## 2. Status quo and trade forecast

Goods transport across the Fehmarnbelt and other straits in the south-western Baltic Sea are the result of intensive North-South trade between East Denmark (e.g. Zeeland), Sweden and Norway on the one hand, and large parts of central and Southern Europe on the other hand. These trade relations will be analysed in the first part of this chapter.



Figure 1 – Schematic overview of relevant cargo flows Source: ISL based on various national sources

While the focus of this study is the structural changes of transport flows that will be induced by the Fehmarnbelt Fixed Link, calculating these changes based on current trade data would give a biased picture due to the expected higher growth in eastern Central Europe. Based on a review of existing forecast, the relevant country-by-country trade matrix for 2035 is estimated (2.2).





### 2.1 Trade and traffic today

#### 2.1.1 Trans-Baltic trade structures 2016

The total amount of traded goods on the Scandinavia<sup>1</sup>-Central-Europe<sup>2</sup>-axis accounts for ca. 180 Mt.<sup>3</sup> On the Scandinavian side Norway stands out with 118.44 Mt (65.8%) of total trade, making up for around 65.8% of total trade between these two groups of countries. Sweden, with ca. 34.37 Mt, combines ca. 19.09 % and Denmark with ca. 27.28 Mt combines ca. 15.16% of trade between central European and Scandinavian countries. On the central European side Germany and the Netherlands are the strongest trading partners. They make up for 43.67% (DE<sup>4</sup>) and 24.36% (NL) of trade with the three Scandinavian Countries.

Table 1 - Total amount of traded goods in million t and percentage of trade relations\* on the Scandinavia-Central-Europe-axis

Northern Countries/Scandinavian Countries	Central European Trading Partners
Denmark (DK) 27.28 (15.16%)	Austria 1.06 (0.59%)
Norway (NO) 118.44 (65.8%)	Belgium 21 (11.67%)
Sweden (SE) 34.37 (19.09%)	Bulgaria 0.13 (0.07%)
	Czech Republic 0.72 (0.4%)
	France 22.23 (12.35%)
	Germany 78.60 (43.67%)
	Hungary 0,41 (0.23%)
	Italy 4.11 (2.28%)
	Liechtenstein 0.002 (0.001%)
	Luxembourg 0.29 (0.16%)
	Poland 5.86 (3.26%)
	Romania 0.21 (0.12%)
	Slovakia 0.32 (0.18%)
	Slovenia 0.10 (0.06%)
	Switzerland 0.59 (0.33%)
	Netherlands 43.85 (24.36%)

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\* deviation from 100% due to rounding

On this trade axis the exports from Scandinavian countries (145.31 Mt) show a great surplus compared to their imports (34.78 Mt) (see table 2).

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<sup>&</sup>lt;sup>1</sup> includes: Denmark, Norway and Sweden

<sup>&</sup>lt;sup>2</sup> includes: Austria, Belgium, Bulgaria, Czech Republic, France, Germany, Hungary, Italy, Liechtenstein, Luxembourg, Poland, Romania, Slovakia, Slovenia , Switzerland, Netherlands

<sup>&</sup>lt;sup>3</sup> Table 1 shows which country combines which amounts on this trade-axis in Mio. t. and percentages

<sup>&</sup>lt;sup>4</sup> Code in brackets shows ISO-3166 country-code, more than one code in brackets gives an order of countries based on the amount of trade



 

 Table 2 - Total amount of traded goods in million t and percentage of trade relations\* on the Scandinavia-Central-Europe-axis

Source: ISL based on Statistics Denmark, Statistics Sweden, Statistics Norway

Imports 34.78	Exports 145.31			
Denmark 15.71	Denmark 11.57			
Norway 7.35	Norway 111.08			
Sweden 11 72	Sweden 22 65			

Table 2 Imports/Exports from Scandinavian Countries with Central Europe in million t

Sources: Statistics Denmark, Statistics Sweden, Statistics Norway / calculations: ISL

The following paragraph considers single countries' trade relations and the main traded goods.

