Rail Baltica Global Project Cost-Benefit Analysis

Executive summary

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Contents

1. Introduction

This executive summary is a synopsis of the Rail Baltica Global Project Cost-Benefit Analysis (CBA) process and key outputs. The CBA has been prepared in accordance with the Terms of Reference and Agreement between EY and Rail Baltica joint venture RB Rail AS (RB Rail)

The analysis has been carried out in close cooperation with RB Rail and national stakeholder representatives. A CBA Steering Committee (consisting of representatives from Rail Baltic Estonia OU, Eiropas dzelzcela linijas SIA, Ministry of Transport and Communications of the Republic of Lithuania, Lietuvos gelezinkeliai AB and RB Rail) has periodically reviewed the CBA progress, coordinated national substantial inputs and approved the compliance of the CBA report with the Terms of Reference and In addition, regular consultations have been held with other key stakeholders (including representatives of the relevant national ministries and governmental institutions) in the preparation and finalization of the CBA.

This CBA is an integral element in the ongoing Rail Baltica project implementation process and a periodic review of the project's economic viability is an important milestone during this process. The latest pan-Baltic CBA study was completed in 2011 by AECOM. Since the AECOM study there has been observable progress in the areas of project maturity and scope of the Rail Baltica global project, including the addition of new track sections and passenger terminals (passenger mainline routing via Riga International Airport, addition of a Kaunas-Vilnius spur), as well as changes in the underlying market conditions.

It is important to note that the current CBA was developed after significant investment decisions had already been made (i.e., submission of applications to INEA, CEF Funding has been granted for the implementation of several Global Project actions by INEA etc.) and important inter-Governmental and inter-Beneficiary agreements have been signed by the three Baltic States. Therefore, compared to the AECOM study of 2011, this CBA has less emphasis on evaluating and supporting the decision making regarding the strategic options of the project. In contrast, the CBA has more emphasis on reassessing the project's economic viability in light of the changes in the project scope and market conditions, as well as serving as a tool to be used to determine the exact co-financing requirements from the European Union (EU).

Finally, final users of the CBA must be aware that the CBA is just one of the strategic documents that supports decision-making in the whole set of studies and expertise that have been and are expected to be developed during the Rail Baltica project implementation process. Therefore, this CBA presents only a high level view of certain elements (e.g., CAPEX, -infrastructure management strategy, the technical solution of the updgrade of Kaunas – Lithuania-Poland border section, long-term national state budgeting impacts etc) that shall be further detailed during other designated studies, for instance, project's long-term business plan, technical designs, commercialization studies, railway operational and infrastructure management plans and others.

The reading and interpretation of this Executive Summary is subject to the following considerations:

- The CBA has been prepared with the view of the Rail Baltica project as a one unified global project spanning the three Baltic States and no methodologically robust disaggregation of CBA calculations and results has been made on national or regional levels.

- The available information on passenger movements for intra-Baltic States travel is very limited (due to lack of physical border controls, traffic measurements etc.). Best available public data was used as a proxy information that was augmented by conducting a mobility survey in Estonia, Latvia and Lithuania. However, the mitigating effect of the survey is limited as it represents mobility patterns only during the limited period of surveying. For further analysis of the passenger potential of Rail Baltica railway line, it is recommended to perform periodic surveying of passenger mobility patterns in the Baltic States as well as vis-à-vis Poland and Finland.
- Freight and passenger traffic forecasts have been prepared assuming that Rail Baltica will be implemented in accordance with the relevant industry practices for major transport infrastructure, including, sufficient promotion of the project among the future users, choice of technical solutions and service offerings that meet market practices and requirements of comparable rail infrastructure in Europe (such as, but not limited to, regular freight shuttle train schedule, infrastructure access points with sufficient capacity, supplementary services etc.)
- Due to the uncertainty regarding the EU Cohesion and CEF policy after 2020, the project co-financing aspects have been presented as sensitivity scenarios and exact financing strategies shall be elaborated in further studies.

2. Background

The Baltic region has historically been a crossroads between East and West in terms of trade and passenger flows. However, the passenger use of railways, while historically significant, is currently outperformed by other means of transport and, as a result, rail infrastructure and the level of service has seen limited development. Currently, there are no direct railway services that would connect the route of Tallinn-Riga-Kaunas/Vilnius and beyond for passenger transport. Vast majority of the rail transit freight traffic flows in the Baltic States originate in Russia and Belarus..

Most of the railway system in the Baltic States is incompatible with the rest of Europe due to the different gauge size. This makes direct rail linkage between the Central and Eastern Europe regions complicated and relatively expensive. Rail Baltica aims to bridge this gap by eliminating this critical missing link in the Eurpean railway network and intergrating the Baltic States into the European rail logistics ecosystem, thereby also strengthening the functioning of the Single European Market. The following figure illustrates the timeline of historical and planned developments of Rail Baltica.

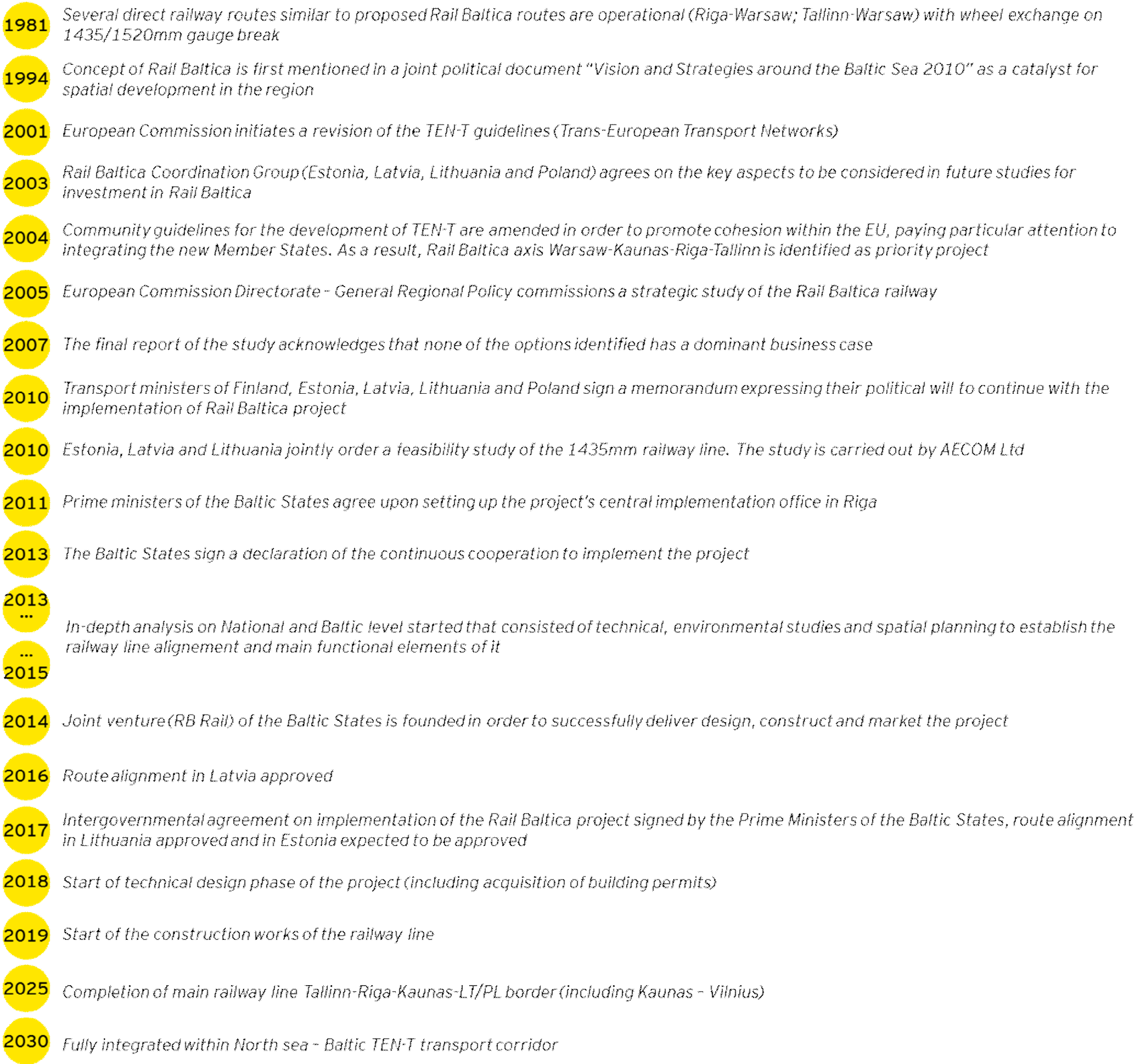


Figure 1 The timetable of historical and planned developments

Rail Baltica is a new fast conventional European standard gauge (1435 mm) double track electrified and ERTMS-equipped railway line with a design speed of 240 km/h and from Tallinn through Parnu-Riga-Panevezys-Kaunas to Lithuania-Poland border with a connection of Vilnius-Kaunas as a part of the railway.

