Rail Baltica Global Project Cost-Benefit Analysis

Final Report

30 April 2017

Co-financed by the European Union
Connecting Europe Facility

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Version

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1. Terms and Abbreviations

Term/ abbreviation	Explanation
AADTI	Average annual daily traffic intensity
AC	Alternating current
AVG	Average
B/C	Benefits divided by costs
bln	Billion
CAPEX	Capital expenses
CARG	Compound annual growth rate
CBA	Cost-Benefit analysis
CBA Guide	Guide to Cost-Benefit Analysis of Investment Projects, version December 2014[1]
CIS	The Commonwealth of Independent States
CN	Combined Nomenclature
CO_2	Carbon dioxide (greenhouse gas)
DG ECFIN	Directorate-General for Economic and Financial Affairs
EC	European Commission
E-multiplier	Elastic-multiplier methodology
ENPV	Economic net present value
ERA	European railway agency
E-roads	European roads belonging, accepted and systemised by UNECE
ERR	Economic rate of return
ERTMS	European Rail Traffic Management System
ELRON	“Eesti Liinirongid” JSC
ETA	Estimated time to Arrival
EU	European Union
EUR	Euro
FDI	Foreign direct investments
FNPV	Financial net present value
FNPV (c)	Financial net present value (before the CEF co-financing)
FRR	Financial internal rate of return
FRR (c)	Financial internal rate of return (before the CEF co-financing)
GDP	Gross Domestic Product
GSM-R	Global System for Mobile Communications – Railway
GVA	Gross Value Added
ha	Hectare
JSC	Joint stock company
IRR	Internal Rate of Return
km	Kilometres
kV	Kilovolts
Ltd.	Limited company
m	Meters
m^2	Square meters
mln	Million

[1] Acquired from: http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf

Term/ abbreviation	Explanation
N/A	Not applicable
NPV	Net present value
OPEX	Operating expenses
PANAMAX	Ships able to pass through Panama canal (max weight 65 000 tonnes, max draft 12 m)
PAX	Passenger
PIT	Personal income tax
PRM	Persons with reduced mobility
PLN	Polish Zloty
RBR	RB Rail AS
Region	Finland, the Baltic States and Poland
Ro-Ro	Roll-on & roll-off
SJSC	State joint stock company
SUEZMAX	Ships able to pass through Suez canal (max weight 160 000 tonnes, max draft 20.1m)
t	Tonnes
tkm	Tonne kilometres
TEN-T	Trans-European transport network
TEU	Twenty-foot equivalent unit
TLU	Tallinn University
Thous.	Thousands
vkm	Vehicle kilometres
V	Volts
UNECE	United Nations Economic Commission for Europe

2. Introduction

2.1 EY work context

In accordance to the agreement between EY and RB Rail AS (RBR), No.8/2015-27 dated 06.10.2015; EY has been commissioned to prepare a Global Cost-Benefit analysis (Global CBA) that involves the following tasks:

- Definition of the 'do-nothing' option.
- Working with general economic development scenarios of the region.
- Passenger and cargo traffic forecasts.
- Identification of options for a cost-benefit analysis for a fast conventional standard gauge railway line (Rail Baltica II) in Estonia, Latvia and Lithuania.
- Financial analysis.
- Socio-economic analysis.
- Risk and sensitivity analysis.

Tasks have been carried out during the period of October 2015 to March 2017, involving:

- Desk research of publicly available data and previously conducted studies.
- Analysis of the information provided by RBR and the national project governance bodies.
- Conducting interviews with transportation and logistics industry representatives as well as Academic and institutional experts.
- Organization of workshops for the determination of specific inputs for the analysis.
- Development of traffic forecast model.
- Conducting the CBA calculations.

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.

2.2 Context 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 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 upgrade 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.

2.3 Key constraints and considerations of the analysis

The reading and interpreting of the Report is subject to the following considerations:

- The Report should be read and interpreted in its entirety, as opinions based on separate parts of the report may be incorrect or inconsistent due to lack of broader context.
- Given the stage and maturity of the Global Project (detailed definition of the Global Project is provided in the chapter Option analysis), the available information regarding CAPEX has not been at the level of detail to reduce contingency risks for such a large scale project. Therefore, the assumptions used in the calculations are subject to a detailed review during the further stages of Rail Baltica project development.
- 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 the Rail Baltica project 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 the 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.)

- Forecasts have been prepared assuming non-discriminatory access to the infrastructure by railway undertakings in accordance with the relevant national and EU legislation.
- Due to the uncertainty of 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.
- The CBA has been prepared with the view of the Rail Baltica project as a whole unified project of the Baltic States and no division of CBA calculations and results has been made on national or regional levels.

3. Background and information about the project

3.1 Project background and timeline

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 European railway network and integrating 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.

- **1981** *Several direct railway routes similar to proposed Rail Baltica routes are operational (Riga-Warsaw; Tallinn-Warsaw) with wheel exchange on 1435/1520mm gauge break*
- **1994** *Concept of Rail Baltica is first mentioned in a joint political document "Vision and Strategies around the Baltic Sea 2010" as a catalyst for spatial development in the region*
- **2001** *European Commission initiates a revision of the TEN-T guidelines (Trans-European Transport Networks)*
- **2003** *Rail Baltica Coordination Group (Estonia, Latvia, Lithuania and Poland) agrees on the key aspects to be considered in future studies for investment in Rail Baltica*
- **2004** *Community guidelines for the development of TEN-T are amended in order to promote cohesion within the EU, paying particular attention to integrating the new Member States. As a result, Rail Baltica axis Warsaw-Kaunas-Riga-Tallinn is identified as priority project*
- **2005** *European Commission Directorate - General Regional Policy commissions a strategic study of the Rail Baltica railway*
- **2007** *The final report of the study acknowledges that none of the options identified has a dominant business case*
- **2010** *Transport ministers of Finland, Estonia, Latvia, Lithuania and Poland sign a memorandum expressing their political will to continue with the implementation of Rail Baltica project*
- **2010** *Estonia, Latvia and Lithuania jointly order a feasibility study of the 1435mm railway line. The study is carried out by AECOM Ltd*
- **2011** *Prime ministers of the Baltic States agree upon setting up the project's central implementation office in Riga*
- **2013** *The Baltic States sign a declaration of the continuous cooperation to implement the project*
- **2013 … … 2015** *In-depth analysis on National and Baltic level started that consisted of technical, environmental studies and spatial planning to establish the railway line alignement and main functional elements of it*
- **2014** *Joint venture (RB Rail) of the Baltic States is founded in order to successfully deliver design, construct and market the project*
- **2016** *Route alignment in Latvia approved*
- **2017** *Intergovernmental agreement on implementation of the Rail Baltica project signed by the Prime Ministers of the Baltic States, route alignment in Lithuania approved and in Estonia expected to be approved*
- **2018** *Start of technical design phase of the project (including acquisition of building permits)*
- **2019** *Start of the construction works of the railway line*
- **2025** *Completion of main railway line Tallinn-Riga-Kaunas-LT/PL border (including Kaunas - Vilnius)*
- **2030** *Fully integrated within North sea - Baltic TEN-T transport corridor*

Figure 1 The timetable of recent and planned developments

3.2 Brief description of the project

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 maintenance 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

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.

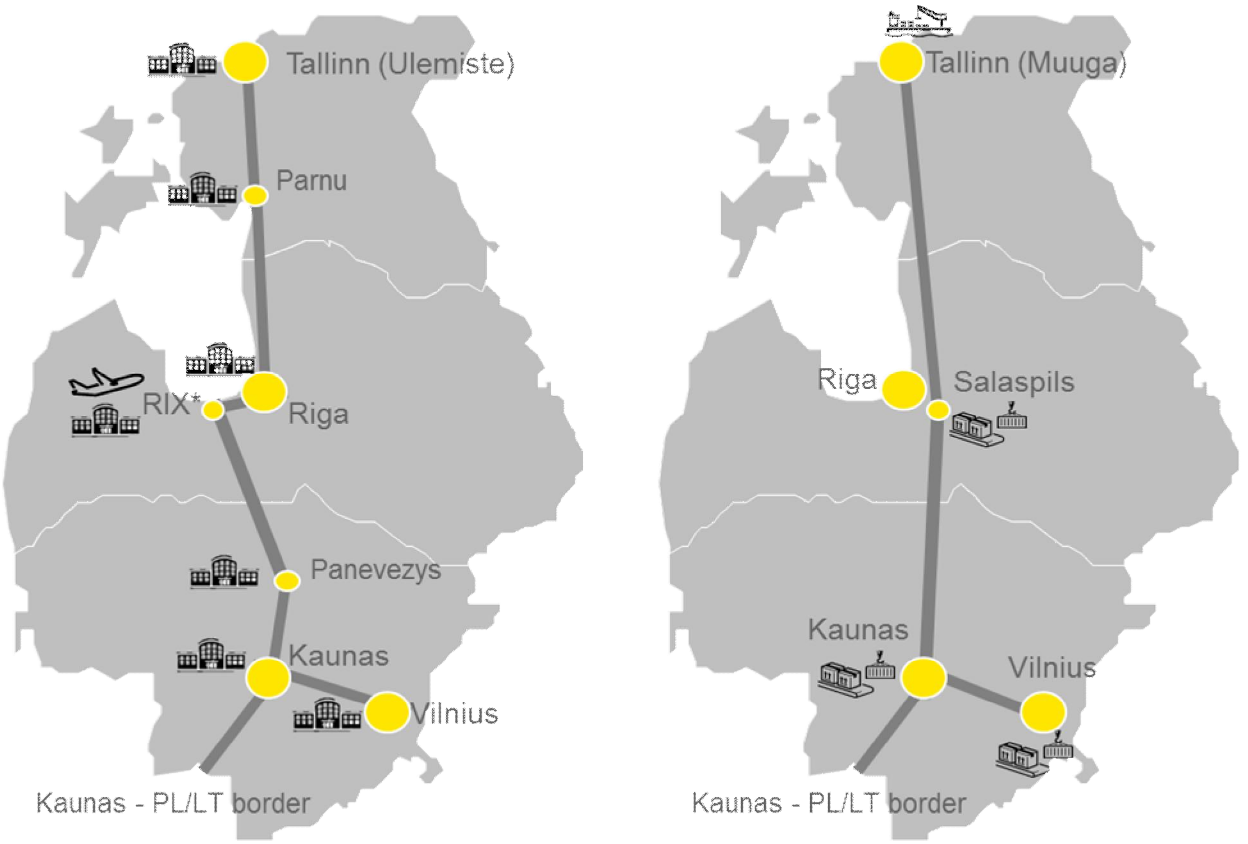
The CBA is conducted for the Global project and encompasses the service between the planned seven international passenger stations (Tallinn, Parnu, Riga, Riga Airport, Panevezys, Kaunas, Vilnius) in the Baltic States as well as international service with Poland (Warsaw) and beyond. The technical parameters 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 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 and transit traffic in the region (mainly the trade of Finland and Poland with the countries in the region) 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 and intermodal and auxiliary services to support the needs of market participants in the region.

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 capturing mainly the trade flows that require reliability and regularity and are being shipped on routes that link Central Europe with the Baltic States and Finland.



*Riga International Airport

Figure 2 Schematic map of railway line location with stations and terminals for passengers(left) and freight(right)

Project governance

Rail Baltica is governed by institutions and companies on several levels, consisting of beneficiaries, central project coordinator (RBR) and national implementing bodies (see Figure 3). Finland and Poland currently have the role of observers in the general governance structure. It has to be noted that the shareholders of the central project coordinator (RBR) are simultaneously also the national implementing bodies to be governed by RBR.

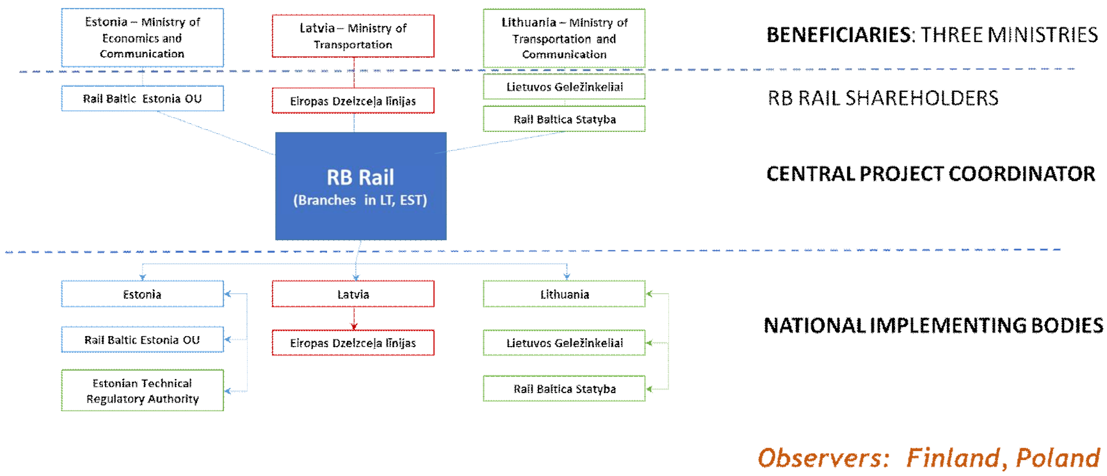


Figure 3 Rail Baltica project governance structure[2]

[2] "Rail Baltica – Project Of The Century" presentation by RBR

One of the key documents that defines roles of authority and responsibility between the RBR, Beneficiaries and national Implementing Bodies is the Agreement on the Contracting Scheme for the Rail Baltica[3]. According to the scheme all procurement are divided into three groups and subjected to the EU public procurement principles and legislation – procurement by RBR, consolidated procurement of the Beneficiaries and supervised national procurement.

[3] railbaltica.org/en/newsletter/rail-baltica-procurement-principles

4. Methodology

Key messages

- ► CBA calculations depend on two key models – passenger and freight forecast model, which acts as direct input to, CBA calculation model in which CBA calculations are performed according to the CBA guide
- ► CBA calculations are done from the perspective of the infrastructure manager and in real prices (excluding inflation)
  Infrastructure charges are estimated using “what market can pay” principle, i.e., as residual payments to infrastructure manager after the consideration of revenues and costs of railway undertakings

4.1 Passenger and freight flow forecasting methodology

4.1.1 Choice of methodology

The traffic forecast model at its core is built using the specific ratio between the GVA and GDP growth rate of the passenger and freight destination country respectively and the passenger growth or foreign trade growth rate of the respective trade link. This ratio, the so-called GVA/GDP multiplier, is derived from a time series of average past data between 2004 and 2014, whereby adjustments are made to exclude non-standard events (peak shaving). Similar approach has been used, for example, by the WTO as a basis for estimates[4]. There are range of the different modelling approaches (e.g., TRANS-TOOLS, STAN and other), however, at their core the models rely on the link between economic development and passenger/freight demand. The choice of a custom model for the purpose of the analysis allows greater flexibility and customization as Rail Baltica is not an improvement of existing infrastructure but important new mode in the overall passenger and freight ecosystem in the Baltic States Estonia, Latvia and Lithuania.

4.1.2 Overall forecasting approach

The forecasting task has been executed according to the approach illustrated in Figure 4 (the steps are explained in more detail in the following chapters Table 1 provides a brief description on every step).

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

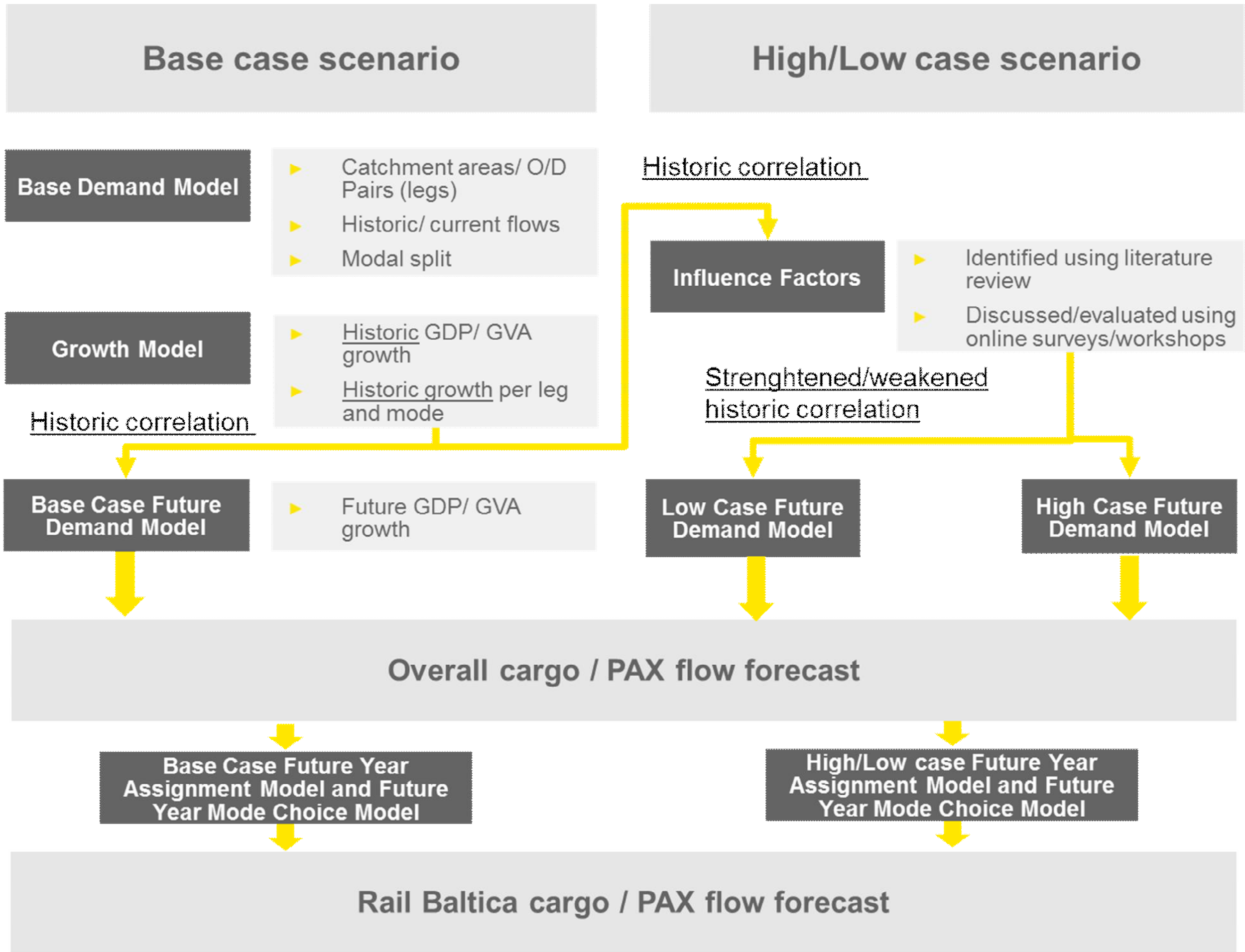


Figure 4 Forecasting approach

Table 1 Forecasting approach steps

Step	Description	Key input	Key output
Step 1: base demand model	At the core of the forecasting model is the base demand model, which encompasses existing trade and passenger movement data to establish the basis for further forecasting. The data are collected by numerous origin/destination pairs that are linked with the countries in the region (such as, Tallinn - Vilnius, Kaunas – Panevezys, Riga Airport – Warsaw Airport for passengers, or Finland-Estonia, Lithuania-Germany, Latvia-Poland etc. For each pair the information was collected for each direction separately). Over 70 (or 140 for both directions) O/D pairs for passengers and over 150 (or 300 for both directions) O/D pairs for freight have been included in the model.	▶ Statistical data (Eurostat and publicly available traffic statistics) and calculations from available data to determine the base flows ▶ Additional data from market studies, mobility survey	▶ Base flows (existing movements) in the base year of forecasts Modal split and other characteristics (e.g., trip reason, freight type) of base flows (existing movements)
Step 2: future growth model	The base demand model is further complemented by the future growth model that, at its core is based on the expected economic growth and development of the countries in each origin/destination pair, utilizing the principle that economic activity (growth of economic activity) drives demand for both freight and passenger movements. Similar approach has been used, for example, by WTO as a basis for estimates[5]	▶ Base flows from the base demand model ▶ Historical GVA/ GDP trends for the O/D pairs in the model ▶ Compiled official GVA/ GDP forecasts for the countries considered in the analysis up to year 2055	▶ Historical correlation ratio between passenger and freight flows and GVA/GDP respectively for each O/D pair

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

Step	Description	Key input	Key output
Step 3: future demand model	The model applies the correlation factor with the expected GDP/GVA trends for the O/D pairs of the model to achieve the future overall passenger and trade flows. For sensitivity purposes, different growth scenarios have been defined and applied (see next chapter). To reflect potential future developments that cannot be captured with historical links between economic activity and freight and passenger movements, a set of influence factors has been identified and validated using public research and expert opinion. The influence factors considered are both advantageous and detrimental to Rail Baltica development, acting separately for each chosen economic development scenario and influencing the future growth model.	▶ Base flows from the base demand model ▶ Historical correlation from the future growth model ▶ Influence factors for historical correlation adjustment for high/Low case	▶ Future overall flows for base, High and Low cases for each O/D pair
Step 4: future assignment and mode choice model	As a final step, the assignment and mode choice model is applied for each case (scenario), indicating the share of overall passenger and freight flows to be captured by the Rail Baltica. Separate model assumptions have been applied for each case (scenario).	▶ Future flows from the future demand model	▶ Future Rail Baltica flows for base, High and Low cases for each O/D pair

4.1.3 Scenarios definition methodology

In order to define the factors that influence the development of the Rail Baltica project in general and to produce passenger and freight traffic forecasts, long-term future forecasting techniques are applied. The main supporting tool used for the future modelling in the study is the scenarios technique.

Scenarios technique is used in “future studies” as an approach for dealing with complexity and future uncertainty[6]. According to German Development Institute[7], a scenario can be defined as a description of a possible future situation, including the path of development leading to that situation. Scenarios are not intended to represent a full description of the future, but rather to highlight the central elements of a possible future and to draw attention to the key factors that will drive future developments. Today, among the primary fields of application of scenarios are strategic planning in companies, municipal and land-use planning, political consultancy, and global scenarios concerning the future of energy or climate[8].

In this study, the development of different scenarios aims to understand the complexity of the Rail Baltica project as well as to define the impact and interactions of various factors and trends on a global and on a regional/ country level that will result in necessary assumptions to evaluate the passenger and freight traffic of the Rail Baltica line. Scenarios put emphasis on the understanding of the drivers of demand for the Rail Baltica services and how they might be expected to evolve over time. The development of a clear long-term vision enables efficient planning and facilitates efficient short to medium term and long-term decisions[9]. It is important to note that the scenarios technique helps to evaluate and take into account not only macroeconomic and socio-economic trends that can be measured quantitatively, but also such factors as politics, decisions and events that influence project development and operations. By defining different scenarios of how these factors may evolve, it is possible to have a contextual look at the complex, globally connected world.

[6] Source: Marta Pérez-Soba and Rob Maas. *Scenarios: tools for coping with complexity and future uncertainty?* In: The Tools of Policy Formulation. Actors, Capacities, Venues and Effects. Edited by Andrew J. Jordan and John R. Turnpenny (2015)
[7] Source: Hannah Kosow, Robert Gaßner. *Methods of Future and Scenario Analysis. Overview, Assessment, and Selection Criteria.* German Development Institute (2008)
[8] Source: Ibid.
[9] Source: Network Rail. Network Route Utilisation Strategy. Scenarios & Long Distance Forecasts

It is assumed that alternative futures are possible – probable, imaginable, desirable or surprising – and in each scenario the influencing factors interact in different combinations and produce various effects on passenger and freight traffic. In order to consider alternative future developments, four scenarios are elaborated on the basis of two principal trends which were identified as crucial for railway development in the Baltic States[10]. Combinations of the main drivers and factors of these trends determine the extremes or radically opposite directions in the development of politics, economy, environment, transport and social fields. The critical trends forming the scenario 'axis' are as follows:

- Degree to which the Baltic States are involved in global processes and how much the European economy, in general, is globally connected or fragmented (globalisation to localisation).
- Degree to which the sustainability principles apply to the habits and policy of the Baltic and European inhabitants (sustainable habits to mass consumerism).

Distribution of scenarios among the axes and key features thereof are presented in Figure 5. It must be noted that the descriptions provide overall trends.

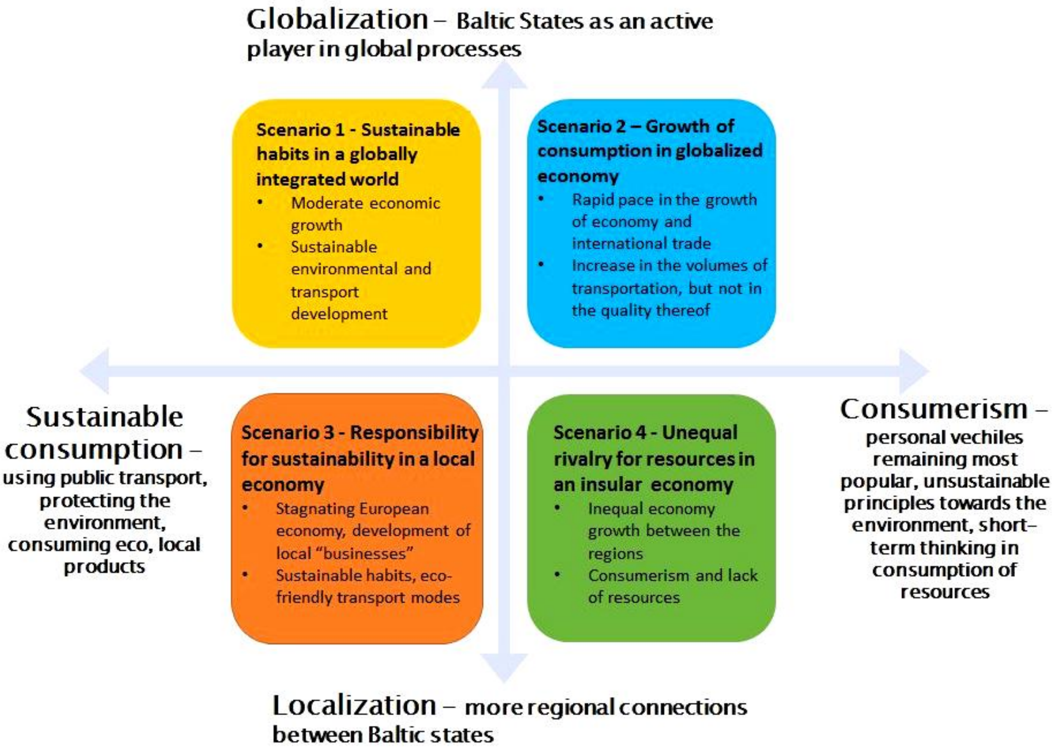


Figure 5 Scenario axes and descriptions

The scenarios presented in Figure 5 have been used as the basis to define the minimal and maximum evolution of the key factors (different in each scenario) that have different impact on passenger and freight traffic. However, due to the relatively low likelihood (as identified during expert discussions), Scenario 4 has been excluded from the further analysis. As a result, the CBA analysis will focus on scenarios 1-3 (see section 6), which will be referred to as Base (Scenario 1, assumed no effect of influence factors), High (Scenario 2) and Low (Scenario 3).

[10] Source: National Study RB, 2016

4.1.4 Freight flow forecasting methodology

4.1.4.1 Overall approach

Figure 6 illustrates the freight flow forecasting approach.

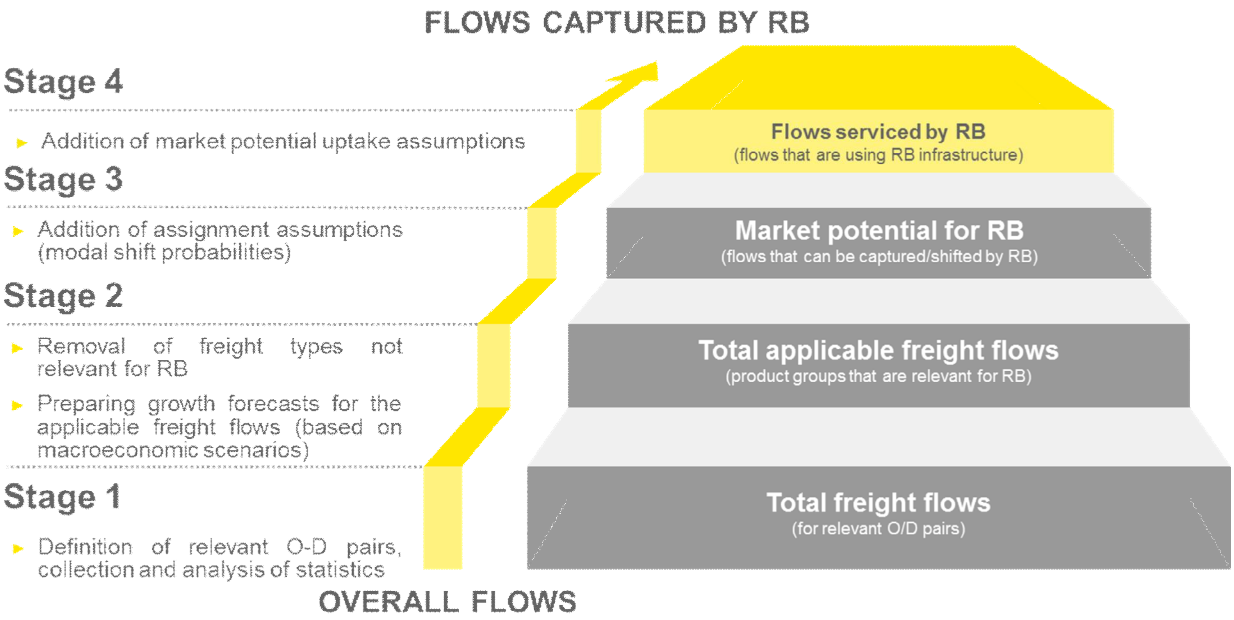


Figure 6 Future freight flow forecasting approach

The freight volumes (Base Demand Model), that are potentially relevant for Rail Baltica, have been identified from the foreign trade volumes (obtained from Eurostat) from the determined catchment area (see 4.1.4.4) , by determining the most likely transport mode for each commodity group and common trade and transport profiles (Base Assignment Model and Base Mode Choice Model).

To develop the traffic forecasts and scenarios up to 2055, the elastic-multiplier methodology (e-multiplier) has been applied, with the underlying assumption that there are certain influence factors (see 6.4) (see that have the potential to change (except in the Base case scenario) the past relationship of trade volumes and GDP (GDP multiplier) in the short to mid-term (5 to 10-years cycles). Thus, the traffic forecast of a given year has been generated by using the identified trade volume of a specific trade link of the previous year and applying both, GDP multipliers and e-multipliers, as follows:

$$TVx = TVx\text{-}1 + [TVx\text{-}1 * grGDPx\text{-}1 *(Mx + Ix)]$$

TVx: Trade volume of an individual trade link in year X

grGDPx-1: Growth rate of GDP (importing country) in year x-1

M: GDP multiplier (M = Trade Growth / GDP Growth) adjusted past average

I: Total e-multipliers for year x (sum of e-multipliers for each influence factor)

Based on regional characteristics, an individual set of influence factors has been developed covering the principal trends of the macroeconomic perspective (e.g. population, demographics, global economy, industrial and service development, economic integration, environmental policies, etc.) as well as the specific Rail Baltica project perspective (e.g. value-added services, transport costs, modal shift, competitiveness of services, policies and attitudes regarding the project, special project milestones for a specific year, etc.). The strength of each influence factor has been defined through a review of available studies, expert panel meetings and professional judgment of the industry experts, and can vary depending on the development scenario (see section "General Economic Scenarios"). Thus, each influence factor can be either positive or negative and as such, increase or reduce the relation between the GDP and trade growth at a different strength per the applied scenario.

To determine the relevant future freight and traffic flows for Rail Baltica, the elaborated traffic forecasts have been used as the basis and EY have applied the Future Year Assignment Model and Future Year Mode Choice Model. Both models are based on the respective base year models and adjusted through the identified trends per scenario (e.g. modal shift road-to-rail due to environmental policies, transport costs and times, competitiveness of Rail Baltica as such, etc., see 6.4).

The elaborated freight and traffic forecasts have the following key features:

- Baseline plus 2 development scenarios considered with or without Rail Baltica.
- Long distance freight volumes to/ from Estonia, Latvia, and Lithuania - import/ export volumes on a trade leg basis (O/D pairs) and per respective catchment area.
- Long distance freight volumes via Estonia, Latvia, and Lithuania (transit).
- Effects of modal shift (air-to-rail, road-to-rail, sea-to-rail, induced traffic).
- Results, in tonnes, per commodity group and transport mode.

Overall, the model results have been complemented and aligned, where necessary, with the modelling results from other studies (such as wider market studies as Market Potential and Competition Analysis for selected ports of the Amber Coast or narrower technical studies, e.g., intermodal terminal development in Salaspils). As such, they provide the answers in particular to questions regarding the potential impacts on the existing transport and logistics industry of the Baltic States or specific elements of Rail Baltica. Moreover, the forecasts provide insights into the potential market share of Rail Baltica and the market characteristics, supporting the strategic development direction of the overall project.

Moreover, through the deep-dive analysis and interviews, the assignment of volumes and the addressable potential induced demand, which might be generated through the implementation of Rail Baltica, was further analysed.

The freight modelling and traffic forecasting is done per freight direction and type (import, export, transit), following the structure presented in the Figure 7. E/N was not considered due to negligible forecasted flows due to short distance.

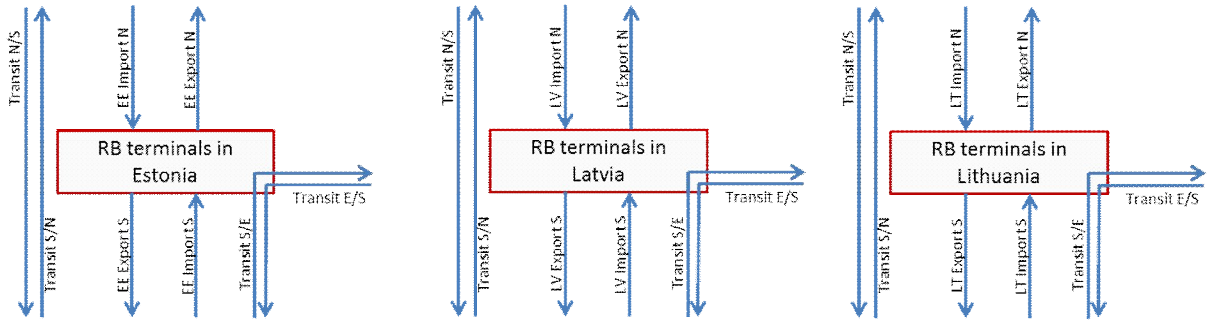


Figure 7 General structure of forecasted freight flows

4.1.4.2 Potential freight volumes resulting from foreign trade

As the first step, a review of the general assignment of all 8-digit CN codes (Eurostat, Intrastat) of foreign traded products (exports and imports) to a specific commodity transportation category (i.e. general cargo, dry bulk, liquid bulk) was conducted. Furthermore, we applied this assignment to the reported foreign trade of each of the three Baltic countries within the different catchment areas and along the most relevant TEN-T Core Network Corridors (North Sea-Baltic Corridor, Adriatic-Baltic Corridor). This general assignment of traded products has been done based on the insights and information gathered of the local and regional industry and transportation. Secondly, the probability has been identified of whether a certain product in general does or does not have the potential to be transported on Rail Baltica.

The results have been cross-checked against related official publications and through professional judgements of independent experts.

4.1.4.3 Selection of applicable freight types

The majority of the potential freight for the Rail Baltica is nowadays transported in containers, trailers (RoRo) and break bulk. Also, to a certain extent, products naturally transported in form of dry or liquid bulk have been partly considered as having potential to be shifted onto the Rail Baltica. These products typically are being transported in big bags or bundles (e.g. flakes, granular, fertilizer) or in barrels or bundles (e.g. special oils and liquids). Dry and liquid bulk shipments, which can be transported in special wagons (e.g. tank wagons and tank containers for crude, open top wagons for coal and grain), have been considered as potential for the induced demand.

4.1.4.4 Freight catchment area of Rail Baltica

For the determination of the catchment area, the corridor approach as defined within the TEN-T policy of the EU was used as general guidance. To collect and analyse the data, and to model and to forecast the freight traffic the trade flows have been split, as relevant for the region on an O/D (origin-destination) basis, into several sub-groups. On a broader perspective, these catchment areas also represent the hinterland accessibility of ports in the respective countries based on the minimum road cost from the main ports.

Therefore, the catchment area for freight has been defined as follows (visualized catchment areas are shown in Figure 8):

- Direct catchment area I (DCA I) - Rail Baltica countries of the North Sea – Baltic corridor: Estonia, Finland, Latvia, Lithuania, and Poland that will be linked by Rail Baltica railway line.
- Direct catchment area II (DCA II) - Countries of the North Sea – Baltic corridor, except for the Rail Baltica countries: Belgium, Germany, and Netherlands. In addition, United Kingdom (UK) was added due to significant trade ties with the Baltic States.
- Wider catchment area I (WCA I) – Countries of the Baltic-Adriatic Corridor: Austria, Croatia, Czech Republic, Italy, Slovakia and Slovenia, except for Poland.
- Wider catchment area II (WCA II) – South-West Europe: France, Portugal, Spain, and Switzerland.
- Wider catchment area III (WCA III) - Orient/ East-Med Corridor and adjacent countries: Bulgaria, Hungary, Greece Moldova, Romania, Serbia, Turkey. For the analytical purposes of the forecast results, the countries with 1520mm rail system have been grouped into separate sub-group.
- Wider catchment area IV (WCA IV) – Scandinavia: Denmark, Norway and Sweden.
- 1520 mm rail system countries – CIS countries that use the 1520mm gauge system: Russia, Belarus, Ukraine, Kazakhstan and others.
- Rest of Europe – the remaining European countries: Cyprus, Luxembourg, Lichtenstein, Ireland, Iceland, Malta and rest of Balkan countries.
- Rest of the World (World) – including countries with significant historical trade volumes with the region, i.e. China or South Korea among others.

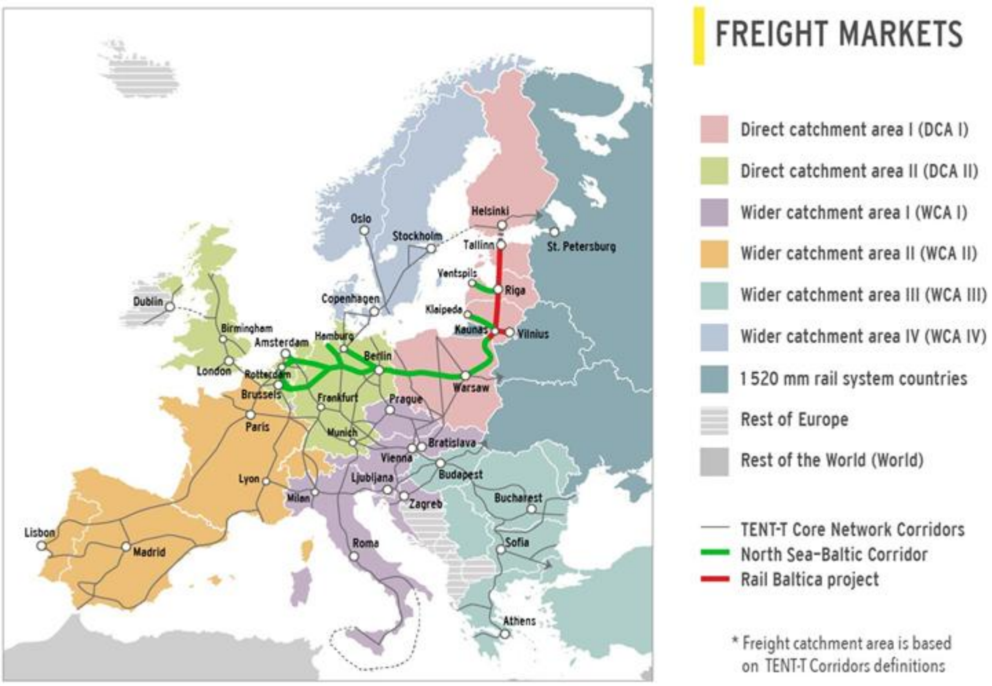


Figure 8 Freight catchment area of Rail Baltica

In terms of the potential for Rail Baltica, it has been assumed that O/D relations concerning DCA have a much higher potential for modal shift to Rail Baltica than O/D relations concerning the wider catchment areas or countries from the rest of the world. Each possible O/D relation has individual assumptions regarding modal shift potential, which are based on the estimated competitiveness of current transport modes and systems, especially road and maritime transportation, and are also taking into account potential development scenarios and different timeframes. A summary of key market shares is presented in section 8.2.2.2.

4.1.4.5 Potential freight volumes resulting from transit flows

In regard to the potential transit volumes through the Baltic States and, as far as they are relevant to Rail Baltica, a two-level approach has been applied. In the first step, using Eurostat data, all relevant trade volumes between the different countries of the catchment areas were identified, where trade flows potentially will go through each of the respective countries as transit in the directions North-South (N/S), South-North (S/N), South-East (S/E) East-South (E/S). In the second step, the trade share was assigned, which has the potential to be moved in the future on Rail Baltica link. The assignment was done based on acquired knowledge of the industry and trade with the support of professional judgment of industry experts.

4.1.4.6 Modelling considerations: Finland-related cargo flows

Finland is a maritime nation with about 90% of its exports and 80% of its imports being carried by sea. Out of the total international freight volumes, in the range of approx. 110 million tonnes in 2014 (of which approximately 96 have been transported via sea)[11], approximately 37 million tonnes (22 million tonnes export and 15 million tonnes import) have been considered as feasible for being carried on the Rail Baltica (excluding trade with Scandinavia).

The cargo that has been considered as feasible for Rail Baltica, is not related to the market of Russia, and is considered to be for the markets in the Baltics, rest of Europe and with a minor share to the rest of the world. It is also cargo that is not considered as liquid or dry bulk transported in big quantities (e.g. fuel, crude oil, coal, ores).

In other words, the considered volumes are, in a technical and economic sense, feasible to be theoretically transported on the Rail Baltica. As this cargo, today, is mainly transported by ship or by truck & ferry, a further sensitivity has been added for the consideration of the direction of cargo flows (O/D pairs) and the most likely value that Rail Baltica could add to these specific O/D pairs. The value added, in this respect, means factors influencing the whole transport and logistics chain, inter alia, factors that may influence the decision maker (shipper) directly or indirectly on his future mode selection (e.g. service time, cost and quality along the whole transport chain, weather conditions, value of goods, environmental considerations, among others).

To summarize, it has been assumed that out of the total freight volumes from Finland considered as generally feasible to be carried on the Rail Baltica, and that are today being carried by ship or truck & ferry, some 3% to 7% will be realistically shifted onto the Rail Baltica. This does not consider the induced demand that may come from, e.g., the paper industry or from retail and food industry.

4.1.4.7 Modelling considerations: Rail gauge transition of cargoes related to Russia and Belarus

The general projected potential demand for the Rail Baltica has been done assuming that the infrastructure for the rail gauge trans-loading from 1435 mm to 1520 mm, and vice versa, is in place.