#### <u>Norway</u>

Trade-relations between Norway/ Germany, Netherlands and France combine 102.08 Mio. t. or ca. 56% of the total trade on this axis. The main exported good from Norway clearly is Natural gas (57.38 Mio. t.) (5DE/FR,) followed by Oil products (21.02 Mio. t.) (NL/DE/FR) and Construction materials (NL/DE/FR).

Norway's total imports from Central Europe (7.35 Mio. t.) mainly stem from Germany (Construction materials/Salts), the Netherlands (Electrodes) and Belgium (Oil products/wheat), though with Belgium the second biggest category of traded goods are "commodities not for publication" (0.95 Mio. t.). Overall, on the export side the predominance of one specific good is much greater, than on the import side.

#### <u>Denmark</u>

In case of Denmark the greatest trading partners are Germany (14.54 Mio. t.), the Netherlands (5.07 Mio. t.) and Poland (2.23 Mio.t.).

The main import-goods are Oil products (NL 0.82 Mio. t.). Considering the top 10 import-goods there is no further predominance, but Oil-Cake And Other Solid Residues (NL/DE) appears twice in the top 10 of imported goods.

The main exported good from Denmark is Construction materials (DE/NL) and Oil products (NL/PL) followed by a rather non predominant order of other goods such as Wood(s) (DE), Wheat (NL) and steel (PL).

#### Sweden

Germany, the Netherlands and Belgium are the biggest trading partners of Sweden.

Oil products (DE/NL/BE) are the most frequently imported good by Sweden. On the export side, famously, iron ore is the predominant trading good (DE/NL/BE). The exports of Iron ore to these three central european trading partners account for ca. 9.30 Mio. t. (ca. 41% of Swedish exports) alone.











Even though Oil products are an important import product (2.34 Mio. t. (NL/DE/PL/BE)), Sweden also has major exports of Oil products (3.94 Mio. t. (NL/DE/BE)).

#### 2.1.2 Major origin and destination regions for manufactured goods

For the Scandinavian countries, nine regions that obtain a high importance for cross-border trade can be identified. Four of them are located in Sweden, three in Norway and three (of which two are relevant) in Denmark. They are displayed in the map below together with the population density. High-populated areas emerged as centres of trade flows as they often reflect areas of goodsmanufacturing for export purpose. Additionally, their population's needs will result in the import of various products as well.



Figure 2 - Population density and major origin and destination regions in south Scandinavia Source: ISL based on various national sources

Population density and major origin and destination regions in south Scandinavia Source

In Norway the major regions are defined as Oslo, Bergen and Stavanger. These cities are atop of the list of highest populated cities in Norway. Oslo represents the country's economic and administrative centre. The city has been transforming into a service-based society with a special focus on information technology (among financial services and research). Despite this trend, the metropolitan area of Oslo possesses 25 per cent of the total Norwegian population and therefore remains a key region for trade in goods. Traditionally the economies of Bergen and Stavanger are highly linked with fishing and shipping as well as the oil industry. Especially the city of Stavanger evolved as a centre for the manufacturing and engineering industry beyond the oil sector.









Like in Norway the south of Sweden accounts for a major part of the country's population. Accordingly the most important regions for the trade in goods are also located there. Stockholm and Gothenburg maintain a key role for the Swedish economy. Both cities and their respective surroundings have a significant share (>15%) of the nation's employees in several industry clusters (Oslo 14, Gothenburg 7). A third key region can be found at the Øresund with the cities of Malmö and Helsingborg. Sweden has a long tradition in the metalworking industry. The manufacturing and automotive industries are still of a high importance for the country. A significant share of these sectors' workforce is not part of the above named agglomerations. Both industries are highly related to crossborder goods trade as they have international customers as well as suppliers. Therefore a fourth region in middle-south Sweden is included to cover these trade flows.

Denmark's western part, Jutland, is included in the map, however, the region's transport volume is not considered to have any relevance for the FBFL project. Denmark's capital Copenhagen is also the economic centre. The metropolitan area of Copenhagen includes around 40 per cent of Denmark's population with a large share of the country's economic activities. The second Danish region considered for modelling is the island of Funen. Its main city Odense is home for various industrial sectors.