The expected core outcome of the Global Rail Baltica Project is a railway line of 870 km in length suitable for both passenger and freight transport and related railway infrastructure (such as passenger and freight terminals and mainennace and rolling stock facilities) to ensure full operability of the railway. It will be interoperable with the rest of the European TEN-T Network and competitive in terms of service offerings with other modes of transport in the region for both passengers and freight.

Rail Baltica Global Project is an initiative of great significance for the Baltic States and at the same time adds value also to the neighbouring countries and Europe as a whole.

Passenger service

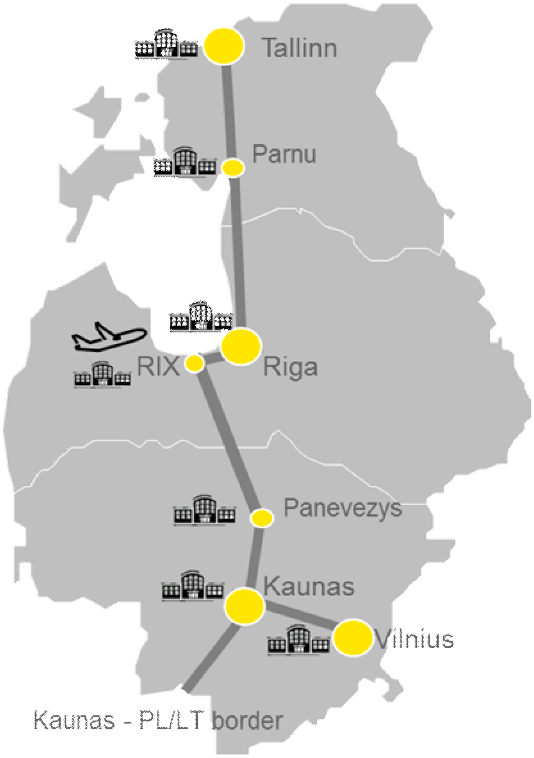


Figure 2 Rail Baltica passenger service

Rail Baltica is expected to provide the first higher speed rail service in the Baltic States that would link the capitals of the Baltic States and beyond as well as the key population and multimodal transport hubs along the route.

The CBA is conducted for the Global project and encompasses the service between the planned seven international passenger stations (Tallinn, Parnu, Riga, Riga Airport, Panevezys, Kaunas, Vilnius) in the Baltic States as well as international service with Poland (Warsaw) and beyond. The technical parameters of the Rail Baltica infrastructure and the new rail service will allow to significantly reduce travel times compared to road transport. Rail Baltica will significantly increase rail service competitiveness also compared to aviation, especially for intra-Baltic routes.

Freight service

Although existing railway network (1520mm gauge) can be used to ship freight in the North-South direction, Rail Baltica is expected to improve the freight shipment potential by rail both for the import/export traffic of the Baltic States, as well as transit traffic in the region (mainly trade flows of Finland and Poland, as well as trans-shipment between the 1520mm and 1435mm railway systems) due to:

- Removal of break-of-gauge barrier on the border of Lithuania and Poland.
- Establishment of intermodal logistics terminals (hubs) in each country (Muuga, Salaspils, Kaunas and Vilnius) that are of adequate capacity as well as intermodal and auxiliary services to support the needs of market participants in the region.

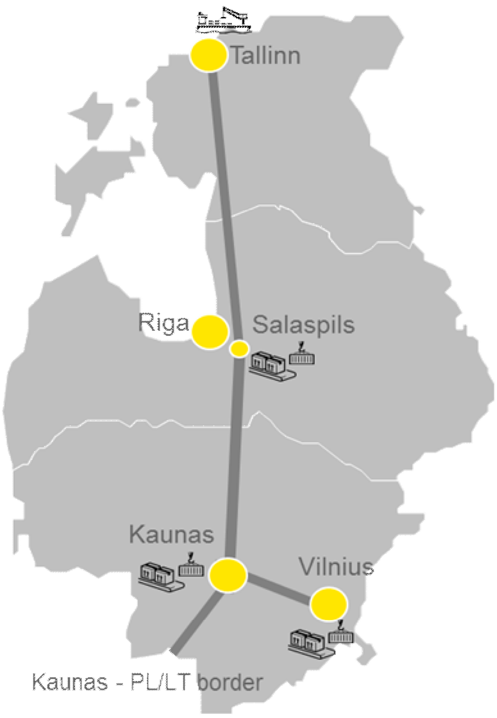


Figure 3 Rail Baltica freight service

The freight service is expected to provide a competitive offering (alternative mode of transportation to sea and road freight) in the form of scheduled or block trains primarily capturing the trade flows that require reliability and regularity and are being shipped on routes that link Central Europe with the Baltic States and Finland.

3. Economic and Sectoral Context

The region most relevant for the analysis of Rail Baltica development consists of the Baltic States, Finland, Poland and Germany, as Finland, Poland and Germany represent the key markets for freight and also passenger commute relevant to the Rail Baltica service.

Table 1 Summary of the key macroeconomic indicators of the region[1]

	Finland	Estonia	Latvia	Lithuania	Poland	Germany
Population, mln., 2016	5.5	1.3	2.0	2.9	38.4*	82.7
GDP, bln. EUR, 2016	214.1	20.9	25.0	38.6	417.9	3 133
GDP, bln. EUR, 2006	172.6	13.5	17.1	24.1	241.4	2 393
GDP CAGR, 2006 - 2016	2.4%	5.0%	4.3%	5.4%	6.3%	3.0%
GDP per capita, 000's EUR, 2016	38.9	15.9	12.8	13.5	10.9	37.9
GDP growth, 2017 est.	1.2%	2.2%	2.8%	2.9%	3.2%	1.6%
Uneployment, 2016	7.9%	6.7%	9.6%	7.9%	8.3%	3.9%
Export, bln. EUR, 2016	51.9	11.9	10.3	22.6	183.6	1 206.9
Import, bln. EUR, 2016	54.9	13.5	12.3	24.8	178.9	954.8
Intl. freight transp. modual share, 2015						
Road	6.2%	9.1%	8.2%	17.4%	86.7%	84.0%
Rail	7.9%	24.9%	39.4%	37.0%	12.9%	8.7%
Maritime	83.4%	66.0%	52.4%	45.6%	0.4%	7.2%
Air	2.4%	0.0%	0.0%	0.0%	0.0%	0.1%

* 2015 data

All countries in the region have relatively close (especially neighbouring countries) economic ties. However, these ties are unbalanced due to significant differences in economic and socio-economic development levels. Economic ties between the countries in the region are summarized in the Figure 4 below.

