FinEst Link WP2
Appendix 3.
Cargo volume estimation

EUROPEAN UNION
European Regional Development Fund
Interreg
Central Baltic

Content

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Methodology and data

Objectives, methodology, main phases

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Objectives

- To produce diverse estimations on cargo potential for year 2050 for maritime and railway tunnel transports between Helsinki and Tallinn in alternative scenario situations.
- To perform sensitive analysis of the effects of different tunnel prices on the transport volumes for illustrating the alternative market situations.

Methodology

- The analyses are performed using FRISBEE freight model *.
- Model is described profoundly in separate Annex.

Main phases

1. Logistics study on driving factors (source materials, statistics)
2. Volume estimations
   - Scenario 0, base scenario, current situation
   - Scenario 0+, existing transport system between Helsinki and Tallinn; Rail Baltica on operation, forecast year 2050
   - Scenario FL, Helsinki–Tallinn tunnel on operation, Rail Baltica on operation, forecast year 2050
3. Sensitivity analysis and maximum scenario
4. Reporting

* The model calculates the theoretical potential for the tunnel and Rail Baltica. Thus the modelling results presume, that there are no operative or infrastructure related restrictions/capacity limitations as an example in terminals or in tunnel. **The potential of all types of goods has been taken into account.**

FRISBEE model – Description

- FRISBEE model is based on system modelling – when making changes the model calculates the whole transportation system based on new data on costs, transport time etc.
- Strategic model of the freight transport system of European (NUT3) foreign trade
- System optimum, simultaneous route and mode optimization
- The model contains information on
  - Transport networks (Finland, Europe, Russia and connections to other continents)
  - Transport demand (13 commodities/types of goods SITC2, Eurostat, Comtrade)
  - Transport freight by mode (rail, road and maritime transports), by type of goods
  - Terminal and port prices
  - Transport time (taking into account the speed limits, congestions etc. as an average on yearly basis concerning all modes)
  - Reliability of transports
  - Risk of damage
  - Lead and handling times in terminals and ports
  - Number and frequency of shipping lines in different ports etc.
- Concerning different types of goods the factors have different weights affecting the route and mode selection.
  - As an example concerning valuable consumer goods the speed and the level of service means more than the transport price in route and mode selection.
  - Correspondingly in mine products the route/mode selection will be made based mostly on the transport price.
- By the model different kind of sensitive analysis by changing freight by transport mode, terminal and port prices, service levels in the ports, transport speed, frequency of shipping lines etc. can be performed.

FRISBEE modelling / additional data for FinEst-Link cargo volume estimations

Prices

- Helsinki-Tallinn tunnel: 450 euros per truck per one direction
- Current maritime transport prices (source Directferries.fi):
  - 200–250 euros per truck (12 metres, max. 13 tons) per direction
  - 300–400 euros per truck (18 metres, max. 44 tons) per direction
- In pricing the Eurotunnel pricing has also been used as reference.

Cargoes and units

- Max. 96 TEU per train
- Max. 48 trucks per train
- 600–700 tons per train
- Average length of train 800–1 000 metres
- Average cargo
  - 8 tons per TEU (source Port of Helsinki)
  - 12–13 tons per truck per trailer (source Finnish Transport Agency).

Cargo volume estimations

Scenario FL

Base scenario FL 2050

Assumptions

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- Cargo terminal is located in **Vantaa** near airport
- Average speed of cargo train **120 km/h**
- Average loading/unloading time of cargo trains **½ hour**
- The model takes into account the average transport speed on the road and street networks as well as on rail network and in maritime transports on yearly basis.
  - The location of terminal outside the city center may decrease the congestions. Time saving can be in average about 15-30 minutes compared with the driving time to current ship terminal.
- Growth of GDP due to tunnel in Helsinki region 0.1% and in Tallinn region 0.2% in year 2050

Cargo volumes 2016 and 2050

Potential of all cargoes

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Scenario 0, year 2016 (no Helsinki–Tallinn tunnel)

- Helsinki–Tallinn maritime cargo
  - 3.8 million tons per year

Scenario 0+, year 2050 (no Helsinki–Tallinn tunnel, Rail Baltica on operation)

- Helsinki–Tallinn maritime cargo
  - 6.9 million tons per year
    - From which the potential for Rail Baltica would be 1.8 million tons per year.

Base scenario FL, year 2050 (Helsinki–Tallinn tunnel in use)

- Helsinki–Tallinn maritime cargo and tunnel cargo
  - 8.4 million tons per year total transports
    - 4.2 million tons per year maritime transports
    - 4.2 million tons per year transports via tunnel
    - The potential for Rail Baltica would be 3.9 million tons per year.
    - Because of the tunnel, the truck traffic in the inner center of Helsinki would decrease roughly about 500-600 trucks per day.