 Table 3 - List of major origin and destination regions in Scandinavia with estimated transport volume share

country	metropolitan area	transport share
Sweden	Stockholm	30%
Sweden	Göteborg-Trollhättan	25%
Sweden	Malmö-Helsingborg-Kristianstad	25%
Sweden	Middle-South Sweden	20%
Norway	Oslo	50%
Norway	Bergen	20%
Norway	Stavanger	30%
Denmark	Odense	10%
Denmark	Copenhagen	50%
Denmark	Jutland	40%

Source: ISL based on various national sources

To identify the counterparts for the Scandinavian trade flows in central continental Europe population numbers and industrial clusters are considered. For modelling the impact of the FBFL 35 regions from twelve different countries are examined.









Figure 3 - Population density and major origin and destination regions in south Scandinavia Source: ISL based on various national sources

Limiting the selection of core areas is not simple as the countries differ heavily. The total trade volumes of the areas are used as a benchmark for comparison within one country but not between them. This is necessary due to the country's diverse socio-economic structure and the related geographical disparities. Switzerland is decentralised to a high degree compared to countries like Slovakia and Hungary. Bratislava and Budapest concentrate a large share of their countries' economic activities in their metropolitan areas. In countries like Switzerland and Poland, manufacturing and trade are distributed in a more balanced way.

Germany is a highly decentralised country in the sense of geographical distribution of population and economic activities. Since Germany's export-oriented industry clusters generate a high trade volume it is possible to subdivide into eight regions while each of them is still of a significant size. One factor in deciding which regions to include is ISL's North European Container Traffic Model (NECTM). It monitors the container traffic of the North range ports and provides a reliable database for the origin and destination of containers respectively the core areas for manufacturing and trade.







### Table 4 - List of major origin and destination regions in continental Europe with estimated transport volume share

country	metropolitan area	transport share	country	metropolitan area	transport share
Germany	Berlin	5%	Switzerland	Basel	60%
Germany	Dresden-Leipzig	10%	Switzerland	Zurich	30%
Germany	Frankfurt- Mannheim	10%	Switzerland	St Gallen	10%
Germany	Hamburg	15%	Italy	Milan	50%
Germany	Rhine-Ruhr	30%	Italy	Venice	30%
Germany	Cologne-Bonn	10%	Italy	other Italy	50%
Germany	Stuttgart	10%	Austria	Vienna	50%
Germany	Munich	10%	Austria	Linz	55%
Netherlands	Amsterdam	20%	Austria	Graz	15%
Netherlands	Rotterdam	40%	Slovakia	Bratislava	100%
Netherlands	Arnhem-Nijmegen	40%	Hungary	Budapest	100%
Luxembourg	Luxembourg	100%	Czech Rep.	Prague	75%
Belgium	Antwerp	100%	Czech Rep.	Ostrava	25%
France	Paris	55%	Poland	Warsaw	40%
France	Strasbourg	15%	Poland	Wroclaw	25%
			Poland	Katowice- Krakow	25%

Source: ISL based on various national sources

The total transport volume of each country is distributed among the major regions. Consequently this leads to an overestimation. However, this is not an issue, as for modelling the transport flows the geographical position is important. Therefore, four regions of France are sufficient even though it is the second largest economy in Europe. Potential French transport volumes from the inland to Scandinavia will pass either one of the named regions. In contrast to this five Polish regions are included. Although the industrial core regions which account for most of the Polish transport volume lie in the area of Warsaw and the South of Poland, Gdansk and Szczecin are also included. Their absolute share is not much compared to the other regions, however, the potential of diverting transports is higher. In 2016, two global players of e-commerce moved to Szczecin which fostered the city's demand for warehouse capacities. The region is considered to be well-located to serve as a distribution hub for Western Europe as well as Scandinavia.6

The table above lists all 35 areas defined for continental Europe. Like in Scandinavia the relevant centres of economic activity are congruent with the most populous regions as well. In most countries capitals play an important role for manufacturing and trade. However, exceptions exist, for example Belgium where Antwerp is the main centre for production and trade in goods as Brussels is predominantly a service-based and administrative city.