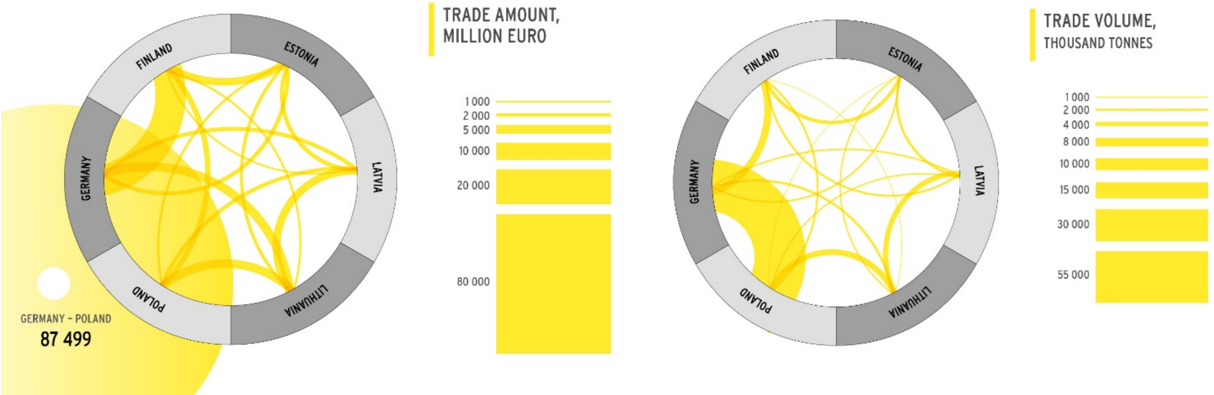


Figure 4 Foreign trade in the region

The Baltic States have recovered from the economic crisis of 2008-2009 and have exceeded the pre-crisis GDP level (despite the economic crisis, the compounded average growth rate of the last decade is positive) and are expected to surpass the EU average GDP growth rate during the forecast period (up to 2055).

[1] Statistics Estonia/Eesti Statistikaamet, Central Statistical Bureau of Latvia, Official Statistics Portal of Lithuania, Central Statistical Office of Poland, Statistisches Bundesamt, Statistics Finland

4. Traffic Forecasts

4.1 Overall Forecasting Approach

The traffic forecast model at its core is built dy deterimining 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[2].

4.2 Passengers

Passenger traffic forecasts are based on the combination of future market growth assumptions (i.e., what is the size of the overall market in a particular year), as well as future modal assignment and modal choice assumptions (i.e., what modes the passengers are expected to choose for their travel). Different assumptions have been applied for base, low and high cases. Figures below represent the annual unique trips (i.e., trips by travelers that are not double-counted due to their trip overlapping with other O/D pairs, e.g., one unique trip from Kaunas to Tallinn is not double-counted in the sub-sections of Rail Baltica that it crosses: Kaunas – Panevezys, Panevezys – RIX, RIX – Riga, Riga – Parnu, Parnu – Tallinn).

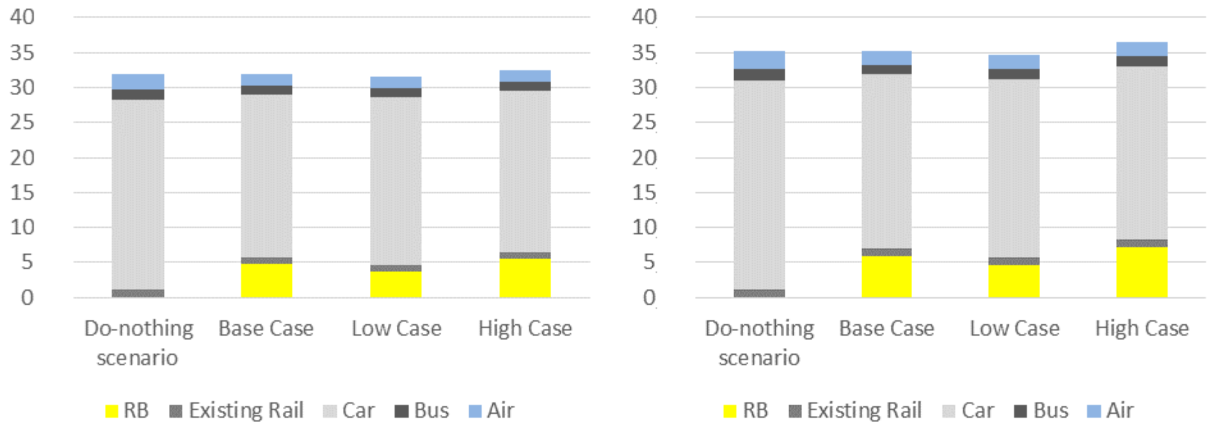


Figure 5 Overall market forecast (miilion unique trips) and the share of Rail Baltica (2026/2055)

The combined effect of the overall market growth and the probability of passengers shifting to Rail Baltica results in the potential flows for Rail Baltica between 4.7 million trips in low case to 7.1 million trips in high case scenarios in 2055 (or 12.8 to 19.5 thousand trips per day respectively), as compared to 3.6-5.5 million unique trips in 2026 (or 9.9 to 14.9 thousand trips per day respectively) for the same scenarios.

The forecasts reflect the considerations of the passenger ecosystem analysis, namely, that Rail Baltica shall be competitive against road travel and air travel, achieving air modal shift rate of 23% (in other words, on average, 23% of air travelers on relevant O/D pairs would shift to Rail Baltica). However, due to relatively lower overall amount of air travelers in the intra-Baltic market, the shifted air travelers form only 11% of the total Rail Baltica passengers, while car travelers make up 85% of the total. The passenger forecasts consider a very conservative induced demand as additional 5% to the diverted flows. The induced demand forecasts represent the passenger

[2] World Trade Report 2013, Section B.3. (https://www.wto.org/english/res_e/booksp_e/wtr13-2b_e.pdf)

flows that would be created by the completely new mobility and connectivity options provided by Rail Baltica, e.g., tourists from Finland and Belarus that might choose to travel to several of the Baltic States' capitals or person choosing to live in Parnu and work in Tallinn due to the convenience of daily commute with Rail Baltica.

To determine the actual flows that will be captured by Rail Baltica, as a final step, the market potential uptake assumptions have been applied. The uptake for passenger flows was benchmarked against Eurostar performance in the first years of operation (Figure 6).

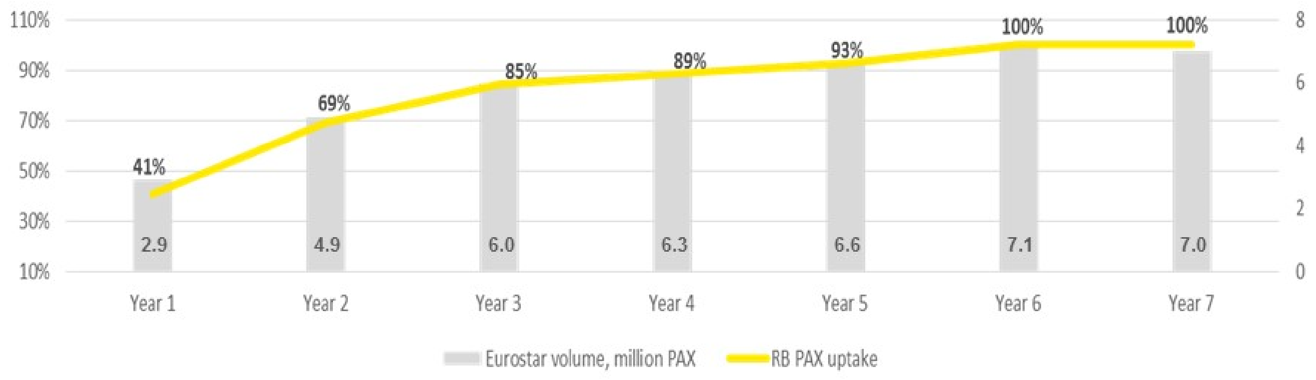


Figure 6 Passenger market potential uptake of Rail Baltica (incl. Eurostar passenger volume for reference)

Three key groups (segments) of Rail Baltica passengers can be distinguished:

- Travellers between adjacent international Rail Baltica stations (referred to as point-to point travellers, e.g., traveller going from Tallinn to Parnu),
- Travellers entering and exiting within the Baltic States (referred to as intra-Baltic travellers, e.g., traveller from Kaunas to Riga Airport will be accounted as intra-Baltic traveller within sections Kaunas – Panevezys and Panevezys – RIX),
- Travellers entering and/or exiting outside the Baltic States (referred to as extra-Baltic travellers, e.g., traveller from Warsaw to Kaunas).

