



Study Results of the FinEst link project – Impact on Rail Baltica

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Technical concept



The technical concept of FinEst Link:

- a 1435 mm gauge railway tunnel (two rail tunnels and a service tunnel)
- two artificial islands (Uppoluoto, Tallinnamadal)
- Stations in Helsinki city centre, Pasila and Helsinki-Vantaa airport for passengers, and freight terminal area close to the airport with connection to the Finnish railway network (1524 mm)
- A passenger station at Ülemiste in Tallinn and a connection to Rail Baltica for passengers and freight

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FinEst Link - Finland









D) North of Airport (>22 km from Pasila)





Estonia – Alignment & Facilities

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- FinEst surface alignment follows the rail corridor presented in Harju County Plan
- FinEst tunnel portal at Iru junction (can be about 5 km to north)
- Freight terminal (including car and truck terminal) in same location than possible Rail Baltic freight terminal

Underground rock spaces

Underground rock spaces:

7

- Area 2 073 725 m² = 2,074 km²
- Volume 12 657 457 m³ = 117*Parlament house of Finland
- > Tunnels together 293 km
 - ✓ Technical 194 km
 - ✓ Metro 34 km
 - ✓ Civil defence 30 km
 - ✓ Parking 14 km
 - ✓ Others 22 km

Päijänne - Helsinki water tunnel 120 km year 1982

Ringrailway tunnel 8 km 2015, Savio freight railway tunnel 13,5 km year 2008







Passenger volumes in the scenario 0+ (Only ferries)

- The average growth of passenger volumes has been +4 % in the past 10 years.
- Port of Helsinki has estimated the annual growth of 2 % in the future.
- Annual passenger growth in scenario 0+ in this estimation:
 - 2016 2030 +2 % / year
 - 2030 2050 +1% / year
- 2016 situation: 8.7 mill. passengers
 2050 situtation: 14.1 mill. passengers







The Fixed link passenger demand (in tunnel)







- 12 M new annual trips
- 32 000 daily trips on the average



Ferry trips in the fixed link scenario



- visit (friends, relatives)
- leisure
- other

Ease of access to commercial areas, services and scenery on a trip matter for these trip types instead of travel time.



Cargo volumes 2016 and 2050

Potential of all cargoes

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

- Helsinki–Tallinn maritime cargo ٠
 - 3.8 million tons per year

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

- Helsinki–Tallinn maritime cargo ٠
 - 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 ۲
 - 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.



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Potential cargo volumes in Scenario FL per direction



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	Trains
	per year	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)

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

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Capacity for passenger and cargo traffic (dim.direction) 1435 mm



Time	0	1	L	2	3	4	5	6	5	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Trai	ns for
		Ma	int	ena	nce	è																					dim	.direc.tot
Passenger Trains 200/h	1						2	2	2	3	2	2	2	2	2	2	2	3	3	2	2	2	2	2	1	1	40	
Slots for 160km/h rolling stock	0																										0	
Car shuttle							1	1		1	1	1	1							1	1	1	1	1			11	
Truckshuttle							2	2	2	1	1	1	1								1	2	2	2	1	1	17	
Slots for 120km/h rolling stock	8																									8		
Cargo	1																								1	1	3	

- With a running speed of 160 km/h for shuttles and 120 km/h for conventional cargotrains, the distribution of trains (train table above) is functional and there is enough capacity.
- During maintenance hours no need for other train operations





Dim direction

40 Passenger trains/day 400m/200km/h 11 Car shuttle trains/day 700 m/160 km/h 17 Truck shuttle trains/day 750 m/160km/h 3 Cargo trains/day 750m/120 km/h Comparison of the results of FinEst-Link cargo volume estimations with cargo volume estimations of Rail Baltica study (=RB)



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.





Economic impacts of FinEstLink

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The focus of the standard cost-benefit analysis model and wider economic impacts analysis are only partially overlapping.

Methodology on long-term structural changes in the economy is lacking.



Source: Laakso & Kostiainen & Metsäranta, 2016 (Originally Venables 2016)

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Cost-benefit analysis Tunnel compared to 0+ ferry connection



The standard model of cost-benefit analysis shows low economic feasibility to the railway tunnel due to its large investment costs.

The problem with the standard cost-benefit analysis is that it applies weakly to other than traditional transport infrastructure projects. Helsinki-Tallinn railway tunnel represents a totally new connection concept in the macro-regional transport system, and therefore requires more innovative research approach than traditional models can offer.







Wider economic impacts



The study on wider economic impacts focuses on the growth of the national economies of Finland and Estonia and on macro-regional development.

The wider economic impacts are in total +6 928 million euros.

Agglomeration impacts form the most important positive economic impact. These include, for instance, price of land, and mobility of work force, which result from the Helsinki-Tallinn twin-city development. The wider economic impacts extend widely into both countries.

Further methodological development is needed on wider economic impacts, as there is no international standard for modeling.

	M€ p.a.	M€ 30 years
Impact factor	Year 2050	discounted
Agglomeration	214	3642
Labour supply	51	983
Work relocation	11	2192
Competition	7	110
Total	281	6928







Helsinki-Tallinn railway tunnel and Rail Baltica form a European Gateway

- The vision of Helsinki-Tallinn tunnel requires Rail Baltica.
- European Gateway connects an intensive cross-border area between two capitals separated by the Gulf of Finland. Improved connectivity is a necessity to enable their full metropolitan growth.
- European Gateway provides people and companies with better accessibility between the core of EU's transport network, High North, Black Sea area and Asia
- In Helsinki node, which is the national multimodal transport hub, the European gauge 1435 mm railway needs to be synchronised with Airport Rail Line and freight terminals to Finland's 1524 mm gauge rail network.







Proposals of new vehicle technology



- Hyperloop One
 - Hyperloop pods in low pressure tubes 1000 km/h
- SwissRapide AG
 - Ultra-highspeed magnetic levitati trains
- AL Engineering OÜ
 - Capsulas with linear motors











Proposals of railways with different concept

- Finest Bay Area
 - Other alingement, fast trains 400 km/
 h, 2 large 17,4 m tunnels
- OÜ Ankurtunnel
 - Underwater concrete anchored tunnel
- Alkutieto Oy
 - Normal train concept, tracks with both gauges 1435/1524, different alignments in both countries (shorter tunnel)









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