[11] http://www.liikennevirasto.fi/web/en/transport-system/international-freight-traffic#.WOVQPVXyipo

When it comes to cargo flows related to Russia and Belarus, a smooth and direct transition of cargo between both gauges should be envisaged. This analysis has taken into account that studies such as the ongoing study for Muuga Rail Baltica Intermodal Logistics Centre (RBILC) or the one for the RBILC in Salaspils, Latvia conducted by AECOM in 2015/2016 have analysed the technical, operational and economic feasibility of rail stations equipped with gantry cranes, which are able to transfer rail containers directly from one track/train to the other. From a transport planning point of view, such solutions that have been analysed in the previously mentioned studies, suitably located in Estonia, Latvia and Lithuania with direct linkage and alignment to existing rail networks and services from/ to Russia and Belarus (such as e.g. the Viking Train) will add significant value for the Rail Baltica to lure cargo flows away from maritime and road transport modes.

4.1.5 Passenger flow forecasting methodology

4.1.5.1 Overall approach

Figure 9 illustrates the future passenger flow forecasting approach.

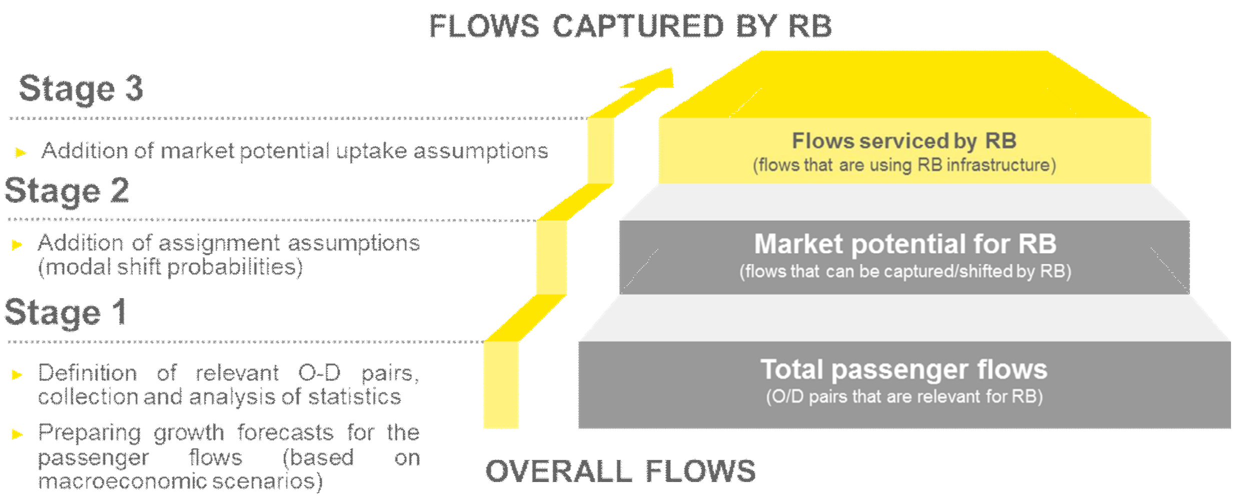


Figure 9 Passenger flow forecasting approach

Similar to freight forecast approach (see chapter 4.1.4 Freight flow forecasting methodology “Freight flow forecasting methodology”), the traffic forecasts have been used as the basis and the future year assignment and mode choice models have been applied to the results. Both models are based on the respective base year models and adjusted through identified trends per scenario (e.g. modal shift road-to-rail due to environmental policies, transport costs and times, competitiveness of Rail Baltica as such, etc.).

Also, for the passenger traffic forecasts and scenarios (except in the Base case scenario) up to 2055, the elastic-multiplier methodology (e-multiplier) has been applied. The traffic forecast of a given year is generated by using the identified passenger volume of a specific connection (inbound, outbound, transit) of the previous year and applying both, GVA multipliers and e-multipliers, as follows:

$$PAX_x = PAX_{x-1} + [PAX_{x-1} * grGVA_{x-1} *(M_x + I_x)]$$

PAXx: Passenger volume of an individual connection in year X grGVAx-1: Growth rate of GVA in year x-1

M: GVA multiplier (M = Passenger Growth / GVA Growth) adjusted past average

I: Total e-multipliers for year x (sum of e-multipliers for each influence factor)

Based on regional characteristics, an individual set of influence factors has been examined covering the principal trends of the macroeconomic perspective (e.g. population, demographics, global economy, industrial and service development, economic integration, environmental policies, etc.) as well as covering the specific Rail Baltica project perspective (e.g. value-added services, transport times and costs, urban mobility, competitiveness of services, policies and attitudes regarding the project, special project milestones for a specific year, etc.). The strength of each influence factor has been defined through a review of other studies, expert panel meetings and professional judgment of the industry experts, and can vary depending on the development scenario. It must be noted that certain permanent trends, such as demographics, have already been considered via implied effect of GVA multiplier calculation, i.e., historical adverse demographic trends have influenced the historical GVA and passenger growth correlation thus limiting the future growth on implied basis.

Elaborated passenger forecasts have the following key features:

- Baseline plus two development scenarios considered with or without Rail Baltica;
- Long distance passenger volumes to/ from rail stations in Estonia, Latvia, and Lithuania (inbound/ outbound traffic) on a travel link basis (origination/destination "O/D" pairs) and per respective catchment area;
- Long distance passenger volumes via Estonia, Latvia, and Lithuania (transit) on a travel link basis (O/D pairs) and per respective catchment area;
- Effects of modal shift (air-to-rail, road-to-rail, induced traffic);
- Results in number of passengers and transport mode.

Overall, the model results are complemented, where possible, with data from other studies and the mobility survey[12]. They have demonstrated the possible effects of modal shift and, in particular, provide answers what impact the population decline and welfare growth leave on passenger traffic. Furthermore, deep-dive analysis and interviews have been conducted in order to update the data base and to further analyse the assignment of volumes and the addressable induced demand, which might be generated through the implementation of Rail Baltica. The passenger forecasts consider a very conservative induced demand as additional 5% to the diverted flows.

4.1.5.2 Passenger catchment area of Rail Baltica

The size and reach of the catchment area and, therefore, the demand for Rail Baltica passenger services depends on various factors, such as the accessibility of stations, local and regional transportation, travelling time and costs, habits of the inhabitants among others. For the determination of the passenger catchment area, the following approach has been adopted:

[12] EY, 2016

- Core Station Area (CSA) - areas around the planned Rail Baltica main stations covering the metropole regions of the major cities in the Baltic States along the Rail Baltica route, i.e. Tallinn, Parnu, Riga, Panevezys, Vilnius and Kaunas but also Helsinki and Warsaw.
- Primary Catchment Area (PCA) includes and the wider region around the respective stations in Estonia, Latvia, Lithuania, Finland, and Poland within an up to 1 hour estimated travel distance.
- Wider Catchment Area (WCA) or area of influence - regions with the potential of using Rail Baltica, also including transit passengers. The considered regions are (visual representation of catchment area is shown in Figure 10):
    - Rest of Finland
    - Rest of Estonia
    - Rest of Latvia
    - Rest of Lithuania
    - Rest of Poland
    - Germany
    - North-West Russia (especially St. Petersburg region)
    - Austria
    - Czech Republic
    - Slovakia

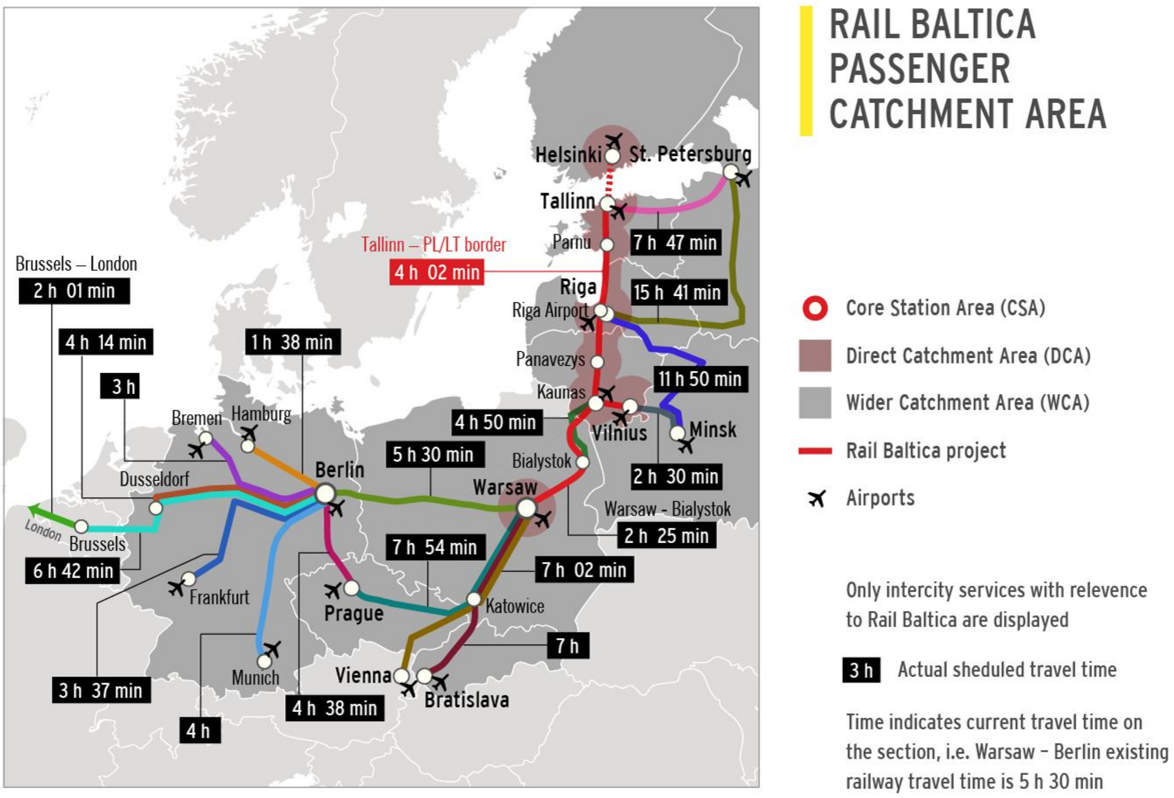


Figure 10 Passenger catchment area of Rail Baltica

4.1.5.3 Potential passenger volumes as relevant to Rail Baltica

Having determined the catchment area, the historical population living and working in these areas was identified. Such factors as the local public transport, transport system of the state and area around the station (park & ride, direct transport to station, etc.) have been also assessed. The core assumption for the potential demand is based on a travel distance of up to 1 hour to the planned Rail Baltica railway station by public transport (rail, intercity bus, regional bus, local public transport).

As to wider catchment areas and transit passengers, the forecast model considers international passengers who already travel to the cities where railway stations are claimed to be located close to other means of transport such as plane and car/ overland bus services. Forecasting has been done by adding data from official statistics, interviews with the industry stakeholders, surveys and technical assumptions for the mode utilization as well as using benchmarks from other countries with similar travel distances (e.g. Germany, the Netherlands, UK, Scandinavia) and as a result, the potential modal shift (shift from road, air to rail) has been estimated.

4.2 CBA methodology

4.2.1 Overall approach

CBA compares different scenarios with-the-project with the baseline scenario without-the-project (do nothing option). CBA has been conducted in accordance with the Guide to CBA of Investment Projects, published by the European Commission (EC)[13]. Detailed financial and economic analysis consists of four fundamental parts, as presented below in Figure 11.

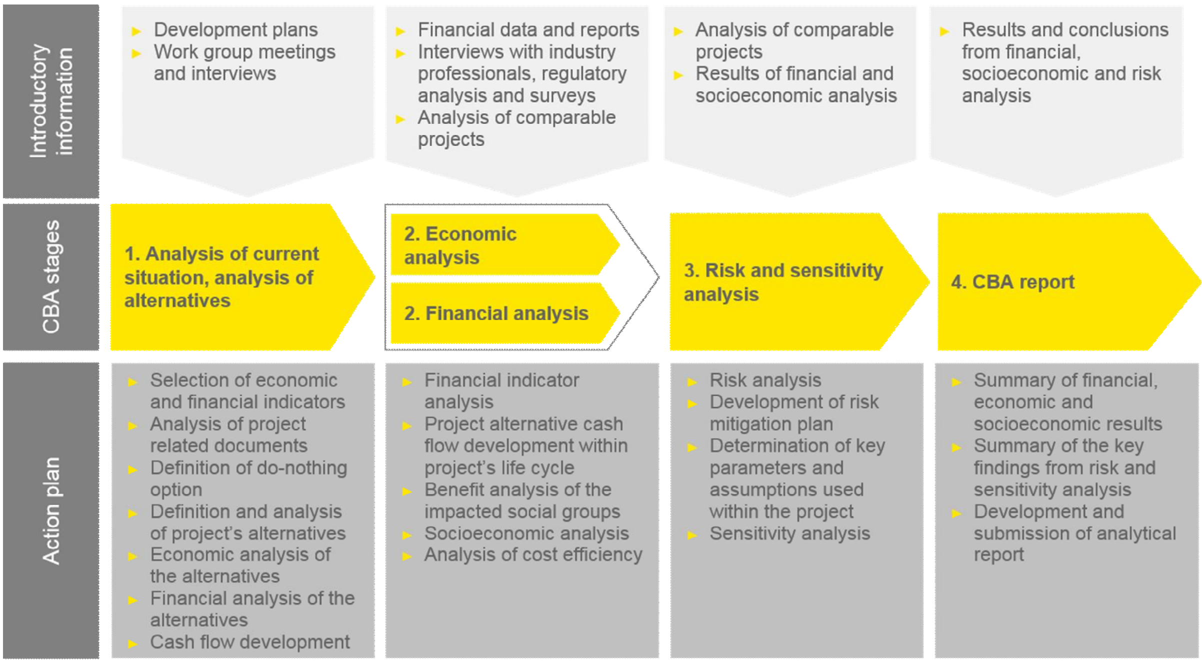


Figure 11 Components of the financial and economic analysis

CBA has been performed according to the following approach for the selected options:

- CBA is conducted from the perspective of the railway infrastructure manager and based on project's revenues and costs, using the incremental approach.
- CBA calculations have been performed on real terms (constant prices, 2015).
- OPEX, CAPEX, pricing assumptions and other assumptions have been set in order to calculate infrastructure manager's net cash flow.

[13] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf

- Costs for the railway infrastructure manager consist of operating costs and maintenance (incl. renewal) costs.
- As the base approach, revenues for the railway infrastructure manager are calculated based on principle "what market can pay"[14] and consist of income from infrastructure charges that are being paid by passenger and freight carriers. The carriers are obliged to pay only the direct costs for the infrastructure usage, increased or full amount of infrastructure access charge (that covers full cost and profit for railway infrastructure manager) are paid only in the case when the carrier has covered its operating costs and ensured sufficient operating profit. In order to determine possible freight and passenger operators' infrastructure usage charge, net revenues of freight and passenger operators have been calculated (more details in section 9.1). For comparative purposes, CBA indicators using existing infrastructure charging principles are presented in the sensitivity analysis.

Combining all the above-mentioned cash flows, net cash flow has been calculated for the infrastructure manager. In addition to net cash flow of the railway infrastructure manager, net socio-economic cash flow has been forecasted and used to determine socio-economic and financial indicators, which have been further tested in the risk and sensitivity analysis. For detailed structure of the CBA model please refer to the Figure 12 below.

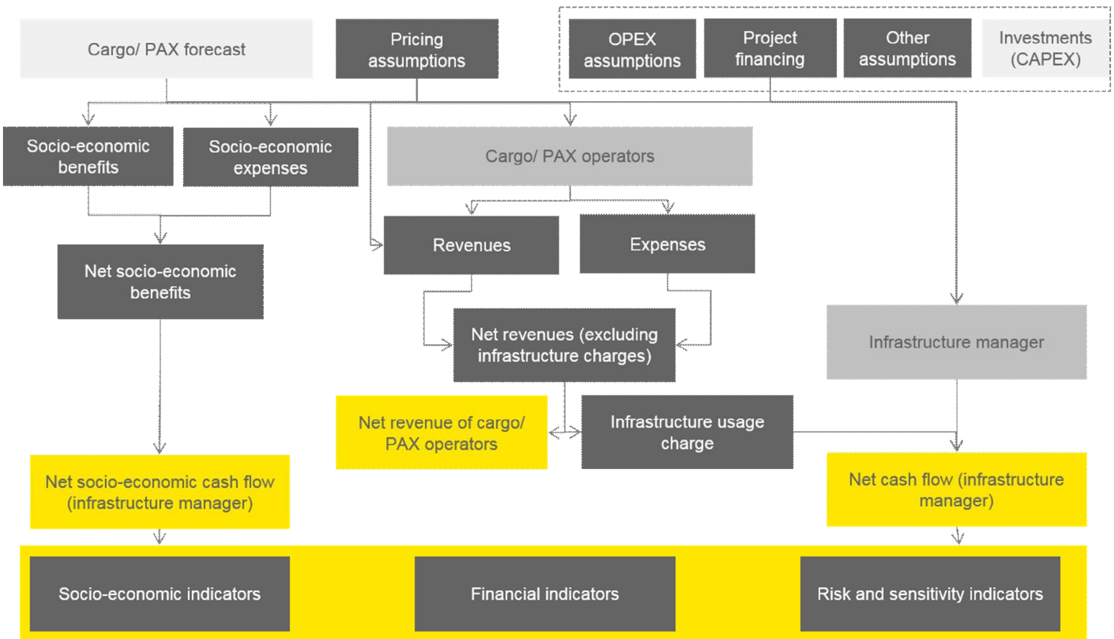


Figure 12 Structure of CBA

The main stages of CBA are depicted in the Figure 13. According to the CBA Guide, only projects with negative financial net present value (NPV), but with positive economic NPV (ENPV) can apply for EU funding. For the selected option (alternative), the financial indicators and funding gap are calculated (see Financial analysis methodology below).

[14] EU Directive 2012/34/EU Article 32 Point 1

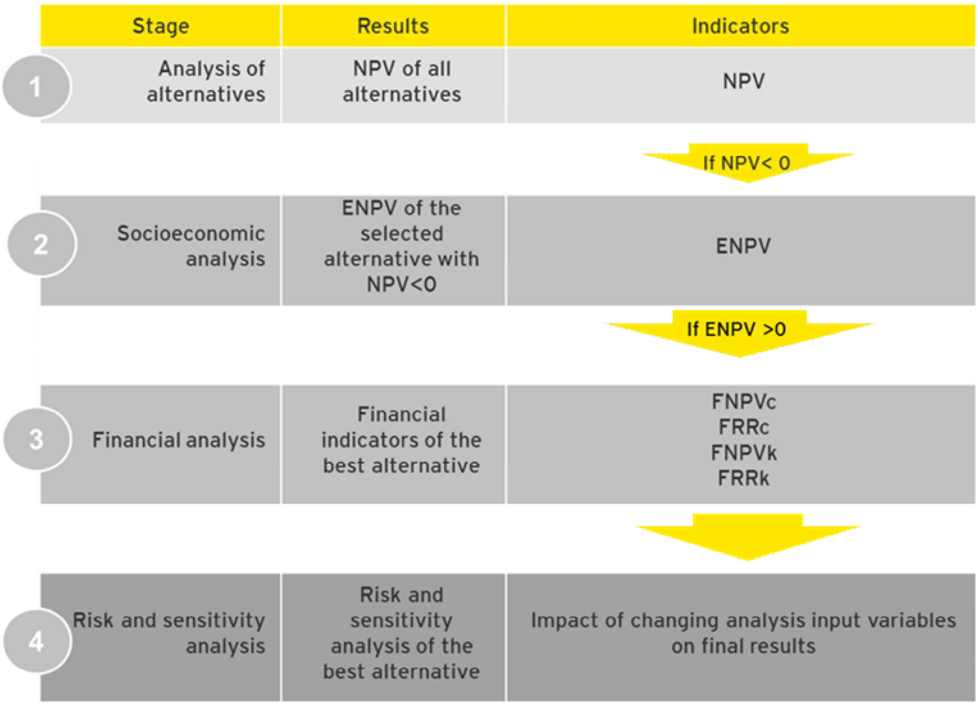


Figure 13 Main stages of the CBA

4.2.2 Economic and financial analysis of the options

The main goal of the analysis of alternatives is to determine the NPV of the project, which shows the financial return of the project.

The main stages in the analysis of options are as follows:

- Definition of the do-nothing option (option against which the incremental cash flows shall be calculated).
- Definition and analysis of project's options (alternatives).
- Incremental cash flows development.
- Economic analysis of the alternatives.
- Financial analysis of the alternatives.

Consolidated financial indicator analysis has been made taking into account consolidated operations of freight and passenger carriers (i.e. for the purposes of the analysis, all of the passenger/freight flows in the analysis have been consolidated for a unified carrier, irrespective of how many actual carrier companies will be present in the market).

According to the CBA guide, the economic and financial analysis is based on analysis using incremental approach (the difference between the analysed option and do-nothing option).

Cash flows development

The main goal of the analysis of the cash flow of the options is to determine the Project's economic and financial NPV in order to determine the applicability of the analysed option for the further stages of analysis (their financial NPV is below 0).

The cash inflows (revenues) and outflows (expenses) for the project have been calculated according to the methodological instructions by the CBA guide[15]. In order to develop cash flow forecast, CAPEX and OPEX for the railway infrastructure manager, freight and passenger operator have been identified. Rail Baltica investment costs (CAPEX) consist of the following parts:

- Rail Baltica infrastructure investment costs:
  - Rail track.
  - Expenses that are associated with the development of infrastructure for freight and passenger transportation.
  - Connections to high voltage grid.
  - Access points.
  - Power supply lines and catenary.
  - Command, control and signalling systems (including ERTMS, etc.).
- Other transport mode infrastructure related investment cost savings

CAPEX savings related to investments that would have been made in do-nothing option, but are avoided because of the construction of Rail Baltica. Revenues consist of the infrastructure access charge payments received by the infrastructure manager from passenger and freight carriers (estimated using the approach described before).

Operational and maintenance costs (OPEX) consists of the following parts:

- Infrastructure manager's operational costs:
  - Infrastructure maintenance costs.
  - Periodic renewal costs.
- Operational costs for passenger/freight carriers:
  - Regular maintenance costs and repair expenses of the rolling stock, which include daily preventive maintenance, regular preventive maintenance, corrective maintenance and cleaning.
  - Energy consumption.
  - Leasing payments for rolling stock.
  - Cost of labour and other administrative expenses.
  - Other overhead expenses.

Economic analysis

In addition to the analysis of the options and cash flows development, economic analysis has been conducted in order to determine the best with-project option of the project. During the economic analysis, such benefits as the reduction of CO_2, NO_x, also time and travel cost savings etc. have been measured (see section on socio-economic analysis 10.1) according to their economic values.

Moreover, since some of the benefits from the Rail Baltica implementation cannot be measured in monetary terms, the quantifiable socioeconomic analysis has been supplemented by the qualitative socioeconomic analysis, to describe the abovementioned financial and economic benefits using comparable case studies, where applicable. Socioeconomic analysis has been made in a quantitative

[15] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf

manner to the extent recommended by the CBA guide (e.g. CO_2, NO_x, time and travel cost savings), but also included qualitative change evaluation, as described in chapter 10.1.2.

Most common groups of the potential socio-economic benefits and costs are:

- Air pollution reduction- Reduction of NMVOC, NO_x, PM2.5, SO_2 in passenger and freight transport.
- Climate change mitigation– The positive impact on climate change is estimated using the economic benefit for climate change per vehicle-km and applying the value to the changes in traffic caused by Rail Baltica. The positive impact results from a decrease in mileage travelled.
- Noise reduction – The positive impact on noise emissions is estimated using the economic benefit for noise reduction per vehicle-km and applying the value to the changes in traffic caused by Rail Baltica. The positive impact results from a decrease in mileage travelled.
- Travel time savings – Travel time saved in comparison to the other transport modes.
- Travel safety increase – Avoided casualties caused by using other modes of transport (both passenger transport and freight transport).
- Impact from investment on GDP and jobs (multipliers) – presented as additional gain to the base socioeconomic cash flows.

Conversion from financial to economic prices has been performed in the form of fiscal correction factors according to the methodological considerations of the CBA guide.

Socio-economic benefits and costs from realization of the project have been determined for each CBA alternative. Results have been further used in the risk and sensitivity analysis.

In order for the project to be beneficial and socio-economically advantageous, ENPV of the selected options with NPV < 0 needs to be higher than zero (ENPV > 0).

Financial analysis

The project's financial sustainability analysis and identification of the financial gap has been made only for the most viable with-project option (see section 7) for the range of defined options for the analysis) from the railway infrastructure manager's perspective (considering both financial and socioeconomic factors.

Financial analysis results in the set financial profitability (FRR, FNPV) and return on national capital (FRR(k) and FNPV(k)). In addition, the financial gap has been calculated and estimation of the required financing from EU funds, as well as the remaining sources of financing have been estimated. Finally, the financial sustainability analysis is carried out and cash flows deficit (situations where cash inflows don't cover cash outflows for the infrastructure manager) has been assessed for each year during the life cycle of the project.

Risk and sensitivity analysis

As final step of the CBA, the risk and sensitivity analysis has been conducted, which has tested the impact of various external and internal factors on the outcome of the financial and economic analysis. The sensitivity analysis allowed determining which particular inputs of the resulting outcomes are the most sensitive. The risk and sensitivity analysis of the project has been conducted from the infrastructure manager's perspective.

The risks have been classified into five groups, as presented in Table 2 below.

Table 2 Risk classification

No	Risk	Description
1	Regulatory risks	► All risks, which depend on legislation and regulations, i.e. compliance with environmental and security requirements, compliance with changes in legislation that are applicable to the project.
2	Financial risks	► All risks, which are connected with the financing of the project, for example, delay in public co-financing, lack of necessary financing, wrong cash flow projections, wrong investment cost and other cost calculations, etc.
3	Strategic risks	► All risks, which depend on the strategic considerations of the project, it's market dynamics and development, as well as the progress of the market in the countries in the region that affect factors such as changes in passenger and freight flows, changes in demand, etc.
4	Operational risks	► All risks, which are connected with the operations of project, such as necessity for new rolling stock and infrastructure maintenance specialists, various processes and procedures, which might go wrong as a result causing delays in operations, for example, wrong planning of necessary support infrastructure, lack of cross-border coordination of the documentation of construction processes, low quality of construction works and potential delays etc., and other risks related to transition to the use of new infrastructure.
5	Technical and construction process risks	► All risks, associated with the construction process, such as lack of local construction capacity etc.

Each identified risk is classified according its potential impact on project, by the following criteria (see Table 3):

Table 3 Meaning of risk classification

Classification	Meaning
I	No relevant effect on social welfare, even without remedial actions.
II	Minor: minor loss of the social welfare generated by the project, minimally affecting the project long run effects – However, remedial or corrective actions are needed.
III	Moderate: Social welfare loss generated by the project, mostly financial damage, even in the medium – long run. Remedial actions may correct the problem.
IV	Critical: High social welfare loss generated by the project; the occurrence of the risk causes a loss of the primary function(s) of the project. Remedial actions, even large in scope, are not enough to avoid serious damage.
V	Catastrophic: Project failure that may result in serious or even total loss of the project functions. Main project effects in the medium-long term do not materialise.

Moreover, each identified risk is classified according to its probability of happening, according to the following criteria (see Table 4):[16]

Table 4 Probability of risk according to classification

Classification	Probability	Probability
A	Very unlikely	0-10%
B	Unlikely	10-33%
C	About as likely as not	33-66%
D	Likely	66-90%
E	Very likely	90-100%

The matrix of risk evaluation is shown in Table 5.

Table 5 Risk matrix

Risk level	Colour
Low	
Moderate	
High	
Unacceptable	

Severity/ Probability	I	II	III	IV	V
A	Low	Low	Low	Low	Moderate
B	Low	Low	Moderate	Moderate	High
C	Low	Moderate	Moderate	High	High
D	Low	Moderate	High	Unacceptable	Unacceptable
E	Moderate	High	Unacceptable	Unacceptable	Unacceptable

[16] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf

5. Economic and market context of the Project

5.1 Macroeconomic overview of the region

Key messages

- ► Foreign trade ties on Rail Baltica axis are strong and economic integration continues
- ► Despite the economic crisis, 10 year historic CAGR of the region's economies is positive and the region's economies are expected to continue outgrowing the average EU growth level

The Table 6 presents selected key macroeconomic indicators for the region (a more detailed information is presented in the appendix Macroeconomic forecasts used for the economic analysis). The cut-off date for the following macroeconomic analysis in the section 5.1. is the most recent data that was available at the moment of performing the analysis.

Table 6 Key macroeconomic indicators of the region

	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

FDI and economic ties in the region

Economic ties between the countries in the region are summarized in the Figure 14 below.

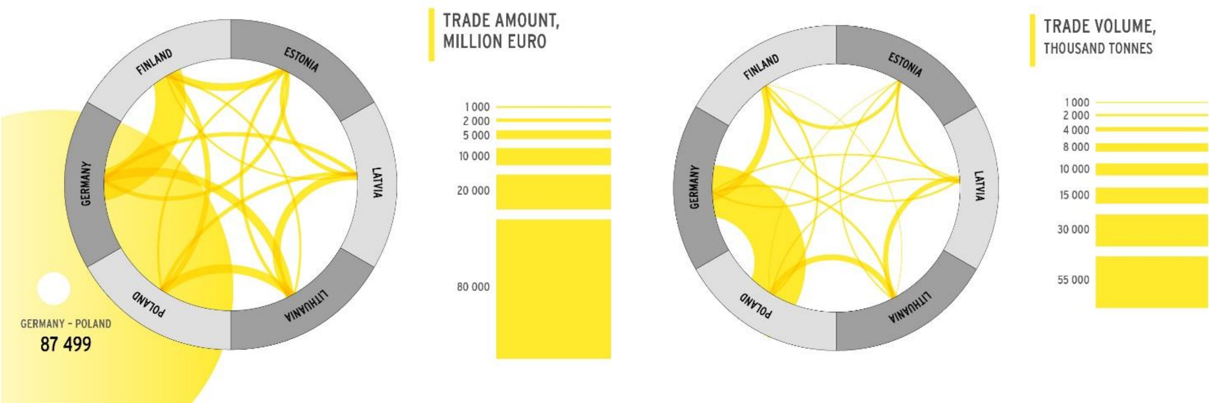


Figure 14 Economic trade in the region

Finland

The accumulated foreign direct investment amount in Finland in 2014 comprised of EUR 77.3 bln. Investments from other region's counties have reached the top-five investor mark[17]. Finland is also the only region's country with a positive FDI balance. The Baltic and Polish markets are also too small to make significant difference to Finland's import/export balances. In 2014, the region comprised only 6.13% of Finland's imports and 6.31% exports (see Figure 15)[18].

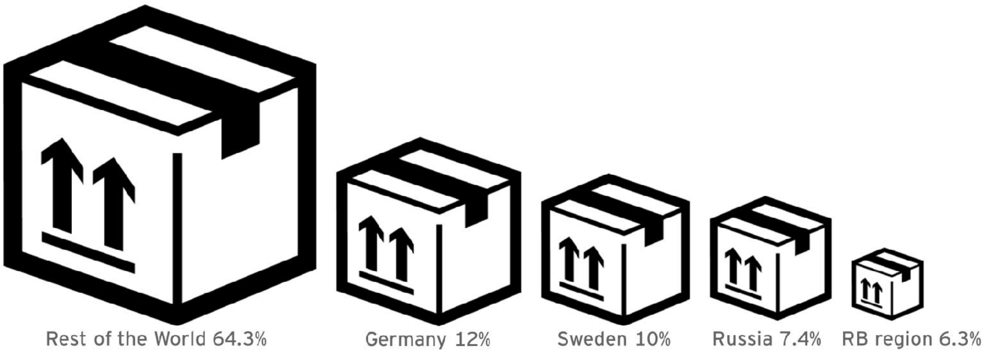


Figure 15 Finland's export structure in 2014

Estonia

The accumulated foreign direct investment amount in Estonia reached EUR 17.3 bln in 2015. Only Finland is amongst the top investors from the Rail Baltica region contributing with 22.6%, or EUR 3.9 bln. Three of the Rail Baltica region countries were among the top five export markets for Estonia in 2015; two – among the top five import origins (see Table 7).

Table 7 Estonia's trade partner structure in 2015[19]

Export form Estonia		Import to Estonia	
Top trade partners	Share, %	Top trade partners	Share, %
Sweden	18.8	Finland	14.5
Finland	16.0	Germany	11.1
Latvia	10.3	Lithuania	9.4
Russia	6.7	Latvia	8.7
Lithuania	5.8	Sweden	8.5
Germany	5.2	Poland	7.4
Norway	4.1	Russia	5.8
Netherlands	3.2	Netherlands	5.5
USA	3.1	China	4.0
Denmark	2.9	United Kingdom	2.7
Others	23.9	Others	22.4

Latvia

The accumulated foreign direct investment amount in Latvia has continually risen since joining the EU in 2004, reaching its peak in 2015 with EUR 15 bln. Rail Baltica region's countries are not the main investors, but still contribute with cumulative 11.22% or EUR 1.68 bln[20]. Two of the region's countries – Lithuania and Estonia – are among top five export destinations with EUR 2.57 bln and EUR 1.04 bln

[17] http://www.stat.fi/til/ssij/2014/ssij_2014_2015-10-30_tie_001_en.html
[18] http://atlas.media.mit.edu/en/profile/country/fin/#Origins
[19] https://www.tradewithestonia.com/estonian/economy-facts
[20] http://www.liaa.gov.lv/en/invest-latvia/investor-business-guide/foreign-direct-investment

respectively. Among top five importer partners are Estonia, Lithuania and Poland with EUR 1.30 bln, EUR 3 bln and EUR 1.94 bln respectively[21].

Lithuania

The cumulative FDI amount in Lithuania in 2014 totalled of EUR 12 bln, having the lowest FDI amount among the Baltic States. Poland is the only Rail Baltica region's country among the top investors in Lithuania, with investments comprising of EUR 713.3 mln (5.9%)[22].

Latvia (EUR 3 bln) and Poland (EUR 1.80 bln) are amongst top five export destinations of Lithuania and top five import origins with EUR 2.58 bln and EUR 3.45 bln respectively[23].

Poland

The accumulated foreign direct investment amount in Poland in 2015 reached EUR 159 bln, and was mostly contributed by Western European countries[24]. Poland had a negative trade balance of EUR 14.3 bln in 2014, and the total export value of EUR 228.6 bln, Poland is one of the largest economies in Europe. The top export destinations of Poland are Germany, the United Kingdom, the Czech Republic, France and Italy. The top import origins are Germany, China, Russia, Italy and the Netherlands. Export to Rail Baltica region countries cumulates to 3.84% and import to 2.05%[25].

All region's countries have close but unequal economic ties due to significant differences in economic and socio-economic levels. Rail Baltica would greatly benefit from Northern connection to Finland and from large export/import volumes of Poland.

5.2 Passenger ecosystem overview

Key messages:

- As evidenced by the Baltic States historical visitor data and mobility survey results, there are strong and growing connections between the Baltic States in terms of people mobility
- Due to the passenger perception of time and cost of travel, Rail Baltica is expected to be the most competitive mode of transport compared to other transport modes for intra-Baltic travellers

5.2.1 Existing passenger movements in the region

Overall cross-border movements between the Baltic States

The observed mobility of inhabitants of the Baltic States initially was examined using publicly available data. Various data sources were used for analysing the historical passenger movement trends in the Baltic States region. Firstly, border crossing and accommodations statistics were used for assessing the overall passenger movement volumes in the region. This data was supplemented with the publicly available data from airlines, bus and rail companies for comparing transport modes against each other and Rail Baltica. Lastly, existing passenger movement volumes were compared and aligned by the mobility survey in order to get a clearer picture of passenger movement preferences by transport mode between key Rail Baltica relevant nodes.

[21] 2014 data; http://atlas.media.mit.edu/en/profile/country/lva/
[22] http://www.lbank.lt/direct_investment_in_2014_1
[23] http://atlas.media.mit.edu/en/profile/country/ltu/
[24] http://www.paiz.gov.pl/poland_in_figures/foreign_direct_investment
[25] http://atlas.media.mit.edu/en/profile/country/pol/#Destinations

Table 8 to Table 10 indicates the annual number of visitors that originate from the Baltic States and travels within the Baltic States and the total number of visitors in each of the Baltic States countries. Numbers are based on one-day visitor amount and on visitor amount at accommodation establishments. To estimate the potential traveller base, the numbers are multiplied by two, to reflect the total number of journeys taken by a visitor when traveling to and from a destination.

Please note that as the numbers from Table 8 to Table 10 are compiled from various data sources, they should be viewed as approximations not as entirely accurate data. In addition, they might potentially underestimate the actual visitor volumes as they are based on accommodation and one-day visitor statistics only, as the one-day trips are estimated by the national statistics offices in contrast to accommodation data that are registered by the hospitality industry.

Furthermore, the intra Baltic States traveller share could also be argued to be larger (Table 8 to Table 10). This is due to visitor origin country breakdown being based on accommodation statistics only (the same proportion being applied to one-day visitors as the national statistics offices do not have such a breakdown available for one-day visitors). Even though there is a statistic uncertainty, it seems reasonable that on average the portion of one-day visitors from the Baltic States could be larger compared to other countries due to such factors as, for example, strong economic integration (see chapter 5.1 Macroeconomic overview of the region), geographical proximity and connectivity.

Table 8 Estonia's visitors (in thousands)[26]

Year	Visitors from LV	LV share of total EE visitor amount, %	Share of total LV travelers visiting EE, %	Visitors from LT	LT share of total EE visitor amount, %	Share of total LT travelers visiting EE, %	Total visitors from LV & LT	Share of LV & LT visitors, %	Total amount visiting EE	Share of 1-day visits, %
2010	359	4.6%	10.8%	168	2.2%	2.4%	527	6.8%	7 725	49.2%
2011	417	4.7%	10.8%	230	2.6%	3.1%	647	7.3%	8 845	49.5%
2012	477	5.4%	10.1%	224	2.5%	2.8%	701	7.9%	8 872	48.3%
2013	563	5.4%	12.7%	279	2.7%	3.0%	842	8.1%	10 361	53.0%
2014	598	5.7%	7.0%	278	2.6%	2.9%	876	8.3%	10 516	52.9%
2015	619	6.6%	13.6%	265	2.8%	2.9%	884	9.5%	9 339	47.8%
CAGR[27]	11.5%			9.5%			10.9%		3.9%	

Table 9 Latvia's visitors (in thousands)[28]

Year	Visitors from LT	LT share of total LV visitor amount, %	Share of total LT travelers visiting, LV, %	Visitors from EE	EE share of total LV visitor amount, %	Share of total EE travelers visiting LV, %	Total visitors from LT & EE	Share of LT & EE visitors, %	Total amount visiting LV	Share of 1-day visits, %
2010	685	6.7%	9.1%	510	5.0%	15.6%	1 195	11.8%	10 168	72.4%
2011	1 008	8.0%	11.8%	713	5.7%	15.6%	1 722	13.7%	12 604	73.0%
2012	880	6.7%	9.5%	738	5.6%	13.7%	1 618	12.3%	13 125	74.2%
2013	1 000	7.2%	10.8%	848	6.1%	16.4%	1 848	13.3%	13 850	73.6%
2014	1 060	7.3%	11.7%	939	6.5%	28.5%	2 000	13.7%	14 557	70.5%

[26] https://www.visitestonia.com/en/for-tourism-professional/reviews
http://statistika.eestipank.ee/?lng=en#listMenu/1770/treeMenu/MAKSEBIL_JA_INVPOS/1410
[27] Hereinafter – “Compound Annual Growth Rate”
[28] http://data.csb.gov.lv/pxweb/lv/transp/transp__ikgad__turisms/TU0020.px/?rxid=649bf089-fcf3-42f8-84f3-37e8c37af823

Year	Visitors from LT	LT share of total LV visitor amount, %	Share of total LT travelers visiting, LV, %	Visitors from EE	EE share of total LV visitor amount, %	Share of total EE travelers visiting LV, %	Total visitors from LT & EE	Share of LT & EE visitors, %	Total amount visiting LV	Share of 1-day visits, %
2015	1 307	8.5%	13.1%	1 108	7.2%	20.1%	2 415	15.7%	15 384	70.4%
CAGR	13.8%			16.8%			15.1%		8.6%	

Table 10 Lithuania's visitors (in thousands)[29]

Year	Visitors from LV	LV share of total LT visitor amount, %	Share of total LV travelers visiting, LT, %	Visitors from EE	EE share of total LT visitor amount, %	Share of total EE travelers visiting, LT, %	Total visitors from LV & EE	Share of LV & EE visitors, %	Total amount visiting LT	Share of 1-day visits, %*
2010	590	7.9%	11.5%**	289	3.9%	4.9%**	879	11.8%	7 458	61.1%
2011	581	6.6%	11.5%**	329	3.7%	4.9%**	910	10.3%	8 820	61.1%
2012	641	6.8%	10.9%	333	3.5%	3.0%	975	10.3%	9 444	61.1%
2013	675	6.7%	9.9%	341	3.4%	5.5%	1 016	10.1%	10 012	61.1%
2014	811	7.9%	11.4%	368	3.6%	7.6%	1 180	11.5%	10 296	61.1%
2015	897	8.6%	13.8%	404	3.9%	6.1%	1 301	12.4%	10 465	61.1%
CAGR	8.7%			7.0%			8.2%		7.0%	

* Estimated as the average of 1-day visits of Latvia and Estonia, due to limited data available
** Average of 2012 to 2015 numbers to due to limited data available

The overall statistical foreign travel data provide the following observations about the travelling habits:

- The share of people visiting Estonia from the other two Baltic States countries has gone up from 6.8% to 9.5% between 2010 and 2015 (from 527 thousand to 884 thousand, CAGR of 10.9%). In addition to that, between 2010 and 2015 10.8% of Latvians and 2.9% of Lithuanians going abroad chose to go to Estonia. Furthermore, out of all visits to Estonia, 50.1% were 1-day visits.
- The share of people visiting Latvia from the other two Baltic States countries has gone up from 11.8% to 15.7% between 2010 and 2015 (from 1 195 thousand to 2 415 thousand, CAGR of 15.1%), and is the highest amongst the Baltic States. This is reinforced by the fact that between 2010 and 2015 11.0% of Lithuanians and 18.3% of Estonians going abroad chose to go to Latvia. Furthermore, out of all visits to Latvia, 72.4% were 1-day visits.
- Share of people visiting Lithuania from the other two Baltic States countries has gone up from 11.8% to 12.4% between 2010 and 2015 (from 879 thousand to 1 301 thousand, CAGR of 8.2%). Even though the intra Baltic States visitor growth has been lower in Lithuania compared to Latvia and Estonia, as of 2015, the total visitor amount in Lithuania still remained by 400 thousand more than in Estonia. In addition to that, between 2010 and 2015 11.5% of Latvians and 5.3% of Estonians going abroad chose to go to Lithuania. Furthermore, out of all visits to Lithuania, 61.1% are estimated to have been 1-day visits.

Publicly available passenger movement statistics in the Baltic States are limited as they do not provide a detailed enough passenger movement breakdown by Rail Baltica relevant transport routes, and they do not fully align with the implied estimations when observing the road traffic data (see next sub-chapter).

[29] http://osp.stat.gov.lt/en/statistiniu-rodikliu-analize?portletFormName=visualization&hash=d0d1de14-1fe5-4cce-9612-81f78e94a2bf
http://www.tourism.lt/en/accommodation-statistics

Similarly, there is not transport modal split breakdown available to the level of detail required for the CBA. To overcome data limitations, a mobility survey was conducted in the Baltic States get a better insight on passenger travelling preferences. The survey contributed to understanding passenger traffic intensities across the Rail Baltica relevant origin/destination nodes, as well as getting a modal split breakdown across the relevant transport modes. The survey covered a sample of over 1 000 participants in each country (spread across age, geographic location and other factors to statistically represent the populations of the respective countries).