<sup>&</sup>lt;sup>6</sup> See the report Poland's Industrial Market in 2016 by the Polish Investment & Trade Agency









#### 2.1.3 Trans-Baltic transport structures 2016

The Fehmarnbelt Fixed Link will affect all three transport modes that are relevant for crossing the straits that separate Scandinavia from central continental Europe. Cargo traffic on the ferry links and across the Great Belt bridge is to a large part international traffic between the Scandinavian countries and central Europe.

Rail traffic uses the Great Belt Bridge and the ferries (either rail ferries or intermodal transport units loaded on vessels) on more or less equal grounds (see Figure 4). Where point-to-point connections have higher volumes for regular rail traffic, rail traffic across the bridge is generally the preferred solution despite the longer distance of the Great Belt route compared with intermodal rail/ferry transport. These are often trains for single companies or at least in large part used by single customers. The ferry ports, in turn, serve as consolidation hubs for the transport of intermodal units. Regular trains connect them with the European hinterland, while the ferry network links the hinterland network with all coastal areas of the Baltic Sea – including Finland, Russia and the Baltic States which are not analysed here.



Figure 4 – Trans-baltic transport structure 2016 (model results) Source: ISL transport cost model

The analysis of the most frequented routes per mode reveals that the corridor from southeast Sweden to the Rhine-Ruhr area and beyond is the most important one in terms of volume. The rail network









has a second major corridor with the north-south link while ferries and trucks mostly serve of eastcentral Europe.



Figure 5 – Transport volume on Western corridor 2016 (model results)

Source: ISL transport cost model

The western corridor (Hamburg-Paris axis) has the largest transport volume. Close to Hamburg, the transport volumes generated by the ferries and by the Great Belt Bridge join up to the Rhine-Ruhr area. The German A1 highway and the parallel rail corridor are hence the most important hinterland routes for traffic on this corridor. The most important ferry routes are Puttgarden-Rödby, Travemünde-Malmö, Travemünde-Trelleborg and Rostock-Trelleborg.









Figure 6 – Transport volume on Central corridor 2016 (model results) Source: ISL transport cost model

The transport volume on the Central corridor – designating the main North-South corridor on the Rostock-Venice axis is higher and includes a considerable volume of long-distance traffic between the Baltic Sea and North Italy where the Adriatic ro-ro ports connect this corridor the Balkan countries and Greece. A considerable portion of this long-distance traffic is using the various rail connections on this corridor.

As regards the ferries, the Puttgarden-Rödby link and the various South Sweden ferries are the most important links for this corridor.









Figure 7 – Transport volume on Eastern corridor 2016 (model results) Source: ISL transport cost model

The Eastern transport corridor spans from Szczecin to Budapest and shows a high share of road traffic. Danish traffic passes through Jutland or the Rostock-Gedser link while Swedish traffic concentrates in large part on the ferry connections between Sweden and Poland.

For this corridor, the Puttgarden-Rödby link is in seventh place only according to the model results. Only 4 % of the traffic has origin or destination in the regions of the eastern corridor.

### 2.2 Trade matrix 2035 without Fehmarnbelt Fixed Link

As a basis for the forecast, the volume of trade in the relevant commodity groups is estimated to grow from 44.2 Mt in 2016 to 58.2 Mt in 2035, i.e. by 1.5 % per year on average (see Table 5). The structure of trade growth is based on the detailed forecast of BVU/Intraplan<sup>7</sup>, but remains slightly more cautious due to the sluggish trade development during the past years.