The point-to-point passenger flows mainly are expected on Riga International Airport – Riga central intermodal public transportation hub section. High point-to-point traffic is expected also between the key population areas in the Baltic States: Tallinn – Parnu and Kaunas – Vilnius sections. The Figure below provides and overview of Rail Baltica expected flows in 2035, after the market potential is expected to be fully achieved (see Figure 7).

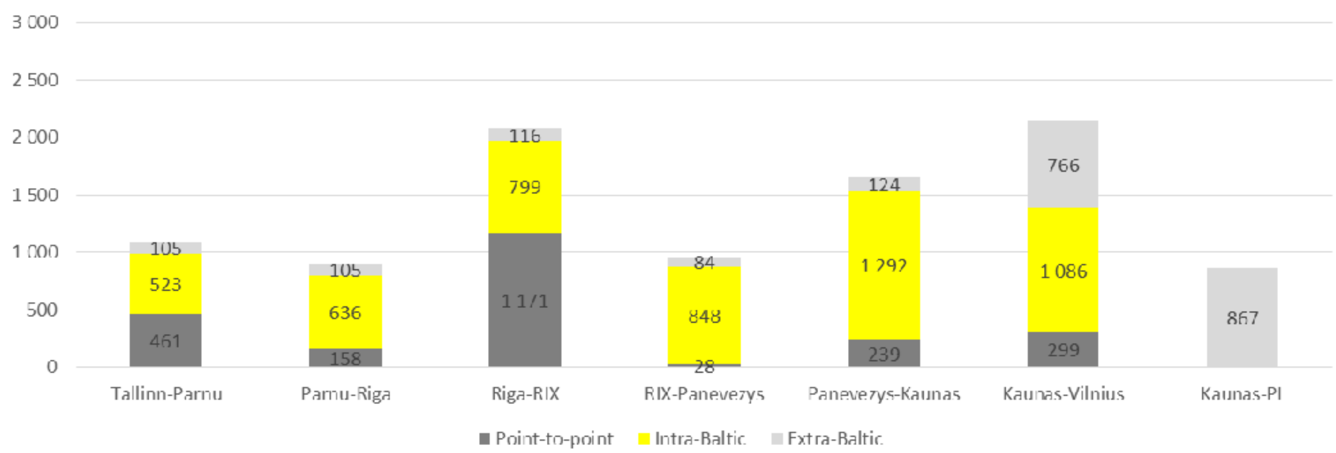


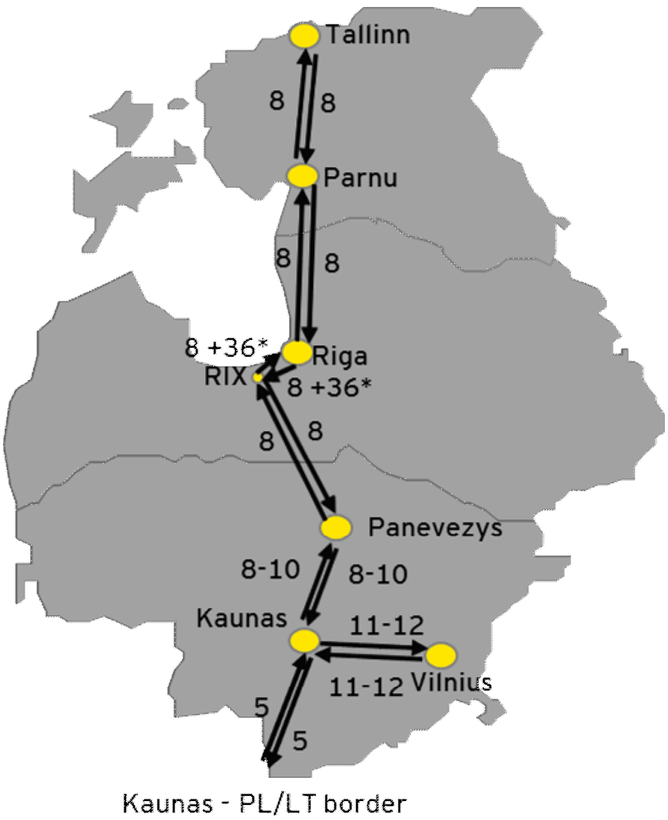
Figure 7 Base case Rail Baltica passenger flow breakdown per main sections, thousand PAX in 2035

Forecasts indicate that Rail Baltica will significantly impact people living in Parnu and Panevezys (greatly improving their access to the largest cities in the Baltic States), allowing them to have greater work, study and leisure possibilities, due to shorter commute times.

Intra-Baltic traffic flows are expected to dominate the flows in each section of Rail Baltica with the highest expected volumes on Panevezys–Kaunas, Kaunas – Vilnius, and RIX – Panevezys sections. The results indicate that the highest intensity sections will be the ones that combine travellers between Riga and Kaunas and Vilnius.

The highest extra-Baltic flows will occur on Kaunas – LT/PL border section, meaning that majority of transit travellers will be travelling to/from southern directions between Lithuania and Poland. Moreover, the results clearly show that Rail Baltica will be used more as an intra-Baltic mode of transport between the neighbouring countries, and relatively small proportion will travel outside the Baltics except the travellers between Poland and Lithuania.

Figure 8 depicts two-way passenger train movements for the base case scenario, split by each section of Rail Baltica.



* - represents Riga Airport shuttle

Figure 8 PAX carrier intensities per section (trains per day in each direction)

The train schedule has been estimated to follow the principles set in the AECOM study that determined the train traffic on the main line at least once per two hours (resulting in eight train pairs daily).

4.3 Freight

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.

The growth rate and the dynamics of the potential flows for Rail Baltica replicate the expected development of the GDP of the countries within the scope of the CBA model with relatively fast development in the next 10 years (1.9-2.0% CAGR) with eventual slowdown further in the future as the Baltic States economic growth converges to the slower growth rates of the Western and Central European countries.

In addition to the overall market growth, the share of potential flows for Rail Baltica in total marketis expected to increase gradually as well (due to the expected general strengthening of the position of Rail Baltica in the market).

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 Ro-Pax and Ro-Ro ferries). These considerations are applied in the further financial and socio-economic analysis.

In contrast to the passenger uptake potential, market uptake for freight is expected to follow the passenger uptake with a two-year lag. This represents the greater rigidity of the supply chain industry to test and switch significant volumes to a new infrastructure compared to passenger services.

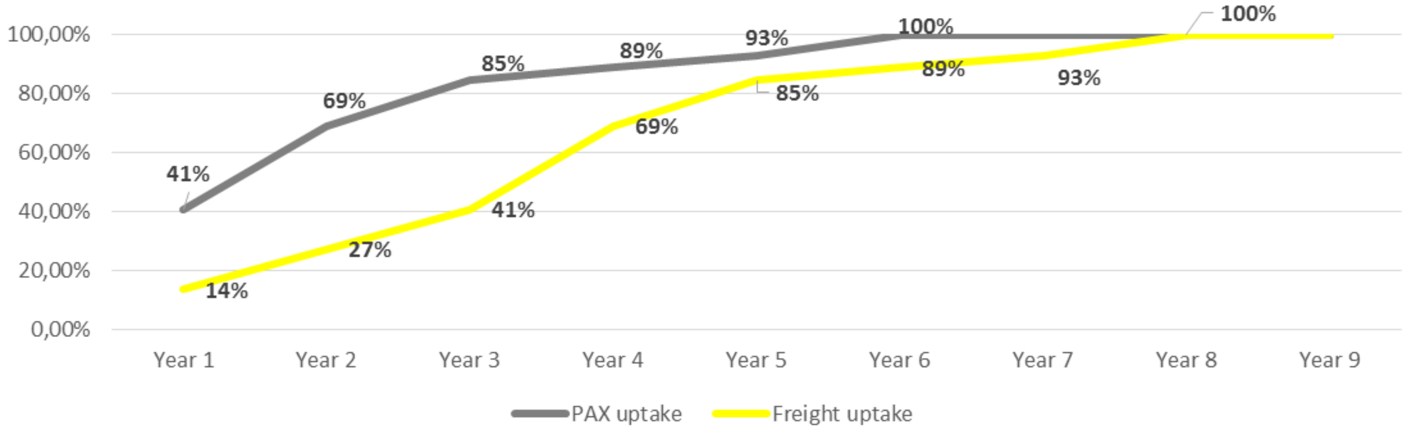


Figure 9 Freight market potential uptake assumption of Rail Baltica and comparison with passenger uptake

The following figures present the forecasted freight flows per each Rail Baltica section in the base case scenario and subsequent comparison with high and low case scenarios.