Existing transport movements between relevant nodes for Rail Baltica

In addition to the mobility survey, publicly available data about traffic intensities per country was gathered to supplement the analysis and determine the intensity and modal split of movements along the planned Rail Baltica route. Also, the results of the mobility survey were calibrated to correspond the available traffic intensities data (to avoid any potential overestimation of the traffic due to limited scope and time of the mobility survey). Figure 16 shows travel intensity data collected from public sources[30].

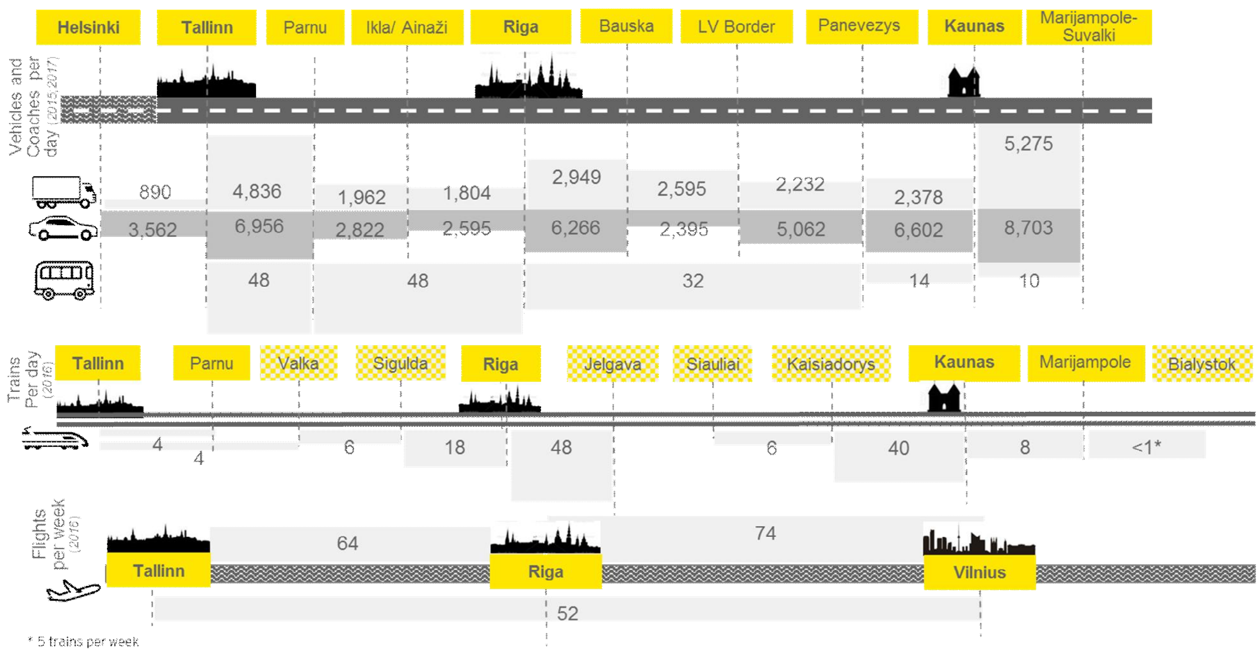


Figure 16 Overview of existing transport unit movements between relevant nodes for Rail Baltica

Note that the discrepancies in the vehicle average daily movement number (Figure 16) between different points of measurement are due to vehicles going on and off from the main motorway (Via Baltica for the most of the journey) at different sections and in various volumes (e.g. 2 395 cars from Bauska to LV border and 5 062 cars from LV border to Panevezys is caused by cars going on and off the main road at such points as Birzai, Pasvalys etc. In such cases the lower number is taken as reference for the analysis for prudency purposes).

[30] Source: Latvian State Roads, Estonia Road administration, Road and transport research institute in Lithuania, Riga International airport, Vilnius International airport, Kaunas airport homepage, Lithuanian railways, City of Helsinki, Online ticket aggregators

The resulting estimates of passenger movements along the Rail Baltica route can be observed in the Figure 17 which indicates an estimate of daily two-way travel intensities along the key Rail Baltica sections (for the base year of forecasts) and which indicates traffic intensities for all transport modes.

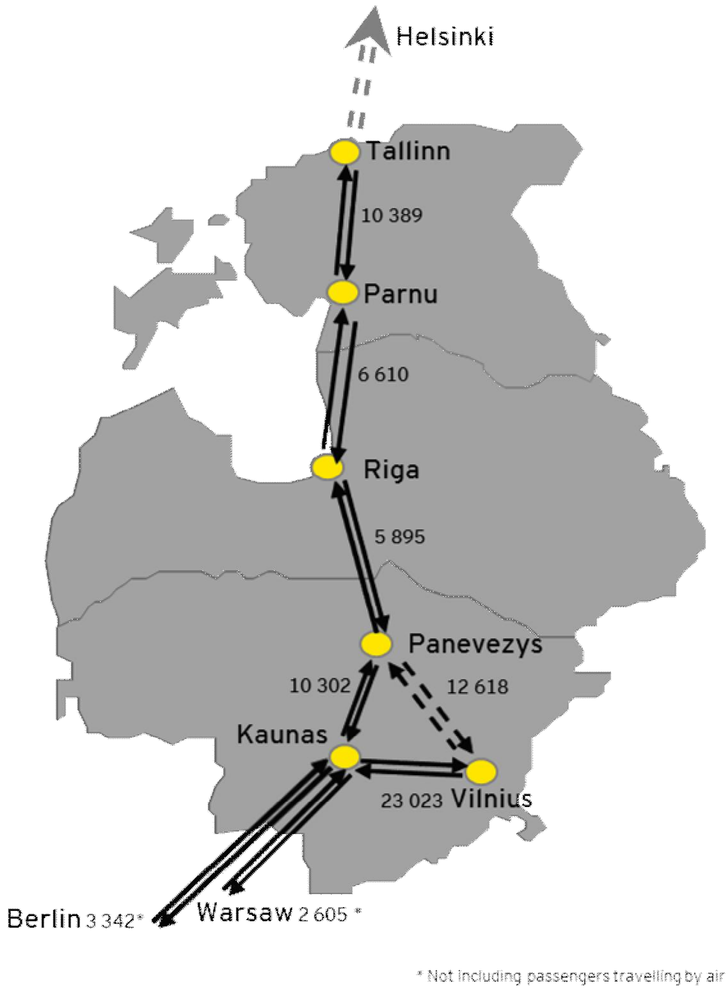


Figure 17 Overview of daily passenger movements between relevant nodes for Rail Baltica (2015 estimate)

The mobility survey also provided an insight for the reasons for travel. According to the responses, approximately one third of travellers from Tallinn to Riga are travelling due to the business reasons, while only 20% of travellers from Riga to Tallinn are business travellers. Approximately 70% of people travelling from Parnu to Tallinn are travelling due to private reasons, while only 14% are business trips. The percentage of business travellers between Vilnius and Riga is around 25%.

Modal split

Based on the mobility survey and existing traffic intensities in the Baltic States, the following modal split has been estimated (see Table 11 and *Figure 18*). Personal cars are estimated to account for more than 80% of the total passenger traffic in the observed key Rail Baltica relevant routes. Another road transport mode – buses - has the second place with nearly 9% of the relevant traffic volume. Existing rail and air transport modes combined represent modal share roughly similar to the buses. Note that the figures represent the annual number of trips for the relevant O/D pairs for Rail Baltica. Unique trips are those 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 counted in the following sections of Rail Baltica: Kaunas – Panevezys, Panevezys – RIX, RIX – Riga, Riga – Parnu, Parnu –Tallinn.

Table 11 Passenger modal split in the key relevant Rail Baltica routes

Transport mode	Passengers (in thousands)	Share, %
Personal car	33 073	80.8%
Bus	3 517	8.6%
Existing rail	2 478	6.1%
Air	1 878	4.6%
Total	40 945	100%

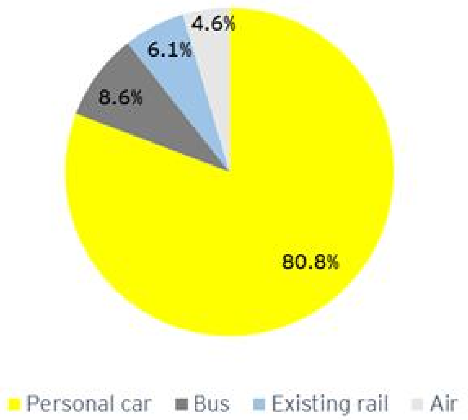


Figure 18 Passenger modal split in the key relevant Rail Baltica routes

In addition to the overall intra-Baltic visitors growth (Table 8 to Table 10), the bus and air passenger growth data also supports the overall growth of passenger movements, despite adverse demographic trends. Figure 19 indicates that between 2013 and 2016 there has been a significant growth (CAGR of 10.3%) of passengers travelling by LUX Express busses (Lux Express was chosen due to availability of data) between the Baltic States countries.

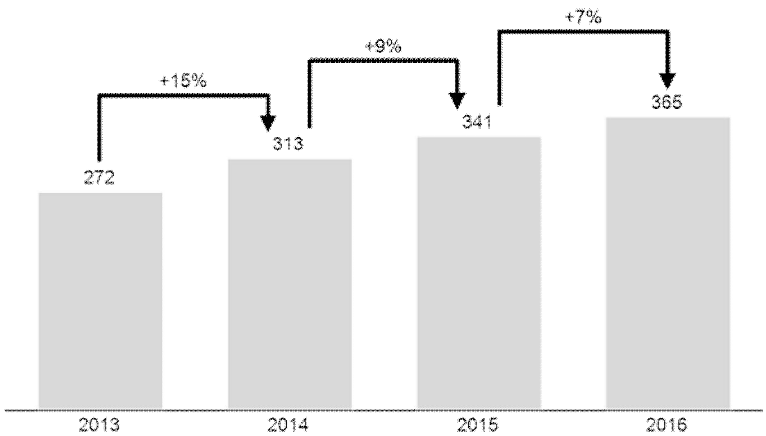


Figure 19 Passenger traffic between the Baltic States countries by LUX Express busses (in thousands of passengers)[31]

In addition, there has been observable growth in air passengers travelling within the Baltic States. Between 2005 and 2014 the total passenger amount increased from 121.1 thousand (see Table 12) to nearly half a million (17.0% CAGR).

[31] https://luxexpress.eu/en/results

Table 12 Air passenger movements within the Baltic States[32]

O/D Pair	RIX-TLL[33]	RIX-VNO[34]	VNO-TLL	Total	Growth
2005	27 703	20 536	72 903	121 142	
2006	32 443	21 307	77 714	131 464	8.5%
2007	42 798	29 234	103 036	175 068	33.2%
2008	78 382	88 199	166 582	333 163	90.3%
2009	154 985	192 059	69 652	416 696	25.1%
2010	150 382	157 066	111 173	418 621	0.5%
2011	173 971	192 097	70 432	436 500	4.3%
2012	187 121	178 527	111 845	477 493	9.4%
2013	198 219	181 615	85 224	465 058	-2.6%
2014	185 088	176 117	136 784	497 989	7.1%
CAGR	23.5%	27.0%	7.2%	17.0%	

Due to competitiveness reasons explained in the next chapter, foreign (outside of the Baltic States) tourist flow is not included in the base demand model passenger flow but treated as potentially a very conservative induced demand created by Rail Baltica.

5.2.2 Comparison of competing transport modes in the region

For the purpose of this study, this section examines the competitive positions of Rail Baltica, existing railways network, road, sea and air for passenger transport. The competitive position examination is conducted through the estimation of time and costs (see Figure 20) as well as other factors that may influence passenger choice of mode for travel through the major trade regions (reflective of the WCAs) examined within the context of this study[35]. The passenger travel destinations were considered for the following regional connections:

- The Baltic States – intra travel.
- The Baltic States – Poland (Warsaw).
- The Baltic States – Germany (Berlin, Hamburg).
- The Baltic States – Benelux.
- The Baltic States – Adriatic region.
- The Baltic States – Southeast Europe.
- The Baltic States – Largest CIS countries (that have the 1520 mm railway gauge).

[32] http://ec.europa.eu/eurostat/statistics-explained/index.php/Air_passenger_transport_-_monthly_statistics
[33] Tallinn Airport
[34] Vilnius Airport
[35] Some regions have not been included as there were no available passenger travel routes for those regions based on the assumptions.

Baltic States	Baltics	Poland	Germany	BeNeLux	Adriatic	Southern EU	CIS
	€/100km | hr./100 km	€/100km | hr./100 km	€/100km | hr./100 km	€/100km | hr./100 km	€/100km | hr./100 km	€/100km | hr./100 km	€/100km | hr./100 km
RB	10.4 0.66						
Existing rail	5.17 | 1.39	4,4 | 1.40****	- *	- *	- *	- *	5.69 | 3.76
Road (PT)**	6.24 | 1.73	4,09 | 1.90	4.45 | 1.52	4.85 | 1.78	- *	4.54 | 1.83	5.71 | 2.20
Road (Own)**	22 | 1,21	22 | 1.32	22 | 1.13	22 | 1.05	22 | 1.08	22 | 1,14	22 | 1.26
Air (P)***	11.24 | 0.50	13,38 | 0.27	11.58 | 0.35	8.81 | 0.23	5.17 | 0.22	6.61 | 0.35	12.64 | 0.34
Air (B)***	24.98 | 0.50	18 | 0.27	19.82 | 0.35	15.36 | 0.23	7 | 0.22	13.03 | 0.35	18.17 | 0.34

* Denotes that the connection with this destination currently is not possible based on the presented assumptions

** Road transport is from the perspective of Public Transport (PT) and the use of own vehicle (Own).

*** Additional 1 h is added to reflect the additional time spent on arriving earlier to an airport to have a sufficient time for security check, boarding etc. Air (P) denotes estimations presented for passengers travelling for personal purposes whereby tickets are purchased month advance, and Air (B) denotes estimation presented for passengers travelling for business purposes whereby tickets are purchased a few weeks in advance.

**** Price and time estimation are based on the only train service currently available: Kaunas – Bialystok

Figure 20 Summary information regarding price and time estimation of passenger travel by different transport modes from the Baltic States to selected regions (based on EY calculations from publicly available data)

In terms of travel time between the Rail Baltica relevant routes, Rail Baltica has an advantage over cars and buses (see Table 13). In addition, in relatively short distances within the Baltic States (highlighted in green colour), it is estimated that travelling with Rail Baltica would take similar amount of time as air travel considering the time spent in the airport and getting to/from the airport. This is due to the fact that air travel requires additional time on such activities as security check, boarding etc., as well as longer access times due to usually non-central location of airports. However, when travelling longer distances (e.g. Tallinn – Warsaw, Riga – Berlin), airplanes do provide a significant time savings compared to Rail Baltica.

Table 13 Transport mode travelling time comparison for selected journeys[36]

Route	Cars	Buses	Airplanes (including security, check in and boarding time - 1h*)	RB
Tallinn - Riga**	4:05	4:20	1:50	1:55
Tallinn - Kaunas	7:24	8:40	-	3:20
Tallinn - Warsaw	12:10	16:20	2:40	6:00
Tallinn - Berlin	17:00	23:50	3:20	9:40
Tallinn - Vilnius	7:00	8:50	2:10	3:55
Riga - Tallinn**	4:05	4:20	1:50	1:55
Riga - Kaunas	3:19	3:50	-	1:25
Riga - Warsaw	8:20	11:50	2:30	4:00
Riga - Berlin	15:40	19:20	3:00	7:40
Riga - Vilnius	3:30	4:00	1:50	2:00
Kaunas - Riga	3:19	3:50	-	1:25
Kaunas - Tallinn	7:24	8:40	-	3:20
Kaunas - Warsaw	5:30	7:10	-	2:20
Kaunas - Berlin	10:50	14:20	-	6:00
Kaunas - Vilnius***	1:10	1:30	-	0:35
Vilnius - Riga	3:30	4:00	1:50	2:00
Vilnius - Tallinn	7:00	8:50	2:10	3:55
Vilnius - Warsaw	6:00	7:45	2:10	3:10
Vilnius - Berlin	11:20	16:30	3:00	6:50
Vilnius - Kaunas***	1:10	1:30	-	0:35

* 1 h is added to reflect the additional time spent on arriving earlier to an airport to have a sufficient time for security check and boarding. In addition, 1 h also includes airplane's waiting time before take-off and after landing.

** Currently there is a 1520 mm train operating between Tallinn-Tartu-Valga/Valka-Riga. Journey takes approximately 8 hours

*** Currently there is a 1520 mm train operating between Vilnius and Kaunas. The journey takes between 1:09h and 1:36h.

[36] Source: Google maps, Lux Express, Air Baltic, Online ticket aggregators, Lithuanian railways

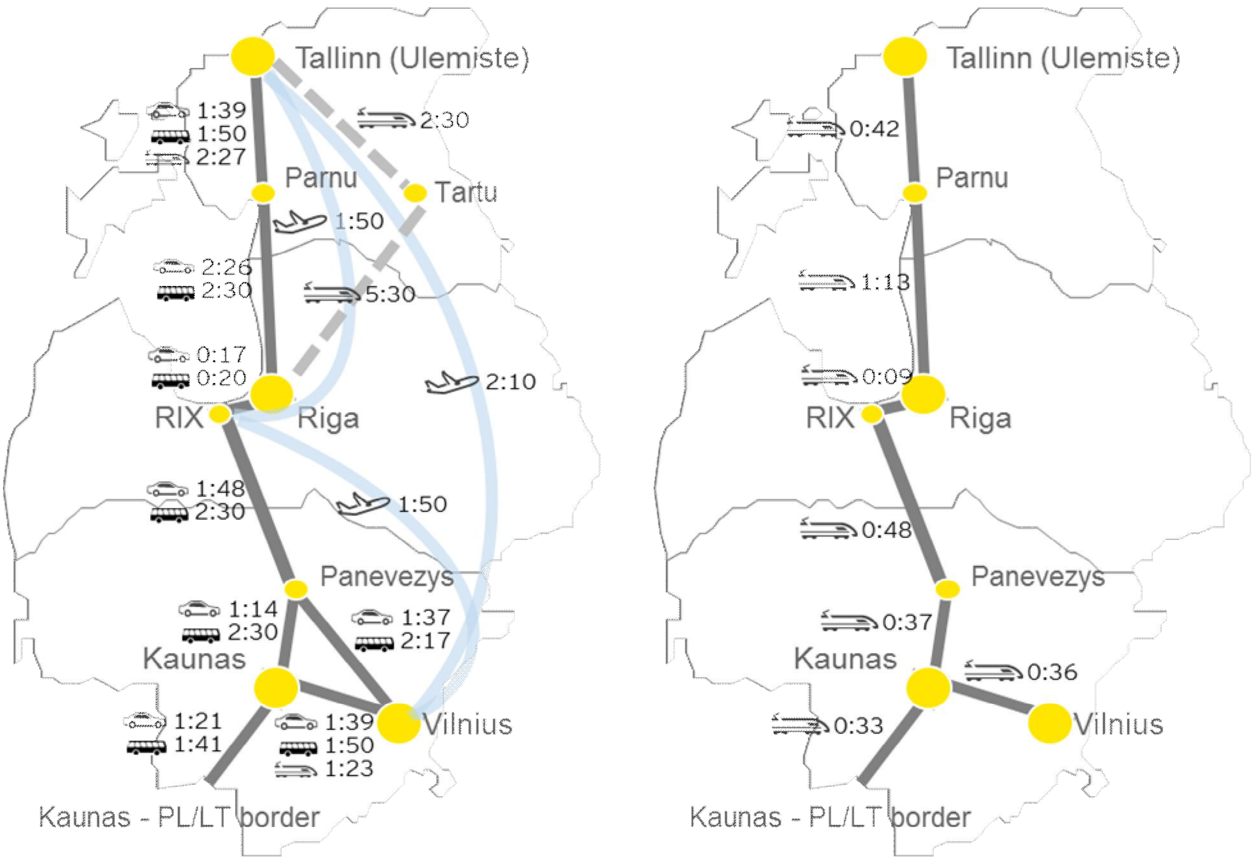


Figure 21 Schematic map of passenger travel time comparison (existing – left, RB only – right)[37]

The estimation of time and costs are based on publically available passenger ticket portals. The key assumptions[38] for the assessment of price and time estimations consisted of:

- Passenger transport only considered for direct connections with the defined transport mode to the major cities of the considered major trade regions above (i.e. capital cities, major destination cities).
- A single passenger is travelling to a single direction (one-way journey).
- Ticket price was selected by taking the average (if available) prices of the lower tier tickets (i.e. luxury tickets of the selected transport mode for the selected journey were not considered), and calculated on a EUR / 100 km basis.
- Time is based on the average time taken to the destination which corresponded with the selected tickets for the price calculations, and is presented on a hours / 100 km basis.
- Ticket prices were estimated by reviewing the price, availability and duration of travel on Friday[39], where possible.

There are ferries operating between Liepaja (LV) and Travemunde (DE)[40], and between Klaipeda (LT) and Kiel (DE)[41]. However, Liepaja is located 216 km from Riga and Klaipeda is 213 km away from Kaunas[42]. In addition to that, these ferries have limited facilities and are more intended for truck transportation. Accordingly, the potential amount of passengers travelling on these ferries instead of

[37] Based on publicly available information and EY estimations
[38] Further assumptions are presented in section "CBA assumptions"
[39] The week day Friday was taken on the basis as it can serve both business passengers and passengers travelling for vacation or family visits.
[40] www.stenaline.lv
[41] https://www.dfdsseaways.lv/pramju-linijas/klaipeda-kile/saraksts
[42] https://maps.google.com

choosing Rail Baltica is estimated to be marginal. Therefore, sea transportation is perceived as a non-competitive mode of transport for passengers traveling from/to the Baltic States and will not be considered further. The price and time estimations of direct passenger travel by different transport modes from the Baltic States to the selected major trade regions are summarized in Figure 20.

Table 14 provides an insight of travel cost comparison between the key Rail Baltica relevant routes with different transport modes. Car travel cost derives from the estimated average cost of per 1km (see section 9.1 CBA assumptions for detailed list of pricing and cost assumptions) multiplied by the distance of the respective route (see section 9.1 CBA assumptions) and is rounded to full figures. Bus and Airplane cost derives from the approximation of the route's average ticket cost that has been provided by the companies operating in the route (Lux Express, Ecolines, Air Baltic, Lot airlines, Ryanair, Nordica). In order to reflect also business traveller booking patterns, ticket prices are used for bookings 1-2 weeks in advance (data gathered during March 2017).

As Table 14 indicates, travelling with Rail Baltica would be cheaper than travelling with cars in all of the given routes, (for comparative purposes it has been considered that there is only one person per a car). On the other hand, in every given case, traveling by bus tends to be significantly cheaper than with Rail Baltica. Nonetheless, such pattern can be observed in the European transportation market, as fast conventional and/or high speed rail provides time saving in exchange for higher price[43]. When Rail Baltica potential ticket cost is compared to aviation ticket prices, Rail Baltica tends to provide significant cost savings on shorter distance travelling (e.g. the intra-Baltic travelling). However, in longer distances, the difference in the ticked prices between Rail Baltica and airplanes tends to narrow, eventually leading to observation that flying to Berlin from the Baltic States would be cheaper than using Rail Baltica.

[43] Online ticket aggregator www.goeuro.com

Table 14 Transport mode cost comparison for selected journeys [44]

Route	Personal cars*	Buses	Airplanes	RB
Tallinn - Riga**	68	17	110	38
Tallinn - Kaunas	127	30	-	65
Tallinn - Vilnius	132	28	130	76
Tallinn - Warsaw	213	38	150	106
Tallinn - Berlin	336	55	160	166
Riga - Tallinn**	68	17	110	38
Riga - Kaunas	59	19	-	27
Riga - Vilnius	65	16	48	38
Riga - Warsaw	146	30	101	68
Riga - Berlin	259	25	60	128
Kaunas - Tallinn	127	30	-	65
Kaunas - Riga	59	19	-	27
Kaunas - Vilnius***	24	6	-	11
Kaunas - Warsaw	90	15	-	41
Kaunas - Berlin	213	44	-	100
Vilnius - Tallinn	132	28	130	76
Vilnius - Riga	65	16	48	38
Vilnius - Kaunas***	24	6	-	11
Vilnius - Warsaw	101	18	165	51
Vilnius - Berlin	224	44	44	111

* Car costs include not only the cost of the fuel, but all car related costs (maintenance, depreciation, taxes etc.)

** Currently there is a 1520 mm train operating between Tallinn-Tartu-Valga/Valka-Riga. The journey costs approximately 22 EUR

*** Currently there is a 1520 mm train operating between Vilnius and Kaunas. The journey costs between 4.46 EUR and 6.08 EUR

It is important to note that the connection between Finland and the Baltic States and then the rest of major connection regions is primarily served by shuttle ferries. Thus, passenger travel from Finland (except by air) should include an additional 2.5 hour journey time and the respective costs based on transport mode to cross the Baltic Sea between Tallinn and Helsinki[45]. This should be added on top of the journey time and cost estimation by Rail Baltica from the Baltic States to the considered major regional connections above. Accordingly, the passenger amount that would originate from Finland would be marginal and to a large extent considered as induced demand.

Air transport is by far the fastest mode of transport, especially in longer distance journeys. However, for intra-Baltic travelling, this difference is diminished due to routes being in rather medium distance length and additional time required before and after the flight.

Road transport with personal car is the second fastest mode of transport, however, it is also the most expensive one in case only a single person[46] is travelling. Multi passenger transport via road (own) costs linearly decrease based on the number of passengers travelling by a single vehicle as the costs can be shared.

[44] Source: Lux Express, Ecolines, Air Baltic, Lot airlines, Ryanair, Nordica, Online ticket aggregators

[45] The ferry takes approximately 2,5 hours and the prices for a return ticket start from approximately 90 euros for a standard car with passenger, and for a single passenger prices start from approximately 40 euros (based on https://www.aferry.com).

[46] Note that one person per a car is presented for simplicity of the illustration, however, in further analysis (section 10.1.1 Core CBA assumptions) the average Baltic traveller number per car is used (1.45)

Based on the results of the analysis, it can be argued that passenger travelling for private needs by air (assuming a booking is made many months in advance at a lower cost, compared to booking a few or several days before the flight) also is more competitive in terms of price compared to other modes of transport. For air passengers who are travelling for business purposes, price tends to be significantly higher, as air fares tend to be more expensive closer to the date of the scheduled flights.

Similarly as for airplane tickets, rail ticket prices also tend to vary based on how many days before the journey they are purchased, as an example, if the tickets are purchased well in advance National rail offers discounts.[47] Nonetheless, when travelling regularly by train, monthly or annual advance tickets can be purchased to mitigate the purchase time impact on the average ticket price, as an example Deutsche Bahn offers a variety of frequent travel cards that can reduce the fare price starting from 25%.[48]

Also, it can be noted that the average travel time (hours per 100 km) by road transport varies depending on the region being travelled to (see Table 13). Notably, the average travel time per 100 km in Poland and in the Baltic States is significantly greater than the average travel time in Germany and Benelux. Journey time via road transport is highly dependent on the availability of high-speed roads. This creates a favourable position for a high speed passenger railway to travel the journey from the Baltic States to Poland, as railroad conditions will not impact average travelling time, therefore, the route from the Baltic States to Poland by fast conventional rail may also be very competitive compared to road transport, if the prices remain similar to the values presented above (see *Table 14*) for the intra-Baltic travel and travel to CIS region.

While for travel by existing railways (to the regions where it is currently possible) the price is comparable to road public transport mode pricing, and in the case of intra-Baltic travel, the journey time is also more favourable for travel with the existing railway. With respect to comparability of travel to the CIS region, it is important to note that in the time estimates for existing railways and road connections, the element of border crossing has been factored in.

Furthermore, it is also important to note that currently there is only a single limited railway connection for passengers between the Baltic States to the EU, Kaunas – Bialystok. With the addition of different routes, passenger travel by railways may become a competitive alternative mode of transport, especially for the route Vilnius/Kaunas – Warsaw. This is because Warsaw if one of the closest major international airports that passengers utilize for cheaper and direct flights, and currently the land leg is provided by road public transport mode.

Of course, passenger choice of transport mode is not always dependent on price and time of the journey. Other journey components need to be considered as well when comparing the competitiveness of different passenger transport modes, including:

- Flexibility
- Passenger comfort

[47] http://ojp.nationalrail.co.uk/service/farefinder/search
[48] https://www.bahn.com/en/view/offers/bahncard/bahncard.shtml?dbkanal_007=L04_S02_D002_KIN0060_ST-BAHNCARD_LZ01

- Productive time
- Auxiliary services

Flexibility

Flexibility refers to travellers to be able to change/adapt their travel destination options to better suit their final destination. From this perspective, road (personal) transport is the most flexible, allowing the traveller to reach the final point of destination directly, while other transport modes such as railways and air travel have fixed arrival locations. Road public transport may provide some flexibility, depending on the level of service provided by the operator and may make some interim stops that allow certain passengers to arrive closer to their final destination. The necessity to make additional journeys via public transport or taxi services to reach the final destination may be key discouraging passengers from choosing different modes of transport as opposed to travelling with their own vehicles.

Passenger comfort

Passenger comfort refers to the environment that the passenger is in whilst making the journey. This includes a variety of aspects such as size of the seat, leg room, surrounding passengers and personal space, etc.

It can be argued that there are advantages in the terms of passenger comfort for modern passenger railway carriages, which provide comfortable seating, greatest areas of leg room and overall more personal space. Furthermore, it is common that passenger railway carriages provide larger fixed tables, in comparison to those available on air or road public transport services.

In addition, there are electricity outlets, food and drinks services, rest rooms and other service level increasing facilities and services. Moreover, train journeys tend to be smoother than air (due to landing, take-off and turbulence zones) and road journeys (due to roads being uneven and potentially not maintained well).

Productive time

Productive time is the time that a passenger during his journey can spend on doing more productive aspects than being involved with the actual travel (e.g. driving a vehicle). As illustrated in VIA Rail Canada example[49], Toronto to Montreal journey, if taken by:

- Rail, consists of approximately 5 hours of productive and no wasted time
- Plane, consists of approximately 1:15 hours of productive and 2 hours of wasted time
- Car, consists of approximately zero productive and 5:30 hours of wasted time

Auxiliary services

Auxiliary services refer to the aspects that provide comfort and convenience to the traveller, such as catering, power outlets, Wi-Fi, bathrooms, etc. where in certain categories rail transport might have competitive advantage.

[49] http://www.viarail.ca/en/plan-your-trip/book-travel/compare-train-and-car

5.3 Freight ecosystem overview

Key messages:

- Europe has close economic ties with multiple overseas countries and trade is mostly organized via sea
- There is potential for rail freight from/to China and other East/Central Asian countries as they increasingly use the land connection as an alternative to sea transport

5.3.1 Trade from global and pan-European perspective

Overview

Volumes of the world trade and the global population are constantly growing, and, with them, the demand for transportation. This is true for both passenger transportation, which will increase particularly strongly in developing and emerging markets, and freight transportation, where the growth forecasts are even higher.

One of the reasons that goods exports have historically been growing faster than the economy as a whole has been the increasing cross-border trade in intermediate goods. Lower costs of trading are making it increasingly attractive to split value chains and create "multi-layered, regional and international production processes (fragmentation[50])." Current observations indicate that the ratio of trade vs economy growth is reducing to the level of 1970's, however, there are still different opinions of whether this is cyclical or permanent trend and the ratio even after the reduction is still above 1 at the level of 1.5[51].

Figure 22 provides an insight in the top five EU export and import markets by the average freight volume (in million tonnes) between 2004 and 2015. In addition, the average value per weight is indicated (thous. EUR per tonne), indicating to which countries were exported and imported more value adding goods and vice versa.

Table 15 EU top export markets summary between 2004 and 2015 (in million tonnes)[52]

Year	United States	Switzerland	Turkey	China	Russia
CAGR (2004-2015)	-3.2%	0.9%	4.6%	8.8%	0.3%
Average (2004-2015)	73	41	38	32	23
Thous. EUR/t (2004)	2.5	1.9	1.5	2.6	2.9
Thous. EUR/t (2015)	5.6	3.6	1.8	3.7	4.4
CAGR (thous. EUR/t) (2004-2015)	7.7%	5.6%	1.7%	3.1%	4.1%
Avg. Thous. EUR/t	3.7	2.8	1.6	3.3	3.8

50 http://ec.europa.eu/economy_finance/publications/economic_paper/2013/pdf/ecp484_en.pdf
51 http://voxeu.org/sites/default/files/file/Global%20Trade%20Slowdown_nocover.pdf
52 http://madb.europa.eu/madb/statistical_form.htm

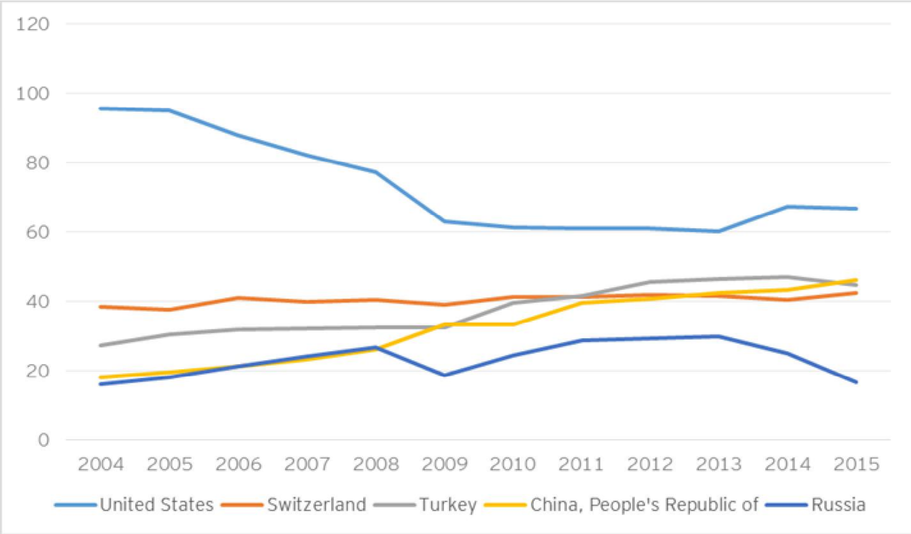


Figure 22 EU top export markets between 2004 and 2015 (in million tonnes)[53]

In terms of export, the highest growth in volume between 2004 and 2015 was observed in China (CAGR of 8.8%). Even though, on average, the most valuable goods were exported to Russia (3.8 thous. EUR per tonne), the highest growth in value of goods was observed in China (7.7% CAGR, see) in the period (see Table 15).

Table 16 EU top import markets between 2004 and 2015 (in million tonnes)[54]

Year	Russia	Norway	Brazil	United States	Algeria
CAGR (2004-2015)	-0.2%	-0.9%	-2.2%	3.5%	-1.8%
Average (2004-2015)	411	195	106	82	62
Thous. EUR/t (2004)	0.2	0.3	0.2	2.5	0.2
Thous. EUR/t (2015)	0.3	0.4	0.3	2.7	0.4
CAGR (thous. EUR/t) (2004-2015)	4.6%	3.6%	5.6%	0.7%	4.8%
Avg. Thous. EUR/t	0.3	0.4	0.3	3.1	0.3

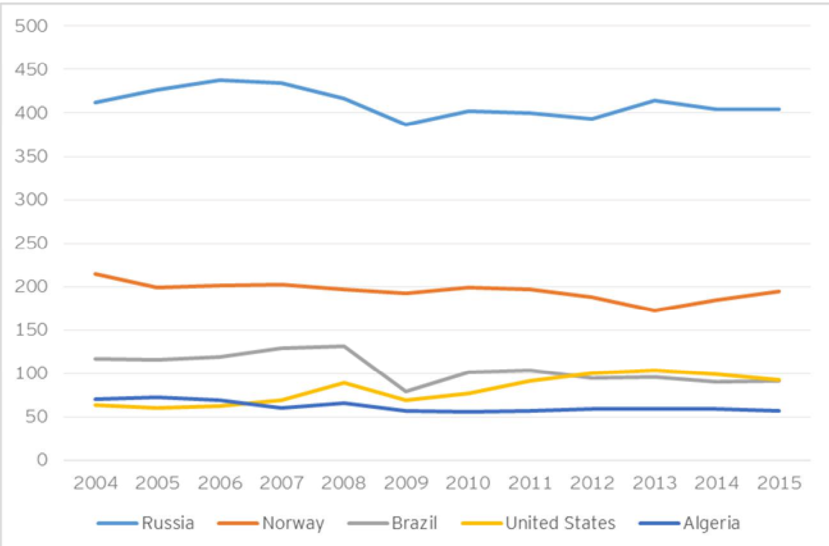


Figure 23 EU top import markets between 2004 and 2015 (in million tonnes)[55]

[53] http://madb.europa.eu/madb/statistical_form.htm
[54] http://madb.europa.eu/madb/statistical_form.htm

In terms of import, the highest growth in volume between 2004 and 2015 was observed in the United States (CAGR of 3.5%, see Table 16). Nevertheless, in terms of total volumes, as of 2015, Russia confidently remains in the first place with 404 million tonnes (see Figure 23). However, most of the high volume imported goods are significantly lower value adding (0.3-0.4 thous. EUR per tonne between 2004 and 2015) compared to the exported goods, but are being compensated with much higher volume. Furthermore, between 2004 and 2015, countries that had imported relatively low value adding goods (Russia, Norway, Brazil and Algeria), has been steadily growing their imports (CAGR between 3.6% and 5.6%). Even though in terms of import volume to the EU, China ranks only is the sixth place with 57 million tonnes between 2004 and 2015, these products are high value adding (6.2 thous. EUR per tonne).

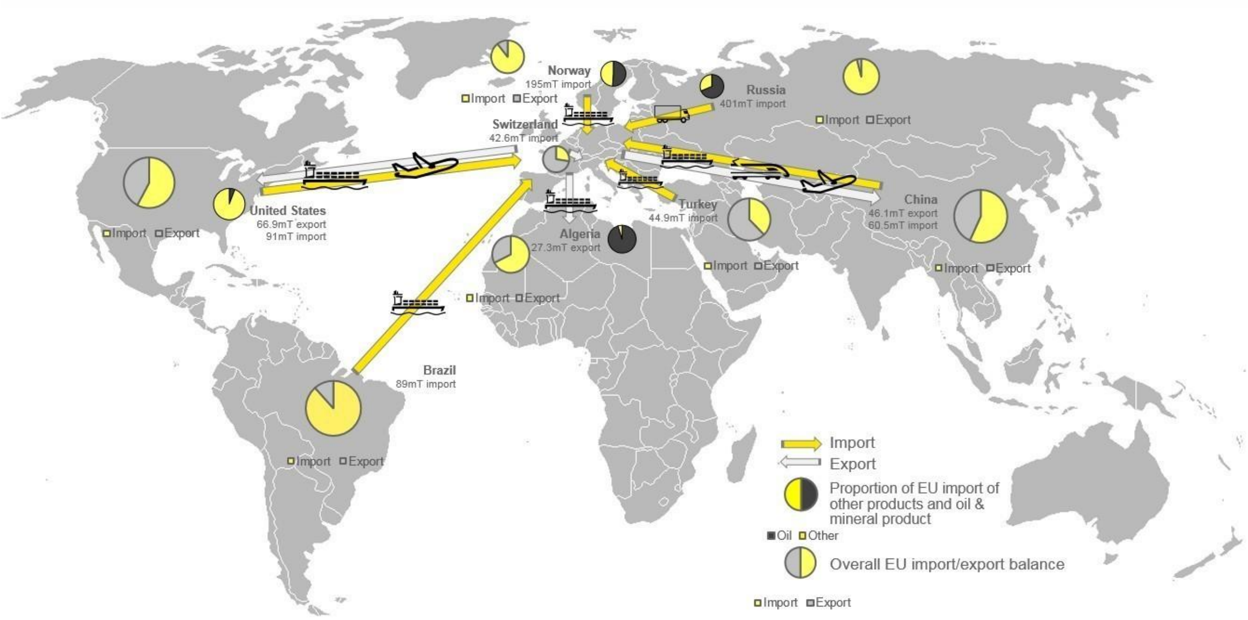


Figure 24 Top five import and export markets, 2015

Out of the top trade partners, there are four countries (Norway, Russia, Algeria and USA) from which the EU imports oil and other energy generating minerals (see Figure 24). These cargoes are not relevant for Rail Baltica, thus are excluded from further analysis and considerations.

Trade volumes and transport connections

From the identified trade patterns above, the following trading corridors can be distinguished:

1) North America – European Union (sea)
2) Mercosur – European Union (sea)
3) China/South Asia – European Union (sea, rail)
4) Russia/Central Asia – European Union (rail)
5) Norway – European Union (sea)

United States – European Union

North America is one of the key trade partners of the EU. According to the Eurostat[56], the main commodities traded between the US and the EU are machinery, transport equipment and chemicals (see

[55] http://madb.europa.eu/madb/statistical_form.htm
[56] http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Trade_in_goods_with_the_US,_by_product_(SITC_level_1),_EU-28,_2013.png

Figure 25). Most of the goods are transported in containerized form with ships or airplanes, which on average provide acceptable speed, high capacity and potential for just-in-time logistics chain.

Compared to other top five export destinations of the EU (see Table 15), the US was the only one were export volumes shrank between 2004 and 2015 (CAGR of -3.2%). Even though the volume shrank, added value (thousand EUR per tonne) grew by CAGR of 3.7% in the same period, indicating that the EU exports to the US switched to higher value adding goods. In contrast, import (see Table 16) volumes from the US grew at a higher pace than added value - CAGR of 3.5% versus CAGR of 0.7% accordingly.

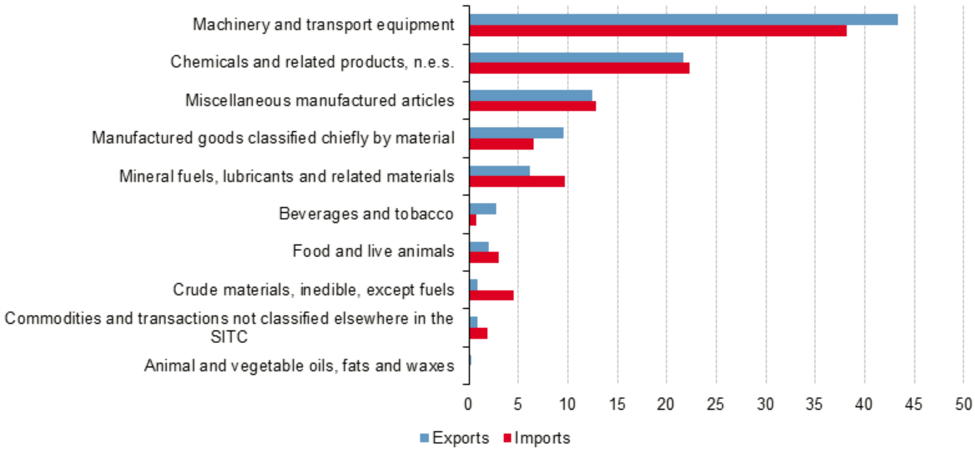


Figure 25 US-EU traded commodities, 2013[57]

The main connection points in the trade corridor are ports of Rotterdam, Hamburg, Antwerp, Bremerhaven (EU) and ports of New York, New Jersey (US). From these hubs cargoes are distributed onto different modes of transport or feeder ships to be carried to their final destinations.