<sup>&</sup>lt;sup>7</sup> BVU/Intralplan: Verkehrsprognose für eine Feste Fehmarnbeltquerung 2014 – Aktualisierung der FTC-Studie von 2002, 2016











Table 5 – Trade volume 2016 and 2035Source: ISL based on BVU/Intraplan

COUNTRY (SOUTH)	2016	2035	AVERAGE ANNUAL GROWTH
GERMANY	17.1	22.0	1.4%
NETHERLANDS	10.6	13.5	1.3%
POLAND	5.0	7.6	2.2%
BELGIUM	3.3	4.6	1.7%
FRANCE	3.0	3.7	1.1%
ITALY	2.7	3.4	1.1%
CZECH REPUBLIC	0.6	0.9	2.1%
AUSTRIA	0.7	0.9	1.4%
SLOVAKIA	0.3	0.6	3.6%
HUNGARY	0.4	0.6	2.1%
SWITZERLAND	0.3	0.3	0.3%
LUXEMBURG	0.1	0.2	1.9%
TOTAL	44.2	58.2	1.5%

Part of this trade is handled on ferry routes outside the corridor (e.g. trade between Sweden and Belgium) and on container vessels. The largest part of this trade, however, crosses the straits of the south-western Baltic Sea on one of the many ferry routes or across the Great Belt Bridge.

It is important to stress here that the trade growth assumed here only has a minor impact on the main results of the study, which focuses on changes induced by the Fehmarnbelt fixed link. These changes are largely independent of the trade growth between the different countries as these do not change the transport structures.







# 3. Impact of Fehmarnbelt Fixed Link on transport flows up to 2035

In order to analyse the way in which the Fehmarnbelt Fixed Link may affect transport flows, the trade flows calculated for 2035 were assigned to each country's major industrial areas (see Table 3 and Table 4) in order to generate regional origin/destination flows. This regionalisation of flows is particularly important for larger countries like Germany, but also in order to separate the Fyn and Jutland volumes from the Zeeland volumes.

As a second step, a transport cost model was developed in order to calculate the attractiveness of the different routes for North/South region pair. The model takes into account

- Trucking costs (including driver per hour, fuel per km, material and other/administration)
- Ferry costs (estimated based on distance, ship type/capacity)
- Handling costs in ports (if applicable, unaccompanied traffic only) and rail terminals
- Ferry frequency (monetarised based on waiting costs)

Five types of transport chains were estimated:

- 1. Direct truck traffic
- 2. Direct rail traffic
- 3. Accompanied ferry traffic (trucks with drivers)
- 4. Unaccompanied ferry traffic (trailers with handling in ports) with pre-/post carriage by truck
- 5. Combination of unaccompanied ferry traffic with rail traffic

The model was calibrated on transport flows for the base year 2016, then fed with the 2035 trade matrix. The elasticity of demand between the different types of traffic was based on parameters estimated in the context of intermodal container transport and were calibrated to match the observed splits in the sum of all origin/destination pairs. For transport types 3 to 5, a ferry choice model was introduced based on the cost advantage/disadvantage of each ferry per transport route. The model was calibrated by introducing 'unobserved costs' of each ferry link to match the actual 2016 volumes per ferry (separately for transport type 3, simultaneously for transport types 4 and 5).

The Fehmarnbelt Fixed Link is introduced based on the assumption that the toll for the tunnel is similar to the price of the ferry link. The advantage of using the tunnel is hence the increased flexibility and reduced waiting time. Due to the probabilistic nature of the model<sup>8</sup>, a reduction of costs for a certain transport chain type increases its market share on all origin/destination relations in which it is competitive.

<sup>&</sup>lt;sup>8</sup> both the split of transport types and the ferry choice model were estimated based on a multinomial logit model









### 3.1 Impact of FBFL on trans-Baltic transport chains

From a bird's view, the most important changes induced by the introduction of the Fehmarnbelt Fixed Link are the shift of rail traffic from the Great Belt route to the FBFL and the deviation of traffic from the existing ferry routes (see Figure 8).



Figure 8 – Changes induced by the FBFL (2035 model results)

Source: ISL transport cost model

The most affected ferry routes are Puttgarden-Rödby and the links between Germany and South Sweden. In the hinterland, the roads connecting the affected ports with their hinterland (e.g. A20 between Rostock and Hamburg as well as S3 between Swinoujscie and Szczecin) show the largest decreases.

The simulation also suggests that there may be a shift from rail to road in the hinterland on certain corridors as direct road traffic gains competitiveness vis-à-vis combined sea-rail-road traffic. This may, however, be compensated by new rail links across the FBFL.