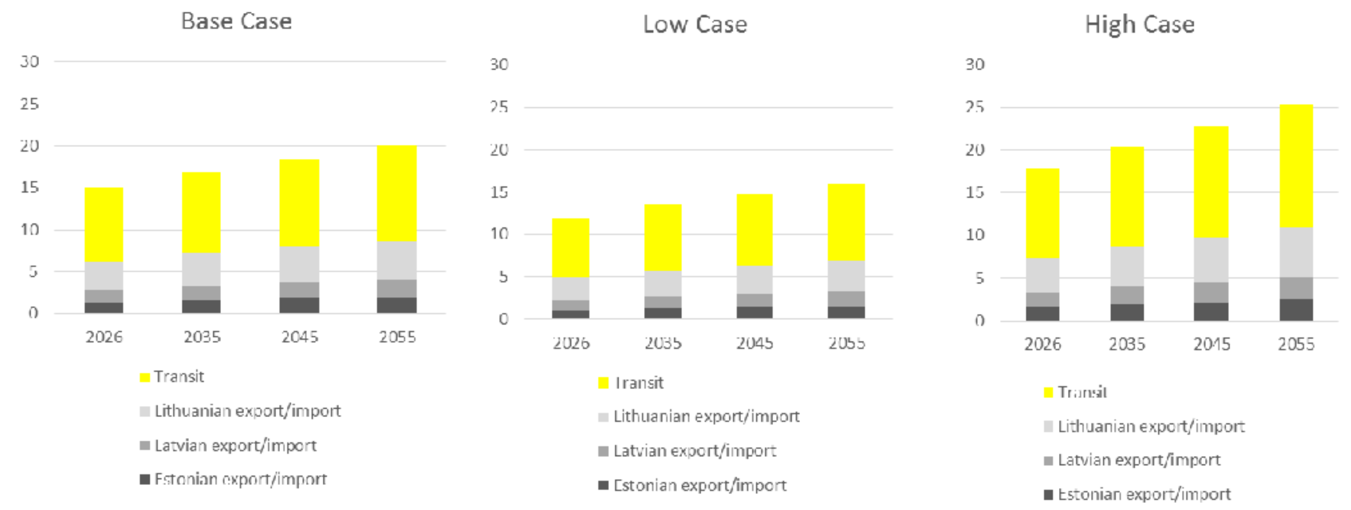


Figure 10 Freight flow forecasts for each scenario (million tonnes)

The forecasts indicate that usage of Rail Baltica infrastructure for freight shipments will be roughly split in proportion 57-43 in favour of transit freight servicing as compared to the imports/exports of the Baltic States.

Table 2 Freight split by flow type, million tonnes

		2026	2035	2045	2055	Average share
Base Case	Estonia export/import	1.4	1.6	1.8	2.0	10%
	Latvia export/import	1.5	1.7	1.9	2.1	10%
	Lithuania export/import	3.4	3.9	4.2	4.6	23%
	Transit	8.7	9.7	10.5	11.4	57%
Low Case	Estonia export/import	1.1	1.3	1.4	1.6	10%
	Latvia export/import	1.2	1.4	1.5	1.7	10%
	Lithuania export/import	2.7	3.1	3.4	3.7	23%
	Transit	7.0	7.8	8.5	9.1	57%
High Case	Estonia export/import	1.6	1.9	2.2	2.5	10%
	Latvia export/import	1.7	2.0	2.3	2.7	10%
	Lithuania export/import	4.0	4.6	5.2	5.7	23%
	Transit	10.5	11.8	13.1	14.4	58%

The forecasts indicate that the Baltic States trade with Poland and Germany makes up 10-15% of the total Rail Baltica freight volumes (in terms of volume in tonnes), which is roughly similar to the share of Finland transit. Consequently, in the terms of tonnes the largest share of Rail Baltica freight will be formed by the transit flows of Poland, Germany and rest of the EU with the largest countries of the CIS (linking the 1435mm gauge system with the 1520mm gauge system). In contrast, in the terms of tonne-km, which more appropriately represent the revenues for the freight carrier, the share of Finland transit is similar to the share of CIS transit due to the fact that the transit to/from Finland travels along the whole distance of Rail Baltica from Tallinn to the LT/PL border.

By evaluating the carried freight from the TEN-T Corridor perspective, the primary freight destinations of individual countries would be Germany, Poland and Finland due to the relatively better connections with other transport infrastructure in these countries, which is expected to be ensured via the infrastructure improvements as part of the North Sea-Baltic Corridor's activities.

Given the improvements in rail connectivity, the North Sea-Baltic corridor is the primary area where the freight is going to be transported. The catchment area of the Baltic States, Finland, and Poland would generate nearly a third of all the cargo carried, while the catchment area of Germany, Belgium, Netherlands, United Kingdom is expected to generate around 10% of all of the cargo carried. These shares are even higher if compared in tonne-km terms.

The highest freight traffic intensity will occur on the Kaunas – LT/PL border section due to the fact that the majority of forecasted freight will be trade of the Baltic States with the rest of the Europe in the southern direction. For other sections the flows are relatively balanced, representing the impact of the Finnish transit flows as well as similar import/export volumes from Estonia and from Latvia. Although regional intermodal terminals may be eventually established in Parnu, Riga Airport and Panevezys, they have not been considered in this analysis.

The comparative forecast data for Rail Baltica sections for the different scenarios are summarized in Table below.

Table 3 Serviced freight of Rail Baltica by section

		Tallinn - Salaspils	Salaspils - Kaunas	Kaunas – LT/PL border	Kaunas - Vilnius
Base Case	2026	5.1	6.1	13.3	5.8
	2035	5.8	7.0	14.9	6.5
	2045	6.4	7.7	16.3	7.1
	2055	7.0	8.5	17.6	7.6
Low Case	2026	4.0	4.9	10.7	4.7
	2035	4.6	5.6	12.0	5.2
	2045	5.1	6.2	13.1	5.7
	2055	5.6	6.8	14.1	6.1
High Case	2026	5.8	7.0	15.5	7.0
	2035	6.9	8.3	18.1	8.0
	2045	7.7	9.4	20.1	8.9
	2055	8.6	10.6	22.1	9.7

Forecasts illustrate that the effect of different scenarios ranges from a 3-4 million tonnes reduction or increase against the base case scenario in the most utilized section (Kaunas – LT/PL border) to approx. 1.5 million tonnes difference for the Estonia's section.

Figure 11 describes two-way freight train movements for the base case, split by each section of Rail Baltica.

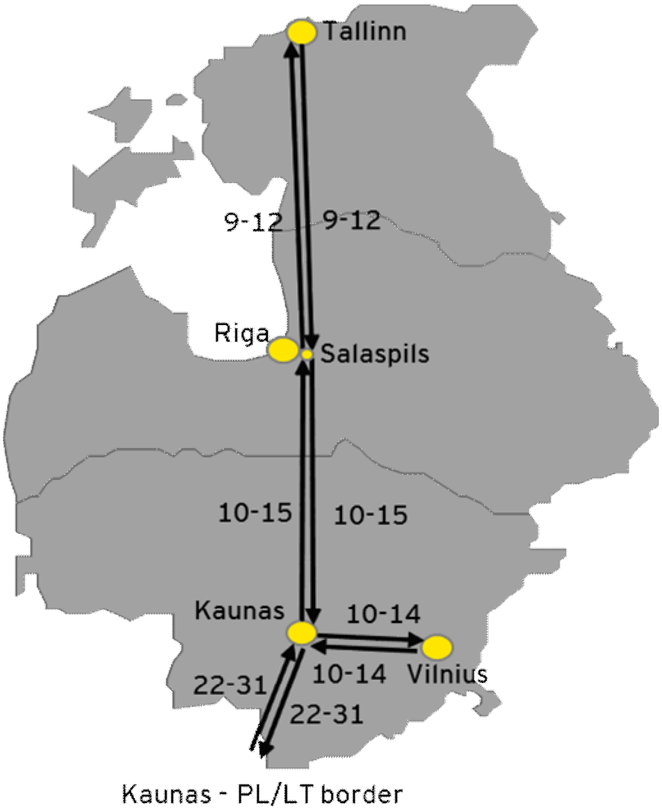


Figure 11 Freight carrier intensities per section (trains per day in each direction)

The train schedule has been estimated from the train rolling stock load factor perspective (i.e., the load rate of the train relative to its maximum weight; the maximum weight has been assumed similar as the average observed train weights for selected infrastructure managers in Europe).