Potential cargo volumes in Scenario FL per direction

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Potential cargo volumes in updated Scenario FL

Potential of all cargo

Maritime transports between Helsinki and Tallinn

	Million tons per year
From Tallinn to Helsinki	1.7
From Helsinki to Tallinn	2.5
Total (both directions)	4.2

Railway transports via Helsinki–Tallinn tunnel

	Million tons per year	Trains per day
From Tallinn to Helsinki	1.8	6–8
From Helsinki to Tallinn	2.4	9–11
Total (both directions)	4.2	15–19

Potential for the Helsinki–Tallinn tunnel: Types of goods (potential of all cargoes)

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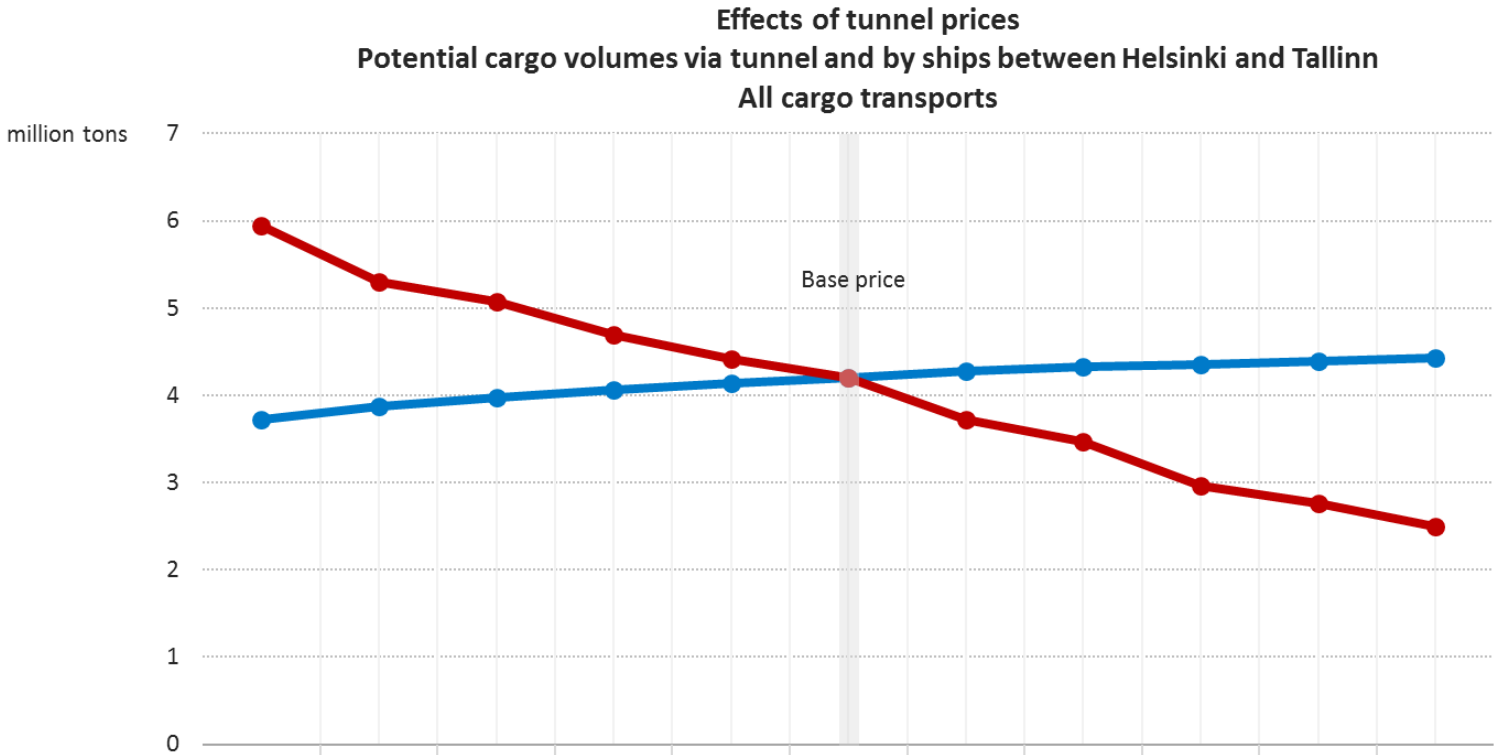
Type of good	Share (%)
Paper, paperboard and articles	30
Machinery and transport equipment	25
Manufactured miscellaneous goods	15
Chemicals and related products	10
Other types of goods	20
Total	100

* The transports of petroleum and mineral fuels are not targeted to tunnel according to modeling results.

The effects of different tunnel prices to potential cargo volumes 2050



Change of the used tunnel price	-25%	-20%	-15%	-10%	-5%	±0%	+5%	+10%	+15%	+20%	+25%
Maritime (million tons)	3,7	3,9	4,0	4,1	4,1	4,2	4,3	4,3	4,4	4,4	4,4
Tunnel (million tons)	5,9	5,3	5,1	4,7	4,4	4,2	3,7	3,5	3,0	2,8	2,5
Total (million tons)	9,7	9,2	9,1	8,8	8,6	8,4	8,0	7,8	7,3	7,2	6,9
Tunnel price (€/truck)	338 €	360 €	383 €	405 €	428 €	450 €	473 €	495 €	518 €	540 €	563 €

Sensitivity Analysis / Maximum Scenario

Sensitivity analysis / Maximum Scenario
Description

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In this Maximum Scenario the before presented base scenario forms the starting point.