### 3.2 Impact of FBFL on selected regions

The map of transport flow changes induced by the FBFL shows that these changes are of a complex nature and that they asymmetrically affect different regions. Regions on the Copenhagen-Hamburg axis will witness the largest traffic increased while regions on the Great Belt route and around the existing ferry links will experience the largest traffic decreases. The remainder of this section is









dedicated to three selected regions: Guldborgsund Municipality as a region with increased traffic volume, Rostock city as a region with decreased traffic volume, and Hamburg city as a region with stable volumes but considerable structural changes of transport flows.

#### 3.2.1 Guldborgsund municipality

Guldborgsund municipality lies between Copenhagen and the two southern Danish ferry ports Rödby and Gedser. The latter port is situated in the south of the municipality.

The rail and truck traffic flows between Copenhagen and the Öresund bridge on the one hand and central Europe on the other hand pass through municipality. In terms of volume, the most important change will be a strong increase in rail freight traffic transiting the municipality on its way to the FBFL (see Figure 9). Similarly, traffic on the E47 passing through the Northern half of the municipality will increase due to the attraction of additional traffic flows after the FBFL's opening.



Figure 9 – Changes induced by the FBFL in Guldborgsund municipality (2035 model results) Source: ISL transport cost model; map: OpenStreetMap contributors

While transit traffic to and from Rödby will increase, traffic in the municipality's Gedser port will decrease after the opening due to a deviation of traffic. The findings of the traffic simulation suggest, however, that the decrease is rather limited as the Rostock-Gedser link is focusing on the central and south corridors while the FBFL will mostly serve the western corridor.







In order to benefit as much as possible from the increase of traffic flows, Guldborgsund Municipality is developing a regional strategy including the expansion of the Business Park Falster situated close to the E47 highway.<sup>9</sup>

#### 3.2.2 Rostock city

Two important ferry routes of the port of Rostock are within the scope of the study: Rostock-Trelleborg (one service operated by Stena Line and one operated by TT Line) and Rostock-Gedser (operated by Scandlines). According to the transport simulation, the former links South Sweden first and foremost with the western and southern corridor while the Gedser link has a higher share of eastward traffic (see Figure 10).



Figure 10 – Transport of selected Rostock ferry links (model results) Source: ISL transport cost model

Both links will see a decrease of cargo traffic, but the impact will be strongest on the Trelleborg route. This is not only due to the higher absolute volume, but also due to the fact that the link is in parallel to the corridor passing over the Fehmarnbelt. The Trelleborg ferry services are hence most directly affected (see Figure 11).

According to the simulation, the shift of cargo traffic from the mentioned ferry routes is at the order of 3 % to 4 %, similar to the results of previous studies.<sup>10</sup> It has to be noted, however, that passenger traffic seems to be more sensitive to travel times so the shifts may be much stronger.<sup>11</sup> If this leads to a reduction of the frequency of the ferry service, this would make it less attractive for cargo transport so the actual shift could be much stronger. The passenger traffic shifts of 45% to 60% projected by

 <sup>&</sup>lt;sup>10</sup> see, e.g., BVU/Intralplan: Verkehrsprognose für eine Feste Fehmarnbeltquerung 2014 – Aktualisierung der FTC-Studie von 2002, 2016
 <sup>11</sup> see "Fehmarnbelt Fixed Link: Modal Split Drivers", TENTacle WP2, Activity 2.1.3, downloadable at http://tentacle.eu/a/uploads/bilder/TENTacle Modal Split Drivers.pdf







TENTacle

<sup>&</sup>lt;sup>9</sup> "Business Park Falster", TENTacle WP2, Activity 2.1.5, downloadable at

http://tentacle.eu/a/uploads/bilder/TENTacle\_Traffic\_Analysis\_Business\_Park\_Falster.pdf



BVU/Intraplan for the different ferry routes would put the economic operation of the ferry services into danger, particularly for the Rostock-Gedser link with its high share of passenger traffic.

The higher the share of goods transport on a ferry, the higher the probability that the demand growth until 2035 will compensate the loss induced by the FBFL. This would allow the operators to offer a frequency similar to the one of the base year 2016.