5. CBA Results

5.1 Capital Costs (CAPEX)

Rail Baltica investment expenses have been consolidated and adjusted by RB Rail, based on the CAPEX data estimates collected from national stakeholders. Investment cost items correspond to the global project definition used in the CBA that includes only key elements of the public railway infrastructure for international passenger and freight service.

Table 4 Rail Baltica investment expenses by section (M EUR)

	Estonia main section	Latvia main section	Lithuania main section	Kaunas - Vilnius spur	Total CAPEX
Railway	612.9	754.0	761.2	275.7	2 403.8
Electrification	124.3	164.4	171.9	51.8	512.4
Signalling	84.9	99.4	138.2	33.5	356.0
Crossings	142.4	277.8	229.8	33.6	683.6
Bridges	12.6	77.8	184.6	131.5	406.4
Tunnels	0.0	73.0	0.0	0.0	73.0
Stations & facilities	186.2	300.0	74.6	150.0	710.8
Noise walls	27.2	59.5	33.3	n/a*	120.0
Land acquisition	22.6	50.8	35.0	21.5	129.9
Technical studies, planning & design	68.7	111.7	32.0	7.0	219.4
Contingency cost	64.1	n/a*	73.7	35.2	173.0
Total CAPEX	1 345.9	1 968.4	1 734.2	739.6	5 788.1

* Part of other expense elements

Investment expenses have been summarised per country and distributed over the time period from 2015 to 2025, based on a preliminary project schedule inputs provided by RB Rail.

Table 5 Schedule of projected investment expenses per country for the period 2015-2025 (M EUR)

	Total CAPEX	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Estonia	1 345.9	0.1	0.7	19.0	40.9	103.8	74.9	55.6	276.0	302.7	353.4	118.8
Latvia	1 968.4	0.1	0.8	12.3	40.8	93.6	343.4	214.7	317.6	484.5	358.2	102.4
Lithuania	2 473.8	0.1	2.9	32.9	51.3	39.8	278.7	327.7	487.5	606.6	502.8	143.6
Total	5 788.1	0.3	4.4	64.2	132.9	237.2	697.0	598.0	1 081.1	1 393.8	1 214.4	364.7

5.2 Operational Costs (OPEX)

Infrastructure manager's OPEX level has been estimated by benchmarking European railway infrastructure maintenance costs and adjusting the labor cost rates to the local markets.

Table 6 Infrastructure manager OPEX

M EUR	2030	2035	2040	2045	2050	2055
Maintenance cost	58.9	69.2	72.8	77.6	84.0	91.9
Track	18.0	22.1	24.5	27.6	31.8	37.0
Interlocking & remote control	3.6	4.5	4.9	5.6	6.4	7.5
Traction	12.0	13.5	13.5	13.5	13.5	13.5
Power current Tele & IT, Buildings, etc.	5.8	7.1	7.9	8.9	10.2	11.9
Bridges/tunnels	11.0	12.4	12.4	12.4	12.4	12.4
Terminals	1.9	2.1	2.1	2.1	2.1	2.1
Depots, yard and service centre	2.9	3.3	3.3	3.3	3.3	3.3
Stations	3.8	4.2	4.2	4.2	4.2	4.2
Other costs	11.8	13.8	14.6	15.5	16.8	18.4
Total OPEX	70.7	83.0	87.4	93.1	100.8	110.3

Due to the gradual uptake of passenger and freight traffic and warranty period of construction works, it is expected that the level of infrastructure manager's maintanace expenses will be lower initially and will gradually increase to the benchmarked level of approx. 69 000 EUR per track km (in 2016 prices). The labor cost component of the maintenance costs is expected to grow according to real wage growth rate during the life cycle of the project.

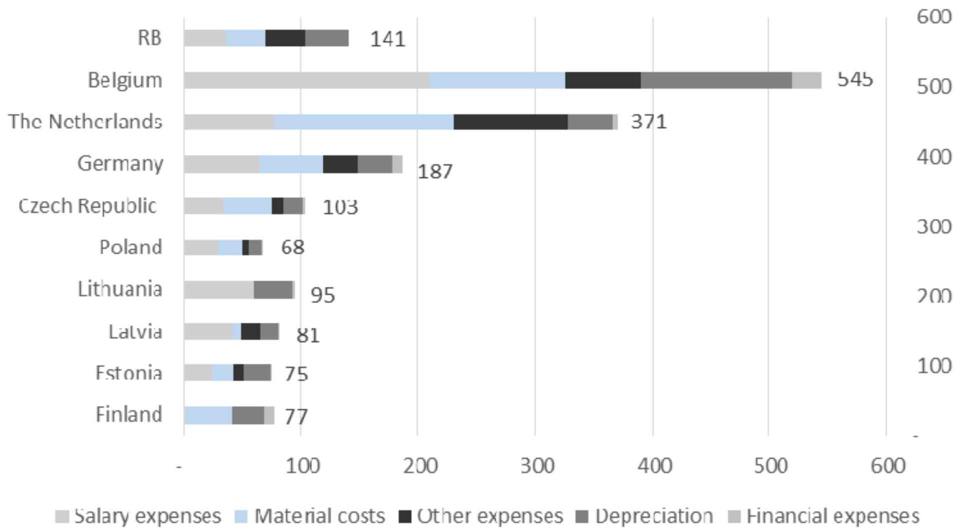


Figure 12 Infrastructure managers' cost benchmarking (EUR thousand/track km)[3]

The benchmarking analysis indicates that forecasted Rail Baltica cost per km is close to the average cost per km among other infrastructure managers.

[3] EY benchmarking study, 2016, depreciation value estimated as a proxy value based on the CAPEX share covered by the States

5.3 Economic Analysis

Table 7 Rail Baltica socio-economic analysis results

Financial cash flows with fiscal corrections			
Revenues	2 613	M EUR	Undiscounted
Revenue from infrastructure charges	2 613	M EUR	Undiscounted
Expenses	7 936	M EUR	Undiscounted
Total CAPEX*	5 183	M EUR	Undiscounted
Do-nothing CAPEX savings*	-133	M EUR	Undiscounted
Maintenance expenses*	1 921	M EUR	Undiscounted
Other expenses*	424	M EUR	Undiscounted
Investments in renewable infrastructure*	609	M EUR	Undiscounted
Do-nothing OPEX savings*	-67	M EUR	Undiscounted
Residual value of infrastructure	1 275	M EUR	Undiscounted
Socio-economic cash flows			
Net Socio-economic benefits	16 226	M EUR	Undiscounted
Air pollution reduction	3 268	M EUR	Undiscounted
Climate change mitigation benefits	3 024	M EUR	Undiscounted
Freight travel time savings	2 866	M EUR	Undiscounted
PAX travel time savings	2 410	M EUR	Undiscounted
Additional personal transport savings/expenses	2 348	M EUR	Undiscounted
Freight carrier operating profit	1 528	M EUR	Undiscounted
Safety improvement	892	M EUR	Undiscounted
Noise reduction	843	M EUR	Undiscounted
Additional freight transportation savings/expenses	374	M EUR	Undiscounted
PAX carrier operating profit	307	M EUR	Undiscounted
Bus company operating profit reduction	-7	M EUR	Undiscounted
Excise tax loss – Bus	-11	M EUR	Undiscounted
Heavy truck company operating profit reduction	-516	M EUR	Undiscounted
Excise tax loss – Heavy truck	-1 098	M EUR	Undiscounted
Socio-economic performance indicators			
Net cash flow	879	M EUR	Discounted
Total revenues	703	M EUR	Discounted
Total expenses	-4 577	M EUR	Discounted
Residual value of infrastructure	172	M EUR	Discounted
Net Socio-economic benefits	4 581	M EUR	Discounted
Economic internal rate of return (EIRR)	6.32%	%	
Economic benefits to costs ratio (EBCR)	1.19	ratio	
Economic net present value (ENPV)	879	M EUR	

* - figures represent the socio-economic cash flow (with fiscal corrections)

On undiscounted terms, the largest socio-economic benefits of the project are climate change mitigation and air pollution reduction benefits, followed by time savings and personal travel cost savings. The socio-economic analysis accounts for certain key cost items, such as the loss of excise tax revenue for the local governments and reduced operating profits of existing transport operators.