Mercosur – European Union

Mercosur alliance consists of five countries – Argentina, Brazil, Venezuela, Paraguay and Uruguay (see Figure 26). This region is the sixth largest trading partner for EU. Mercosur's biggest exports to the EU are made up of agricultural products (43% of total exports) and raw materials (28%), while the EU mostly exports manufactured products, machinery and transport equipment (46% of total exports) and chemicals (22% of total exports).

Amongst the top five importing countries to the EU between 2004 and 2015 (see Table 16), Brazil had the highest drop in volumes (CAGR of-2.2%). However, this was counterbalanced by the strongest increase in added value (CAGR of 5.6%).

[57] http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Trade_in_goods_with_the_US,_by_product_(SITC_level_1),_EU-28,_2013.png

Figure 26 Mercosur alliance

Similar to North America, most commodities are traded in containerized form and are carried with ships or airplanes. The main connection points for sea freight are ports of Santos, Paranaque, Buenos Aires (Mercosur) and ports of Rotterdam, Hamburg and Antwerp.

China/South Asia – European Union

China, with its growing economy, is one of the key trading partners for the EU. Both regions actively trade machinery and transport equipment, manufacturing materials, chemicals and inedible crude materials (except oil)[58]. The majority of goods, historically, have been and still are transported via vessels (mostly via Suez Canal) or air freight; however, the "New Silk road" land connection is predicted to have a considerable growth potential and transfer some of the cargo flow from sea/air to land (see Figure 27). Figure 27 provides an illustration on how rail freight from China can be organized. The "New Silk road" vision covers wide rail network (see Figure 28). Besides air freight, which is costly and provides low capacity, there is no other fast transport option for the trade.

Between 2004 and 2015 EU export volumes to China grew at the highest rate (CAGR of 8.6%) compared to the other top five export destinations (see Table 15). Not only the export volumes grew, but also the added value of the goods increased at solid rate (CAGR of 3.1%), indicating advancing trade relationships with China. In the same period import volumes from China grew at 3.6% CAGR, whilst added value of goods increased by at a higher rate (CAGR of 5.6%), signalling the increase of higher added value product imports from China.

[58] http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_113366.pdf

Figure 27 EU-China land and sea trade block routes[59]

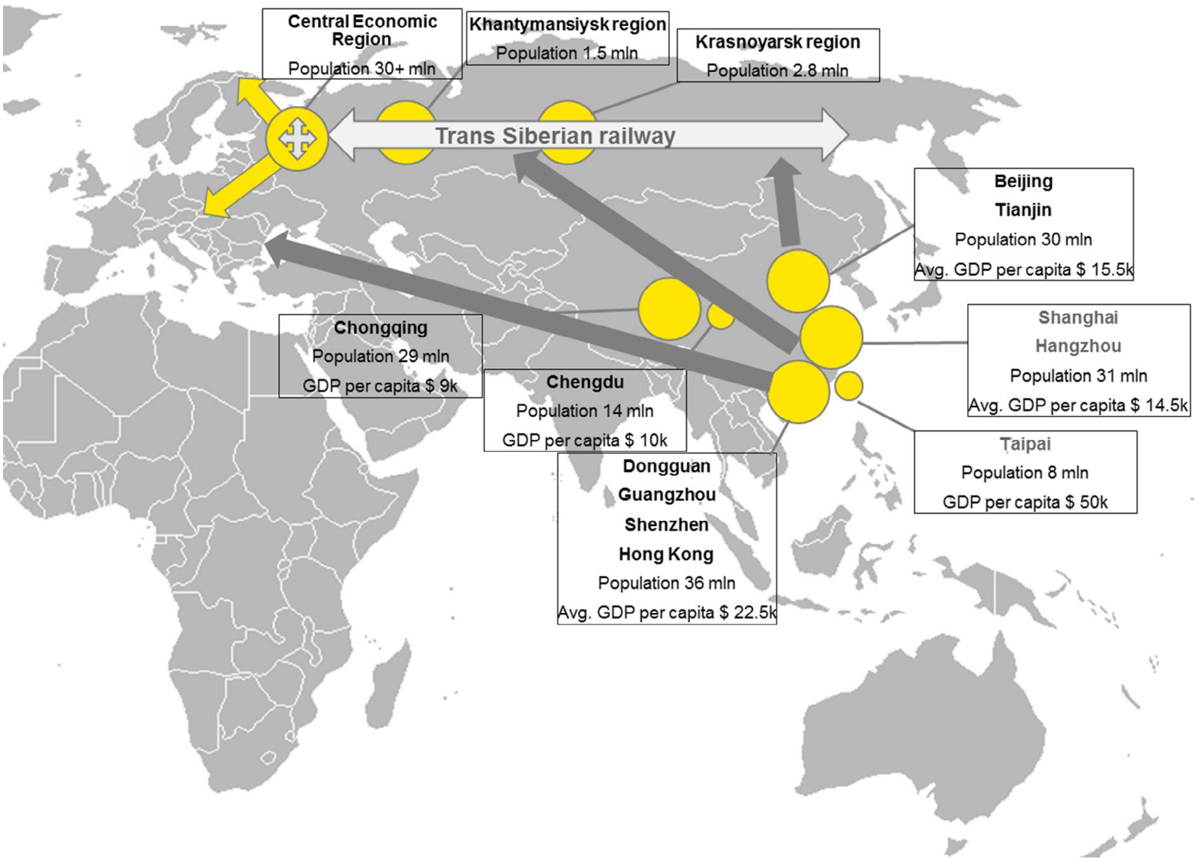


Figure 28 Trade corridors from the wealthiest regions of China and Russia[60]

[59] https://www.merics.org/fileadmin/_processed_/csm_ChinaMapping-Silk-Road-DEC2015-EN_686923c005.jpg

The main connection points for sea freight are ports of Rotterdam, Hamburg, Antwerp, Marseille, Piraeus and ports of Shanghai, Shenzhen, Hong Kong and various others in South and East China Sea. The main air cargo routes connect Shanghai, Hong Kong, Beijing and other cities in China with London (Heathrow), Paris (CDG), Frankfurt and Amsterdam in the EU.

Russia/Central Asia – European Union

The main import products from Russia comprises oil products, natural gas and metals. Vice versa, the export segments consist of automobiles, machinery and equipment, pharmaceuticals and food products. Transportation is performed via rail, air or sea. Russia has made significant investments in ports of Ust-Luga, St. Petersburg, Bronka and Primorsk to provide cargo maritime transportation services to Western Europe. For different liquid and dry bulk cargo types, ports of Riga, Ventspils, Klaipeda and Kaliningrad are used as well.

Between 2004 and 2015, export import volumes from Russia to the EU were by 17.6 times smaller than export volumes. However, the volume discrepancies were partly counterbalanced by the EU exporting more value adding products to Russia (by 11.3 times).

There are several rail routes between Russia and the EU which all face the same obstacle – the need to change the 1520mm gauge rail to/from 1435mm gauge, used as standard in the most of Europe. This break of gauge is among the factors that have promoted the existing trade pattern whereby the last leg uses sea transport, i.e., freight is delivered by 1520mm network to a Baltic Sea or Black sea port and then shipped to the largest ports of Western Europe (Rotterdam, Antwerp, Hamburg etc.).

Norway – European Union

Norway is one of the richest countries by GDP per capita and a large trading partner of the EU. Norway is a significant exporter of natural gas, oil and oil products, metals, ferro-alloys and fishery products. For example, Norway is the EU's main source of natural gas and primary aluminium. The EU export to Norway mostly comprises of machinery and equipment, manufacturing sub-products and chemicals. Norway has multiple seaports for feeder trade from the largest Western Europe ports (Hamburg, Antwerp, and Rotterdam). There is also a land connection route between Sweden and Denmark.

Even though Norway being a relatively small country in terms of population, it was the second highest exporter to the EU in terms of volume (falling just behind Russia) with an average of 195 million tonnes between 2004 and 2015.

5.3.2 Regional trade from the perspective of Rail Baltica

Key messages:

- Regionally, the key trading partners of the Baltic States and Finland (in the 1435mm system) can be clustered into two axis – along the North Sea-Baltic corridor (encompassing Germany, Belgium, Netherlands and further to UK) and Baltic-Adriatic corridor (encompassing Central and Eastern Europe countries route to Adriatic Sea)
- Short sea shipping and trucks will remain the main competitors of Rail Baltica for the identified axis, respectively
- Even with current break-of-gauge restriction there are combinations of O/D pairs and shipment

[60] EY material based on public statistics data, 2015

- parameters for which rail can be cheaper than road transport. However, the competitiveness of Rail Baltica is limited by the greater flexibility of the competing modes
- Several case studies indicate the feasibility of certain industries and supply/logistics chains to be developed with the help of rail as well as the impact of intermodal hubs on attracting traffic

EU level trade dynamics and trends

Figure 29 and Figure 30 shows the geographical locations of the Europe's largest logistics regions and illustrates their importance[61].

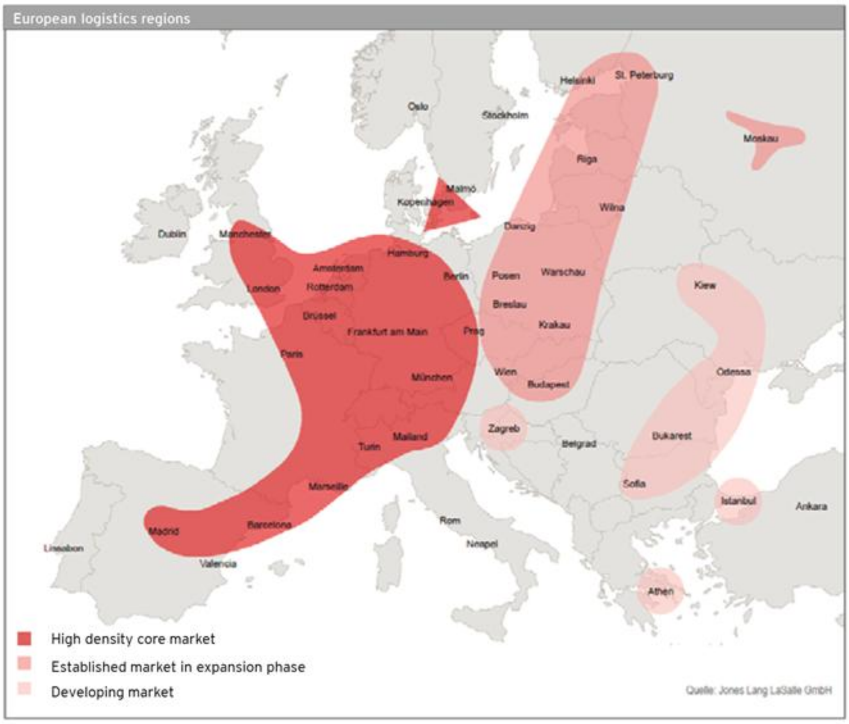


Figure 29 European logistics regions[62]

According to the view of DB Mobility logistics[63], Rail Baltica corridor corresponds to the logistics region expected to be still under development, which is complemented by the view of Colliers International (see Figure 30).

[61] Visions of the future: transportation and logistics 2030, DB Mobility logistics, 2014
[62] Visions of the future: transportation and logistics 2030, DB Mobility logistics, 2014
[63] Visions of the future: transportation and logistics 2030, DB Mobility logistics, 2014

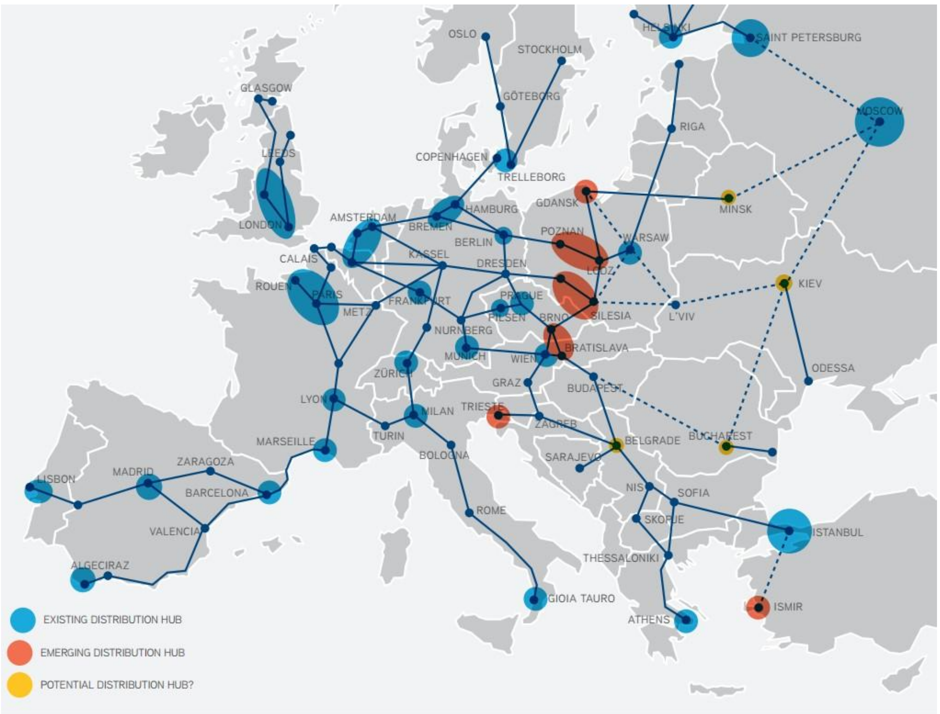


Figure 30 Europe's logistics hubs in 2020[64]

According to the survey conducted by JLL in 2014, in which the respondents comprised of more than 60 corporations that are major users of logistics and industrial real estate across Europe, countries that are expected to emerge or develop further over the next 5 years are Russia, Turkey and Poland. Additionally, according to the survey, the most important factors for freight carriers are transport costs, proximity to motorway network, property costs and access to customers[65].

Currently, Germany, due to its central location, is Europe's most important logistics hub. Transit traffic across all modes of transport is expected to increase by some 25% in the period from 2012 to 2030. Transit by road will increase faster than by rail. Figure 31 shows this development in freight transport for Germany.

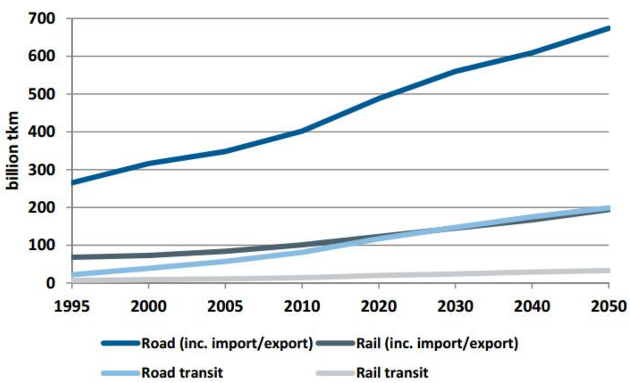


Figure 31 Forecast of volume sold in freight transportation - Germany up to the year 2050[66]

In summary, traffic is expected to increase in the years ahead, and therefore create major challenges, especially for road transportation, but also for rail. The share of international traffic, particularly transit traffic, is expected to increase further in the coming years. The most important factors considered in

[64] European Industrial Logistics: A long-term view, Colliers international, 2012
[65] Occupier survey on European logistics and industrial trends, JLL, 2014
[66] Visions of the future: transportation and logistics 2030, DB Mobility logistics, 2014

this forecast are the general growth in transportation levels, especially in freight, and the close correlation with economic growth. Furthermore, the importance of cross-border cooperation between logistics service providers is also reinforcing this trend. Although road will remain the most important mode of freight transportation in the future, there are also trends that will support rail transportation and cause the share of cross-border international traffic to increase.

According to DHL, the four major global trends are[67]:

- Continued global trade growth, but shift in pattern:
  - Growth in long-haul trade and transport slowing down.
  - Importance of emerging markets still increasing.
- Acceleration of e-commerce and more demand for last-mile solutions:
  - More “fine distribution” and direct shipping also in B2B.
  - Multi-channel delivery for B2C.
- Accelerating impact of process technology and automation:
  - Automation drives efficiencies.
  - Importance of data leads to new ways of running businesses.
- Increasing demands for responsible business:
  - Increasing importance of social and ethical behavior.
  - Growing need for greener solutions.

In addition, the challenges resulting from globalization and the growth of freight transportation can be summarized below:

- Congestion of infrastructure reducing quality of transportation.
- Merging of individual logistics regions.
- Transportation corridors with mismatched transport flows[68].

In the context of the region and Rail Baltica axis and corresponding geographic positioning within the pan-European trade flows, the following key transport (transit) corridors are assessed to have potential impact on Rail Baltica; Euro-Asia trade by sea (either in the form of short sea shipping to/from Northern Sea ports or using Adriatic corridor via Adriatic Sea ports or the potential Arctic sea route) and Euro-Asia Land bridge (especially the direct trade links between Scandinavia/Finland with Central Asia and China).

Trade and transport network in the Rail Baltica region

For the purpose of this study and according to the scope of work, the region is defined as the direct catchment area of Rail Baltica, thus includes Finland, Estonia, Latvia, Lithuania, and Poland.

The Rail Baltica region is considered as a medium densely populated area. Working age population varies significantly between counties – from <57.5% in Finland, 57.5-59% in the Baltics to >62% in Poland (see Figure 32)[69].

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[67] http://www.dpdhl.com/content/dam/dpdhl/Investoren/Veranstaltungen/Investorenkonferenzen/2014/DPDHL_DZ_Bank_Roadshow_Frankfurt_2014-08-06.pdf
[68] Visions of the future: transportation and logistics 2030, DB Mobility logistics, 2014
[69] http://ec.europa.eu/eurostat/statistics-explained/index.php/Population_statistics_at_regional_level#Population_density

Inequality also can be observed among the economic outputs per country, since GDP per capita in Finland varies between 90-100% of the EU average while for Latvia and the largest parts of Poland the indicator is below 75% from the EU average[70]. As explained in the methodology section before, apart from the specific development factors considered, the demand for Rail Baltica services will directly rely on purchasing power of the region. However, the countries in the region are also expected to outgrow the EU average GDP growth rate (1.93% in comparison to 1.66% between 2020 and 2055, according to public macroeconomic outlooks) indicating potential for strong transportation demand growth.

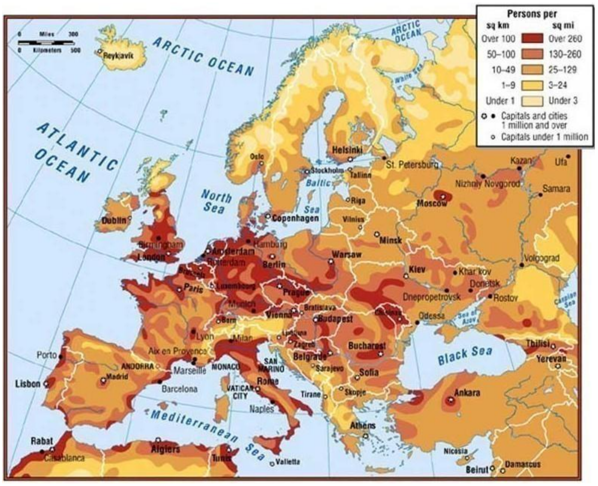

Figure 32 Population density, Europe[71]

Table 17 summarizes Baltic States trade (in million tonnes per annum) with the key Rail Baltica catchment areas. As of 2015, the top trading partners were 1520 mm connection countries (35.9% of total), WCA IV[72] (14.0% of total) and Benelux & UK (13.2%). Between 2015 and 3035 the trade is forecasted to accelerate on the fastest pace with China (from 1.4% to 4.6%), Finland (from 7.5% to 12.4%) and Poland (from 9.9% to 12.6%).

Table 17 Baltic States trade dynamics (in million tonnes) [73]

	2004			2015			2025			2035		
	Export	Import	%	Export	Import	%	Export	Import	%	Export	Import	%
Poland	1.5	1.2	4.3%	4.8	3.1	9.9%	8.8	6.9	12.1%	11.4	8.1	12.6%
Germany	2.6	1.4	6.3%	4.0	1.5	7.0%	6.4	3.1	7.4%	7.0	3.7	6.9%
Benelux & UK	5.6	0.9	10.4%	8.0	2.4	13.2%	9.4	3.9	10.2%	10.1	4.4	9.4%
WCA I	0.7	0.7	2.3%	1.7	1.0	3.3%	2.4	2.0	3.4%	2.7	2.5	3.3%
WCA II	3.6	0.4	6.4%	3.0	0.8	4.8%	3.3	1.8	4.0%	3.5	2.2	3.7%
WCA III	0.6	0.3	1.4%	2.0	0.3	2.9%	2.8	0.8	2.8%	3.5	1.0	2.9%
WCA IV	9.3	1.7	17.5%	7.7	3.5	14.0%	12.3	6.3	14.4%	13.5	7.4	13.6%
Finland	2.8	1.4	6.7%	2.9	3.1	7.5%	5.0	8.7	10.5%	5.7	13.5	12.4%
China	0.0	0.2	0.3%	0.7	0.4	1.4%	3.2	1.5	3.6%	5.1	1.9	4.6%
1520 mm	2.3	25.5	44.4%	4.9	23.6	35.9%	8.7	32.2	31.6%	10.1	36.7	30.4%
Total	29.0	33.7	-	39.6	39.8	-	62.2	67.1	-	72.7	81.5	-

70 http://ec.europa.eu/eurostat/statistics-explained/index.php/GDP_at_regional_level
71 https://econstudentlog.files.wordpress.com/2011/11/europepop1.jpg
72 Wider catchment area IV (WCA IV) – Scandinavia: Denmark, Norway and Sweden.
73 Eurostat and EY forecasts

Table 18 summarizes Finland's trade (in million tonnes per annum) with the key Rail Baltica catchment areas. As of 2015, the top trading partners were 1520 mm connection countries (38.5% of total), WCA IV (18.9% of total with Sweden accounting for 70% of WCA's trade or 10.6 million tonnes) and Benelux & UK (14.5%).

Table 18 Finland's overall trade dynamics (in million tonnes)[74]

	2004			2015		
	Export	Import	Share of total trade, %	Export	Import	Share of total trade, %
Poland	0.5	1.9	2.6%	0.9	0.6	2.1%
Germany	5.3	2.4	8.6%	0.5	0.3	1.0%
Benelux & UK	6.9	4.0	12.2%	7.6	3.9	14.5%
WCA I*	1.4	0.6	2.2%	1.3	0.6	2.6%
WCA II**	3.4	1.4	5.4%	1.9	1.4	4.7%
WCA III***	0.9	0.2	1.3%	1.0	0.3	1.9%
WCA IV****	7.0	10.8	19.8%	5.9	9.2	18.9%
Baltic States	1.4	2.8	4.7%	3.1	2.9	8.4%
China	0.8	0.2	1.1%	2.0	0.4	3.4%
1520 mm	2.2	35.8	42.1%	1.8	25.5	38.5%
Total	29.8	60.2	-	26.0	45.0	-

* Austria, Croatia, Czech Republic, Italy, Slovakia, and Slovenia
** France, Portugal, Spain, and Switzerland
*** Bulgaria, Greece, Hungary, Moldova, Romania, Serbia and Turkey
**** Denmark, Norway and Sweden

Overview of the trade dynamics in the last decade (in million tonnes), outlook for next two decades and the respective growth rates are presented from Figure 33 to Figure 39 (for historical figures, data has been obtained from Eurostat, forecasts are based on EY estimations (see chapter 4 for forecasting methodology description). Furthermore, Table 19 to Table 24 illustrates Baltic States and their respective catchment areas key traded and forecasted trade product groups (data source is Eurostat).

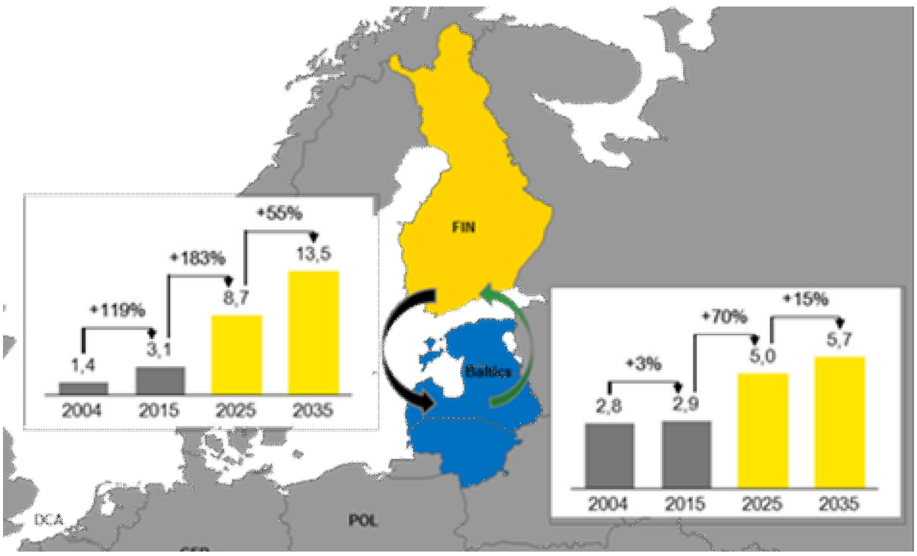

Figure 33 Baltic States and Finland's trade (in million tonnes)

Whilst Baltic States export to Finland between 2004 and 2015 was stable (3% growth), import experienced a significant uplift, growing by more than 2 times. Between 2015 and 2035 export to

[74] Eurostat and EY forecasts

Finland is expected to accelerate by growing by almost 2 times. However, import from Finland is expected to accelerate even more between 2015 and 2035 by increasing by approximately 4.5 times. As a result, Finland's trade balance over Baltic States is forecasted to increase from minus 1.4 million tonnes in 2004 to 7.8 million tonnes in 2035.

Table 19 Key Baltic States and Finland's trade product groups between 2004 and 2015

EXPORT FROM BALTIC STATES TO FINLAND		IMPORT TO BALTIC STATES FROM FINLAND	
Top product groups	Share, %	Top product groups	Share, %
Wood and articles of wood	61.20%	Mineral products	58.50%
Mineral products	18.90%	Base metals and articles of base metal	10.30%
Base metals and articles of base metal	5.90%	Pulp of wood or of other fibrous cellulosic material	7.60%
Fastest growing product groups	CAGR, %	Fastest growing product groups	CAGR, %
Plastics and articles thereof	20.40%	Wood and articles of wood	19.70%
Vegetable products	19.10%	Mineral products	12.90%
Articles of stone, glass and glassware	16.20%	Vegetable products	8.80%

Key observations:

- Top product groups traded between Baltic States and Finland are fairly similar - mineral and metal products. Besides that, approximately 60% of Baltic States exports are relatively low value adding wood products and some 8% of imports from Finland are higher value adding pulp of wood products.
- In contrast to the top export products, amongst the fastest growing ones, there are more value adding groups as plastics and vegetable products.

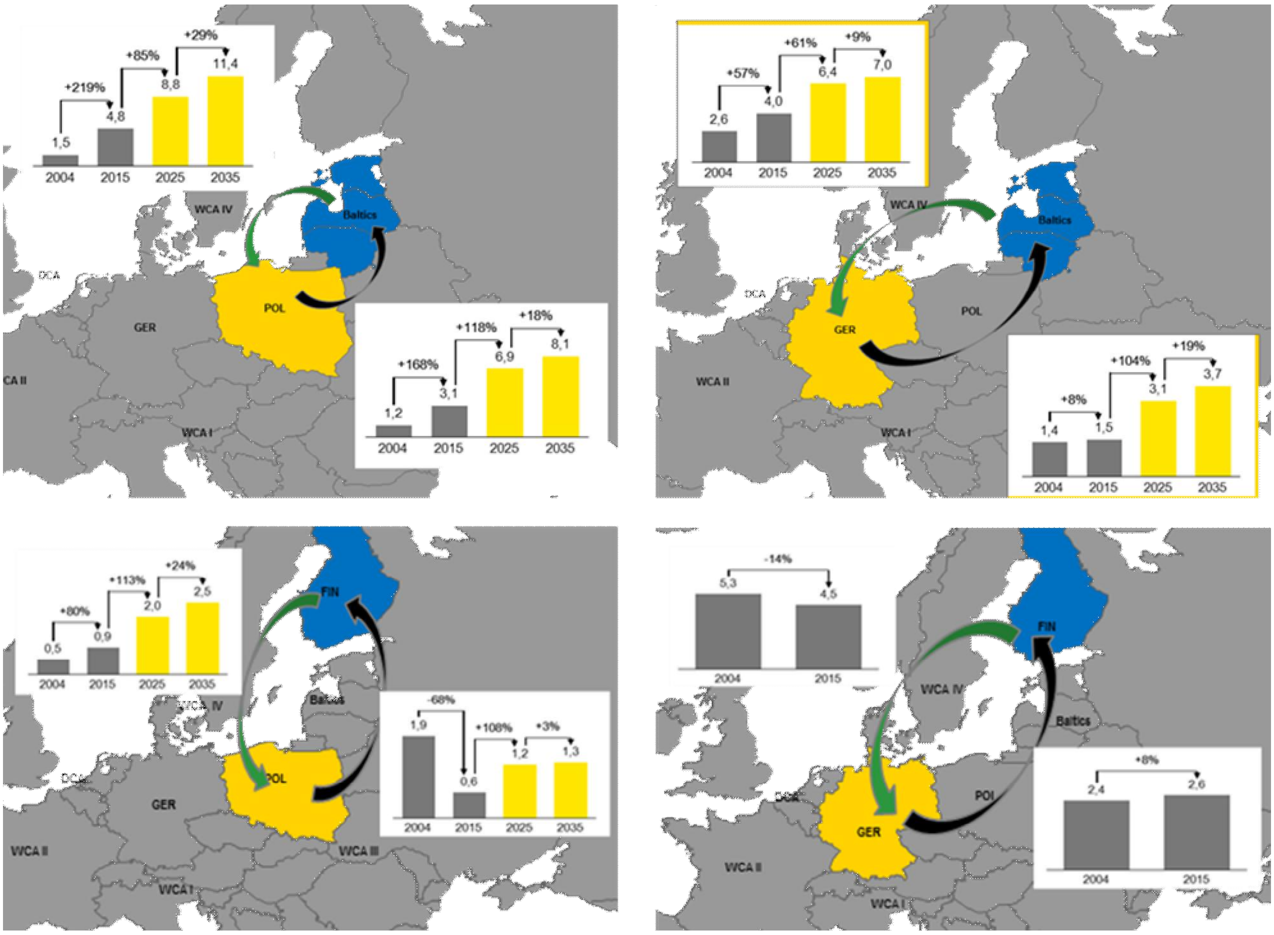

Figure 34 Baltic States and Finland's trade with Poland and Germany (in million tonnes)

Between 2004 and 2015 the Baltic States import and export to Poland has increased by approximately 3 times, whilst between 2015 and 2035, it is expected to experience a gradual slowdown. Nonetheless, whilst in 2004 Baltic States had a positive trade balance over Poland of approximately 0.3 million tonnes, the surplus is forecasted to increase to approximately 3.3 million tonnes by 2035.

Between 2004 and 2015 the Baltic States export to Germany increased by 57%, whilst import experienced only a slight uplift of 8%. Between 2015 and 2035 export and import is expected to increase by approximately times. As a result, in 2004 the Baltic States had a 1.2 million tonnes positive trade balance over Germany, it is forecasted to increase to 3.3 million tonnes by 2035.

Between 2004 and 2015 Finland's export to Poland almost doubled, however import shrunk by more than 3 times. Whilst between 2015 and 2025 the export is expected to continue its rapid growth by increasing by more than 2 times, between 2025 and 2035 it is expected to experience a gradual slowdown (24% increase). Between 2015 and 2025 import from Poland is expected to partly rebound by increasing more than 2 times. Nevertheless, the growth is expected to experience a significant slowdown between 2025 and 2035 (3% increase). In 2004 Poland's trade balance over Finland was 1.4 million tonnes. However, by 2015 the situation had changed and Finland' trade balance over Poland was already by 0.3 million tonnes, and it is forecasted to increase to1.2 million tonnes by 2035.

As for mature economies, Finland's historical trade (between 2004 and 2015) with Germany had been relatively stable. Export shrunk by 14% in the period but, import grew by 8%. Nonetheless, Finland's trade balance over Germany still remained 1.9 million tonnes as of 2015.

Table 20 Key Baltic States trade product groups with Poland and Germany between 2004 and 2015

POLAND

EXPORT FROM BALTIC STATES		IMPORT TO BALTIC STATES	
Top product groups	Share, %	Top product groups	Share, %
Mineral products	49.50%	Mineral products	29.60%
Wood and articles of wood	18.40%	Articles of stone, glass and glassware	12.80%
Base metals and articles of base metal	7.70%	Prepared foodstuffs, beverages, tobacco	10.70%
Fastest growing product groups	CAGR, %	Fastest growing product groups	CAGR, %
Live animals; animal products	40.70%	Mineral products	21.20%
Vegetable products	30.80%	Prepared foodstuffs, beverages, tobacco	17.60%
Articles of stone, glass and glassware	27.40%	Live animals; animal products	16.20%

GERMANY

EXPORT FROM BALTIC STATES		IMPORT TO BALTIC STATES	
Top product groups	Share, %	Top product groups	Share, %
Mineral products	38.20%	Mineral products	22.40%
Wood and articles of wood	29.00%	Vehicles, aircraft, vessels and equipment	15.30%
Vegetable products	10.40%	Base metals and articles of base metal	11.30%
Fastest growing product groups	CAGR, %	Fastest growing product groups	CAGR, %
Vegetable products	22.50%	Mineral products	12.50%
Plastics and articles thereof	15.10%	Plastics and articles thereof	7.60%
Wood and articles of wood	10.10%	Live animals; animal products	6.20%

Key observations:

- Top export groups to both of the countries were more mineral and wood related products, whilst import consisted of mineral and also processed manufactured goods.
- In Germany, part of the fastest growing export and import product groups (vegetable and mineral products), are also amongst the top product groups. Accordingly, this should potentially ensure that these products remain amongst the top groups also in the future.

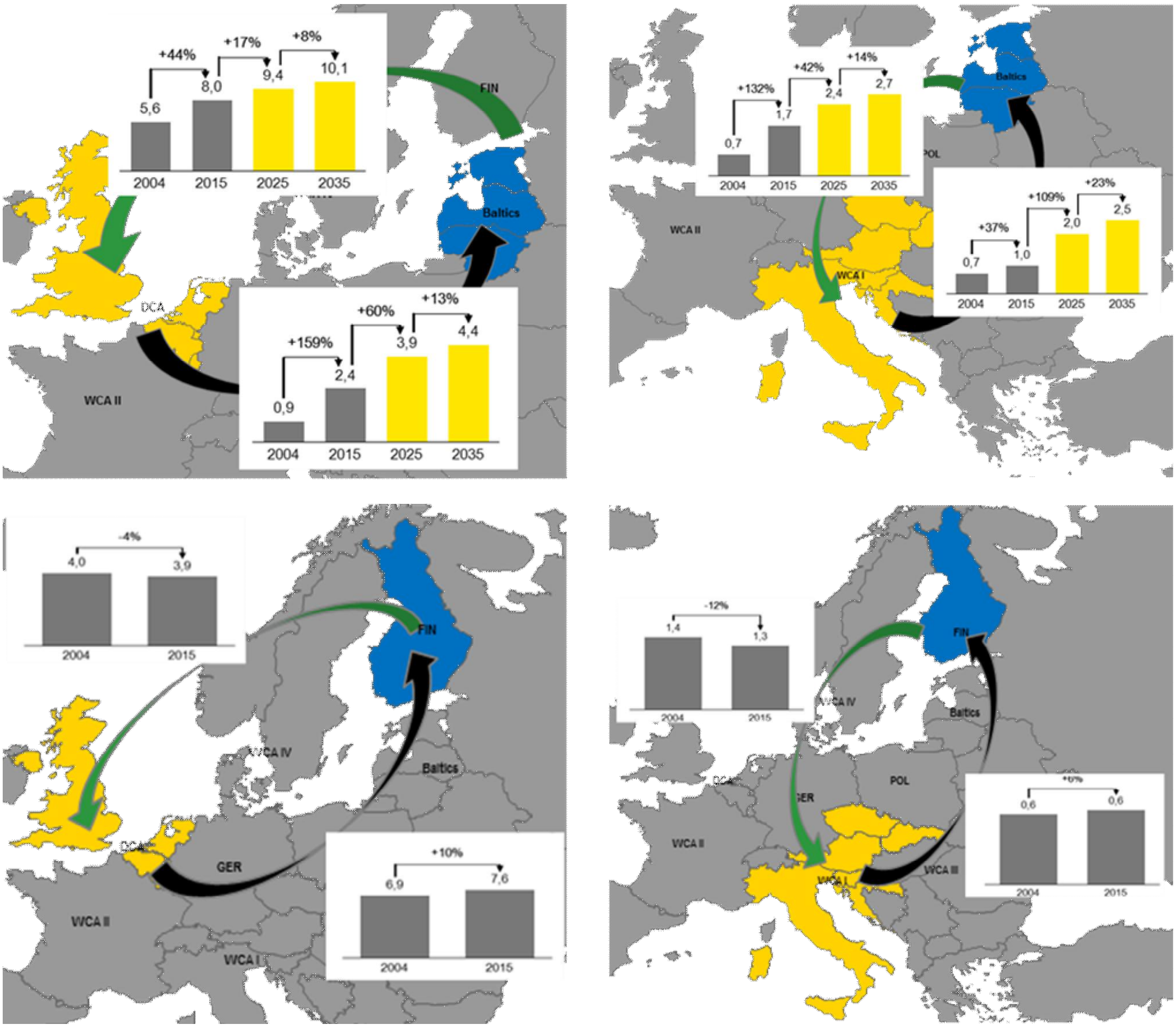

Figure 35 Baltic States and Finland's trade with Benelux, UK and WCA I (in million tonnes)

Whilst the Baltic States export to Benelux and UK grew by 44% between 2004 and 2015, import increased by 37%. Furthermore, between 2015 and 2035 export is expected to grow by approximately 20%. In the same period the import is expected to almost double. Even though the Baltic States nominal trade balance over Benelux and UK is forecasted to increase from 4.7 million tonnes in 2004 to 5.7 million tonnes in 2035, the ratio of it is forecasted to decrease from 6.2 to 2.3 in the same period.

Whilst the Baltic States export to WCA I grew by approximately 2.5 times between 2004 and 2015, import increased by 159%, however from significantly lower nominal base. Between 2015 and 2035 export and import is expected to grow by approximately 60% and 160% respectively.

As for mature economies, Finland's trade with Benelux and UK and WCA I has remained fairly steady between 2004 and 2015. Export to Benelux decreased by 4%, while import grew by 10%. Similarly, between 2015 and 2035 export to WCA I decreased by 12%, while import grew by 6%.

Table 21 Key Baltic States trade product groups with Benelux & UK and with WCA I between 2004 and 2015

BENELUX & UK

EXPORT FROM BALTIC STATES		IMPORT TO BALTIC STATES	
Top product groups	Share, %	Top product groups	Share, %
Mineral products	59.50%	Mineral products	36.60%
Wood and articles of wood	24.90%	Vegetable products	19.10%
Vegetable products	5.40%	Prepared foodstuffs, beverages, tobacco	11.80%
Fastest growing product groups	CAGR, %	Fastest growing product groups	CAGR, %
Vegetable products	34.50%	Mineral products	22.00%
Plastics and articles thereof	17.00%	Vegetable products	16.10%
Pulp of wood or of other fibrous cellulosic material	19.20%	Pulp of wood or of other fibrous cellulosic material	12.20%

WCA I

EXPORT FROM BALTIC STATES		IMPORT TO BALTIC STATES	
Top product groups	Share, %	Top product groups	Share, %
Mineral products	45.80%	Vegetable products	17.10%
Wood and articles of wood	25.10%	Base metals and articles of base metal	14.50%
Live animals; animal products	4.50%	Prepared foodstuffs; beverages, tobacco substitutes	12.90%
Fastest growing product groups	CAGR, %	Fastest growing product groups	CAGR, %
Plastics and articles thereof	30.70%	Prepared foodstuffs; beverages, tobacco substitutes	18.60%
Miscellaneous manufactured articles	21.80%	Mineral products	12.00%
Pulp of wood or of other fibrous cellulosic material	19.70%	Pulp of wood or of other fibrous cellulosic material	10.70%

Key observations:

- Whilst the Baltic States top export groups are heavily dominated by mineral and wood products, in return a large portion of imports from both of the regions consist of food products.
- Plastic, mineral and food related products were amongst the fastest growing trading groups for both of the regions. Even though mineral products are already amongst the top import groups from both regions, they are also amongst the fastest growing groups, indicating that their total share could increase even more.

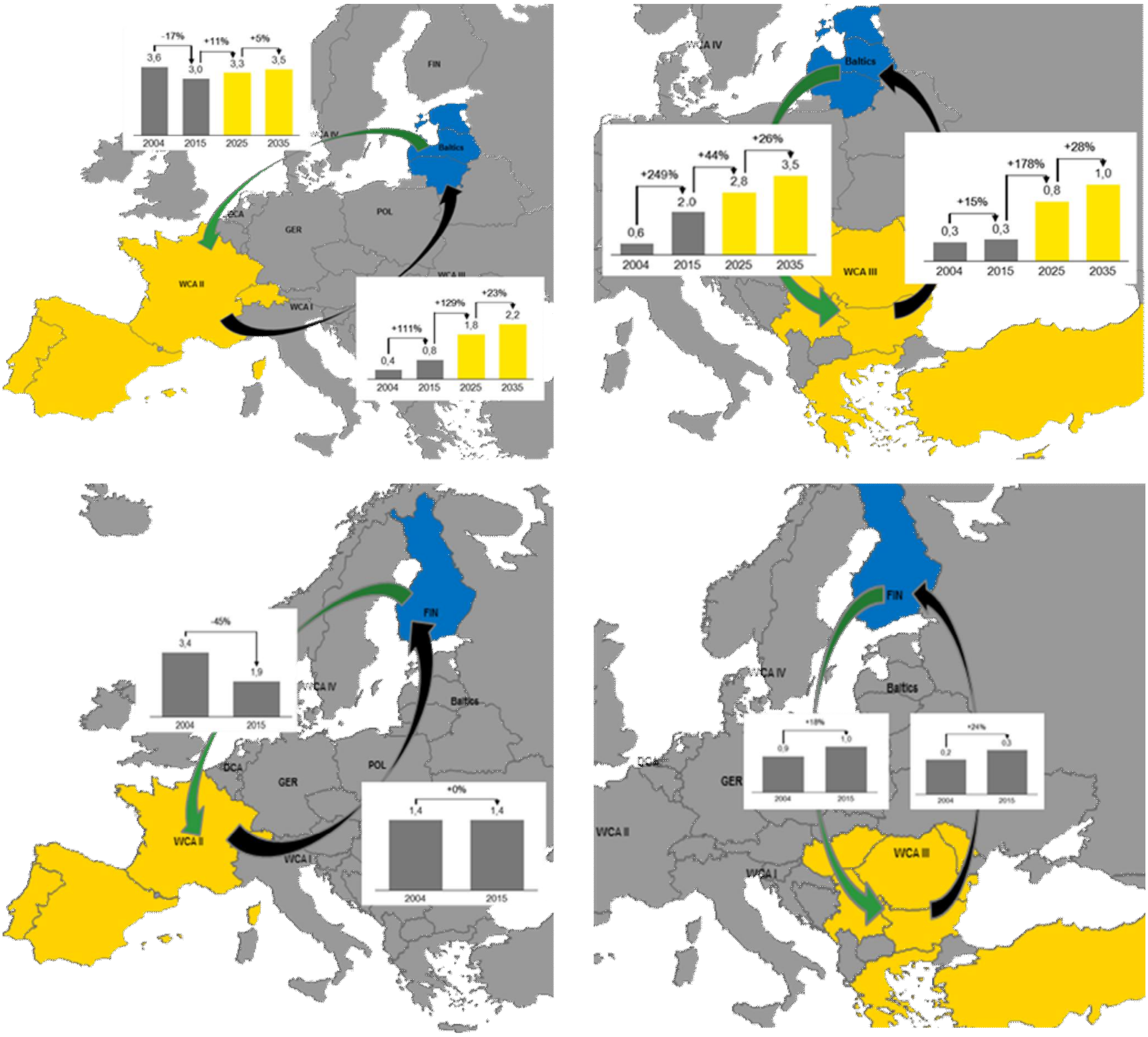

Figure 36 Baltic States and Finland's trade with WCA II and WCA III (in million tonnes)

Whist the Baltic States export to WCA II has remained and is expected to remain relatively stable between 2004 and 2035 (decrease from 3.6 million tonnes to 3.5 million tonnes), import is expected to reach 2.2 million tonnes by 2035 (an increase by almost 6 times from 0.4 million tonnes in 2004). As a result, the Baltic States trade surplus vis-à-vis WCA II is forecasted to shrink from 3.2 million tonnes in 2004 to 1.3 million tonnes in 2035.