Figure 11 – Changes induced by the FBFL in Rostock (2035 model results) Source: ISL transport cost model; map: OpenStreetMap contributors

Cargo traffic on the Denmark ferries is predominantly accompanied traffic, i.e. trucks drive on the ferries on their own. The economic effects on the transit ports are rather limited. The Sweden traffic, however, has considerable volumes of unaccompanied trailers which are loaded or discharged by the terminal operators in the port. Additional activity is generated by intermodal transport, i.e. shifts between ferries and rail. Therefore, a decrease of this traffic would significantly affect the port's economy.

As regards intermodal rail/sea traffic, the model suggests that Rostock will have to focus on its hub function, connecting different hinterland regions with different origins/destinations in the Baltic Sea region. The tunnel will have a competitive advantage for terminal-to-terminal traffic with complete block trains, but it cannot offer the consolidation function of an intermodal terminal. Finland cannot be served at all so the Finland services will remain unaffected.









It has to be noted here that the volume shift depends largely on the pricing of the tunnel and the strategies of the ferry and ro-ro operators, particularly for accompanied traffic. Intermodal traffic will be less price-sensitive as long as it relates to Rostock's consolidation function.

As part of the TENTacle project, the Port of Rostock has analysed the potential to attract new traffic in order to compensate for the expected loss in cargo traffic.<sup>12</sup>

#### 3.2.3 Hamburg city

Hamburg is at the crossroads of the 'old' and 'new' land routes, namely the route over the Great Belt and the route of the Fehmarnbelt. Accordingly, while the volume of flows transiting the city state will not change significantly, the geography of flows will. Direct rail traffic between East Denmark and Sweden on the one hand and central Europe on the other hand will come in from Lübeck now instead of Neumünster. The same is true for road traffic, but the shifts are much less pronounced because road traffic is already predominantly using the Puttgarden-Rödby links or other ferries instead of the Great Belt bridge.



Figure 12 – Changes induced by the FBFL in Hamburg (2035 model results) Source: ISL transport cost model; map: OpenStreetMap contributors

<sup>&</sup>lt;sup>12</sup> "Impact of the Fixed Fehmarn Belt Link on the Tranport of Forest Products from Northern to Central Europe" and "Impact of the Fixed Fehmarn Belt Link on the Transport of Ferrous Metals from Northern to Central Europe", TENTacle WP2, Activity 2.1, downloadable at http://tentacle.eu/downloads/











There may be a positive impact of the Fehmarnbelt Fixed Link not analysed here: the port of Hamburg may become more competitive for deep-sea container traffic to and from Lolland, Falster or even Zeeland, depending on the tariff of the tunnel. The cost of feedering to Copenhagen includes transhipment handling fees <sup>13</sup> in Hamburg or another North Range port, the handling fee in Copenhagen and feeder transport, which – taken together – may give Hamburg the chance to expand its hinterland further to the Northeast.

<sup>13</sup> two quayside moves and hence generally more expensive than handling charges of hinterland containers







# 4. Conclusions

The cargo traffic simulations conducted as part of the present study help understanding the structural impact of the Fehmarnbelt Fixed Link (FBFL) on transport flows across Europe. The impact is not limited to the coastal areas as the ferries and fixed links in the region are part of trans-European transport chains spanning across large parts of central and central-eastern Europe as well as Scandinavia.

Linking the ferry routes with hinterland transportation sheds new light on the impact of the FBFL. It is not only the distance between an existing ferry route and the new fixed link that is decisive for the magnitude of shifts, but also whether or not they serve the same transport corridors. Traffic with the western and central corridor are more affected than traffic with the eastern corridor even on the nearby Rostock-Gedser link. An open question for further research is the impact of shifting passenger flows on the frequency of the ferries and hence on the attractiveness of ro-ro transport in the southern Baltic Sea after the opening of the FBFL.

The results of the simulation have been analysed for three example regions in the present study to show the diversity of impacts from a single infrastructure project. The full simulation results will be provided on the project website www.tentacle.eu.