5.4 Additional Socio-Economic Benefits

In addition to monetizable socio-economic benefits/costs, the project provides many unquantifiable socio-economic benefits, which create additional added-value for the society.

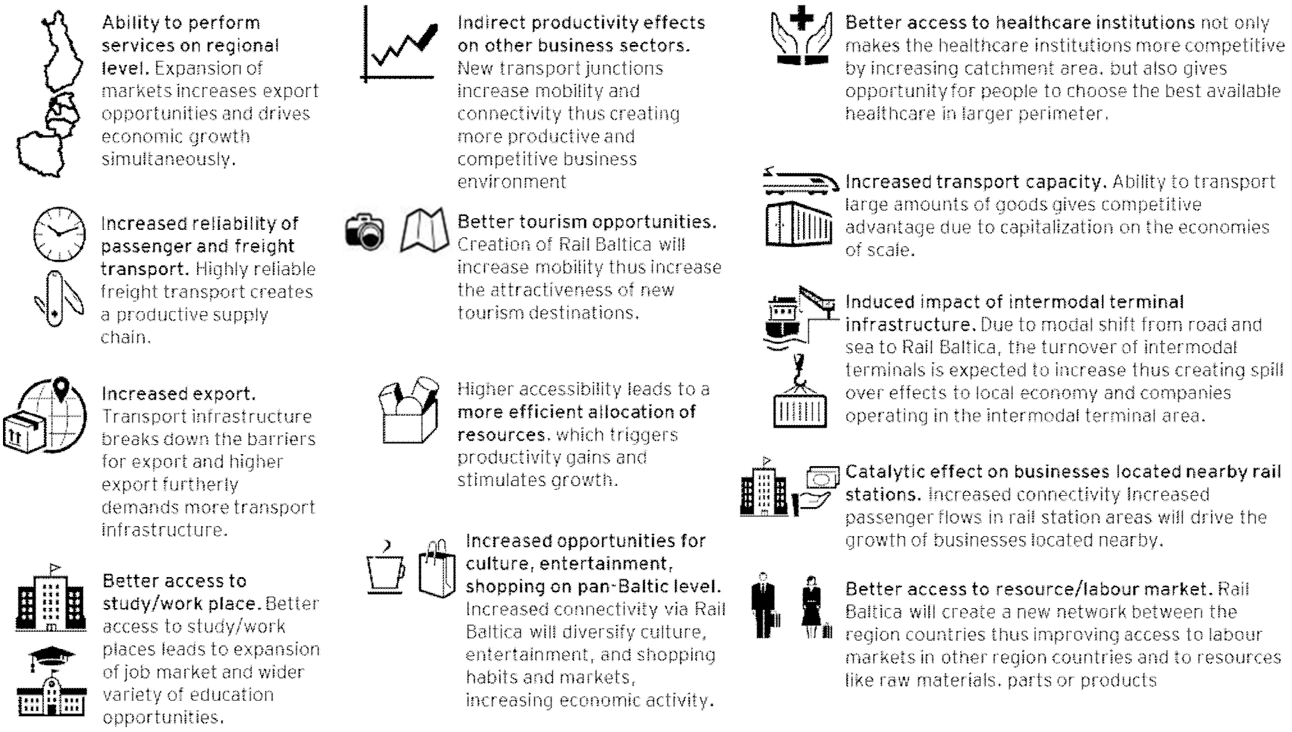


Figure 13 Socio-economic benefits that were not quantified

5.5 Financial Analysis

According to the CBA methodology and approach, the revenues of infrastructure manager are determined by the "what market can pay" principle, therefore, the initial step of the financial analysis determines the profitability of freight and passenger carriers (see tables below).

Table 8 Passenger carrier key financial and operational indicators

	2030	2035	2040	2045	2050	2055
Revenues, M EUR	97.8	110.5	112.5	116.9	121.4	123.1
Infrastructure access charge, M EUR	2.9	9.5	10.2	12.5	13.1	13.6
Other OPEX, M EUR	86.9	88.2	89.4	89.4	90.6	90.6
Operating profit, M EUR	8.0	12.7	13.0	15.0	17.6	18.9
Operating profit margin, %	8.21%	11.54%	11.54%	12.83%	14.52%	15.35%
Infrastructure charge, % of total expenses	3.18%	9.76%	10.24%	12.29%	12.67%	13.02%
Infrastructure charge, EUR per train-km	0.55	1.80	1.89	2.33	2.41	2.48

Table 9 Freight carrier key financial and operational indicators

	2030	2035	2040	2045	2050	2055
Revenues, M EUR	189.1	232.1	240.9	255.0	270.0	277.3
Infrastructure access charge, M EUR	65.7	77.6	80.6	85.7	91.8	100.1
Other OPEX, M EUR	81.2	100.7	101.7	109.9	114.0	120.3
Operating profit, M EUR	42.2	53.7	58.7	59.4	64.1	56.9
Operating profit margin, %	22.32%	23.15%	24.36%	23.29%	23.75%	20.52%
Infrastructure charge, % of total expenses	44.72%	43.52%	44.22%	43.80%	44.61%	45.43%
Infrastructure charge, EUR per train-km	10.39	9.89	10.18	10.00	10.34	10.68

Combining the profitability levels of the carriers and OPEX assumptions of the infrastructure manager, the resulting funding gap rate is 94.18% (see table below).

Table 10 Rail Baltica funding gap calculation (M EUR)

Key parameters	Undiscounted value	Discounted value
Total investment expenses	5 788	
		4 202
Applicable investment expenses	5 788	
		4 202
Residual value	1 275	
		255
Revenues		898
Expenses		909
Net profit		245
Expenses not covered by net profit		3 957
Funding gap rate		94.18%

The results indicate that the infrastructure manager in the long term is self-sustainable, however, initially it would require additional financing (during the market potential uptake stage). Total initial funding amount is estimated to be 28.6 M EUR. In addition, during 2048 – 2052 renewal investments will have to be made, therefore, the project would need additional financing at that stage as well. The financing equals to the part of renewal investments that cannot be financed with the accumulated surplus cash flow of the infrastructure manager. It is estimated that the financing need for the renewal investment would amount to around 534 M EUR.

As the EU plans its financial support initiatives for the development of transport infrastructure in the context of multi-annual financing framework periods, the financing plan has been divided into two parts. It is assumed that the project will have the current base case funding gap rate and EU co-financing rate of 85% during the 2015-2020 period.

Consequently, various EU co-financing rate scenarios for the period after 2020 have been analysed (see Table 11).

Table 11 CAPEX breakdown for the two EU long term financial perspective periods per country (M EUR)

	Total	2015 - 2020	2021 - 2025
Estonia	1 346	239	1 106
Latvia	1 968	491	1 477
Lithuania	2 474	406	2 068

Table 12 Financing plan, assuming 85% EU co-financing after 2020 (all remaining CAPEX is financed by the state funding, M EUR)

	2015 – 2020			2021 - 2025			Total		
	State funding	EU financing	Other financing	State funding	EU financing	Other financing	State funding	EU financing	Other financing
Estonia	48	192	0	221	886	0	268	1 077	0
Latvia	98	393	0	295	1 183	0	393	1 576	0
Lithuania	81	325	0	413	1 656	0	493	1 980	0
Total	227	909	0	928	3 724	0	1 155	4 634	0

Alternitavely, if the financing after 2020 will be financed from the EU at 40% co-financing rate, the respective composition of financing sources is provided in the table below.