In Maximum Scenario the followed data has been changed compared to base scenario:

- The growth of GDP in Finland is 30 percentage unit higher than in base scenario.
- The competition ability of Rail Baltica has been increased by lowering the unit prices 10 % in the tunnel and in Rail Baltica.
- The future changes in production structure has been taken into account. The production structure has been changed based on the coefficients defined as a result of the expert panel meetings in the logistics study of Uusimaa Region.
  - Expert group from different industrial and transport sectors estimated the changes in import and export of different cargo types.

Sensitivity analysis / Maximum Scenario
Cargo volume estimations 2050

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- Maritime transports between Helsinki and Tallinn (**Maximum Scenario FL**)
  - Total 5.9 (4.2 in base FL scenario) million tons per year
    - From Tallinn to Helsinki 2.4 million tons per year
    - From Helsinki to Tallinn 3.5 million tons per year

- Transports via Helsinki-Tallinn –tunnel (**Maximum Scenario FL**)
  - Total 6.1 (4.2 in base FL scenario) million tons per year
    - From Tallinn to Helsinki 2.6 million tons per year
    - From Helsinki to Tallinn 3.5 million tons per year

- Finnish cargo potential for Rail Baltica
  - 2.5 million tons per year **in maximum scenario 0+** (Rail Baltica on operation, **no** Helsinki-Tallinn –tunnel)
  - 5.8 million tons per year **in maximum scenario FL** (Rail Baltica and Helsinki-Tallinn –tunnel on operation)

Comparison of results with Rail Baltica (RB) Study (Rail Baltica Global Project Cost-Benefit Analysis)

Rail Baltica Study (later = RB)
Forecasting approach

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- The traffic forecast model at its core is built by determining and applying the specific ratio between the passenger and foreign trade growth rate and the economic development (as indicated by GVA and GDP growth rate for passengers and freight respectively) of the relevant urban nodes and country pairs within Rail Baltica catchment area. This ratio, the so-called GVA/GDP multiplier, is derived from a time series of historical data (average over a period of time), with adjustments to exclude non-standard events (peak shaving). Similar approach has been used, for example, by the WTO as a basis for estimates.

- Freight traffic forecasts are based on the combination of future market growth assumptions (i.e., what is the size of overall market in a particular year), as well as future modal assignment and modal choice assumptions (i.e., what modes are expected to be chosen for freight shipments). Different assumptions have been applied for base, low and high cases respectively.
- Important considerations were formulated during the analysis:
  - Sea transport is the observed cheapest option for the O/D pairs that are easily and conveniently reachable by sea from Finland and the Baltic States. For example, the shipping rate for one TEU from Rotterdam to Helsinki by sea may cost approximately EUR 500, while the land transport cost maybe three times higher.
  - Considering that the Rail Baltica infrastructure would form maximum one third of the total end-to-end journey of the freight for most O/D pairs, it would mean that even offering the Rail Baltica section for very low price, the overall shipment, for instance, from Rotterdam to Helsinki would cost considerably more by train than by sea.
  - Information gathered during industry analysis indicates that in certain distances the rail transport may prove to be price competitive with road transport, as the road transport generally follows the same route as railway thus allowing the rail service to compete in the terms of speed and cost. In view of these considerations the freight flows captured by Rail Baltica have been determined to shift predominantly from the road traffic. Due to the wide range of O/D pairs considered in the analysis, in certain routes the modal shift would involve also partial shift from the sea (e.g., part of the journey done by trucks on RoPax and Ro-Ro ferries).

Source: Rail Baltica Global Project Cost-Benefit Analysis, 30 April 2017

Comparison of the results of FinEst-Link cargo volume estimations with cargo volume estimations of Rail Baltica study (=RB)

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Potential of Finnish transport demand for Rail Baltica				
Million tons	**2045 (RB)**	**2050 FinEst-Link 0+**	**2055 (RB)**	**2050 FinEst-Link FL**
Low case	1.5-2.2	-	1.6-2.4	-
Base case	1.9-2.8	1.8	2.0-3.0	3.9
High/maximum case	2.3-3.4	2.5	2.5-3.8	5.8

- Despite of different modelling methods the estimations of cargo potential of Finnish transport demand for Rail Baltica are at the same level.
  - ✓ The estimation of FinEst-Link 0+ base scenario (no tunnel) is little bit lower than the estimation in RB study.
  - ✓ In high/maximum scenario the results are almost same.
  - ✓ In FL scenario the whole potential for the Helsinki-Tallinn -tunnel is 4.2 million tons per year (in maximum scenario 6.1 million tons).
  - ✓ FL scenario (Helsinki-Tallinn –tunnel on operation) was not studied in RB study.

Main sources

Main sources

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