The Baltic States export to WCA III grew by more than 3 times between 2004 and 2015. However, import remained relatively stable in the same period (growth of 15%). Between 2015 and 2035 export to WCA III is expected to increase by 75%, with import expected to increase by 3 times. As a result the Baltic States trade surplus vis-à-vis over WCA III is forecasted to grow from 0.3 million tonnes in 2004 to 2.5 million tonnes in 2035.

Finland's export to WCA II between 2004 and 2015 decreased by almost two times, while import levels have remained stable. In the same time, Finland's export and import to WCA III grew by 18% and 24% respectively.

Table 22 Key Baltic States trade product groups with WCA II and with WCA III between 2004 and 2015

WCA II

EXPORT FROM BALTIC STATES		IMPORT TO BALTIC STATES	
Top product groups	Share, %	Top product groups	Share, %
Mineral products	60.10%	Vegetable products	20.20%
Vegetable products	12.10%	Prepared foodstuffs; beverages, tobacco substitutes	17.40%
Wood and articles of wood	10.10%	Mineral products	16.30%
Fastest growing product groups	CAGR, %	Fastest growing product groups	CAGR, %
Miscellaneous manufactured articles	30.70%	Vegetable products	15.50%
Plastics and articles thereof	22.60%	Prepared foodstuffs; beverages, tobacco substitutes	12.90%
Pulp of wood or of other fibrous cellulosic material	21.00%	Pulp of wood or of other fibrous cellulosic material	11.90%

WCA III

EXPORT FROM BALTIC STATES		IMPORT TO BALTIC STATES	
Top product groups	Share, %	Top product groups	Share, %
Base metals and articles of base metal	52.90%	Prepared foodstuffs; beverages. tobacco substitutes	21.40%
Mineral products	24.70%	Vegetable products	18.70%
Vegetable products	7.80%	Base metals and articles of base metal	17.00%
Fastest growing product groups	CAGR, %	Fastest growing product groups	CAGR, %
Vegetable products	43.10%	Wood and articles of wood	14.40%
Articles of stone, glass and glassware	28.40%	Pulp of wood or of other fibrous cellulosic material	9.40%
Base metals and articles of base metal	23.10%	Machinery and mechanical appliances	9.00%

Key observations:

- Similarly, as trade with Benelux & UK and with WCA I, Baltic States top export groups are heavily dominated by solid material products – minerals and metals. However, import volumes, to a large extent consist of food and related products.
- Whilst fastest growing export groups to WCA II are not amongst the top groups, it is quite opposite with export to WCA III where two of the fastest growing product groups are also amongst the top groups, indicating growing importance of the top product groups. Similar pattern can be observed with import flows.

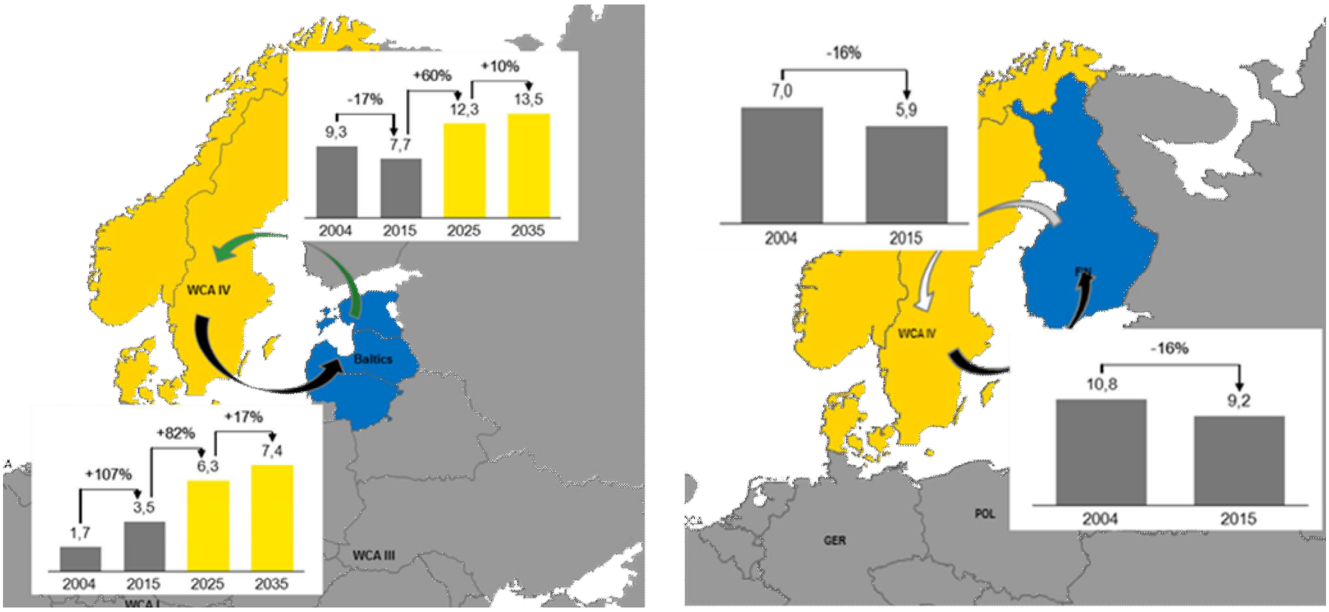

Figure 37 Baltic States and Finland's trade with WCA IV (in million tonnes)

Whilst between 2004 and 2015 The Baltic States experienced a drop in export to WCA IV, between 2015 and 2035 export levels are expected to almost double. As a result, the Baltic States trade balance over WCA IV is forecasted to shrink from 7.6 million tonnes in 2004 to 5.9 million tonnes in 2035, and ratio of it to decrease from 5.5 to 1.8 in the same period.

Historically, between 2004 and 2015 Finland's trade with WCA IV has decreased by 16% (both – export and import).

Table 23 Key Baltic States and WCA IV trade product groups between 2004 and 2015

EXPORT FROM BALTIC STATES		IMPORT TO BALTIC STATES	
Top product groups	Share, %	Top product groups	Share, %
Wood and articles of wood	53.50%	Mineral products	70.70%
Mineral products	14.40%	Prepared foodstuffs, beverages, tobacco	5.20%
Vegetable products	10.60%	Base metals and articles of base metal	4.10%
Fastest growing product groups	CAGR, %	Fastest growing product groups	CAGR, %
Pulp of wood or of other fibrous cellulosic material	30.20%	Mineral products	33.50%
Prepared foodstuffs, beverages, tobacco	19.60%	Wood and articles of wood	26.60%
Articles of stone, glass and glassware	17.50%	Articles of stone, glass and glassware	15.10%

Key observations:

- None of the fastest growing export product groups are amongst the top groups. Therefore, there could potentially be a change in shares of trade in relatively near future (for the second and third most important categories, as the top type of product has dominant share).
- In terms of import, not only it is heavily dominated by mineral products, mineral products also enjoyed the fastest growth pace in the periods.

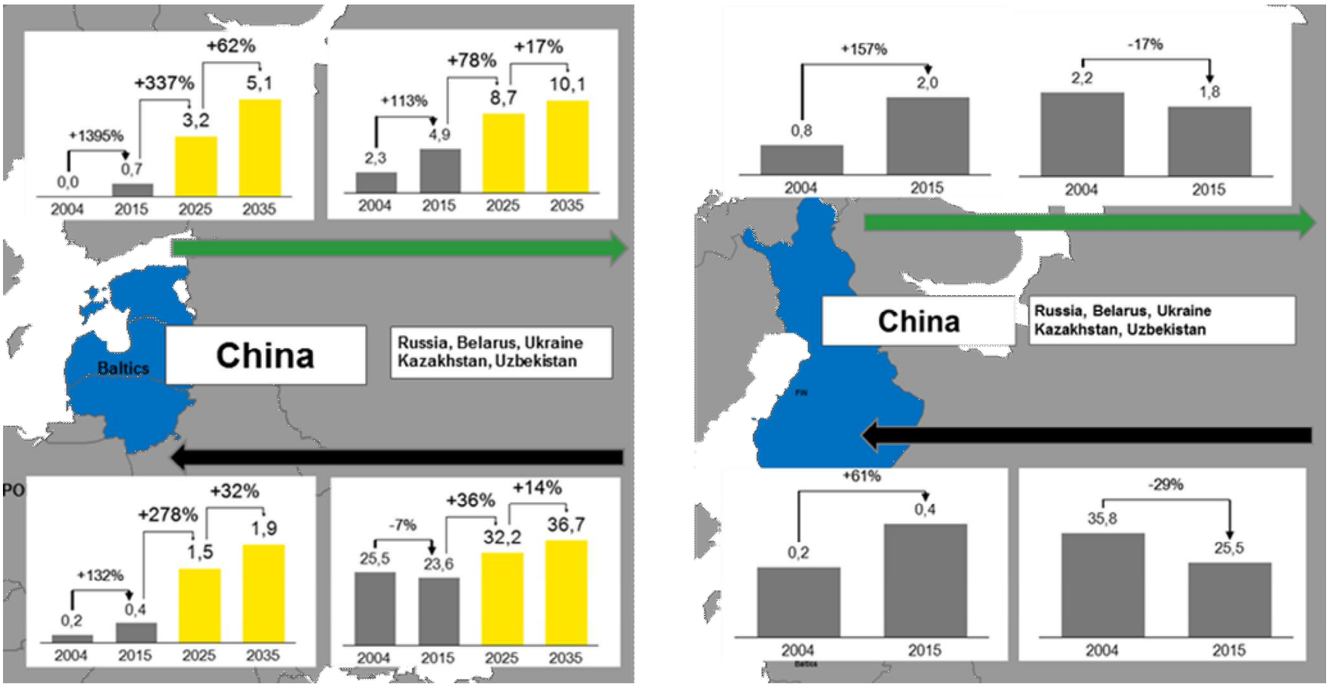

Figure 38 Baltic States and Finland's trade with China and 1520 mm countries (in million tonnes)

The Baltic States trade volume with China considerably increased (from the very low base) between 2004 and 2015, and is expected to remain at high growth rates between 2015 and 2035. Export with 1520 mm connection countries had more than doubled between 2004 and 2015, and is expected to further double between 2015 and 2035. However, import from 1520 mm connection countries experienced a slight drop between 2004 and 2015. Nevertheless, it is expected to pick up between 2015 and 2035 growing by approximately 50%.

Finland's trade with China between 2004 and 2015 experienced a significant growth (export growth of 157%, import growth of 61%), however from a low nominal base. Both export and import with 1520 mm countries plummeted between 2004 and 2015 with decrease of 17% and 29% respectively.

Table 24 Key Baltic States trade product groups with China and with 1520 mm gauge connection countries between 2004 and 2015

CHINA

EXPORT FROM BALTIC STATES		IMPORT TO BALTIC STATES	
Top product groups	Share, %	Top product groups	Share, %
Wood and articles of wood	53.90%	Base metals and articles of base metal	20.80%
Mineral products	25.30%	Articles of stone, glass and glassware	16.40%
Base metals and articles of base metal	6.60%	Machinery and mechanical appliances	14.50%
Fastest growing product groups	CAGR, %	Fastest growing product groups	CAGR, %
Pulp of wood or of other fibrous cellulosic material	76.80%	Plastics and articles thereof	15.70%
Wood and articles of wood	51.10%	Base metals and articles of base metal	13.20%
Miscellaneous manufactured articles	36.30%	Miscellaneous manufactured articles	9.60%

1520 mm GAUGE RAILWAY REGION

EXPORT FROM BALTIC STATES		IMPORT TO BALTIC STATES	
Top product groups	Share, %	Top product groups	Share, %
Mineral products	38.40%	Mineral products	81.00%
Vegetable products	12.70%	Wood and articles of wood	8.90%
Prepared foodstuffs, beverages, tobacco	9.40%	Base metals and articles of base metal	5.10%
Fastest growing product groups	CAGR, %	Fastest growing product groups	CAGR, %
Miscellaneous manufactured articles	24.40%	Animal or vegetable fats and oils	26.30%
Mineral products	16.90%	Vegetable products	11.10%
Plastics and articles thereof	15.40%	Prepared foodstuffs; beverages, tobacco	6.40%

Key observations:

- Top trade product groups with both of the regions were dominated with relatively heavier and less value adding product groups.
- Fastest growing export product structure to both regions are fairly similar to the top product group structure, accordingly, potentially less value adding. In terms of the fastest growing import groups from both region, only one group is amongst the top product groups, signalling about the increase of potentially higher value adding product groups.

The export structure for the region mostly consists of raw materials, agricultural goods, metal sub-products, food products, chemicals and packaged pharmaceuticals, paper (mostly Finland) and vehicle parts and furniture (mostly Poland). The region imports are mostly agricultural products, refined petroleum, computers, food products and basic metals and raw materials.

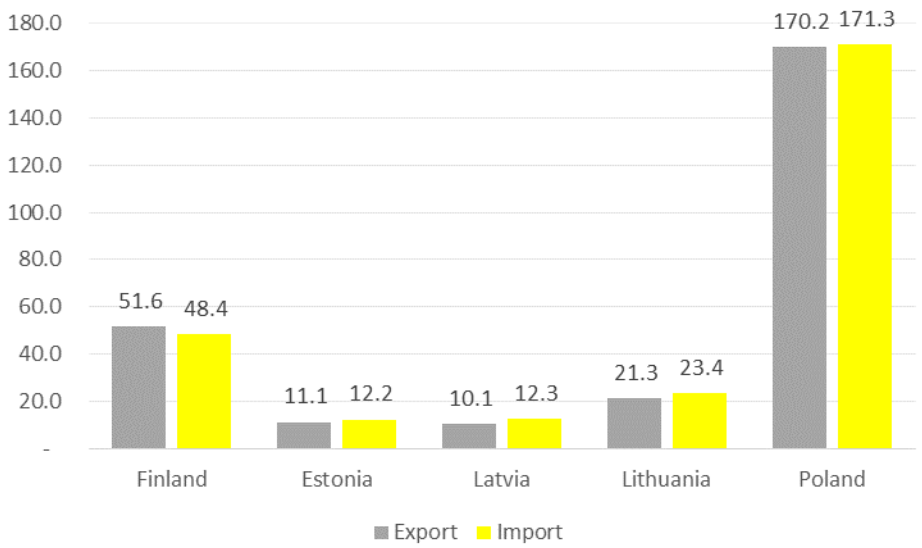

Figure 39 Import/export balance for region's countries (bln EUR)[75]

[75] Country data retrieved from http://atlas.media.mit.edu/en/

Current freight transport modes in the region

Most of the trade for all five countries in the region currently is organized via short sea maritime routes and road transport (see Figure 40). Due to the geographical restrictions (limited draft through Danish straits) and lack of demand, large container vessels rarely call in Lithuanian, Latvian, Estonian or Finnish ports, even though ports tend to have the necessary technological capabilities. PANAMAX and SUEZMAX container ships usually stop at Northern European ports or Poland and feed the East Baltic Sea ports by feeder short sea ships. Cargo structure shipped by the region countries with super-size ships currently consists mostly of cargoes that are not the target market for Rail Baltica – dry and liquid bulk[76].

Figure 40 Import/export paths for the region

Trucks usually carry out inter-Europe trade or service the locations that are more distant from the Baltic Sea and North Sea ports, often utilizing ferries for a part of their journey (see Figure 41).

[76] http://www.europarl.europa.eu/RegData/etudes/STUD/2015/540350/IPOL_STU(2015)540350_EN.pdf

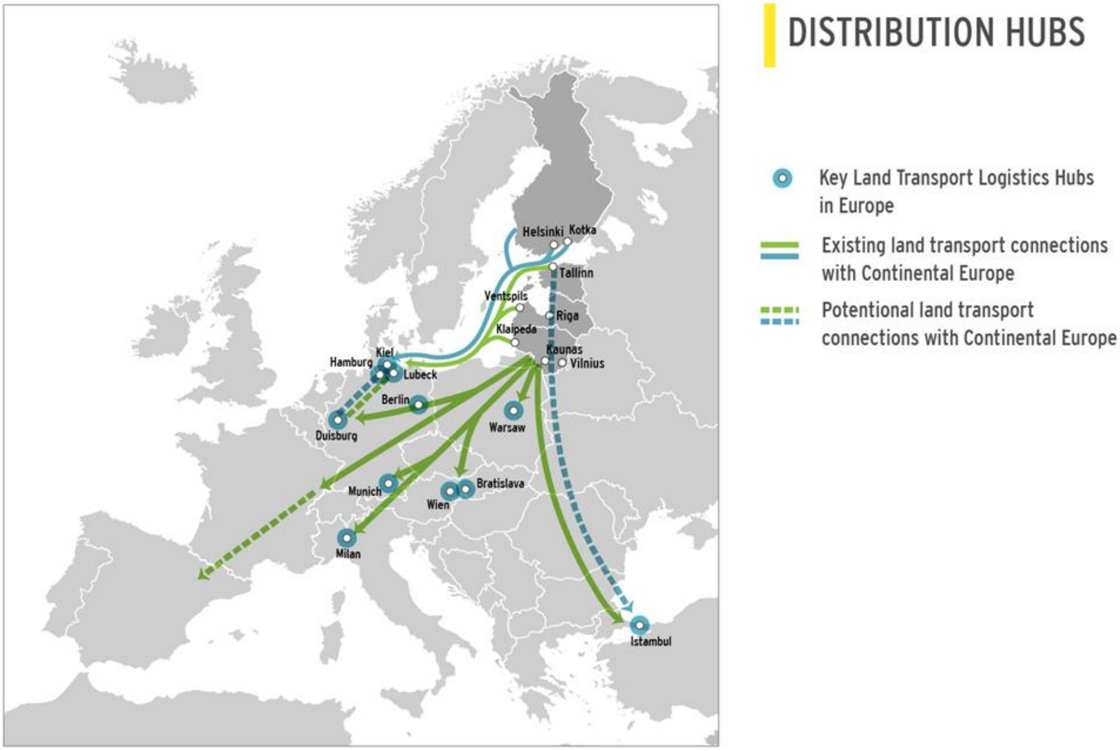

Figure 41 Main trade links and key hubs between Finland and Baltic States and Continental Europe

Based on the assessment of cargo flows and case studies (see further in the text), the land transport corridors of Finland/Baltic States with Continental Europe presented in Figure 41 have been assessed to be the most relevant for Rail Baltica (shifting freight from trucks to rail).

Cargo transit to and from CIS countries is organized either by trucks, or by rail, depending on cargo type (bulk is transported almost exclusively by rail, general cargo – by trucks).

Current shipping routes and ports in the region and their development perspectives

There are 15 average to high activity seaports in the East Baltic Sea region (includes Russia's Baltic Sea ports and Rail Baltica region). The Table 25 summarizes the main technical characteristics and cargo structure of each port.

Table 25 The main characteristics of seaports in the East Baltic Sea region [77]

Port	Land area (ha)	Quay (m)	Draft (m)	Wh. (m2)	Open storage (m2)	Container	RoRo	RoRo+ LoLo / Conv.	Liquid bulk	Dry bulk	2015 (Mln t)	Line PAX
Gdansk			10.2 /			▲	▲		▲	▲		▲
	653	10 399	15	106 300	548 000	3 berths	6 + (1) berths		6 berths	Various	35.9	4-5
						9.2-16.5 m	6.4-9.4 m		9.5-15 m	5-10.2 m; 15 m coal		6.4-9.4 m
Gdynia		11 000				▲	▲	▲	▲	▲		
	492.6	40 berths	13	230 000	400 000	5 berths	3+ (1) berths	4 quays	1 quay	3 quays	18.2	▲

[77] Riga Port Development Program 2009-2018; Table is illustrative and may not present exactly precise current measurement

Port	Land area (ha)	Quay (m)	Draft (m)	Wh. (m2)	Open storage (m2)	Container	RoRo	RoRo+ LoLo / Conv.	Liquid bulk	Dry bulk	2015 (Mln t)	Line PAX
						11.5 m	7.7-11.5 m	(2 238 m)				
Tallinn	736	13 400	18	151 000 (11 500 reefer); 1.1 million m³ oil; 300 000 t grain	670 000	▲	▲		▲	▲	22.4	▲
Hamina	320	3 000	7-10 12.5 in 2010	341 000; 830 000 m3 liquids	200 000	▲ 1 berth 610 m	▲ 7 ramps 7.9 -10 m		▲ 3+1 berths 9 -10 m	▲ 2 berths 6.5 m	12.7	
Kotka	300	2 734	15.5	230 000 for TEU	900 000 for cars	▲ 10+2 berths 10 -12 m	▲ 3 berths 7.9-10 m	▲ 8 berths 7.7-10 m	▲ 2 berths 10-13.5 m	▲ 9 +4 berths 8.5 m; 10-13.5 m		
Klaipeda	415	19 216	13-14.5	160 628 m²; 646 500 m³ tanks; 368 000 t dry; 45 500 m² refrig.	780 300	▲	▲ 7 berths 1 300 m 8.5-9.4 m		▲	▲	38.5	▲
Ust-Luga	140	N.A	16		N.A	▲ 2 berths 13.5 m	▲ 1 berth, 320 m 10 m	▲		▲ Coal		
Butinge	Tanks	Buoy	20	254 000 cbm	N/A				▲		4.5 (2007)	
Helsinki (Vuosaari)	150		11			▲ 2 berths (2 x 750 m)	▲ 11/15 berths			▲	11.4	▲
Liepaja	370	1 600	12	20 000	120 000	▲	▲		▲	▲	5.3 (2014)	
Ventspils	2 640 (1.200 free)	11 012 (overall)	15	170 000; liquid cargo 1 500 000 m³	190 000	▲	▲		▲	▲	22.6	▲
Primorsk	Tanks	2 035	17.5						▲		59.6	
Petersburg	269	8 900	11			▲			▲	▲	51.5	▲
Kaliningrad	230	Approx. 7 000	8			▲ Sea Port (dry bulk)	▲ 2+2 berths 8 m	▲ Fishery Port	▲ 1+8 berths 7.5-9.4 m	▲ 21+2 berths; 8 m +2 200 m quay	15.8 (2007)	
Riga	1 962	13 818	14.5			▲	▲		▲	▲	37.1	▲

▲ = Commodity Group is handled at respective port

There are only few comparable new ports in the area. Most of the main ports remain in their historical locations, as there have been no significant changes in the general commodity flows.

There are two general shipping routes from the region (see Figure 42):

1) Cargo feeding to larger Northern Europe ports (for the purposes of the analysis defined as the largest ports in the Norther Sea and South Baltic Sea – Gdansk, Hamburg, Rotterdam or similar).
2) Direct transcontinental shipment.

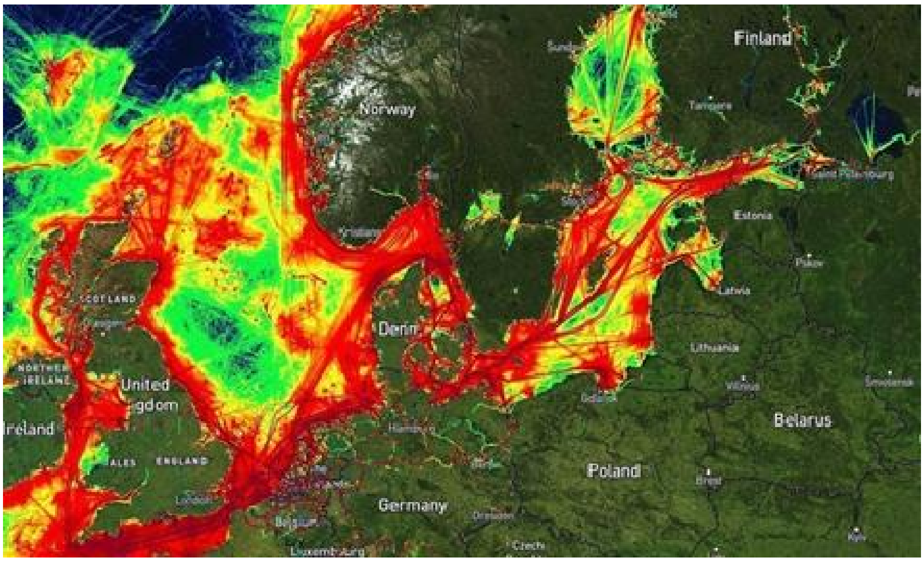

Figure 42 Vessel traffic intensity in the region, 2016 (marinetraffic.com)

For the purpose of the analysis, only the key ports relevant to the region are reviewed (see Figure 43) – Rotterdam, Amsterdam (The Netherlands), Hamburg and Bremen (both Germany), Antwerp (Belgium). Irrespective of the future potential development perspectives, Northern Europe ports have several geographical advantages over Southern ports (for the purposes of the analysis defined as the largest ports in the Mediterranean Sea) that give them an inevitable "head-start'' in the competition for European import/export cargoes.

However, the key ports of Northern Europe still have identified the perspective fields for further development:

1) IT infrastructure modernisation to improve cargo flow management;
2) Reducing carbon footprint to increase sustainability[78];
3) Productivity increase for existing terminals to fully utilise potential;
4) Upgrading of hinterland connections.

The main competitors for Rail Baltica for trade with Northern Europe seaports are short sea shipping lines. In 2014, short sea shipping from/to the direct Rail Baltica catchment area (DCA I&II, mostly to the large Northern Europe ports) accounted for total of 3 998 thous. TEUs[79].

[78] http://www.ship-technology.com/features/featurehow-and-why-have-northern-european-ports-surpassed-their-southern-counterparts-4944128/

[79] http://ec.europa.eu/eurostat/statistics-explained/index.php/File:SSS_of_containers_by_reporting_country,_2005-2014_(volume_of_containers_in_1000_TEUs).PNG

Figure 43 North Sea – Baltic corridor

Rail Baltica has a potential to be competitor to short sea shipping lines with the following advantages:

1) Speed – freight transport between Riga and Northern Europe ports would take less than two days while the same shipping route takes up to four days;
2) Scheduling – freight train schedule is more elastic and can be arranged with greater frequency than short-sea feeder ship schedule, e.g., freight train schedule can be aligned with ferry schedule between Tallinn and Helsinki;
3) Reliability – with limited stops and high resilience to unfavourable weather conditions, supply chains via rail can be organized on just-in-time basis;
4) Full loads – the region has several key stopping points (hubs) where full load can be obtained, thus limiting empty kilometres.

With continuous increase of cargo volumes in Northern Europe ports, Rail Baltica might overtake some of the cargo currently transported via short sea shipping routes by feeder ships. This could occur if short sea shipping becomes more expensive than rail due to additional environmental restrictions implemented in the future in the Baltic Sea region[80]. Detailed assessment of the competitive position is presented in the next chapter.

Competitive position of rail transport in the Region

For the purposes of this study, this section examines the competitive positions of Rail Baltica, existing railway network, road, sea and air freight transport. The competitive position examination is conducted through the estimation of time and costs of transporting cargo by different transport modes to the major trade regions (reflective of the DCAs and WCAs) examined within the context of this study. The cargo transportation connections were considered for the following major trade regions:

- Baltic States – Finland.
- Baltic States – intra trade.

[80] http://ec.europa.eu/environment/air/transport/pdf/sss_report.pdf

- Baltic States – Poland.
- Baltic States – Germany.
- Baltic States – Benelux.
- Baltic States – Adriatic cluster.
- Baltic States – Largest CIS countries (that have 1520 mm railways gauge).
- Baltic States – China.

The estimation of time and costs are based on responses from transport services providers and associated organizations. The key assumptions[81] for the assessment of price and time estimations consisted of:

- Cargo transportation by different transport modes was considered only for direct transport by transport mode (not considering the intermodal possibilities).
- Cargo origin/destination (O/D) pairs was considered only for the key Rail Baltica stop cities – Kaunas, Riga, Tallinn, and including Helsinki where applicable.
- Cargo O/D pair destination were selected, where possible, which can accommodate direct cargo transportation by all of the transport modes.
- Transportation of general cargo for a single journey, transported in a dry 40 foot container, weighing 15 tonnes (or their equivalents).
- Price is based on the averages of the provided estimations for O/D pairs of the key cities of major trade regions defined above, and calculated on a km/EUR basis.
- Time is based on the averages of the provided estimations for O/D pairs of the key cities of major trade regions defined above, and calculated on a day basis and does not consider externalities such as transit times or scheduling.
- Finland's road trade is assumed to be shipped over to Tallinn by Ro-Ro sea transport.

Disclaimer
The price and time estimates provided are indicative only, i.e. they do not represent permanent combination of the best prices or fastest travel durations as these are subject to numerous variables.

The analysis of the comparability of different transport modes surrounding the Baltics States and major trade regions, provided an important distinction of the position of Finland. Given the geographical position of Finland, sea transport is the dominant form of cargo transportation with the EU. Road and railway transport requires ferry (or container feeder) services between Helsinki and other ports[82] to continue their transportation journeys. In the absence of any form of tunnels or bridges, land transport, in particular railways are not very competitive.

On the other hand, sea competitiveness position is no longer so significant when considering trade with Russia – Asia regions, whereby existing railway connections provide a very viable alternative so sea, which requires to sail significantly more distance to reach destinations.

[81] Further assumptions are presented in section 10.1 "CBA assumptions"
[82] In these analysis it was assumed that freight from Finland would be carried over by sea to Port of Tallinn

Figure 44 depicts the price (as measured by EUR / km) and time (as measured in days) estimations of direct cargo transport by different transport modes from the Baltic States to the selected major trade regions.

Baltic States	Finland € / km | day	Baltics € / km | day	Poland € / km | day	Germany € / km | day	BeNeLux € / km | day	Adriatic € / km | day	CIS € / km | day	China € / km | day
RB		0,75 1 d.						
Existing rail**	- *	- *	0,97 | 5 d.	0,70 | 6 d.	0,73 | 6 d.	0,9 | 6 d.	0,91 | 3 d.	0,44 | 15 d.
Road	1,07 | 1 d.	0,72 | 1 d.	0,80 | 1 d.	1,08 | 2 d.	0,94 | 3 d.	1,05 | 3 d.	0,82 | 3 d.	0,42 | 15 d.
Sea	0,47 | 2 d.	- *	0,50 | 2 d.	0,50 | 2 d.	0,50 | 3 d.	0,39 | 5 d.	- *	0,18 | 30 d.
Air	140 | 1 d.	117 | 1 d.	48 | 1 d.	- *	140 | 1 d.	20 | 1 d.	107 | 1 d.	6,78 | 1 d.

* Denotes that the connection with this destination has either been considered as a non-competitive alternative, or direction connections are not possible based on the presented assumptions.
** Existing rail has been calculated based from the perspective of cargo transportation with Finland.

Figure 44 Price and time estimation of cargo transport by different transport modes from the Baltic States to selected regions (based on EY calculations from publicly available data)

Based on the results presented, there is a tendency for rail price per km to decrease substantially when delivering goods to Germany and Benelux regions from the Baltic States and Finland. Rail has a favourable position in comparison to road transport (when measuring price per km). Furthermore, the difference between delivery times of road and rail are 3 days respectively in favour of transport by road, however, the railway transport can deliver cargo at approximately 25% less cost. Such trends can be exemplified by the prices and time estimation to a few sample routes as presented in the Table 26.

Table 26 Price and time estimation by different transport modes for sample routes

Route	Description	Cost and time estimates	Difference
Sample route A – longer route with competition from sea			
A.1	Rotterdam – Helsinki via sea	A.1$_1$) Rotterdam – Helsinki ¿à EUR 500 per 40'' container; ETA 3 days	Sea transport is the cheapest and the fastest. However, rail transport is 25% cheaper than road transport, while only 1 day longer in duration.
A.2	Rotterdam – Helsinki via rail	A.2$_1$) Rotterdam – Tallinn ¿à EUR 1 400 per 40'' container (16 tonnes); ETA 4 days A.2$_2$) Tallinn – Helsinki àà EUR 300 per 40'' container (16 tonnes); ETA 1 day, plus 1 day stay in Tallinn	
A.3	Rotterdam – Helsinki via road	A.3$_1$) Rotterdam – Tallinn ¿à EUR 1 800 per 40'' container (16 tonnes); ETA 4 days A.3$_2$) Tallinn – Helsinki àà EUR 300 per 40'' container (16 tonnes); ETA 1 day	
Sample route B – shorter route with limited competition from sea			
B.1	Kaunas – Warsaw via rail	B.2$_1$) Kaunas – Warsaw ¿à EUR 380 per 40'' container; ETA 3 days	Road transport is 1 day faster and it is 30% cheaper.
B.2	Kaunas – Warsaw via road	B.1$_1$) Kaunas – Warsaw ¿à EUR 250 per 40'' container; ETA 2 days	

There is a favourable competitive position for rail for delivering goods, especially in greater quantities than truckloads, to regions that are further away from the Baltic States than Poland as opposed to road, especially when the final destination does not have strong connections to sea. Although, sea transport also provides a plausible alternative, with the lowest price and delivery time estimations of all the modes, but railway transport maintains a competitive position against sea, especially when considering that railways can deliver goods to inland areas in those regions, while sea would require an intermodal component that would increase the price and duration.

When considering transportation to/from the Adriatic cluster (WCA I), there appears to be relatively equal competitive position between existing rail, road and sea transport. While sea transport appears to be cheaper and quicker than existing rail connection (if shipped to/from Finland), the concerns again arise with the final destination delivery and requirement for intermodal transfer from the ports. Whereas, the road transport may be slightly quicker (Figure 44 depicts as 3 days as road delivery time, however, additional time of 1 day is required to be added for the truck to cross the Finnish Gulf (as the existing railway comparison is presented from Helsinki)), but the cost per km of existing railways is lower.

When considering transportation to/from the 1520 mm rail gauge system countries, it appears that road and railway transport modes are approximately equal in the cost and delivery time of cargo. One of the key reasons is that there is no additional costs and time needed for transferring between 1435 mm and 1520 mm railway gauge.

Also, it is important to note that current market conditions for road transport for the Baltic States and Poland may not be directly reflective of the estimates provided for smaller (1 truck load) and single cargo transportations. This is because the market is very saturated with smaller road transport providers who, for a variety of reasons such as returning for maintenance or fuel excise tax expenditure optimization, may provide prices that are well below market norms.

In addition, the prices of Ro-Ro ferries that are being used to travel from the Baltic States to/from ports of Northern Germany as part of the journey are highly flexible toward market conditions, e.g., immediately after dispute between Poland and Russia on truck entry allowances the ferries from Klaipeda increased their rates for non-Lithuanian licence plate holders. These circumstances would limit the potential market share of Rail Baltica, as one of the expected advantages would be relatively fixed price for longer periods of time. However, it has been noted from the interviews with industry representatives that, for example in Lithuania, regular container trains are becoming cheaper than road transport for, even, short journeys.

As per the presented results in the Figure 44, railway transport has the best competitive position when considering cargo transportation to/from China. Railways costs are less than transportation by road, while taking the same time for delivery. Sea, on the other hand, presents the most cost effective alternative, however, their delivery time is nearly double to that of railways. However, the key concern for the competitiveness of railway transport is the availability of end destinations (hubs), thus requiring an additional intermodal component (which might travel a greater distance than destination from seaport) and may increase the price.

As indicated by industry representatives, additional factor for land bridge rail competitiveness is current discount policies of China rail infrastructure, which currently reduce the rail transportation cost in the territory of China by approximately 50%.

While air transportation may be competitive in terms of time taken to transport goods to destination, key concerns are the availability of direct transport routes of the airports in the Baltic States and Finland that can service required deliveries. Transit time between different airports for larger cargo transportation may significantly impact the duration of transport, and when considering the high price, makes such mode of transport for greater volumes not competitive with other transport modes.

Based on the price and time estimation results, it can be deducted that railway holds a competitive position for the delivery of goods for medium to long distance, provided that there is a developed railway network and intermodal hub infrastructure at those destinations, allowing for the delivery of goods closer to the final destination.

Furthermore, the correlations between the indicative prices may be affected if the cargo is transported on a pallet basis, rather than a tonnage. This is due to pallet primarily being based on volume, rather than weight, which may result in a larger volume requiring to be transported. When considering the volume being transported, this has significant impact onto the amount of containers and their size needed to be utilized. For example, if one measures how many euro standard pallets can fit into a 40 foot container used for rail and the standard tent containers used by trucks, the trucks can fit approximately 30% more euro standard pallets[83]. The differences are also more significant if comparing 20 foot containers. Therefore, for lighter packaged goods, transport by road may result in not only being faster but also cheaper per euro standard pallet transported. Also, the flexibility of road transportation provides it with capabilities to maintain competitive prices in the event when there is no return cargo from the destination of initial delivery. This is not the case with rail, and in the event that there limited amount of return cargo, the price for transportation by rail (for the initial cargo) may rise almost two fold, whereas for road transport this may be a rise of a few percent.

In addition, for transportation by rail, the price and time is significantly impacted[84] by whether the train is a regular shuttle train or a single container transport via rail. On the other hand, regularity of schedule, may not be so significant on the time factor when the cargo is transported by road. Although, prices are positively affected in road transport, as similar to the scheduled shuttle train, when there is a consistent and regular volume that is required to be transported between two destinations, giving rise to economies of scale. Therefore, for regular container cargo that would be transported between two destination (i.e. from Finland/Baltic States to other EU or CIS destinations) may result in the road transport being not only faster and more convenient but also highly competitive on price as opposed to current railways.

Thus, for rail transport to be competitive, it is largely dependent on regular bi-directional and significant amount of volume of cargo to be transported, especially, when there is no significant difference between the amounts that can be fitted onto rail versus road versus sea containers. Furthermore, competitiveness off rail freight transportation can arise from the stable scheduling and consistency in long-term rates, which may be taken up positively by the market, as the sea rates and truck rates may fluctuate significantly month to month. Also, transport by railway may be subject to the preferred transport mode of large organizations who transport greater amounts of manufactured products based on their corporate ecological policies, whereby there is willingness to pay a price premium for the use of ‘greener’ technologies.

[83] Based on the discussions and information provided by Lithuanian Railways.

[84] Based on the time and price estimations provided by Lithuanian Railways, the price and time increase for a single wagon load train in comparison to a shuttle train are over 200% and 100% respectively.

Case Study: Integrated logistics of the paper industry

In 2015, the European paper industry's performance in total was second best in the world after China, with a stable production and increased consumption compared to 2014. The packaging sector's production continued to increase whilst graphic paper (newsprint, printing and writing paper) maintained its recent decline mainly due to ongoing digitalization trend especially in developed countries. According to CEPI (Confederation of European Paper Industries), overall pulp and paper industry in the member countries of CEPI[85] consisted of 633 companies operating overall 917 mills and employing about 178 212 people in 2015 (Estonia, Latvia and Lithuania are not CEPI members, therefore these stats do not include the Baltic States). Total industry turnover was approximately 79 billion Euros in the same year, contributing with almost 16.5 bln EUR to the EU GDP. The industry, as such, underwent a structural change in the early 2000s, which made consolidation of businesses necessary. In this course, over 50% of employment was cut down and number of mills were reduced by 1/3rd, while maintaining almost stable turnover and overall production capacity. Leading countries of paper and board production (about 90.9 million tonnes p.a.) within CEPI are Germany (24.9%), followed by Finland (11.4%) and Sweden (11.2%), the global market share of CEPI in terms of production is about 22.4% and in terms of consumption 18.9%.[86] The global industry outlook for the coming years is considered to follow a declining trend with round about -2% in paper product sales[87].

The largest paper and pulp factories in Finland and the Baltics and the planned projects are: in Estonia - completed factories: Kunda Estonia Cell (around 160 000 tonnes), Kehra Horizon (ca 130 000 tonnes), important planned plants: Äänekoski (Finland), Est-For Invest Tartu (Estonia), both investments amount to above 1 bln EUR and could provide significant cargo traffic to Rail Baltica.

Overall, the paper industry is highly globalized, with raw materials being supplied (e.g. kaolin/ china clay, hardwood pulp) from emerging countries such as South America, Russia and China, and principle production conducted in facilities in Asia, the US, and Europe, while consumption disbursed across the world with the consumption being slightly decreasing in developed countries but increasing in emerging and developing countries. The Figure 45 exemplifies the structure of the paper (and pulp) market.