Table 13 Financing plan, assuming 40% EU co-financing after 2020 (all remaining CAPEX is financed by the state funding, M EUR)

	2015 – 2020			2021 - 2025			Total		
	State funding	EU financing	Other financing	State funding	EU financing	Other financing	State funding	EU financing	Other financing
Estonia	48	192	0	690	417	0	737	608	0
Latvia	98	393	0	921	557	0	1 019	950	0
Lithuania	81	325	0	1 289	779	0	1 370	1 104	0
Total	227	909	0	2 900	1 753	0	3 126	2 662	0

6. Risk and Sensitivity Analysis

The project yields significantly positive ENPV in the Base and High case scenarios (see Table 14). However, the Low Case scenario produces ENPV slightly above zero.

Table 14 Socio-economic analysis results by scenario

	Base case	Low case	High case
ERR	6.32%	5.05%	7.69%
B/C	1.19	1.01	1.43
ENPV, M EUR	879	30	1 951

Sensitivity analysis enables the identification of the variables, which have the largest impact on the project's financial and/or economic performance. In order to estimate by how much the variable must change in order for the net economic present value of the project to become zero, switching value analysis is applied (see Table 15). The most sensitive variables for the project's economic return are CAPEX level, freight carrier revenue rate and freight flow level.

Table 15 Switching value analysis

	ENPV switching value	Change versus base value
CAPEX, M EUR	7 311	26%
Time value for private travel	0.036	-81%
PAX carrier revenue rate	n/a	n/a
Freight carrier revenue rate	0.0207	-49%
PAX flow change	-29.71%	-29.71%
Freight flow change	-23.92%	-23.92%

The scenario analysis indicates the change of key CBA indicators, in the case of the emergence of various future scenarios (see Table 16).

Table 16 Various development scenario analysis

Scenario	FNPV (M EUR)	ENPV (M EUR)	B/C	Funding gap	Additional financing needed to infra. manager (M EUR)
Reference scenario	-3 957	879	1.19	94.2%	28.61
Historical infrastructure charge principles (full cost)	-3 902	879	1.19	92.9%	0.00
Real GDP per capita growth decreases by 50%	-3 957	433	1.09	94.2%	28.61
Both passenger and freight base demands decrease by 20%	-4 119	-448	0.90	98.0%	262.47
Freight uptake takes 10 years instead of 8	-4 025	618	1.14	95.8%	147.87
Passenger flow uptake equals freight uptake	-3 948	678	1.15	94.0%	8.70
Both uptakes increase up to 10 years	-3 986	227	1.05	94.9%	69.99
CAPEX increases by 20% in Low Case scenario	-4 824	-640	0.88	95.7%	107.52
CAPEX increases by 20% and freight base flows drop by 20 %	-4 846	-526	0.90	96.1%	135.15

Scenario	FNPV (M EUR)	ENPV (M EUR)	B/C	Funding gap	Additional financing needed to infra. manager (M EUR)
GDP multiplier effect is added	-3 957	2 027	1.44	94.2%	28.61
GDP multiplier effect is added (with locally absorbed CAPEX share reduced by 50%)	-3 957	1 453	1.32	94.2%	28.61
PAX train effective speed decreases by 50%	-4 023	-182	0.96	95.7%	88.87

The results of the analysis of various future development scenarios provide the following key takeaways and consequently indicate key risk areas of the project to be monitored and mitigated:

- Freight base flows decrease and freight flows uptake lag can significantly increase additional financing needed, thus it is of key importance to promote the Rail Baltica service, in order to achieve the expected future passenger and freight flows.
- Reduced passenger train speeds significantly decrease ENPV of the project and bring ERR below 5% benchmark.
- It is important to control and budget investment expenses (CAPEX), since any increases of CAPEX might considerably reduce the net benefits of the project, as well as might dramatically increase additional financing needed.
- The (also known as “what market can pay”) infrastructure charge calculation principle set in the Directive 2012/34/EU provides higher funding gap rate compared to the historical “full cost’’ principle, since the coverage of the infrastructure manager’s expenses by track access charges depends on the profitability of passenger and freight carriers.
- Project’s investment costs are expected to provide strong boost to the local economies, which is supported by the effect of GDP multiplier on ENPV.
- The rate of EU co-financing after 2020 is one of the key risks and crucial from the point of view of the return on state funding and the financial capacity of the national budgets and liabilities, although not directly influencing the project’s economic returns.

7. Conclusions

The results of CBA analysis indicate the following conclusions:

- The project has an ERR rate of 6.32% for the base case scenario and ERR exceeds the 5% threshold level for all passenger and freight flow scenarios.
- Market analysis and forecast modelling illustrates clear potential for Rail Baltica both in terms of passenger and freight flows. The potential is sufficiently balanced, i.e., for passengers there are core segments of point-to-point and intra-Baltic traffic, while for freight there is balance between Finland transit, local imports/exports, and intermodal transit to/from 1 520mm railway system.
- Without public co-financing Rail Baltica is not financially viable (its discounted net revenues do not cover discounted investment costs over the life cycle of the project, partially attributable to the infrastructure charging principles stipulated by the EU transport policy). However, after the investment has been made, the infrastructure manager reaches a breakeven point in the year 2031 and could be financially sustainable from this point (the annual revenues from railway undertakings exceed the annual operating costs).
- Due to the gradual uptake of the potential passenger and freight flows, in the first years of the operation (2026-2030) public contribution is needed to ensure financial balance of the infrastructure manager. The amount and length of such contribution is significantly impacted by the ability of Rail Baltica to shorten the period or intensify the rate of uptake (according to the evidence from Eurostar, uptake might take a least 5 years). In order to facilitate the uptake, early commercialisation of the new infrastructure along with the establishment of efficient and effective infrastructure management is needed.
- The project is beneficial from the societal point of view, as its economic benefits exceed the costs. The economic viability is dependent on ensuring project output parameters that determine the key benefits – such as, offered speed of transportation, environmental impact, usage of local labour force and materials, etc.
- Sensitivity analysis indicates that the project does not reach economic viability if CAPEX increases over 26% as compared to the figures used in the analysis. Freight and passenger flows are also key determinant of economic viability.

Considering the conclusions presented above, the following recommendations can be made:

- For a more detailed estimation of the amount of potential users of Rail Baltica infrastructure, it is advised to perform a periodic surveying of mobility patterns in the Baltic States as well as extend the scope of the survey to Poland and Finland as well as logistics market analysis.

- To reduce the uptake period or intensify the rate of uptake, Rail Baltica governing bodies should proactively establish project promotion process to the potential users of the infrastructure, including organizing test runs on existing infrastructure. An especially important aspect is the involvement of the potential users during the process of designing of the technical solutions and user facing solutions of the infrastructure.
- From the market perspective the Infrastructure should be governed as a single body, offering unified approach to the access charges and eliminating potential discriminatory practices of the infrastructure manager or railway undertakings.
- Efforts shall be made to ensure timely development of necessary logistics infrastructure (multimodal logicstics centres) as the potential of freight flows uptake can only be achieved with the well-functioning ecosystem of logistics infrastructure and solutions provide competeive logistics services.
- Periodic review of the business case (including monitoring of critical variables to ensure that forecasted financial and economic return can be ensured) of the project needs to be carried out, especially at the completion of important project stages, such as, completion of technical design, signing the construction contract, etc.
- Considering the dependence from the flows from Poland and Finland on the financial and economic performance of the project, involvement of the representatives of the logistics industry and relevant stakeholders from Poland and Finland would benefit further development of the project.
- Due to the complexity of the project as cross-border project of three countries (or in the wider definition – five countries), it is paramount to ensure adequate project management and governance structures that would facilitate successful implementationand capture of the potential benefits while keeping costs at the expected levels.