[85] Member countries are: Austria, Belgium, Czech Republic, Finland, France, Germany, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom.
[86] Source: CEPI Key Statistics 2015
[87] Sources: Euler Hermes Economic Research and Moody's 2016

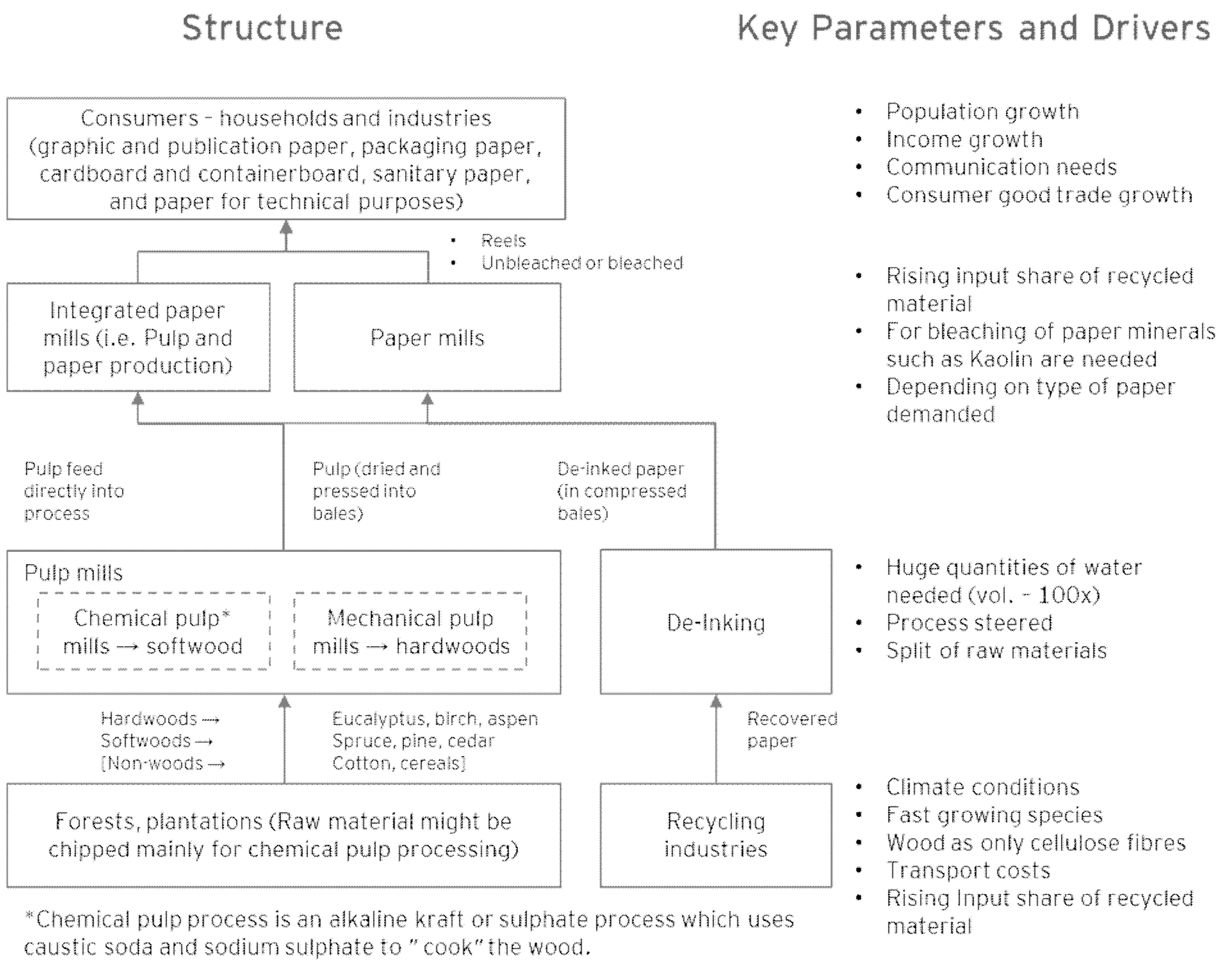

Figure 45: Paper (and pulp) market structure

Being reliant on globally traded commodity prices (e.g. for kaolin and pulp), the industry, especially in Europe, is very cost sensitive. As a result, leading market players, such as Stora Enso or UPM Kymmene from Finland, continuously optimize their sourcing and distribution network (logistics), monitor the overall supply chain efficiency in terms of frequency, reliability, visibility and cost. This includes the employment of different transport modes, establishment of regional hubs, the usage of special designed load units (e.g. SECU unit[88] of Stora Enso, see Figure 46), as well as employment of own vehicles and vessels (e.g. own or charted vessels on main routes by UPM, tailor made SECU-carriers by Stora Enso).

[88] Note: The Stora Enso Cargo Unit (SECU) is a type of intermodal container specially designed for moving bulk cargo like paper on railways and vessels. It is slightly taller than the standard 40' ISO container and can carry up to 80 tonnes.

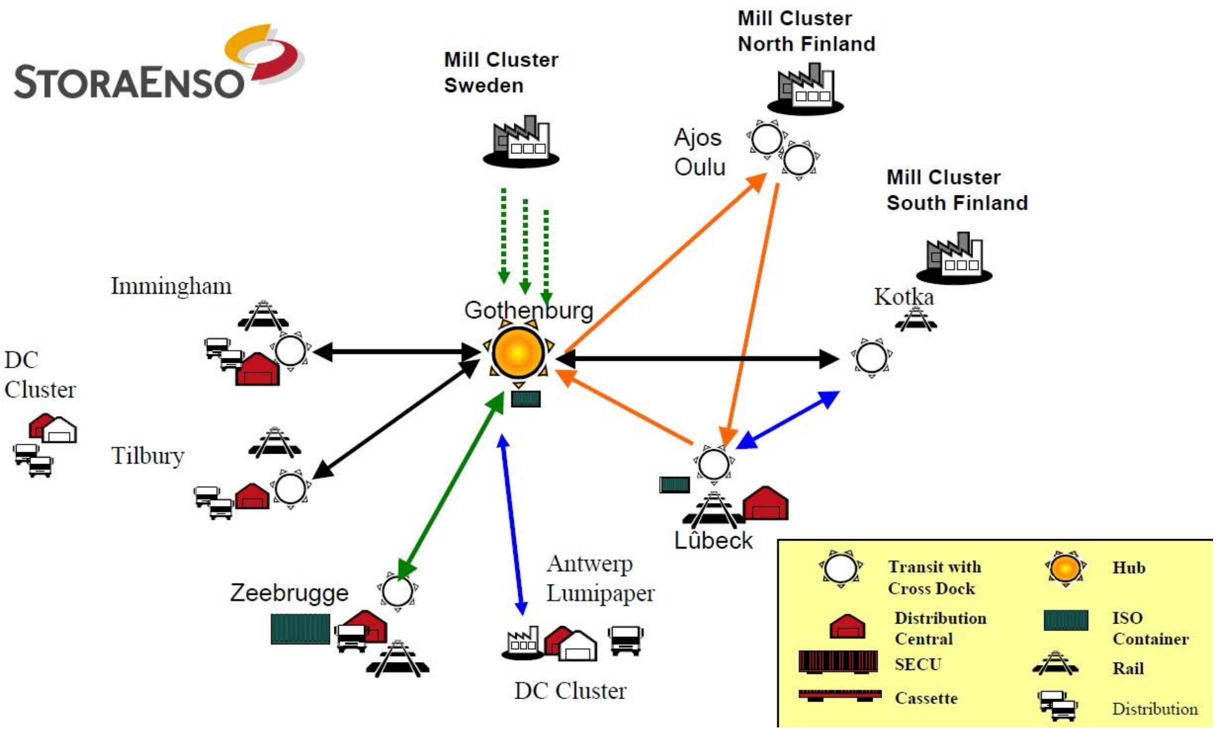

Figure 46: Main traffic solutions of Stora Enso, 2006

Even though companies such as Stora Enso or UPM operate on established logistic networks, industry outlooks as well as interviews with decision makers from these companies indicate that a new transport solution such as the Rail Baltica in the region would enrich the existing networks and could potentially attract business from these companies in case, Rail Baltica services are competitive in terms of cost, time and frequency and are able to offer integrated services (e.g. handling and transport of SECUs).

Case Study: Reconfiguration of the Supply Chain Structure (IKEA context)[89]

The case profiles IKEA's logistics operations with a particular emphasis on Poland from which 17% of its furniture is being sourced. IKEA is known in the logistics industry as a company that strives to use railway transport whenever possible (in 2007, 18% of its all transportations were by rail) for transporting its products. The usage of railway is supported by an argument that IKEA prefers transporting its products in an environmentally friendly manner. By switching to rail, some of the benefits generated are:

- Transport cost reduction.
- Supplier lead time reduction.
- Reduction of CO_2 and noise emission.
- Reduction of noise emission.
- Reduction of road accidents number.

In Rail Baltica context, a strong case can be made that IKEA would use its services for transporting its products to/from Baltic countries and potentially to/from Scandinavia (via the Baltic States).

[89] http://www.elabestlog.org/sites/default/files/cases/Ikea%20Reconfiguration%20Supply%20Chain.pdf

Case Study: UUSIKAUPUNKI MERCEDES FACTORY SUPPLY CHAIN [90]

One of the Mercedes-Benz factories (Valmet Automotive) is located in western Finland. Currently, Mercedes parts from plants in Germany, are sent to Travemunde by rail in piggyback semi-trailers, and trans-loaded onto a Ro-Ro ferry and shipped to Finland for assembling.

In the future, there is a potential to shift some of this and similar type of logistics chains onto Rail Baltica. In this particular case, a clear benefit for Rail Baltica versus the sea transport is a faster delivery time and also savings on intermodal transloading costs (parts are already loaded on train when leaving the plant in Germany).

Case Study: Copenhagen-Malmo Port (CMP) automotive logistics[91]

CMP is a hub for import and handling of new cars in the Baltic Sea region. The four ultra-modern terminals can accommodate up to 40 000 cars simultaneously. It is the biggest Nordic port for cars, with hundreds of thousands of vehicles passing through annually. The success of the hub has been achieved largely due to:

- Location (4 million consumers in Oresund region and Denmark, Sweden and Norway can be reached without further being shipped).
- Wide range of automotive industry services being available.
- Modern facilities.
- Professional team and well managed operations.

In relation to Rail Baltica, this is a good example on how to add extra value through specialization.

Case Study: Duisport[92]

Duisport trimodal logistics hub is the largest inland hub in Europe. It handles 3.7 million TEU annually. It is considered as one of the leading railway hubs in Europe and is well connected with North Sea via the Rhine. Furthermore, it is able to effectively shift between road, ship and rail freight types. It has also emerged as one of the key destinations for the goods traveling along the China-Europe land bridge rail connection.

One of the main advantages of Duisport is the ability to leverage the existing railway network in order to ship the received cargo internationally. In cases where further connections are needed, the rail infrastructure is used to deliver the cargo to other ports. For instance, there is a continuous container traffic to and from Finland, which is provided by eight freight operators. With this logistics network, it is possible for the freight shipment to arrive in the destination in four days' time[93].

In addition, the hub adds extra value by providing:

- Sophisticated all-in-one packaging solutions for various sized units.
- Facility management.
- Transportation and logistics services.
- Project logistics.

[90] http://www.dsv.com/About-DSV/media/latest-news/2013/02/Valmet-automotive-Mercedes
[91] http://www.cmport.com/en/business/cars
[92] http://www.duisport.de/en/
[93] http://www.duisport.de//media/files/576bd76ca9462-bahnl_en_06-2016.pdf

In relation to Rail Baltica, it is an example on how to add extra value by offering various additional services and leverage railway network for the delivery of cargo. As indicated by the logistics chart of Duisport, due to the lack of rail infrastructure, freight to the Baltic region and Finland is being delivered by sea. There is a good potential for the new rail infrastructure to attract part of the freight, which is currently being transported by the sea, not only from Duisport, but also from other freight shipping companies in the Mainland Europe (see Figure 47).

Figure 47 Duisport intermodal connections

Case Study: DHL Hub Leipzig – "A new door to the world - built in record time"[94]

Political decisions halted the expansion of DHL's sorting hub in Brussels. In order to continue expanding the business, DHL decided to build an intermodal airfreight hub in Leipzig/Halle. Investments reached around EUR 300 million. The new intermodal airfreight hub uses modern technologies and is capable of sorting 100 000 items per hour. Part of the success is the operation layout of the hub. Airplanes land, swap the containers and take off again. The received cargo is then then sorted and cleared for onward transport by air, truck or rail.

With the new airfreight hub, DHL managed to obtain the capacity needed to solidify the current position and grow the business in the future. It is now the main gateway to the world for DHL, based on the number of interconnected flights.

DHL's example is relevant as it indicates the benefits of a modern multimodal intermodal transport hub with a particular emphasis on the air-rail connectivity for freight. Rail Baltica potentially might replicate the success of DHL by having a similar setup that would take advantage of the Rail Baltica's ability to quickly deliver freight to/from a centralized sorting facility or transcontinental hub that would then distribute the freight further in the region, not least in connection with an intercontinental air freight

[94] http://www.dpdhl.com/en/logistics_around_us/from_our_divisions/leipzig_hub/hub_built_in_record_time.html

link geared towards e-commerce shipments, given that region's main airports shall be integrated into the Rail Baltica logistics corridor.

Case Study: The Port of Helsinki has significant positive economy and employment-related effects[95]

According to a research conducted by the Brahea Centre at the University of Turku, the total value of the business operations at the port of Helsinki in 2015 was 1.6 bln EUR. In addition, the port employed approximately 15 000 thousand people. Furthermore, if adding indirect economic benefits generated by the port, the total financial effect of the port was up to 2.6 bln EUR in 2015. Accordingly, Rail Baltica would enjoy the economic benefits of being located within relatively close proximity from the Helsinki port.

5.3.3 Factors influencing the regional trade patterns in the future: Arctic corridor

Key message:

- Arctic sea corridor might be the most cost-efficient logistics solution for trade between Europe and East, however, its regular use is subject to significant environmental barriers and fulfilment of necessary market conditions.

It is expected that, in the near future the Northern Sea Route (shipping route in Arctic Ocean between Far East and Northwest Europe) will account for 2/3 of cargo flows currently routed from Far East to Europe via Suez Canal (see Figure 48)[96]. As for now, Northern Sea Route is not a reliable and safe passage for constant cargo shipments. The current condition of the Arctic cap allows regular cargo ships to use the passage only two to four months a year and it remains unpredictable even if all passage routes will be free from ice.

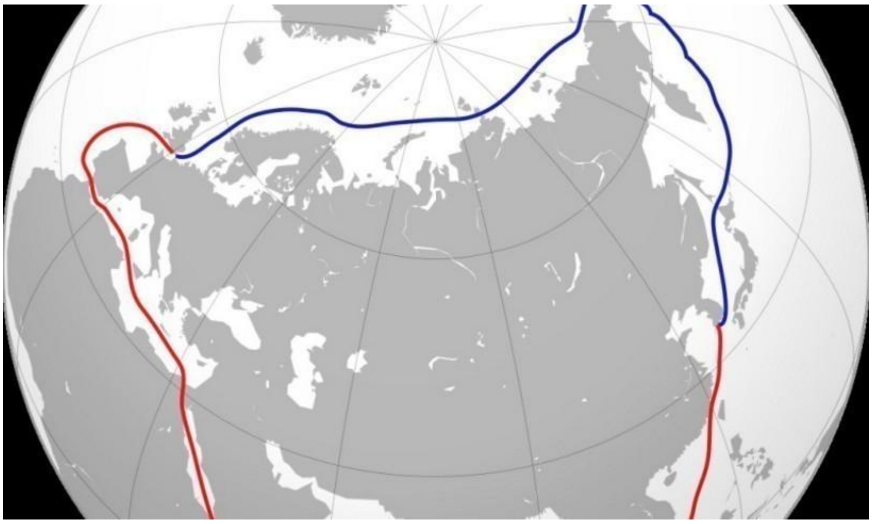

Figure 48 Northern Sea Route (blue)[97]

As a result, in 2015 only 18 vessels passed the Northern Sea Route mostly with insignificant food cargoes. Yet the route has a tremendous potential (see Figure 49). With the current pace of climate change, Northern Sea Route will be free from ice year-round by 2050 and the Arctic cap will shrink to such a diameter to allow for a straight shipping route from Alaska to Europe. Red lines indicate ship

[95] http://www.portofhelsinki.fi/en/port-helsinki/whats-new/news/port-helsinki-has-significant-positive-economy-and-employment-related

[96] http://worldmaritimenews.com/archives/161360/study-northern-sea-route-to-overpower-suez-canal/

[97] http://www.highnorthnews.com/new-rules-to-ensure-cleaner-shipping-in-the-arctic/

routes available during the summer, whilst the blue lines show available routes during the winter for ships with moderate icebreaker capacity.

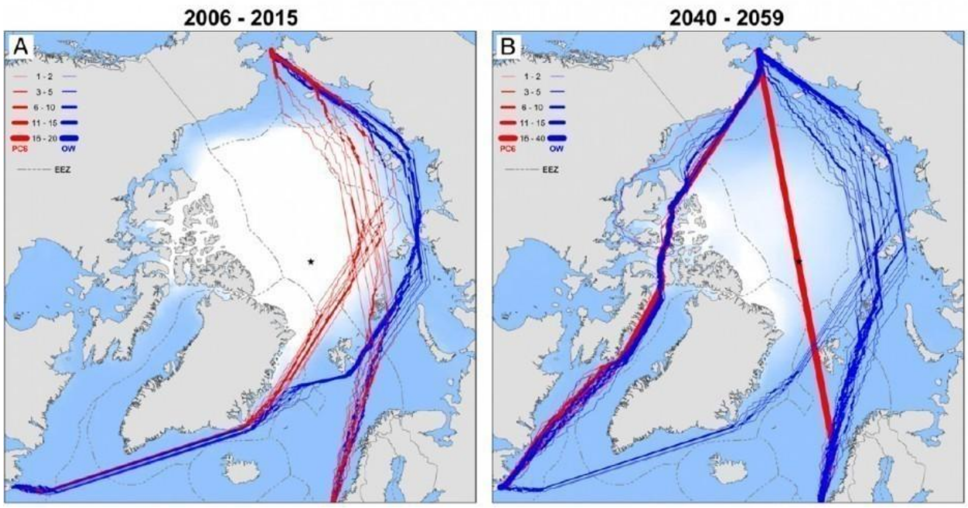

Figure 49 Climate change effect on Northern Sea Route[98]

The future choice between Northern Sea Route and the currently used Southern Sea Route in obvious. Passage time saving on the route between Yokohama, Japan, and Rotterdam, Netherlands, is estimated at 35% in comparison to the route through the Suez Canal. Significant cost saving and productivity increase can be expected from such time savings.

In relation to Rail Baltica, in the near future, there are no realistic indications of Northern Sea Route cargo shift to land transport in Northern Norway and further carried by rail to Central/Southern Europe. Even with removed physical barriers, political barriers would most likely remain if tension between Russia and the EU countries do not settle. However, there is a scenario with certain preconditions, under which increased use of the Northern Sea Route would positively affect Rail Baltica. The preconditions are the following:

1) Time sensitive goods prevail over cost sensitive goods along the route;
2) Port of Kirkenes (Norway) experiences significant development in terms of capacity and inter-modality;
3) Arctic railway (Figure 50) is in active use with a minimum capacity of 3 mln tonnes;
4) There is a feasible ferry solution between Finland and Estonia.

Under these preconditions, it can be expected that there would be a potential for containerized LNG, fishery product and Arctic resource cargoes to flow from the Northern Sea Route to Rail Baltica and further to Europe. Furthermore, under the listed preconditions, the potential of freight flows relevant for Rail Baltica might be up to 1 mln tonnes by the years 2030-2040 and up to 3 mln tonnes in period of 2040-2050[99].

[98] https://www.washingtonpost.com/news/wonk/wp/2013/03/05/climate-change-will-open-up-surprising-new-arctic-shipping-routes/

[99] Freight Flow Forecasting from Arctic Sea Route and Adriatic Route to Rail Baltica Railway Line. Jüri Sakkeus, Aado Keskpaik, Erik Terk

Figure 50 Arctic Railway project

5.3.4 Factors influencing the regional trade patterns in the future: Adriatic corridor

Key messages:

- Rail Baltica has a potential to be one of the links in the Adriatic transit corridor for trade between Scandinavia and Finland and the East

Adriatic corridor temporarily holds a significant advantage over Arctic sea routes as a transit corridor for the cargo flows from Scandinavia to Asia via Rail Baltica. This chapter does not investigate the direct trade of the region with the Adriatic region countries (WCA I), for which the abovementioned competitiveness and Rail Baltica service considerations have been applied. According to TLU[100], even though the Adriatic seaports still have to significantly increase their competitiveness in terms of depth, capacity and intermodal hinterland connections compared to Northern European ports, it holds the potential for serving Asia-bound trade, as it is approximately 2000 nautical miles closer to Suez Canal than its Northern Europe competing ports.

However, according to experts from the TLU, distance would not be the key criteria in this case. A sample calculation shows that intermodal transfers required for a container trip from Asia to Finland via Adriatic corridor would be nearly twice as expensive and only around four days quicker, which is not enough to justify the costs (see Table 27).

Table 27 Sample route for Adriatic corridor

Route	Description	Costs and time by route	Total costs and time	Difference
A	Singapore – by sea to Koper – by rail (partially Rail Baltica) to Tallinn – by sea (specialised container carrier) to Helsinki	a_1) Singapore – Koper à EUR 1 200 per TEU; ETA 18 days a_2) Koper – Tallinn à (calculating: distance 2 200 km; EUR 0.9 per TEU) EUR 1 980 per TEU; ETA: 2.5 days, plus stay in Koper: 2 days a_3) Tallinn – Helsinki à EUR 120 per TEU; ETA: 2 days (incl. stay in Muuga)	• EUR 3 300 per TEU • ETA: 24-25 days	• EUR 1 600 in favor to route B; • 3-4 days in favor of route A.

[100] Freight Flow Forecasting from Arctic Sea Route and Adriatic Route to Rail Baltica Railway Line. Jüri Sakkeus, Aado Keskpaik, Erik Terk

Route	Description	Costs and time by route	Total costs and time	Difference
B	Singapore – by sea (large container carrier) to Rotterdam – by a feeder vessel to Helsinki	b_1) Singapore – Rotterdam à EUR 1 200 per TEU; ETA: 23 days; stay in Rotterdam approx. 2 days b_2) Rotterdam – Helsinki à EUR 500 per TEU; ETA: 3 days	• EUR 1 700 per TEU; ETA: 28 days	

Yet there are several realistic preconditions under which Adriatic corridor would make more economic sense in the future. According to TLU, the Adriatic corridor would be a fixed logistics solution for relatively expensive and time-sensitive goods, which are currently transported by air. As of now, the catchment area of the transit corridor - Scandinavia, Baltics, Poland – does not trade enough of such goods to make the corridor feasible. According to estimates by TLU 0.13 mln. tonnes of containerized cargoes per year are required to achieve an acceptable economic feasibility for a container train line from Scandinavia to Adriatic Sea (see Figure 51).

Besides the minimum cargo volumes, there are several other preconditions required to be met for the corridor to be feasible:

1) Feasible container traffic between Tallinn and Helsinki;
2) Increased demand for expensive goods and just-in-time deliveries;
3) Improved hinterland connections to Adriatic seaports.

With the implementation of Rail Baltica and the fulfilment of the necessary preconditions for the transport mode shift from feeder vessels to rail, the competition between Northern Europe ports (currently serving the Eastern Europe and Scandinavian markets with feeder ships) and Southern Europe ports should increase significantly, even though they typically are expected to operate in separate cargo segments.

For the purpose of the analysis, only the key ports of the corridor are reviewed – Koper (Slovenia), Trieste, Venice (Italy) and Rijeka (Croatia). According to TEN-T research project carried out in 2015, some of the major development initiatives that the ports are expected to take place including - building new terminals, upgrading infrastructure and systems, and other improvements.

With the mentioned upgrades, Adriatic corridor will considerably increase the number of direct calls and overall throughput. According to estimates by TLU, by 2030 the freight and passenger transportation demand in the corridor could increase by 33% and 32% respectively. The container flow from Eastern Europe and Poland is estimated to rise by 70-90%[101].

The politically expressed aim for the Adriatic region is to attract containerized cargoes flowing from Balkans, Central Europe, Eastern Europe, and north of the Alps to Germany and Austria, Switzerland and Romania. Considerable amount of the cargoes originating in or flowing to Eastern Europe, consequently, might be carried via Rail Baltica.

[101] Accessibility Improved At Border Crossing For The Integration Of South East Europe – ACROSSEE WP3 Institutional Platform and Administrative Cooperation

Under the fulfilment of mentioned preconditions, it is estimated that the potential of cargo volumes in Adriatic corridor as a transit between Scandinavia and Finland via Rail Baltica might warrant several trains per day by 2050[102].

Figure 51 Baltic-Adriatic Rail Corridor[103] according to the AS Baltic Rail vision

5.3.5 Factors influencing the regional trade patterns in the future: Euro-Asia Land Bridge

Key messages:

- Rail Baltica has a potential to act as feeder for Euro-Asia Land Bridge.
- The preconditions and volume potential is similar to the Adriatic transit corridor

The strongly growing economy of China (approx. 7% annually[104]) has determined a clear need for additional logistics solutions to Europe[105]. With overcrowding and bottlenecking seaports along coast of China, for several manufacturing regions in in-land China it has become a more attractive option to organize container train lines over the Euro-Asia Land bridge (also known as the "New Silk road") – a railroad crossing China, Kazakhstan, Russia, Belarus and reaching Central Europe through Poland (see Figure 52). With several alternative routes, the corridor also crosses Mongolia and Northern China, directly connecting to the Trans-Siberian railway already in Siberia.

[102] Freight Flow Forecasting from Arctic Sea Route and Adriatic Route to Rail Baltica Railway Line. Jüri Sakkeus, Aado Keskpaik, Erik Terk
[103] The corridor vision represents current rail network, upon the completion of Rail Baltica the route of the Baltic States would be changed to Rail Baltica alignment
[104] http://www.tradingeconomics.com/china/gdp-growth-annual
[105] http://www.forbes.com/sites/wadeshepard/2016/08/03/how-the-new-silk-road-is-stimulating-local-economies-and-changing-lives-from-china-to-europe/#184dcf07b77e

Figure 52 Euro-Asia Land Bridge

However, the "New Silk Road" is still not the optimal logistics solution as the corridor faces several constraints and barriers. Firstly – the 10 000 km railway passes three economically, politically and culturally different countries making it difficult to harmonize safety, customs and other regulations. Secondly – full transhipment from China to Europe requires double gauge shift as China and Europe uses the regular 1435mm gauge while Russia uses 1520mm gauge. These shifts increase the costs and lead times. Thirdly – economic feasibility. According to The Geography of Transport Systems estimations, train is the most feasible mode of transport for distances of up to 3 000-4 000 km, which is 3 to 4 times less than the length of Euro-Asia Land Bridge. Similar to Adriatic corridor, the time gain (approx. 6 days to reach Europe compared to Southern Sea Routes to Northern Europe ports) does not compensate for additional costs[106].

Similarly to the Adriatic transit corridor, Euro-Asia Land Bridge is feasible only for expensive to semi-expensive, time-sensitive goods. As there currently is no direct service link between Euro-Asia Land Bridge and the Baltic States and a direct rail branch from Moscow and St. Petersburg connects the Land Bridge to Finland, Rail Baltica might contribute as a feeder facility to/from the link currently tested/operated between China and Western Europe.. According to TLU[107], the estimated potential for Rail Baltica might be similar to cargo volumes intended for Adriatic corridor – approx. 0.39 mln tonnes by the year 2050 - as both logistic solutions have similar background O/D combinations.

5.3.6 Factors influencing the regional trade patterns in the future: Finnish cargo contribution to Rail Baltica

Key messages:

- Finnish economy is expected to grow its share of time-sensitive cargo exports in next 20 years, thus creating potential for Rail Baltica freight flows
- The level to which the Finnish freight potential might be reached depends on the competitive position of Rail Baltica and transit facilities in the Gulf of Finland

[106] https://people.hofstra.edu/geotrans/eng/ch5en/conc5en/NEW_Corridor_Freight.html

[107] Freight Flow Forecasting from Arctic Sea Route and Adriatic Route to Rail Baltica Railway Line. Jüri Sakkeus, Aado Keskpaik, Erik Terk

As described in previous sections, in the near future, the Adriatic transit corridor, under several conditions, is one of the potential logistics paths for Rail Baltica cargoes. The success of Rail Baltica and Adriatic transit corridor depends on export ability of Finland, in particular on the Finland to Asia direction export capabilities. In 2015, Finland contributed 60% of cumulative Finnish/Baltic State exports to Asia. Currently 90% Finnish exports and 80% imports is organized via sea trade.

According to considerations mentioned above, the Adriatic transit corridor would make economic sense only when transporting goods of certain characteristics:

1) Relatively expensive;
2) Time – sensitive;
3) High quantity.

As of now, the potential catchment area of Rail Baltica (let alone Finland only) does not have enough cargo of such characteristics. However, according to predictions of TLU experts, in 20-30 years Finland will shift its export segment from small machinery and spare parts to biological products and large machinery with high added value, which are more time-sensitive and more expensive products thus more rail-friendly. According to study ordered by Finnish Transport Agency in 2014, around the year 2040, the main Finnish export market will be Asia and "Other Asia" – all Asian countries outside the Near and Middle East. Summing the estimates together, it is expected that the potential of Finnish export that might be serviced by Rail Baltica by year 2040 could reach nearly seven mln tonnes (see Table 28).

These estimates, however, present the optimal case development when Rail Baltica would capture a rather high market share for the cargo. The three forecast scenarios of this CBA have been done by assuming a more conservative impact of cargo from Finland and such volumes from Finland are only considered in the optimistic sensitivity scenario.

Table 28 Finland freight export flow forecast for 2040[108]

	2013, million t	2040, million t	Increase, million t	Increase, %
Paper and board	0.65	0.74	0.09	14
Pulp	0.90	1.80	0.90	100
Sawmill products	0.68	2.80	2.12	312
Metal products	0.21	0.96	0.75	357
Chemicals	0.16	0.65	0.49	306
TOTAL	2.60	6.95	4.35	167

However, there are still multiple preconditions that need to be met to capture the potential and achieve the modal shift of the Finnish cargoes to rail. One of the main ones is the transit over Gulf of Finland to Estonia and onto Rail Baltica (see next chapter). Other considerations include ensuring a competitive service versus the short sea shipping, which, as discussed above, is a strong alternative to the land connection.

Considerations on transit link between Finland and Estonia (Vousaari-Muuga)

Three main Finland-Estonia connection solutions have been discussed in various decision-making levels. According to TLU, all three are worth deeper analytical consideration, in particular reflecting of the

[108] Freight Flow Forecasting from Arctic Sea Route and Adriatic Route to Rail Baltica Railway Line. Jüri Sakkeus, Aado Keskpaik, Erik Terk. Forecasts of this CBA have been done by assuming more conservative impact of cargo from Finland.

technical aspects, in making the final decision. The general description and analysis of benefits for all three considered solutions is given below.

Rail ferry

Rail ferry is a ship designed to carry rail wagons using Ro-Ro principle (Figure 53). According to experts interviewed, rail ferry is considered an expensive project to implement and operate, as it requires highest safety standards and specialized ro-ro ships. In addition, such connection would limit flexibility. On the other hand, rail-ferry would be a considerably faster connection than loading containers onto ships for standard seaborne passage.

Figure 53 Rail – ferry option for the crossing of the Gulf of Finland

Container ship

An alternative for rail ferry traffic is a regular short sea shipping container line. Both Helsinki and Tallinn ports currently operate container handling terminals, thus there would be no need of significant expenditure for infrastructure upgrades. However, double loading of containers would add additional time of passage, thus decreasing the added value of Rail Baltica (see Figure 54). In addition, from long-term perspective, short sea shipping in the Baltic Sea is not sustainable due to expectations of various potential restrictions aimed at ecological sustainability (e.g. Sulphur directive, Natura 2000 site expansion, etc.).

Figure 54 Rail – sea - rail option for the crossing of the Gulf of Finland

Tunnel

For various reasons, the development of a tunnel underneath the Gulf of Finland in recent years has gained considerable political and public support. Even though it is the most expensive alternative, a tunnel would completely remove the Gulf of Finland barrier to enable a fast, sustainable and reliable cargo flow between Finland and Eastern Europe (see Figure 55). In June 2016, the EU INTERREG Central Baltic Programme 2014-2020 allocated one million euros for conducting a feasibility study for the potential tunnel project as it would potentially have a high impact on the areas freight ecosystem. However, due to unclear feasibility and time schedule for this project, for the purposes of the analysis it is expected that the tunnel will not be completed within the life cycle of the Rail Baltica project.

Figure 55 Rail - tunnel - rail option for the crossing of the Gulf of Finland

5.3.7 Factors influencing the regional trade patterns in the future: development trends of competing transport modes

Key message:

- Rail Baltica is expected to be increasingly competitive in comparison to other modes of transport due to lower environmental impact, especially if the environment policy will remain a key priority of the EU

Air

Competitiveness of airfreight significantly relies on two factors – fuel price and technological innovations. The main advantage of airfreight has always been the speed it offers, yet it comes with additional costs. At the same time, freight volumes keep growing and air traffic tends to face capacity shortages, congestions and, thus, delays[109]. In addition, airports face challenges in expanding their capacity, as exemplified by, for example, the Heathrow or Vienna cases.

It has become a trend to build larger airfreight hubs and collaborate with other infrastructure hubs to increase efficiency. This is mostly done to retain and increase the speed advantage and offer larger variety of services.

In the era of e-commerce and need for short delivery times, the role of airfreight has increased significantly. This trend has led e-commerce companies such as Amazon, Alibaba etc. to vertically integrate by establishing their own in-house or directly associating with niche airfreight companies, putting pressure on the “legacy” airfreight companies such as FedEx, UPS, DHL, etc.

Sea

The general trend for small and medium ports, like ports located in the Region, is to specialize in handling one or few types of cargoes and in many cases it is driven by demand or geographical restrictions. However, there are many examples of small ports doing exactly the opposite, i.e. diversifying their cargo base and adding new value added logistics services. One of the main concerns for maritime traffic will remain the environmental protection regulations. One of such example is the sulphur directive[110] that requires vessels in the Baltic Sea to use low sulphur fuel, which, according to experts[111], will cause significant costs for shipping lines. This effect has been partially mitigated by current period of lower fuel price levels.

Another development trend is the increasing capacity– deepening sea routes, increasing hinterland connections and maximizing the speed of cargo handling. In larger ports, it has become imperative to automate processes to increase productivity and decrease possibilities of human errors. Besides, global

[109] http://www.bauhaus-luftfahrt.net/research/fokus-operationelle-aspekte/herausforderungen-und-entwicklungsperspektiven-fuer-drehkreuzflughaefen-in-europa-1

[110] DIRECTIVE 2012/33/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 November 2012 amending Council Directive 1999/32/EC as regards the sulphur content of marine fuels

[111] schonescheepvaart.nl/downloads/rapporten/doc_1361790123.pdf

trends such as big data and analytics, mega ship construction, fleet over-capacity management etc. has led to optimization and competitiveness improvements of maritime transport.

Road

Road transport remains one of the most competitive short-distance transport modes. Not only does it provides highly competitive just-in-time/just-in-place service, it also has wide future growth perspectives:

1) Increased speed and capacity – with continued development of high-speed intercity highways and vehicle technological development, services will be provided even faster;
2) Increased mobility – significant funds every year are invested in building new roads, thus making even the most remote rural areas more accessible;
3) Increased safety – with technological advancements and investments in road infrastructure, road transport is likely to become safer[112].

Road transport remains the main competitor of Rail Baltica. However, there is also a high potential for collaboration between the two transport modes (e.g. container traffic, piggyback transportation).

5.3.8 Factors influencing regional trade patterns in the future: rail transport industry trends and innovative technologies

Key message:

- Technological advancements might level the competitiveness of rail vs other road transportation modes from the point of view of information accessibility

Currently the rail sector is focused on safety, productivity and adding convenience. Advancements in technology have brought multiple innovative solutions for these development needs. More and more rail companies implement different types of predictive analytical software to advance communication, identify problems and find the right solutions. These innovative solutions can drive efficiencies in operations, to provide better information to customers and better information to communities thus increasing the competitiveness (or achieving similar information level as key competitors) of Rail Baltica. Automatization is another trend and an innovation platform for the rail industry. There are multiple train and metro lines that already use driverless trains, however it is still not a widely-used solution.

Train and railway inspection is another field for innovation in the railway sector. There is a number of companies working on a portal-like sensors system with cameras, lasers and strobes that inspect rail cars as a train passes by, providing a 3-D model and image of each car to identify any anomalies. Drone technologies are also becoming more popular for the inspection of large rail yards.

Even though innovations and digital applications in the rail industry are numerous, rail companies need to establish a closer collaboration with technology developers as rail is a niche industry, thus scope for technology sales is limited[113].

[112] http://www.transport-research.info/sites/default/files/project/documents/20120316_153333_22169_Publishable%20Report.pdf
[113] http://www.progressiverailroading.com/rail_industry_trends/article/The-next-wave-of-technological-wonders-in-rail-country--49381

6. Macroeconomic and sector development scenarios

Key messages:

- The chosen macroeconomic scenarios are based on the ambiguous development of the global trade and the level of environmental consciousness. Each scenario represents a combination of various outcomes of these two dimensions
- Expert panels and industry representative surveys were used during the development of influence factors for forecasting purposes

6.1 Overall approach

To ensure robustness and avoid excessive bias of the set of factors that form a particular scenario, for passenger and freight forecasting the scenarios technique has been applied as follows:

1) To demonstrate the effects of the expected macroeconomic development without any influence from the factors, a neutral (Base case) scenario has been created and used as a reference scenario. This scenario assumes that overall trade and passenger flows would grow according to respective countries' GDP and GVA development, considering historically observed correlation between trade and mobility growth vs GDP and GVA growth respectively.

2) To test the viability of the project in different macroeconomic circumstances and account for uncertainty of future developments, we have added to the Base case two scenarios that would represent opposite potential development trends. Based on panel discussions and factor surveys, one of the scenarios – Scenario 4 – was dropped from further evaluation as it was deemed to have the lowest probability (significantly lower than the other scenarios) and, therefore, not reasonable for inclusion in further analysis. Afterwards, to strengthen the sensitivity effect of the scenarios, two scenarios with the most diverse expected macroeconomic developments were chosen:

   - High case scenario: Scenario 2 – Waste of resources in the name of economic progress.
   - Low case scenario: Scenario 3 – Responsibility for sustainability in a local economy.

   The scenarios have been constructed as a set of factors that influence positively or negatively the future overall freight and passenger movement. A scenario can contain both positive and negative factors, e.g., there might be factors that increase economic growth (which is a basic driver for trade), however, the effect of the factor might be (partially) outweighed by trade fragmentation or deployment of protectionist policies (which hinder trade growth). In addition, the effect of each factor was assessed over three separate forecast periods (2020-2030, 2031-2040, 2041-2055), i.e., a factor might have more strong influence in the short term and weaker influence in long-term etc. The influence of particular factors has been gauged for the chosen scenarios using information gathered from expert panel discussions and online surveys. For the calculation of each Influence factor's weight, results of the Rail Baltica factor impact survey have been taken into account according to the following approach.

   Each reply of the survey participants for every single valuated influence factor received a point for calculation purposes as per Table 29 below.

Table 29 Survey impact assessment and calculation

Survey impact assessment	Points for calculation
High negative impact	- 1.5
Average negative impact	- 1
Low negative impact	- 0.5
Neutral	0
Low positive impact	+ 0.5
Average positive impact	+ 1
High positive impact	+ 1.5

The summary of points for each influence factor then has been divided by the number of survey participants and further by a model factor between 90 and 110 depending on the respective time period. This model factor is required for adapting the influence factor weighting gathered through the survey process to the model calculation structure while maintaining the original proportion of survey results. Results of this calculation have been applied for the High case Scenario, while for the Base case Scenario, as described above, a neutral weighting for all influence factors has been considered. For the Low case Scenario, mark-ups for the probability have been added to the calculated factor points based on a stochastic approach. In other words, the Low case received negative mark-ups for each time period.

6.2 High case scenario: Scenario 2

The scenario is characterized by increasing global integration between countries and a significant foreign trade growth can be observed between the countries (growth of trade exceeds GDP growth rates). Most of the world adopts the values and expectations prevailing in today's industrialized countries, trust is placed in further globalization and liberalization to increase corporate wealth, create new enterprises and livelihoods[114]. Consumerist values aimed at technologies has a growing role in Europe, the growth itself becomes more important than social equality and quality of life, and the global interdependency increases[115], with market fluctuations having a huge impact on economic and social ,development.

EU and the Member States continue consuming the available resources while failing to apply sustainable environmental policy principles and failing to achieve a balanced development. Out of the aims set by the White Paper 2011 "Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system" only a few elements are implemented due to local interests, lack of compromise or insufficiency ofEU support policy the European countries, despite the fact such political agreements exist formally. This means a much slower shift of freight and passenger transportation to rail, and a relatively large adverse impact by the transport industry on environment. The Baltic States

[114] Scenario „Market's First" in Four Scenarios for Europe. Based on UNEP's third Global Environment Outlook, 2003. Available at: https://web.unep.org/geo/sites/unep.org.geo/files/documents/four_scenarios_europe.pdf
[115] Scenario „World Markets" in Socio-Economic Scenarios of European Development and Integrated Management of the Marine Environment, University of Bath School of Management Working Paper Series, 2008. Available at: http://www.bath.ac.uk/management/research/pdf/2008-08.pdf

engage actively in establishing international relations, especially in the field of trade and services, through involvement in international trade value chains.

6.3 Low case scenario: Scenario 3

Globalisation processes in the world slow down and are not that comprehensive any more. Polycentric development and regional networks around development centres of various sizes (including of regional significance) gain higher importance. Economy, production and external trade volumes continue to grow, at the same time growth rates in Europe become steadier and the economy is based on ecological and sustainable development primarily aimed at the welfare of the inhabitants. Cooperation and knowledge transfer gain higher importance than competition as the driving forces of businesses, which account for a slower, but more stable economic growth. The economy and the policy of the EU becomes fragmented, there is local development within some countries and smaller regions, which accounts also for a larger role of local administration systems and decreased impact by trans-national authorities[116]. Large-scale de-materialism and self-sufficiency is present, trade barriers for products and services with high environmental and social harm are introduced[117], thus external trade volumes in Europe decrease.

At the local level, focus is on social equality and environmental protection, and Member States pass strict regulations to achieve specific social and environmental sustainability aims[118]. Priorities defined by Europe 2020 are met – development of knowledge and innovation-based economy; promotion of resource-efficient, less environmentally harmful and more competitive economy; promotion of high employment economy allowing for economic, social, and territorial cohesion[119] – however, each Member state takes more care of its domestic development with less focus on the European level or cross-border projects. Also in transport policy, sustainable and intermodal solutions as well as shifting of freight and passenger transportation to rail are preferred, yet integrated development within the Single European Transport Area is missing. Baltic States do not become more active in globalisation processes, rural development is more distinct, and sustainable management and consumption of local resources is promoted. Development of the Baltic States is focused on the improvement of local and regional transport connections, eco-friendly transportation, sustainable management, and a lifestyle that promotes the significance of local markets.

6.4 Summary of factors used in scenarios

External macroeconomic factor analysis was conducted in order to evaluate the impact that certain factors may have on the project according to the PEST methodology. PEST analysis describes the operating environment from political, economic, social and technical dimensions. In each dimension, multiple macroeconomic factors were identified. The identified macroeconomic factors then were rated

[116] Scenario „Local Responsibility" in Socio-Economic Scenarios of European Development and Integrated Management of the Marine Environment, University of Bath School of Management Working Paper Series, 2008. Available at: http://www.bath.ac.uk/management/research/pdf/2008-08.pdf

[117] Scenario „Slow Motion" in OPEN:EU Scenario Storylines Report: Scenarios for a One Planet Economy in Europe PROJECT REPORT, 2011. Available at: http://www.oneplaneteconomynetwork.org/resources/programme-documents/WP6_Scenarios_Storyline_Report_Cover.pdf

[118] Ibid. reference 14, see also Scenario „Policy First" in Four Scenarios for Europe. Based on UNEP's third Global Environment Outlook, 2003. Available at: https://web.unep.org/geo/sites/unep.org.geo/files/documents/four_scenarios_europe.pdf

[119] Europe 2020: A European Strategy for Smart, Sustainable, and Inclusive Growth. Available at: http://ec.europa.eu/eu2020/pdf/1_LV_ACT_part1_v1.pdf

by industry experts in every Rail Baltica partner country. Experts rated the impact of the macroeconomic factor by the following options:

- Significant negative impact.
- Low negative impact.
- Neutral impact.
- Low positive impact.
- Significant positive impact.

Each answer option has a particular score. At the end, all answers in each option category were counted, multiplied by the score and the total sum of all scores was divided by the number of respondents.

The key macroeconomic factors are summarized in Table 30. Macroeconomic factors that the experts evaluated as the most important are presented in bold letters and highlighted in light grey.

Table 30 PAX and freight factors

Passenger traffic				
Political	Passenger transport system development - planning that would foresee optimization of the current mode of transport with the goal of directing the passenger flows to rail	EU environmental legislation - further limitations on emissions in order to protect the environment	Geopolitics - limitations of mobility to Russia and CIS countries due to political stance	Development of the single European railway area - political will ensures access to railway infrastructure for all interested passenger carriers
Economic	Economic development (effect on passenger flows) - increased economic activity around rail infrastructure due to favourable location	Growth and development of global economy - additional passenger flows due to increased economic activity	Development of more service oriented economy (PAX) - ability to cater to the needs of passengers who make frequent business trips in the region	Local economic integration (PAX) - increased cooperation between businesses due to creation of infrastructure hubs
Social	Urbanization	Tourism	Demographic tendencies	
Technological	Airport connectivity - new way of reaching the destination (Airport)	Passenger transport system development - new way of travelling to the largest cities in the region	Competitiveness in quality for passenger service - raised standards of provided services	Digitalization - increased usage of various digital technologies in the provision of the service

Freight traffic				
Political	EU directives for environment - further limitations on emissions in order to protect the environment	Geopolitics - further development of own infrastructure in Russia and CIS countries due to political stance	Freight transport system development (Inter-modality) - political will to invest in inter modal connections to facilitate trade	Adriatic corridor development - political decision to develop this corridor may lead to increased freight traffic from the region
Economic	Economic integration - deeper economic cooperation in the Baltic region leading to increased demand for freight services	Growth and development of global economy - additional cargo flows due to increased economic activity	Economic development (effect on freight flows) - increased economic activity around rail infrastructure due to intermodal connections	China development (new silk road) - additional freight flows from increased economic activity
Social	Eco friendly vehicle development - technological progress allowing for vehicles that comply with strict environmental requirements			
Technological	Freight transport system development (Inter-modality) - new way of combining means of transport for freight transportation purposes	Airport connectivity - new way of transporting freight to the airport	Development of Rail Freight Corridor #8 (RFC#8) - new way of connecting the regions in the North Sea - Baltic freight corridor	Digitalization - increased usage of various digital technologies in the provision of the service

A summary of the factors and their influence on the expected growth of trade and passenger flows relevant to Rail Baltica for both scenarios is provided in Table 31 and Table 32 (the values of influence factors estimated based on expert input and acquired knowledge of expected macroeconomic and industry trends).

The following formula was used in order to calculate the passenger flows:

$$PAXx = PAXx\text{-}1 + [PAXx\text{-}1 * grGVAx\text{-}1 *(Mx + Ix)]$$

PAXx: Passenger volume of an individual connection in year X

grGVAx-1: Growth rate of GVA in year x-1

M: GVA multiplier (M = Passenger Growth / GVA Growth) adjusted past average

I: Total e-multipliers for year x (sum of e-multipliers for each influence factor)

For detailed description of the approach please see section Passenger flow forecasting methodology.

Table 31 Passenger flows factor summary (basis points, basis point equals I value multiplied by 1000)

Passenger Flows	Low case			High case		
	2020-2030	2031-2040	2041-2055	2020-2030	2031-2040	2041-2055
TOTAL impact	-50	-20	-10	90	70	70
Tourism	-8	-3	-1	14	9	9
European passenger rail transport system	-6	-2	-1	10	7	9
European economic integration (increased cooperation on pan-European level)	-5	-3	-1	10	9	8
Economic development of European countries (in terms of growth of economy)	-6	-2	-1	10	8	7
Pan-Baltic economic integration (focus on pan-Baltic cooperation, Europe as a whole does not necessary integrate)	-5	-2	-1	9	7	6
Airport connectivity of Baltic airports with other destinations	-2	-1	-1	4	2	4
Growth and development of global economy (Overall global growth, not necessary only Europe)	-5	-2	-1	9	7	6
Urbanization (Higher amount of people living in cities)	-4	-2	-1	7	8	6
Geopolitics (Political-economic relationship among countries on European continent)	-4	-2	-1	7	6	6
More service-oriented economies	-5	-2	-1	8	7	6

The following formula was used in order to calculate the freight flows:

TVx = TVx-1 + [TVx-1 * grGDPx-1 *(Mx + Ix)]

TVx: Trade volume of an individual trade link in year X

grGDPx-1: Growth rate of GDP (importing country) in year x-1

M: GDP multiplier (M = Trade Growth / GDP Growth) adjusted past average

I: Total e-multipliers for year x (sum of e-multipliers for each influence factor)

For detailed description of the approach please see section Freight flow forecasting methodology.

Table 32 Freight flows factor summary (basis points, basis point equals I value multiplied by 1000)

Freight Flows	Low case			High case		
	2020-2030	2031-2040	2041-2055	2020-2030	2031-2040	2041-2055
TOTAL impact	-10	10	0	70	90	90
Adriatic ports and related trade flows (focus on pan-European South-North trade flows and goods coming from China and USA)	-1	1	0	5	10	8
North Sea – Baltic Rail Freight Corridor development	-1	1	0	10	10	10
EU directives for environment (shifting transportation towards more environmentally friendly modes)	-2	1	0	11	12	14
European freight rail transport system and intermodality	-1	1	0	8	10	12
Airport connectivity of Baltic airports with other destinations	0	1	0	1	5	5
Growth and development of global economy (Overall global growth, not necessarily only Europe)	-1	1	0	7	8	10
Urbanization (Higher amount of people living in cities)	-1	1	0	4	8	7
Geopolitics (Political-economic relationship among countries on the European continent)	0	1	0	3	5	7
European economic integration (increased cooperation on pan-European level)	-1	1	0	9	8	10
Economic development of European countries (in terms of economic growth)	-1	1	0	9	10	9

7. Option identification

7.1 *Do-nothing* option analysis

7.1.1 Do-nothing option definition

Since CBA measures changes in values against the Base case, at first, a benchmark do-nothing option needs to be defined, which takes into account the following parameters:

- Investments in as-is road, port, railway, airport infrastructure.
- Maintenance costs as-is of road, port, railway, airport infrastructure.
- Economic costs and benefits of existing road, sea, railway, and air traffic (noise, air pollution, traffic accidents, etc.).

For the do-nothing option, current infrastructure managers (holders) were surveyed and their development plans analysed. Key highlights are presented below, detailed description of as-is situation and do-nothing option is provided in the Appendix

7.1.2 Summary of expected developments in the do-nothing option

7.1.2.1 Infrastructure

	Estonia	Latvia	Lithuania	Notes
Rail	There is a need to maintain the rail infrastructure between Parnu and Lelle (annual costs approx. EUR 1.5 million as estimated by infrastructure manager).	The do-nothing option assumes that it is necessary to construct and maintain a 1520mm connection between the Riga central station and Riga Airport.	No railway infrastructure developments affected by Rail Baltica	
Road	The infrastructure managing authorities do not have particular development plans that would be affected by Rail Baltica.	The infrastructure managing authorities do not have particular development plans that would be affected by Rail Baltica. The maintenance and investment schedules not directly linked with traffic volume.	All road development plans are planned to be implemented independently of the realization (or not) of the Rail Baltica project.	Current traffic intensities on the majority of Via Baltica sections are still relatively low, compared to maximum intensity allowances on these roads. The maintenance works are planned on a regular basis, independently of changes of traffic intensities, thus it is assumed that reduced traffic intensities on roads will not in any way impact expected maintenance costs in the future.
Air	The infrastructure managing authorities do not have particular development plans that would be affected by the realization (or not) of Rail Baltica.	No changes to airport operations (no significant difference in operations between 1520mm and Rail Baltica connection)	The infrastructure managing authorities do not have particular development plans that would be affected by the realization (or not) of Rail Baltica.	

	Estonia	Latvia	Lithuania	Notes
Sea	The infrastructure managing authorities do not have particular development plans that would be affected by the realization (or not) of Rail Baltica.	The infrastructure managing authorities do not have particular development plans that would be affected by the realization (or not) of Rail Baltica.	The infrastructure managing authorities do not have particular development plans that would be affected by the realization (or not) of Rail Baltica.	

7.1.2.2 Market developments

	Passenger market	Freight market
Rail	Rail system development regarding passenger service expected to occur in commuter segment, no significant improvements expected regarding intra-Baltic connections on the existing 1520mm network.	Existing rail system development on the north-south axis already developed (project Rail Baltica I) thus no further capacity improvements expected in the do-nothing scenario.
Road	Incremental capacity and quality improvements expected to be outweighed by the increase of traffic, therefore, the key road traffic parameters (the effective speed, safety etc.) are expected to remain constant.	Incremental capacity and quality improvements expected to be outweighed by the increase of traffic, therefore, the key road traffic parameters (the effective speed, safety etc.) are expected to remain constant.
Air	No significant improvements expected regarding intra-Baltic air connections.	No significant improvements expected regarding intra-Baltic air connections.
Sea	No improvements expected regarding intra-Baltic sea connections that would be influenced by Rail Baltica.	No improvements expected regarding intra-Baltic sea connections that would be influenced by Rail Baltica.

7.2 *With project* option analysis

7.2.1 Global project definition

Key messages:

- Rail Baltica project scope needs to be assessed via functional, infrastructure and technical layers
- The scope of the CBA relates to the public railway infrastructure part of the project that serves the primary purpose of fast conventional international rail traffic

Based on the RBR Shareholders' Agreement, the most appropriate definition of Rail Baltica is a new fast conventional double track electrified railway line with the maximum design speed of 240 km/h and European standard gauge (1435 mm) on the Route (from Tallinn through Parnu-Riga-Panevezys-Kaunas to Lithuania-Poland Border on the route as proposed by AECOM study with a connection of Vilnius-Kaunas as a part of the Railway). This definition also has been referenced in the latest Joint Declaration of Transport Ministers (Rotterdam 2016). The Contracting Scheme Agreement[120] provides definition for the "Rail Baltica Global Project" as all the activities undertaken by the Parties in order to build, render operational and commercialize the Rail Baltica railway and related Railway Infrastructure in accordance with the agreed route, technical parameters and time schedule.

The expected core outcome of the Global Rail Baltica Project is a fully interoperable railway line of more than 870 km in length, meant for both passenger and freight transport and the required additional railway infrastructure (such as passenger and freight terminals, maintenance and rolling stock facilities). It will be integrated into the EU TEN-T Core Network as part of the North Sea – Baltic Corridor and will be competitive in terms of quality with other modes of transport in the region.

[120] Agreement on the contracting scheme fo the RB, 30 September 2016

Rail Baltica Global Project is an initiative of great significance and adds value, both, in the Baltic Sea region and Europe as a whole.

It is in line with the Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network (TEN-T) and the Regulation (EU) No 1316/2013 of the European Parliament establishing the Connecting Europe Facility, where Rail Baltica is mentioned in the pre-identified project list of the European Union TEN-T Core Network[121].

Among all Core Network Corridors set out in the CEF regulation (Annex I), the North Sea-Baltic corridor has the potential of becoming one of the most economically diverse transport corridors in the European Union. However, it is currently characterized by insufficient transport infrastructure with long sections where the core network railway infrastructure (1435 mm gauge) is completely missing, as a result of which the part of the corridor in the Baltic States is currently an isolated network. Removing this bottleneck would provide individuals, consumers and businesses in the Baltic States and neighbouring countries with new efficient possibilities to access Central Europe and beyond, thereby increasing the capacity for the free movement of people, goods and services. The improved connectivity would promote further economic and social cohesion between Baltic States and the rest of the EU.

This is supported by the Communication from the Commission “Building the Transport Core Network: Core Network Corridors and Connecting Europe Facility” from 7 January 2014 (COM (2013) 940)[122] which identifies the Rail Baltica project as a major missing cross-border project and a project with a high added value to EU. Rail Baltica is also defined as one of the flagship projects[123] of the trans-European transport network (TEN-T), highlighting its particular significance for the region.

Implementation of the Project will also have a positive impact on the environment as availability of the railway alternative for both passenger and freight transportation would facilitate a modal shift in passenger traffic from road and air transport and freight traffic from road and sea transport to railways, which would result in a reduction of transport related CO_2 emissions.

Since there are multiple projects directly and indirectly related to Rail Baltica, it is reasonable to split the definitions into three layers:

- Functional layer (separate sub-layer for passenger and freight transportation, describing potential services within the scope of the Rail Baltica supply chain).
- Infrastructure elements layer (fundamental infrastructure elements, necessary for the fulfilment of necessary functional and technical requirements).
- Technical layer (list of projects and sub-projects directly and indirectly related to Rail Baltica separated into global, extended and wider project categories).

The technical layer project categories are defined as follows:

[121] Kaunas-Vilnius connection is out of the scope of TEN-T and CEF regulations
[122] http://ec.europa.eu/transparency/regdoc/rep/1/2013/EN/1-2013-940-EN-F1-1.Pdf
[123] http://europa.eu/rapid/press-release_IP-15-5269_en.htm

- The Global project[124] includes infrastructure elements that guarantee primary functionality and technical requirements to ensure that Rail Baltica delivers international fast conventional passenger and freight services, including interoperability.
- The Extended global project includes potential enhancements of Rail Baltica, which are not part of the infrastructure elements required to guarantee technical requirements for Rail Baltica as a fast conventional passenger and freight international connection. These enhancements create value added for the Project by generating additional international passenger and freight flows and further leverage the Rail Baltica infrastructure and promote its integration into functional intermodal supply chains, as well as promote cross-industrial synergies.
- The Wider project includes local scale projects with limited impact on international flows and the primary aim of Rail Baltica as an international connection.

7.2.1.1 Functional layer

The primary functionality of Rail Baltica is to serve as a connection to the European international freight and passenger logistics ecosystem, taking two parts into consideration (see Figure 56):

- The definition of passenger transportation services (passenger service needs facilities and other infrastructure that does not end at the PL/LT border).
- The definition of freight transportation services.

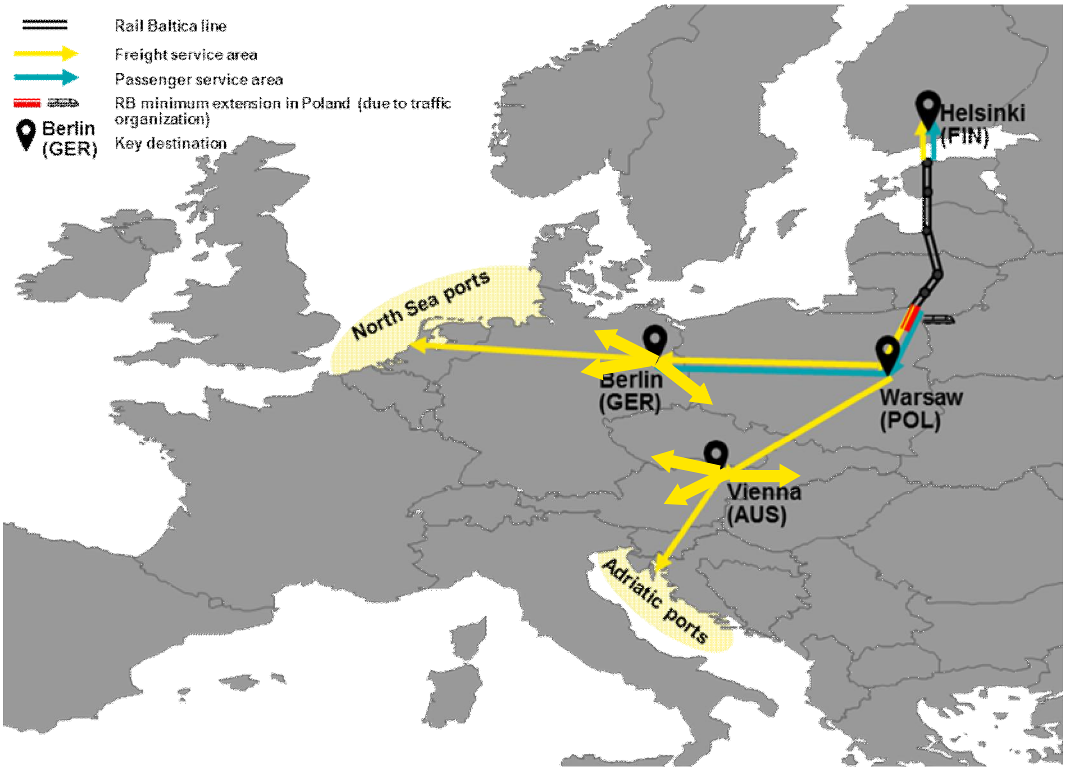

Figure 56 Functional layer of Rail Baltica

Passenger transportation services

Besides passenger transportation within the Baltic States, Rail Baltica would allow for competitive passenger transportation services northbound, for example to Helsinki (via the sea), and southbound to

[124] The term "Global project" has been defined specifically for the purposes of the CBA and option analysis and does not fully coincide with the use of this term for institutional and eligibility purposes in the wider context of project implementation and other documents

cities such as Warsaw and Berlin. Rail travel to farther southern destinations may have a limited competitiveness due to uncompetitive pricing and longer traveling time, compared to air transport. It is assumed that Rail Baltica will serve the destinations within a day's (12 hour) travel distance.

Freight transportation services

In addition to freight transportation within the Baltic States, a key strength of Rail Baltica would be serving the Baltic foreign trade flows vis-a-vis Western and Southern Europe as well as for transit cargos to/from Finland especially from/to southern part of Europe. Currently, northbound shipment would require a combination of rail-sea transport, while freight transportation to the south could go beyond passenger service level reach and extend to the port of Rotterdam (the Netherlands) and the port of Koper (Slovenia), in combination with the Baltic-Adriatic TEN-T corridor (south of Warsaw) and North-Sea Baltic corridor (Rail Freight Corridor #8).

Rail Baltica minimum extension to Poland

For practical passenger and freight service considerations, from functionality perspective it needs to be ensured that the railway undertakings have required infrastructure to perform daily operations also in the territory of Poland, e.g., nightly servicing and cleaning of passenger trains.

7.2.1.2 Infrastructure layer

As mentioned in the Joint Declaration of Transport Ministers (Rotterdam 2016), Rail Baltica is defined as a fast conventional railway line connecting Tallinn-Parnu-Riga-Panevezys-Kaunas-LT/PL border, with a spur from Kaunas to Vilnius, as part of the project in the future (see Figure 57).

Figure 57 Infrastructure layer of Rail Baltica

From the technical viewpoint, the infrastructure needs to be established to ensure a competitive service in terms of quality, price and time compared to other modes of transport; therefore, core infrastructure elements include not only railway tracks, but also elements such as passenger stations, intermodal freight terminals, etc.

The main technical parameters shall correspond to traffic code P2-F1 as per INF TSI (Commission Regulation 1299/2014/EU) and shall have the following main technical parameters:

- Double track, design speed on the main track 240 km/h, gauge GC, design speed on side tracks minimum 100 km/h.
- Axle load 22.5 t.
- Distance between track centers at least 4.20 m on the main tracks.
- Distance between two sided passing loops approximately 50 km and crossovers approximately 25 km but staged according to a train traffic forecast.
- All road crossings only as above or below grade crossings (segregated grade crossings), fencing for the entire length, noise barriers where needed.
- ERTMS Level 2 with possible update to the newest version.
- Communications system GSM-R with a view to accommodate the new generation railway communications standard.
- Electrification 2x25 kV AC, to accommodate freight trains of up to 740 m length (with the possibility to extend to 1050 m in a long term) and with the maximum speeds of 120 km/h, and to accommodate passenger trains of up to 250 m length (with the possibility to extend to 400 m in a long term) and with the maximum speeds of 240 km/h.

All elements of the core infrastructure, required to provide competitive service, are mentioned in the following technical definition, as elements within the core global project scope.

7.2.1.3 Technical layer

Implications for Global CBA

As mentioned above, the technical definition of Rail Baltica is separated into three segments - the global project, the extended project and the wider project.

The Global project list is used for the Global CBA calculations (both investments and costs/benefits of infrastructure elements). This project guarantees primary benefits and functionality.

The Extended project list includes projects directly related to Rail Baltica, which generate additional flows; however, these infrastructure elements will not be used for investment cost calculations. The benefits generated from these projects will be included in certain CBA scenarios.

The Wider project list includes existing or potential projects indirectly related to Rail Baltica that would contribute to the wider and catalytic effects of the Global project. These projects will not be taken into account for Global CBA calculations.

Estonia

The technical definition for Rail Baltica project in Estonia is presented in the Figure 58.

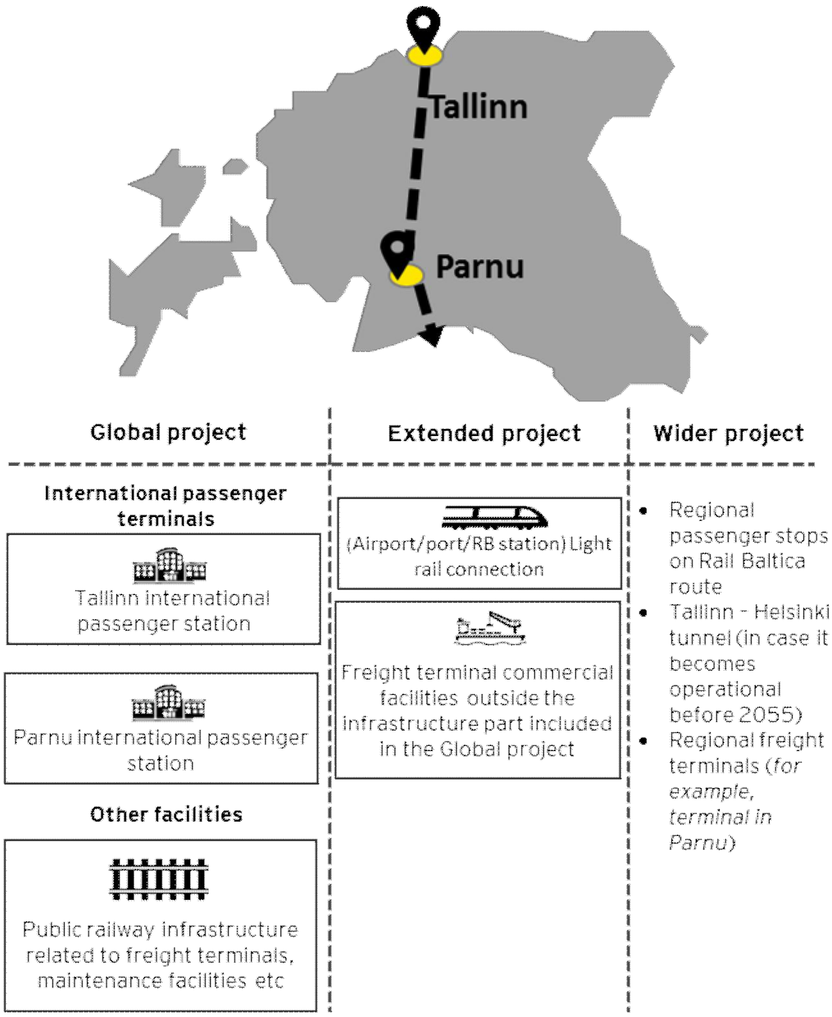

Figure 58 Technical layer of Rail Baltica (Estonia section)

Besides the core railway track, the Global project includes the public railway infrastructure related to freight terminals, maintenance facilities etc. in order to provide the basis for service provision by railway undertakings.

Latvia

The technical definition of Rail Baltica project in Latvia is presented in the Figure 59.

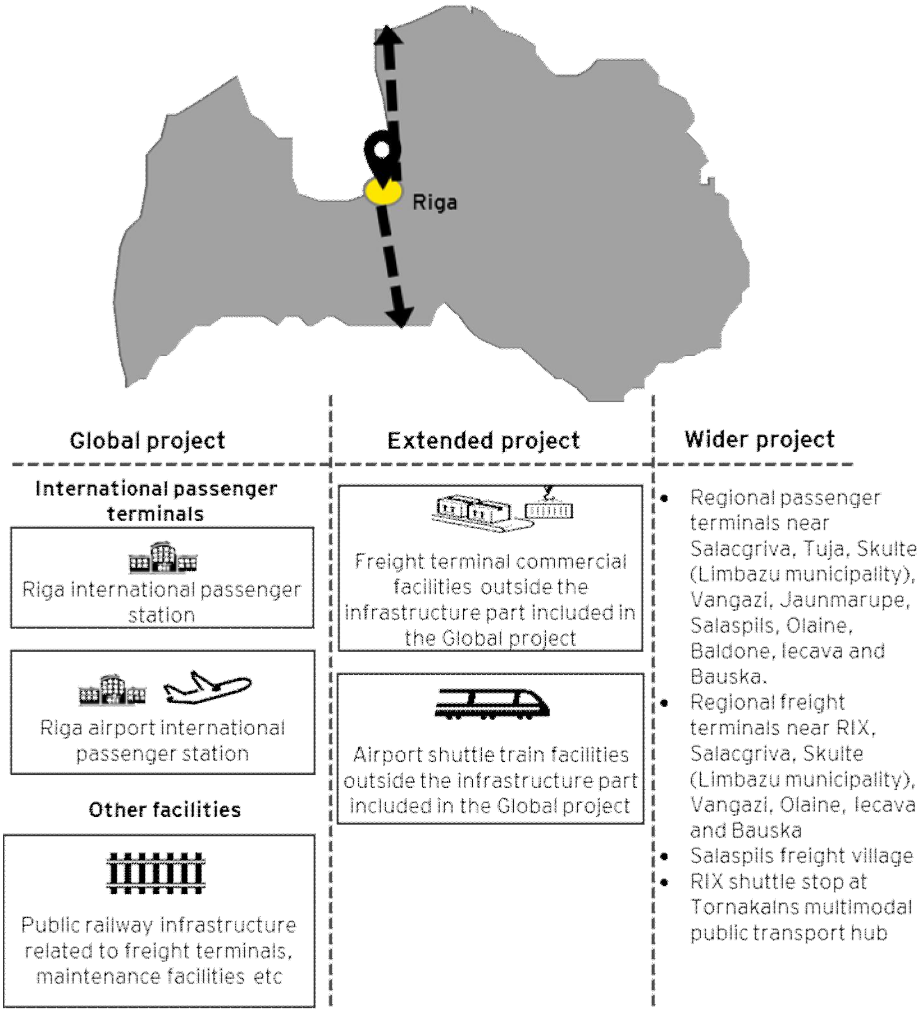

Figure 59 Technical layer of Rail Baltica (Latvia section)

Besides the core railway track, the Global project includes the public railway infrastructure related to freight terminals, maintenance facilities etc. in order to provide the basis for service provision by railway undertakings.

Lithuania

The technical definition of Rail Baltica project in Lithuania is presented in the Figure 60.

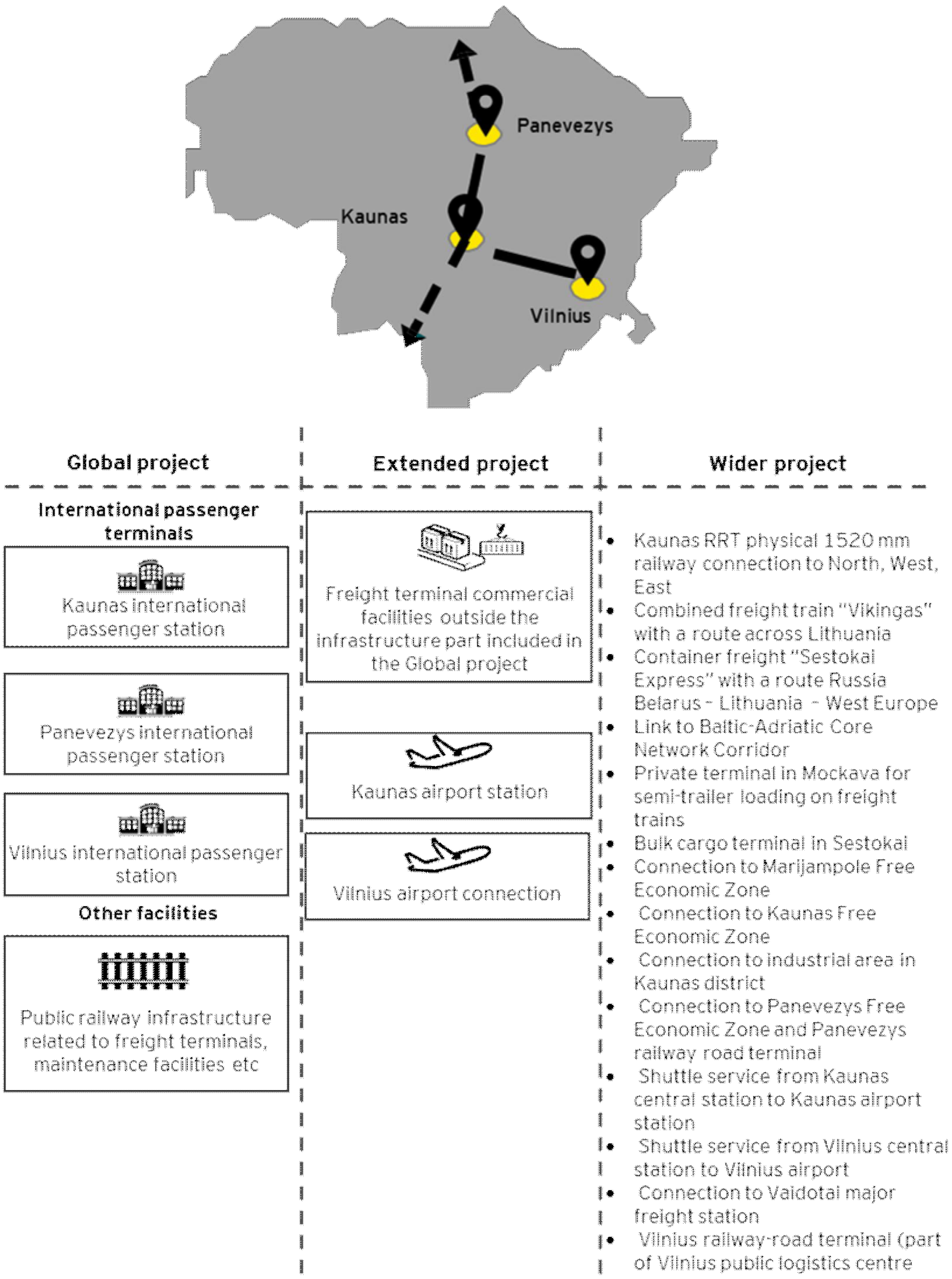

Figure 60 Technical layer of Rail Baltica (Lithuania section)

Besides the core railway track, the Global project includes the public railway infrastructure related to freight terminals, maintenance facilities etc. in order to provide the basis for service provision by railway undertakings..

7.2.2 Analysis of options and selection of options relevant for further analysis

Key messages:

- Rail Baltica project options need to be assessed via functional, infrastructure and technical layers and set of screening criteria
- Most of options are not applicable for the further analysis as the Rail Baltica project is already in implementation phase

7.2.2.1 Approach to the analysis of options

Recognizing that the Rail Baltica project has matured beyond initial assessment or pre-feasibility stage and is already in the early stages of implementation as evidenced by altogether three financing packages – on-going Actions financed under CEF Transport that include not only studies but also works, the range of available options needs to be strictly screened and evaluated, as decisions regarding

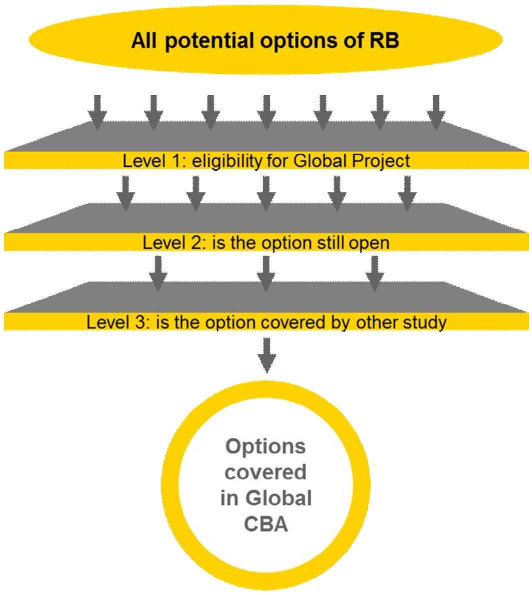

Figure 61 Options analysis for Rail Baltica global CBA

certain technical and functional options are already taken (Figure 61).

Therefore, the screening process of options for the purposes of this CBA is done by looking at potential options in functional, infrastructure and technical layer on Baltic level and on the national (or local) level, where appropriate, and applying 3 levels of criteria for and option to be eligible:

- Level 1: Is the option part of the global project?

  This criterion is important to screen out the options that are not related to the Global project (as defined in the previous section above) and therefore to this CBA and should be subject to separate studies in the future.

- Level 2: Has a decision been made regarding the option?

  This criterion is important to screen out the options that are not practically implementable. The decision in the scope of this screening is defined as either explicit selection defined in the CEF applications or local documents such as environmental impact assessments etc.

- Level 3: Is there a particular external study investigating the option in detail?

  This criterion is important to screen out the options that are covered in detail by other studies in parallel with the global CBA, where the CBA should only incorporate the results from such studies.

If the option passes all three levels of criteria, then it is considered valid for analysis of the Global CBA.

7.2.2.2 Analysis of options

Table 33 summarizes the options analysis results

Table 33 Options analysis results

Country	Section	Lo-cation	Option	Applicable for further analysis			Explanation
				L1	L2	L3	
Functional and infrastructure layer							
Baltics	Whole route	Whole route	Construction of the railway line with reduced service level (single track, lowered maximum speed etc.)	Yes	No	N/A	In Joint Declaration of Ministers, Rotterdam 2016, Rail Baltica defined as double track 1435 mm gauge electrified railway line with the maximum design speed of 240 km/h on the route from Tallinn through Parnu-Riga-Panevezys-Kaunas to the Lithuania-Poland border as proposed by the AECOM study with connection of Vilnius-Kaunas as part of the route
Baltics	Whole route	Whole route	Construction of the railway line according to AECOM red corridor with the main line going through RIX and separate Riga bypass for freight	Yes	Yes	Yes	Latvia's alignment approved by the Government on 9th of August 2016. Lithuania alignment approved by the Government on 11th January 2017
Latvia	Salaspils-Panevezys	LV Central loop	Construction of single track the section where main line is parallel to Riga bypass (except section between Riga passenger terminal and RIX passenger terminal)	Yes	No	N/A	The Environmental impact assessment and approved alignment foresee double track (that matches Joint Declaration of Ministers, Rotterdam 2016)
Lithuania	Kaunas-LT/PL border	Kaunas-LT/PL border	No upgrade of the section (section is functioning as currently constructed)	Yes	No	N/A	In Joint Declaration of Ministers, Rotterdam 2016, Rail Baltica defined as double track 1435 mm gauge electrified railway line with the maximum design speed of 240 km/h on the route from Tallinn through Parnu-Riga-Panevezys-Kaunas to the Lithuania-Poland border as proposed by the AECOM study with connection of Vilnius-Kaunas as part of the route
Lithuania	Kaunas-LT/PL border	Kaunas-LT/PL border	Upgrade of existing section to meet the functional standards	Yes	Yes	No	Separate study is planned by RBR to examine the optimal way of ensuring that the section meets the Global Project technical standards and parameters
Lithuania	Kaunas-LT/PL border	Kaunas-LT/PL border	Construction of new line in the section to meet the functional standards	Yes	Yes	No	Separate study is planned by RBR to examine the optimal way of ensuring that the section follows the functional standards
Lithuania	Kaunas-Vilnius	Kaunas-Vilnius	Construction of Vilnius spur with reduced service level - reduced speed and capacity (single line, 160 km/h maximum speed, etc.)	Yes	No	N/A	In Joint Declaration of Ministers, Rotterdam 2016, Rail Baltica defined as double track 1435 mm gauge electrified railway line with the maximum design speed of 240 km/h on the route from Tallinn through Parnu-Riga-Panevezys-Kaunas to the Lithuania-Poland border as proposed by the AECOM study with connection of Vilnius-Kaunas as part of the route
Technical layer							
Estonia	Tallinn-Parnu	Parnu	Parnu regional freight terminal construction	No	N/A	N/A	Regional terminal is out of scope of the Global Project
Estonia	Tallinn-Parnu	Tallinn	Construction of Tallinn light rail connection with Tallinn Ulemiste terminal	No	N/A	No	Tallinn tram is an urban node, and is not part of the Global Project. In addition, separate study is being carried out to determine the best light rail connection
Estonia	Tallinn-Parnu	Tallinn	Construction of terminal in Muuga that includes both sea terminal and RRT	Yes	Yes	No	Separate study is planned by RBR to examine the optimal way of developing the Muuga terminal
Estonia	Tallinn-Parnu	Tallinn	Construction of terminal in Muuga that includes separate sea terminal in Muuga	Yes	Yes	No	Separate study is planned by RBR to examine the optimal way of developing the Muuga terminal

Country	Section	Lo-cation	Option	Applicable for further analysis			Explanation
				L1	L2	L3	
			and RRT terminal in Maardu				
Estonia	Tallinn-Parnu	Tallinn	Construction of RRT terminal in Maardu and further using 1520mm connection to reach sea terminals in Muuga	Yes	Yes	No	Separate study is planned by RBR to examine the optimal way of developing the Muuga terminal
Latvia	Parnu – Salaspils	Skulte	Skulte regional freight terminal construction	No	N/A	N/A	Regional terminal is out of scope of the Global Project
Latvia	Riga – RIX	Riga	Development of city stations between Riga passenger terminal and RIX passenger terminal to be serviced by the airport shuttle	No	N/A	N/A	City transport is and urban node and is out of scope of the Global Project
Lithuania	Kaunas-Vilnius	Kaunas-Vilnius	Vilnius spur construction delay until the year 2030	Yes	No	N/A	In Joint Declaration of Ministers, Rotterdam 2016, the Ministers, supported by the European Coordinator, highlight the need for substantial further funding and financial support in the next financial period, in order to complete the project in the Baltic States by the target date of 2025, and to reach efficient connection up to Warsaw
Lithuania	Kaunas-Vilnius	Kaunas-Vilnius	Upgrade of existing Vilnius – Kaunas 1520mm connection and no new 1435mm connection until 2055	Yes	No	N/A	In Joint Declaration of Ministers, Rotterdam 2016, Rail Baltica defined as double track 1435 mm gauge electrified railway line with the maximum design speed of 240 km/h on the route from Tallinn through Parnu-Riga-Panevezys-Kaunas to the Lithuania-Poland border as proposed by the AECOM study with connection of Vilnius-Kaunas as part of the route

To conclude, the available options for the analysis of Global CBA are:

- Construction of fully functional railway line according to currently approved geographical alignment, including Kaunas - Vilnius until 2025[125].
- Development of Muuga terminal and Kaunas – LT/PL border section: subject to inputs from other studies.

[125] At first it requires to be included in TEN-T and CEF regulations scope

8. Passenger and freight forecasts

8.1 Passenger flow forecasts

Key messages

- Overall passenger market is expected to develop in all scenarios, although more slowly than freight traffic despite negative demographic outlook
- The existing passenger flows demonstrate prevalence of personal car transport which is the main modal shift source for Rail Baltica. Also, Rail Baltica is expected to capture approximately a quarter of existing intra-Baltic air traffic

8.1.1 Forecasted development of the market

According to the methodology described in the section 4.1, the forecasts have been based on the different future growth model and future assignment and modal choice models for Base, Low and High cases respectively.

Graphic representation of overall market developments and the share of Rail Baltica passenger flows has been illustrated in the figure below. The figures represent the annual movements of 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 counted in the following sections of Rail Baltica: Kaunas – Panevezys, Panevezys – RIX, RIX – Riga, Riga – Parnu, Parnu – Tallinn) of the relevant O/D pairs for Rail Baltica as defined in the catchment area.

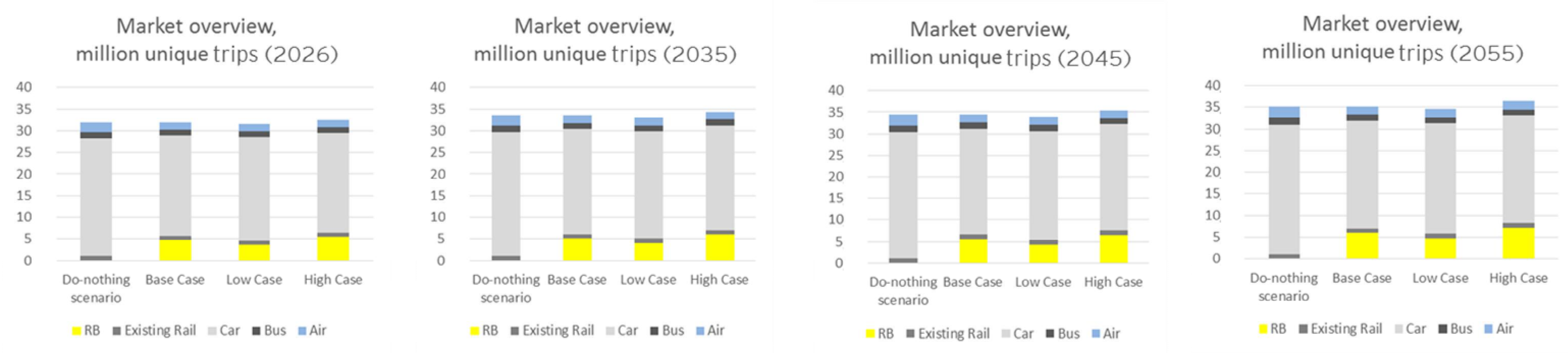

Figure 62 Overall market forecast and the share of Rail Baltica

The forecasts demonstrate the combined effect of different future growth model assumptions as well as different future assignment and modal choice models for the scenarios. For example, the overall market passenger flows vary from 34 million PAX (Low case) to 36 million PAX (High case) in 2055, while the share of Rail Baltica market is in the range from 14% to 20% in the low and High case respectively. The combined effect of both of these models results in Rail Baltica market potential fluctuating from 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 daily), in comparison to 3.6-5.5 million trips in 2026 (or 9.9 to 14.9 thousand trips daily) for the same scenarios.

The key figures of the overall market and Rail Baltica market potential forecasts are provided in Table 34.

Table 34 Overall market forecasts summary

		Year			
		2026	2035	2045	2055
Total market flows (million trips/year, both do-nothing and with project)	High case	32.4	34.3	35.4	36.4
	Base case	31.9	33.5	34.4	35.2
	Low case	31.6	33.0	33.9	34.6
Total market flow annual CAGR since last reference period, %	High case	2.0%	0.6%	0.3%	0.3%
	Base case	1.8%	0.5%	0.3%	0.2%
	Low case	1.7%	0.4%	0.2%	0.2%
Rail Baltica potential market share, %	High case	17%	17%	19%	20%
	Base case	15%	15%	16%	17%
	Low case	11%	12%	13%	14%
Rail Baltica market potential (million trips/ year)	High case	5.5	6.0	6.6	7.1
	Base case	4.7	5.1	5.5	6.0
	Low case	3.6	4.0	4.3	4.7
CAGR of the Rail Baltica market potential, %	High case	n/a	1.0%	0.9%	0.8%
	Base case	n/a	0.8%	0.8%	0.7%
	Low case	n/a	1.1%	0.8%	0.7%

The growth rate and dynamics of Rail Baltica potential market share replicate the expected development of the GVA of the countries within scope with a relatively fast development in the next 10 years (1.7-2.0% CAGR) with an eventual slowdown further in the future as the Baltic economic growth converges to the slower growth rates of the Western and Central European countries. As described in section 6 "Macroeconomic and sector development scenarios", the low and High case scenarios provide a weaker and stronger correlation (and therefore CAGR) between the growth of passenger flows and the growth of GVA (this also illustrates that the macroeconomic development forecasts envisage growth of GVA despite the adverse demographic trends in the Baltic States).

The dynamics of the share of Rail Baltica market potential illustrate that in the Base case there is gradual increase of the Rail Baltica market potential shares (due to the expected general strengthening of the position of Rail Baltica in the market).

The market overview graphs also show that the dominating mode of existing and expected future travel is car transport, with public transportation having a share of approximately 15% in total market, which indicates the main segment for modal shift in the case of Rail Baltica. However, with Rail Baltica the share of public transport grows to 25-30%. Exact modal split and shift shares have been presented in the Table 35.

Table 35 Modal shift intensities for Rail Baltica passengers

		Other transport modes			
		Existing Rail	Car	Bus	Air
Existing modal split	100%	3%	85%	5%	7%
Share of the modes that have shifted to Rail Baltica	100%	1%	85%	4%	11%
Proportion of the existing mode that has shifted to Rail Baltica	n/a	3%	15%	12%	23%

The model forecasts reflect the considerations described in the passenger ecosystem analysis, namely, that Rail Baltica shall be competitive against road travel and air travel. 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 share. It should be noted that these figures represent the situation regarding trips and these modal shift and split rates have been assessed for each O/D pair separately in the future mode choice model.

8.1.2 Forecasted passenger flows of Rail Baltica

According to the approach described in the section 4.1 "Freight and passenger flow forecasting methodology", to determine the actual flows that will be captured by Rail Baltica, as a final step, the market potential uptake assumptions have been applied (see financial analysis assumptions list in the section 9.1.2 for detailed information). As a proxy for passenger uptake potential estimation, historical Eurostar ramp-up rates have been analyzed.

The passenger market uptake assumptions over the years are shown in Figure 63.

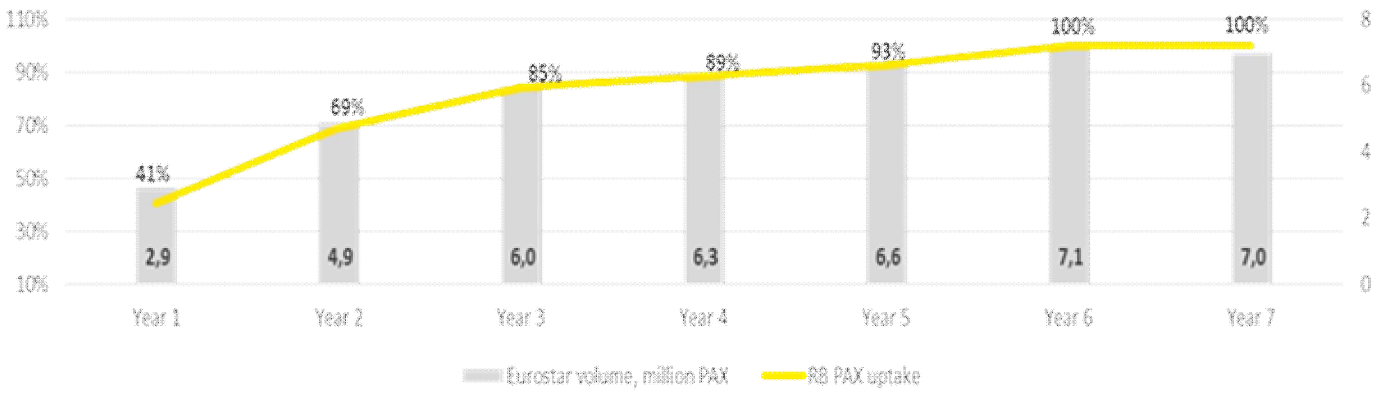

Figure 63 Passenger market potential uptake assumptions for Rail Baltica

Table 36 shows a summary of the Rail Baltica passenger flow market potential and actual captured flow forecasts (including an additional very conservative induced demand) in thousand PAX per annum for each Rail Baltica section. As illustrated in the Figure 63, starting with 2031 (year 6), Rail Baltica achieves it's full market potential. The table demonstrates the difference between the overall and unique trips, i.e, for the Base case in year 2026 the sum of actual modal shift passengers for all sections is 3.7 million, of which only 1.9 million are unique. This indicates that each passenger on average travels at least two sections (two stops) on the Rail Baltica route. In the Base case in 2055, it is forecasted that Rail Baltica will service over 1.2 billion pax-km (as a comparison, in 2014 the total combined passenger travel volume by rail (incl. international traffic) in the Baltic States was 1.3 billion pax-km, including local commuter trains[126]). These forecasts are further explained in the following chapters.

Table 36 Passenger forecasts summary (thous. passengers): per railway section and in total

			Tallinn-Parnu	Parnu - Riga	Riga-RIX	RIX-Panevezys	Panevezys - Kaunas	Kaunas - Vilnius	Kaunas - PL/LT border	Trips
Base case	2026	Potential modal shift	997	824	1 852	914	1 585	2 068	836	4 701
		Actual modal shift	407	337	756	373	648	845	341	1 920
		Rail Baltica induced flows	20	17	38	19	32	42	17	96
	2035	Potential modal shift	1 089	899	2 085	961	1 655	2 151	867	5 105
		Actual modal shift	1 089	899	2 085	961	1 655	2 151	867	5 105
		Rail Baltica induced flows	54	45	104	48	83	108	43	255
	2045	Potential modal shift	1 178	973	2 347	1 009	1 722	2 232	901	5 525
		Actual modal shift	1 178	973	2 347	1 009	1 722	2 232	901	5 525
		Rail Baltica induced flows	59	49	117	50	86	112	45	276
	2055	Potential modal shift	1 263	1 045	2 628	1 056	1 787	2 308	930	5 954
		Actual modal shift	1 263	1 045	2 628	1 056	1 787	2 308	930	5 954
		Rail Baltica induced flows	63	52	131	53	89	115	46	298
Low case	2026	Potential modal shift	791	654	1 470	727	1 159	1 645	664	3 631
		Actual modal shift	323	267	600	297	473	672	271	1 483
		Rail Baltica induced flows	16	13	30	15	24	34	14	74
	2035	Potential modal shift	858	708	1 643	761	1 312	1 705	686	4 032
		Actual modal shift	858	708	1 643	761	1 312	1 705	686	4 032

[126] Data from Rail Market Monitoring (RMMS). http://ec.europa.eu/transport/modes/rail/market/market_monitoring_en

			Tallinn-Parnu	Parnu - Riga	Riga-RIX	RIX-Panevezys	Panevezys - Kaunas	Kaunas - Vilnius	Kaunas - PL/LT border	Trips
		Rail Baltica induced flows	43	35	82	38	66	85	34	202
	2045	Potential modal shift	925	763	1 841	796	1 362	1 766	712	4 350
		Actual modal shift	925	763	1 841	796	1 362	1 766	712	4 350
		Rail Baltica induced flows	46	38	92	40	68	88	36	217
	2055	Potential modal shift	989	818	2 056	833	1 413	1 826	734	4 678
		Actual modal shift	989	818	2 056	833	1 413	1 826	734	4 678
		Rail Baltica induced flows	49	41	103	42	71	91	37	234
High case	2026	Potential modal shift	1 146	944	2 151	1 051	1 832	2 395	975	5 458
		Actual modal shift	468	386	878	429	748	978	398	2 229
		Rail Baltica induced flows	23	19	44	21	37	49	20	111
	2035	Potential modal shift	1 271	1 044	2 460	1 118	1 930	2 511	1 020	6 002
		Actual modal shift	1 271	1 044	2 460	1 118	1 930	2 511	1 020	6 002
		Rail Baltica induced flows	64	52	123	56	96	126	51	300
	2045	Potential modal shift	1 391	1 145	2 810	1 184	2 018	2 619	1 065	6 563
		Actual modal shift	1 391	1 145	2 810	1 184	2 018	2 619	1 065	6 563
		Rail Baltica induced flows	70	57	141	59	101	131	53	328
	2055	Potential modal shift	1 506	1 243	3 190	1 250	2 104	2 718	1 102	7 137
		Actual modal shift	1 506	1 243	3 190	1 250	2 104	2 718	1 102	7 137
		Rail Baltica induced flows	75	62	160	63	105	136	55	357

To illustrate the market uptake more clearly, Table 37 contains the forecasted passenger flows over the first 10 years of operation.

Table 37 Passenger forecasts summary for the first 10 years of operation (thous. passengers)

		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Base case	Tallinn-Parnu	0	428	733	910	970	1 031	1 115	1 122	1 129	1 136	1 144
	Parnu - Riga	0	354	606	752	800	850	920	926	932	938	943
	Riga-RIX	0	794	1 366	1 702	1 819	1 940	2 107	2 127	2 148	2 168	2 189
	RIX-Panevezys	0	392	668	826	875	925	997	1 000	1 003	1 006	1 009
	Panevezys - Kaunas	0	680	1 159	1 431	1 515	1 601	1 725	1 728	1 732	1 735	1 738
	Kaunas - Vilnius	0	887	1 510	1 864	1 972	2 082	2 243	2 247	2 251	2 254	2 258
	Kaunas - PL/LT border	0	358	610	752	795	839	904	906	907	909	910
	Trips	0	1 920	3 288	4 081	4 343	4 612	4 990	5 018	5 047	5 076	5 105
Low case	Tallinn-Parnu	0	339	581	720	766	814	880	885	890	895	901
	Parnu - Riga	0	280	480	595	633	671	726	730	735	739	743
	Riga-RIX	0	631	1 083	1 348	1 440	1 534	1 665	1 679	1 695	1 710	1 725
	RIX-Panevezys	0	312	531	656	694	733	791	793	795	797	799
	Panevezys - Kaunas	0	497	846	1 043	1 103	1 270	1 369	1 371	1 373	1 375	1 378
	Kaunas - Vilnius	0	706	1 201	1 481	1 566	1 652	1 780	1 782	1 785	1 787	1 790
	Kaunas - PL/LT border	0	285	484	597	631	665	716	717	719	720	721
	Trips	0	1 483	2 537	3 146	3 344	3 650	3 947	3 968	3 989	4 010	4 032
High case	Tallinn-Parnu	0	492	844	1 051	1 122	1 195	1 295	1 305	1 314	1 324	1 334
	Parnu - Riga	0	405	695	864	922	981	1 064	1 072	1 080	1 088	1 096
	Riga-RIX	0	922	1 589	1 985	2 126	2 272	2 471	2 498	2 526	2 554	2 583
	RIX-Panevezys	0	451	770	953	1 011	1 070	1 156	1 160	1 165	1 169	1 173
	Panevezys - Kaunas	0	786	1 341	1 658	1 759	1 861	2 007	2 011	2 016	2 021	2 026
	Kaunas - Vilnius	0	1 027	1 752	2 164	2 293	2 424	2 614	2 619	2 625	2 631	2 637
	Kaunas - PL/LT border	0	418	712	880	931	984	1 061	1 064	1 066	1 069	1 071
	Trips	0	2 229	3 825	4 755	5 070	5 394	5 841	5 881	5 921	5 961	6 002

The Figure 64 shows origin and destination of forecasted Rail Baltica passenger flows for each Rail Baltica section. The results indicate that the majority of travelers would originate from nearby cities and neighboring countries, and the majority of people travelling outside of the Baltic States towards Poland would come from Kaunas and Vilnius. This aligns with the previously noted observation that on average one passenger would travel two stops (sections of Rail Baltica).

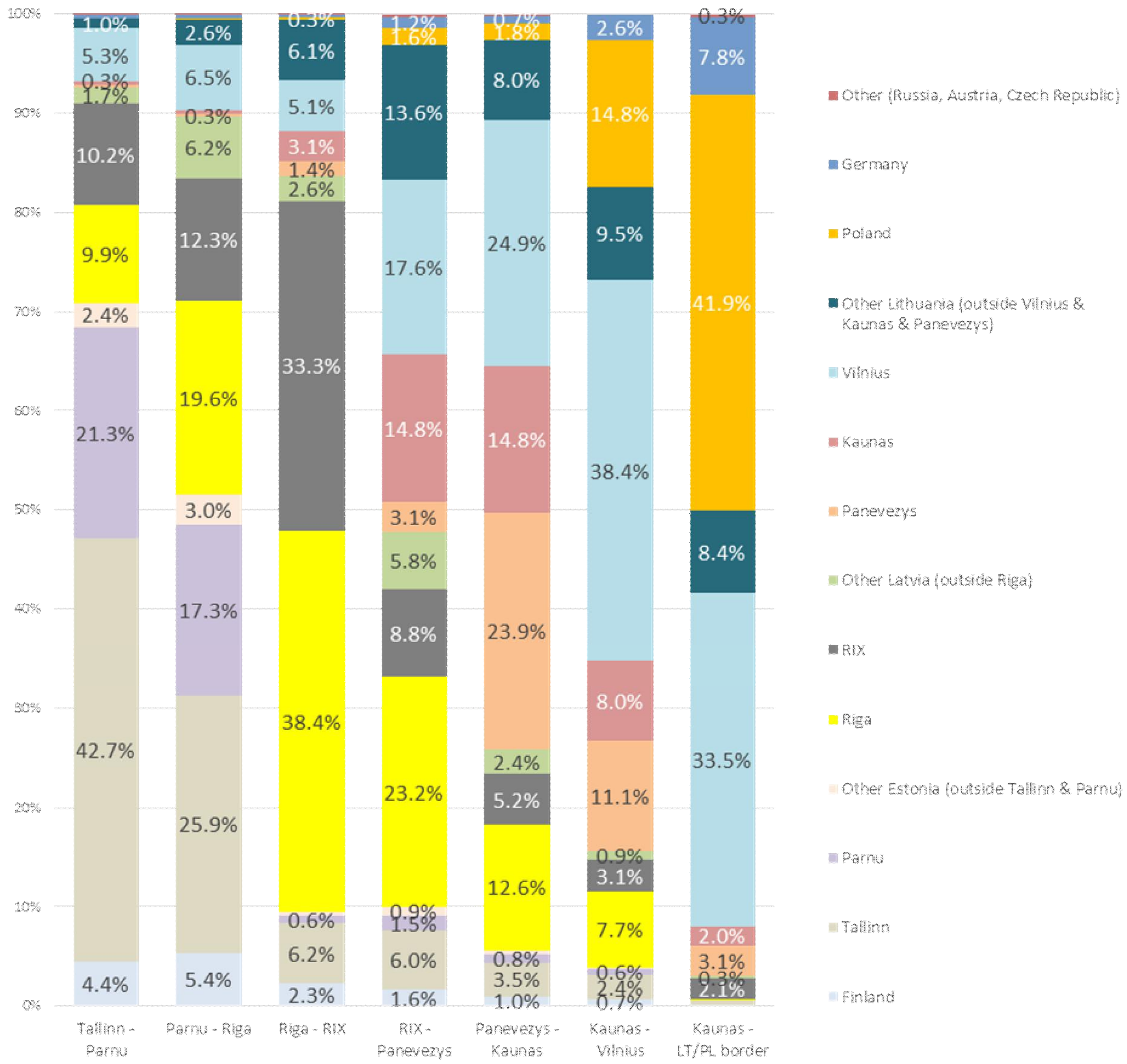

Figure 64 Split of passenger origin/destination within Rail Baltica sections

Considering the travelers outside the Baltic States, as it can be observed, passengers to/from Poland have higher impact on the Rail Baltica flows than Finland due to the fact that arrivals from/departures to Finland require the use of sea (or air) transport thus making Rail Baltica much less competitive compared to direct air travel from Helsinki.

8.1.2.1 Base case detailed passenger flows for the sections of Rail Baltica

The following subsections present the forecasted passenger flows per each Rail Baltica section in the Base case scenario and subsequent comparison with high and Low case scenarios. The vertical axes represent the total forecasted annual number of passengers in thousands at various time periods as indicated by the columns (see Figure 65). The forecasted flows are separated into three groups:

- Travellers between adjacent international Rail Baltica stations (referred to as point-to-point travellers, e.g., traveller going from Tallinn to Parnu).
- Travellers originating 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 originating and/or exiting outside the Baltic States (referred to as extra-Baltic travellers, e.g., traveller from Warsaw to Kaunas).

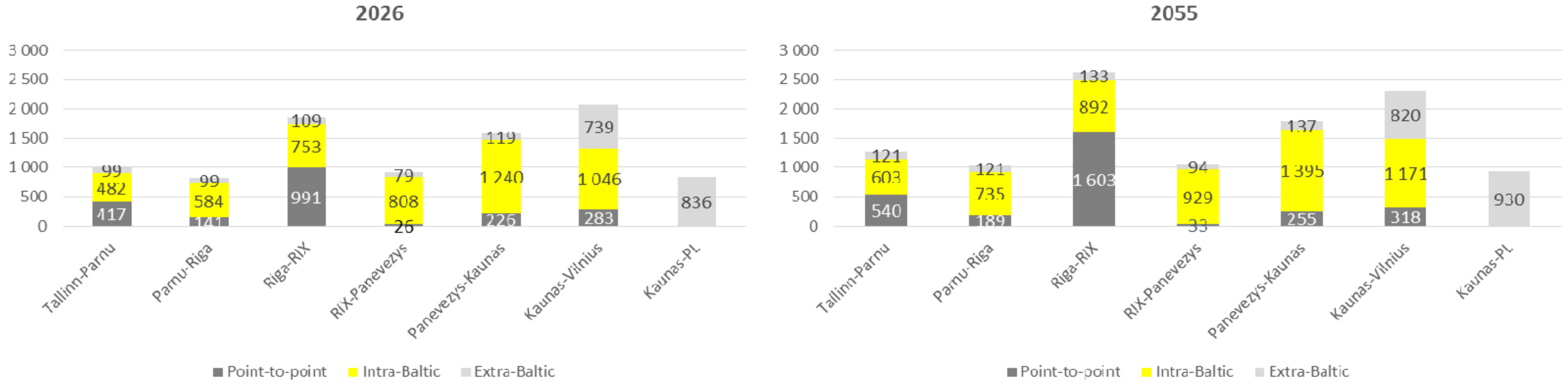

Figure 65 Base case Rail Baltica passenger flow breakdown per main sections, thousand PAX

The figures above illustrate that in the Base case the point-to-point passenger flows mainly are expected on the Riga International Airport – Riga central intermodal public transportation hub section. The second and third highest point-to-point traffic is expected between the key national population areas: Tallinn – Parnu and Kaunas

– Vilnius sections. Such 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 combines travelers between Riga and Kaunas and Vilnius.

The highest extra-Baltic flows will occur on Kaunas –LT/PL border section, meaning that majority of transit travelers will be travelling to/from southern directions, with the majority of people that are travelling 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 neighboring countries, and relatively smaller proportion will travel outside the Baltics (as explained before in section 8.1.2, due to greatly reduced competitiveness of rail vs air travel for longer distances), except the travelers between Poland and Lithuania, where the travel distance and speed is still competitive for Rail Baltica vs other competing modes of transport.

8.1.2.2 Comparison of the detailed passenger flows for the sections of Rail Baltica among the scenarios

The comparative data between base, high and low scenarios is presented in the below. The forecasts in general align similarly across all scenarios, with the relative shares of point-to-point, intra-Baltic and extra-Baltic passengers corresponding to the Base case (see Table 38).

Table 38 Comparative passenger flow data for Rail Baltica sections across the scenarios (thous. passengers)

		Point-to-point				Intra-Baltic				Extra-Baltic				TOTAL				Average share		
		2026	2035	2045	2055	2026	2035	2045	2055	2026	2035	2045	2055	2026	2035	2045	2055	Point-to-point	Intra-Baltic	Extra-Baltic
Tallinn-Parnu	High case	489	549	604	655	543	598	653	706	115	124	134	145	1 146	1 271	1 391	1 506	43%	47%	10%
	Base case	417	461	502	540	482	523	564	603	99	105	112	121	997	1 089	1 178	1 263	42%	48%	10%
	Low case	330	363	394	422	382	412	442	472	78	83	89	95	791	858	925	989	42%	48%	10%
Parnu - Riga	High case	166	188	210	231	663	732	800	866	115	124	135	146	944	1 044	1 145	1 243	18%	70%	12%
	Base case	141	158	174	189	584	636	686	735	99	105	113	121	824	899	973	1 045	18%	71%	12%
	Low case	112	124	136	148	463	500	538	575	79	83	89	95	654	708	763	818	18%	71%	12%
Riga-RIX	High case	1 163	1 399	1 674	1 979	860	924	988	1 051	127	137	148	160	2 151	2 460	2 810	3 190	59%	36%	5%
	Base case	991	1 171	1 377	1 603	753	799	846	892	109	116	124	133	1 852	2 085	2 347	2 628	58%	37%	5%
	Low case	785	920	1 077	1 250	599	632	667	702	86	92	98	104	1 470	1 643	1 841	2 056	58%	37%	5%
RIX-Panevezys	High case	31	34	37	40	927	985	1 041	1 096	93	99	106	113	1 051	1 118	1 184	1 250	3%	88%	9%
	Base case	26	28	31	33	808	848	889	929	79	84	89	94	914	961	1 009	1 056	3%	88%	9%
	Low case	21	22	24	26	643	672	702	732	63	66	70	74	727	761	796	833	3%	88%	9%
Panevezys - Kaunas	High case	264	280	290	298	1 431	1 503	1 573	1 642	138	147	156	164	1 832	1 930	2 018	2 104	14%	78%	8%
	Base case	226	239	247	255	1 240	1 292	1 343	1 395	119	124	131	137	1 585	1 655	1 722	1 787	14%	78%	8%
	Low case	77	190	196	202	987	1 024	1 063	1 102	94	98	103	108	1 159	1 312	1 362	1 413	13%	80%	8%
Kaunas - Vilnius	High case	329	350	362	373	1 204	1 261	1 318	1 375	862	901	939	971	2 395	2 511	2 619	2 718	14%	50%	36%
	Base case	283	299	309	318	1 046	1 086	1 128	1 171	739	766	795	820	2 068	2 151	2 232	2 308	14%	51%	36%
	Low case	225	237	245	252	833	861	893	925	588	606	628	648	1 645	1 705	1 766	1 826	14%	51%	36%
Kaunas - PL/LT border	High case	0	0	0	0	0	0	0	0	975	1 020	1 065	1 102	975	1 020	1 065	1 102	0%	0%	100%
	Base case	0	0	0	0	0	0	0	0	836	867	901	930	836	867	901	930	0%	0%	100%
	Low case	0	0	0	0	0	0	0	0	664	686	712	734	664	686	712	734	0%	0%	100%

8.1.3 Passenger traffic intensities and capacity utilization

Table 39 depicts two-way passenger carrier movements for each macroeconomic scenario under consideration, split by each section of Rail Baltica, while Figure 66 visualizes the PAX carrier movements on a map.

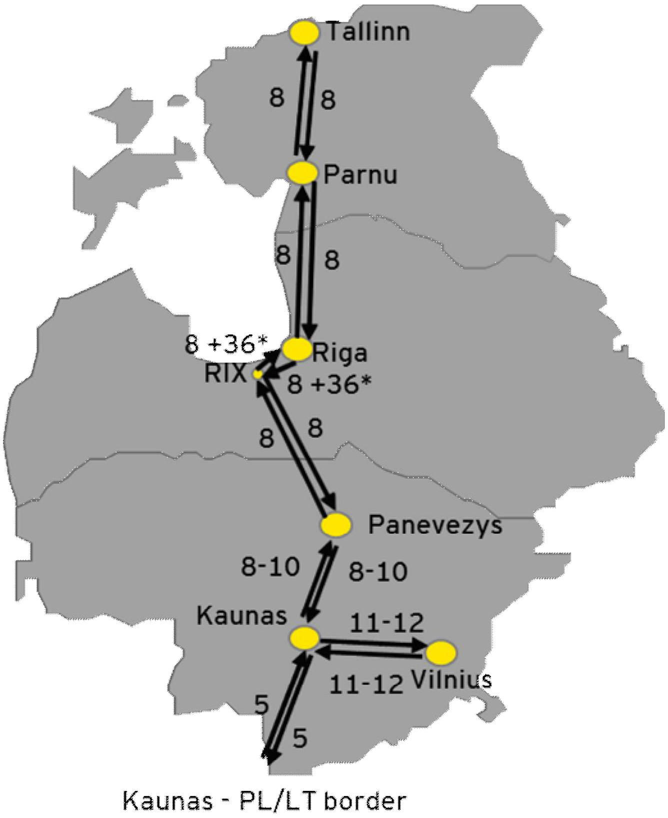

Figure 66 Map of PAX carrier intensities per section
*Shuttle service with airport

Table 39 PAX carrier intensities per section (train pairs/per day)

	Base case			Low case			High case		
Section	2030	2040	2050	2030	2040	2050	2030	2040	2050
Tallinn-Parnu	8	8	8	8	8	8	8	8	8
Parnu - Riga	8	8	8	8	8	8	8	8	8
Riga-RIX	8	8	8	8	8	8	8	8	8
Riga-RIX shuttle	36	36	36	36	36	36	36	36	36
RIX-Panevezys	8	8	8	8	8	8	8	8	8
Panevezys - Kaunas	8	9	10	8	8	8	10	10	11
Kaunas - Vilnius	11	12	12	9	9	10	12	13	14
Kaunas - PL/LT border	5	5	5	4	4	4	5	6	6

*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). This base train schedule was then evaluated from the train rolling stock load factor perspective (i.e., occupancy rate of the train seats assuming similar rolling stock as the Pendolino type trains in Poland with 402 seats per EMU).

The exception was Riga airport shuttle with 228 seats assuming similar rolling stock as Arlanda Express and schedule to cover at least 2 train movements per hour during the working hours of the airport and 15 minute intervals during the peak hours. Load factor data was used to identify the potential lack of capacity and resulting requirement of additional trains. Considering the seasonal and daily fluctuations of the traffic flow, the train schedule was adjusted not to exceed 70% load factor level on average. Due to this in certain sections, especially in the High case scenario there was the requirement to add additional train pairs. The resulting occupancy rates are provided below.

The Figure 67 to Figure 69 presents train capacity utilization for each Rail Baltica section. The calculations show that only certain sections approach the 70% load factor threshold (Kaunas – Panevezys and Kaunas – Vilnius).

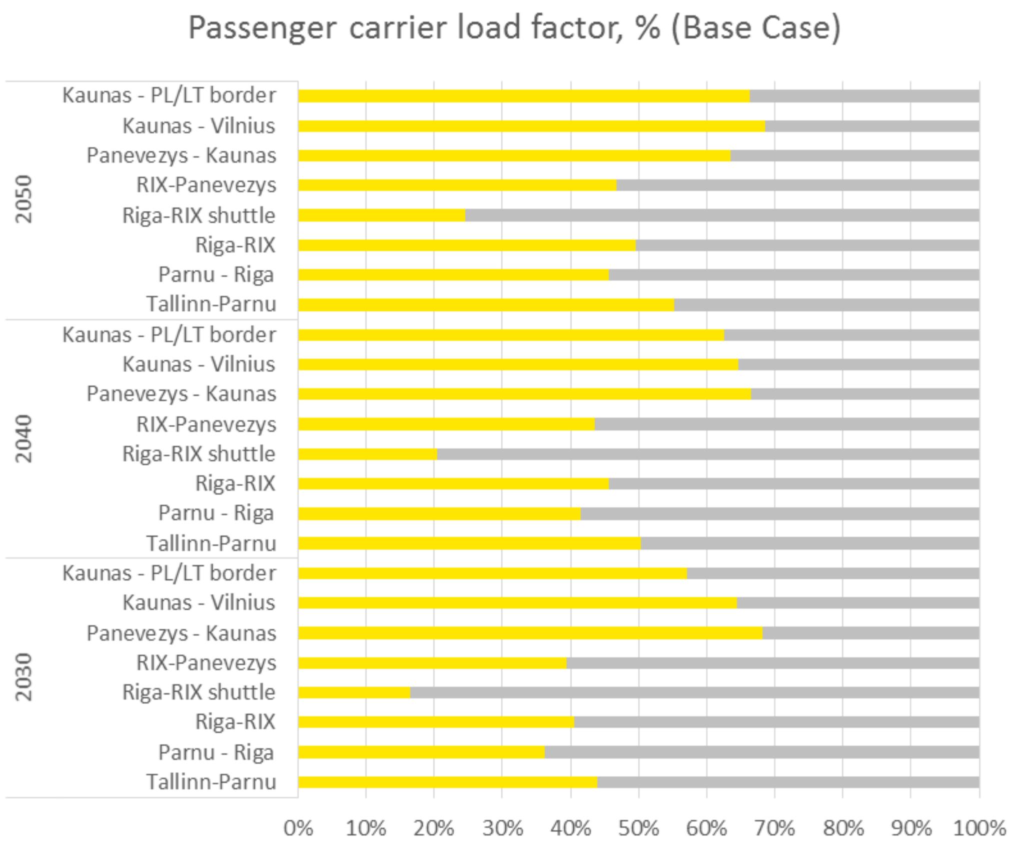

Figure 67 Passenger carrier load factor (Base case)

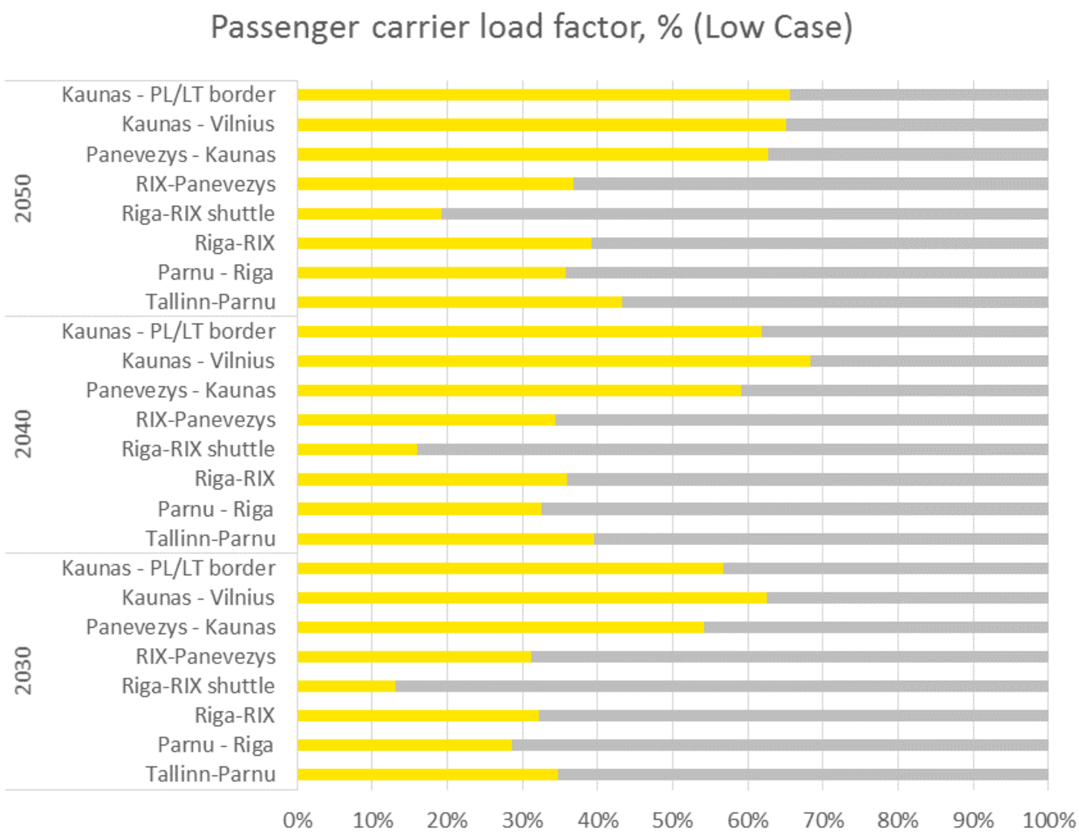

Figure 68 Passenger carrier load factor (Low case)

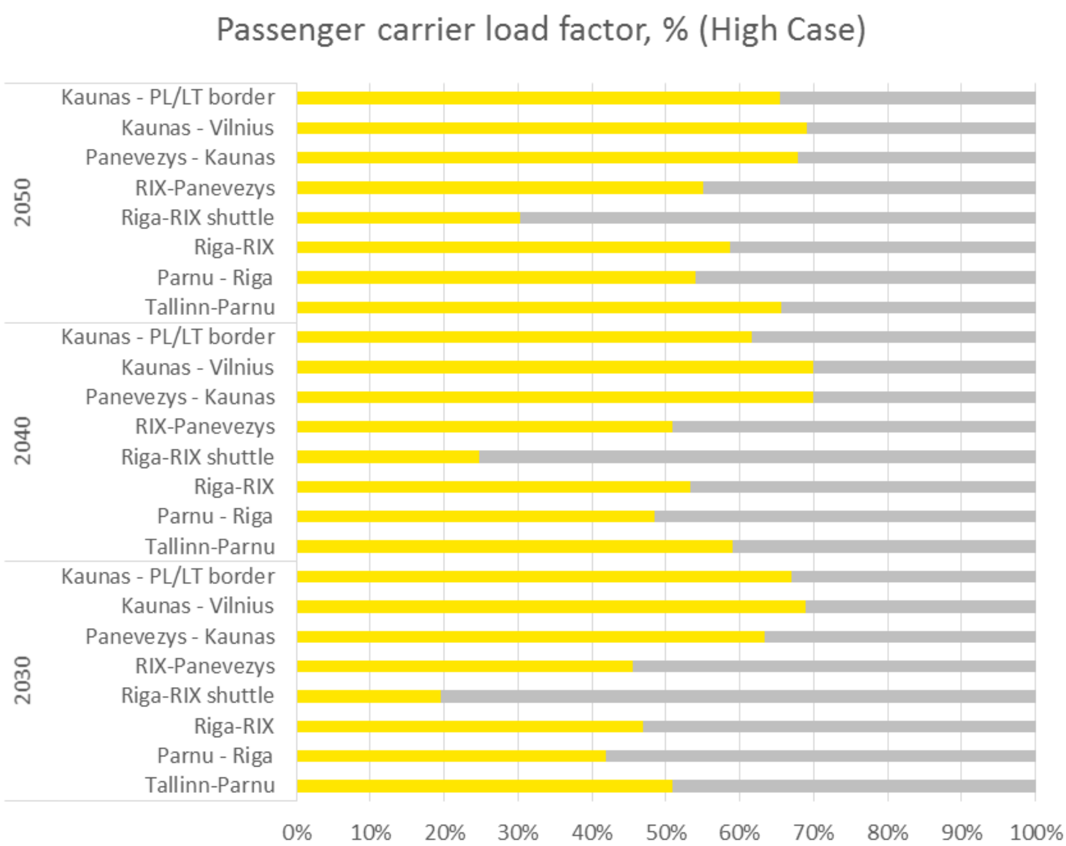

Figure 69 Passenger carrier load factor (High case)

8.2 Freight flow forecasts

Key messages:

- Overall freight market is expected to develop in all scenarios despite the adverse effect of influence factors in the Low case
- The freight flows that Rail Baltica would be likely to capture can be divided into three roughly equal parts – Finland transit, local (Baltic) imports/exports and intermodal trans-shipment between 1435mm and 1520mm gauge rail systems

8.2.1 Forecasted development of the market

According to the methodology described in section 4.1, the forecasts have been based on the different future growth model assumptions and future assignment and modal choice models for Base, Low and High cases respectively.

A graphic representation of the overall market developments (total market freight transport volume of Rail Baltica applicable types of goods over all available transport modes) and the share of Rail Baltica freight flows has been provided in Figure 70. The figures represent the annual movements of unique tonnes of goods for all transport modes (i.e., freight volumes that are not double counted due to their shipment overlapping with other O/D pairs, e.g., one unique shipment from Germany to Estonia is counted in the following sections of Rail Baltica: LT/PL border – Kaunas, Kaunas – Panevezys, Panevezys – Salaspils, Salaspils – Parnu, Parnu –Tallinn) of the relevant O/D pairs for Rail Baltica as defined in the catchment area (see section 4.1.4).

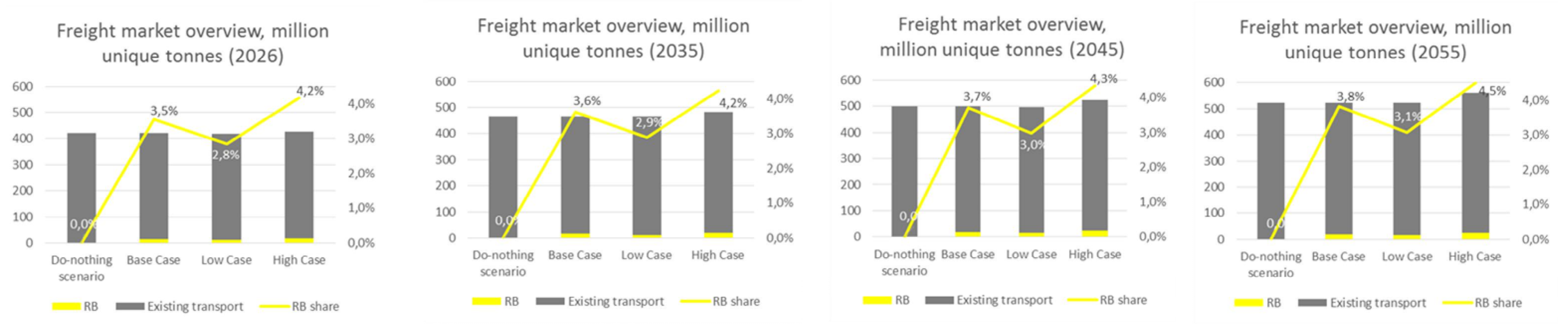

Figure 70 Overall freight market forecast and the share of Rail Baltica

The forecasts demonstrate the combined effect of different future growth model assumptions as well as different future assignment and modal choice models for the scenarios. For example, the total market varies from 552 million tonnes (Low case) to 561 million tonnes (High case) in 2055. This overall market represents the sum of the total applicable Rail Baltica trade flows for the O/D pairs covered in the model, some of which are currently present as transit flows through the Baltic States to a very limited extent (less than 5%, i.e. Finland – Germany). It is important to note that the flows include the total trade for all modes of transport. However, as described in the forecast methodology (section Freight flow forecasting methodology 4.1.4), such flows contain some potential for Rail Baltica thus they are covered in the analysis. The share of Rail Baltica market potential varies from 3.1% to 4.5% in the low and High case respectively. The combined effect of both of these models results in Rail Baltica market potential fluctuating between 16 million unique tonnes in the Low case and 25 million unique tonnes in the High case scenarios in 2055 (or 1.2 to 1.8 million TEU[127] equivalents annually), in comparison to 12-18 million unique tonnes in 2026 (or 0.9-1.3 million TEU equivalents annually) for the same scenarios. It must be noted that the overall market volumes exclude also O/D pairs with very limited albeit potentially feasible trade flows, for example, the trade between Russia (and other CIS) countries with the rest of the EU (except the Baltic States). Such O/D pairs have large volume (over 400 million tonnes), however, they cannot be ignored from the perspective of Rail Baltica, especially considering that the second most populous and economically advanced region in Russia – Saint Petersburg, is located in the vicinity of the Rail Baltica alignment and is expected to provide opportunities for the capture of trade flows between the Saint Petersburg region and Central Europe.

The key figures of the overall market and Rail Baltica market potential forecasts are provided in Table 40.

Table 40 Overall market forecasts summary

		Year			
		2026	2035	2045	2055
Total market flows (million unique tonnes/year, both do-nothing and with project)	High case	427	481	525	561
	Base case	421	467	498	523
	Low case	420	465	498	522
Total market flow annual CAGR since last reference period, %	High case	3.1%	1.2%	0.9%	0.7%
	Base case	3.0%	1.0%	0.7%	0.5%
	Low case	3.0%	1.0%	0.7%	0.5%
Rail Baltica market potential (million unique tonnes/year)	High case	18	20	23	25
	Base case	15	17	18	20
	Low case	12	13	15	16
Rail Baltica market potential share, %	High case	4.2%	4.2%	4.3%	4.5%
	Base case	3.5%	3.6%	3.7%	3.8%
	Low case	2.8%	2.9%	3.0%	3.1%
CAGR of the Rail Baltica market potential, %	High case	n/a	1.4%	1.1%	1.0%
	Base case	n/a	1.2%	0.9%	0.8%
	Low case	n/a	1.2%	0.9%	0.8%

The growth rate and the dynamics of Rail Baltica market potential share replicate the expected development of the GDP of the countries within scope 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. As described in the section 4.1 the low and High case

[127] Average load per TEU 13.7 tonnes, see assumptions section.

scenarios provide weaker and stronger correlation (and therefore CAGR) between the growth of passenger flows and GDP growth.

The dynamics of the share of Rail Baltica market potential illustrate that in the Base case there is gradual increase of the Rail Baltica market potential shares (due to the expected general strengthening of the position of Rail Baltica in the market).

8.2.1.1 Modal shift considerations for Rail Baltica freight flows

For determination of the potential sources and existing transport modes the following 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 the 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.

8.2.2 Forecasted freight flows of Rail Baltica

According to the approach described in the section 4.1 Passenger and freight flow forecasting methodology, in order to determine the actual flows that will be captured by Rail Baltica, as a final step, market potential uptake assumptions have been applied (see financial analysis assumptions list in the section 9.1.2 for detailed information). In contrast to the passenger uptake potential, market uptake for freight is expected to follow the passenger uptake with a two-year lag (see Figure 71). This represents the greater rigidity of the supply chain industry to test and switch significant volumes to a new infrastructure, compared to passenger services.

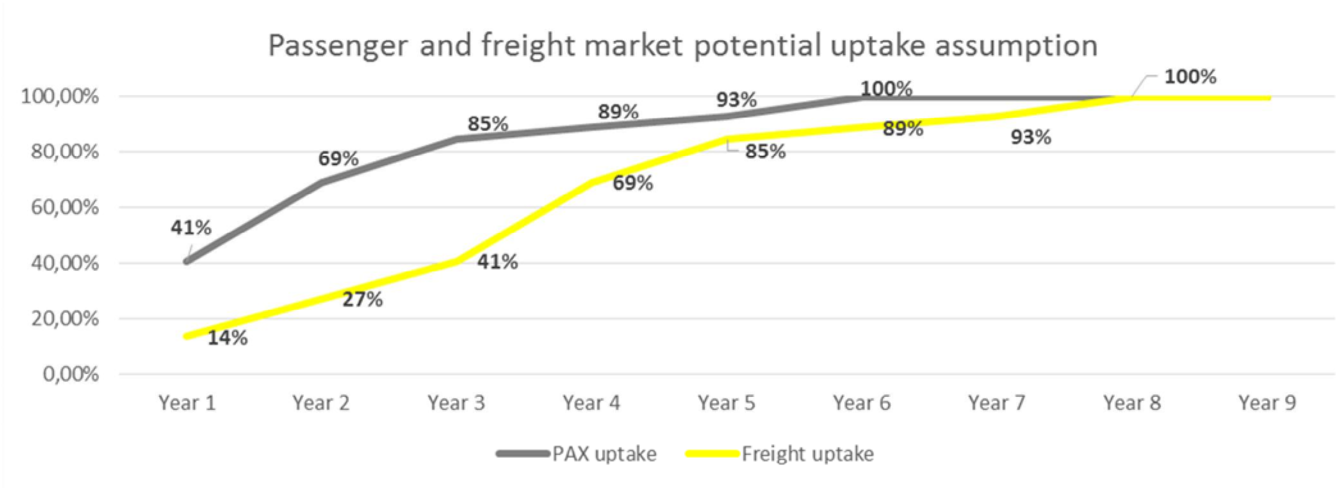

Figure 71 Freight market potential uptake assumption of Rail Baltica (and comparison to passenger uptake)

The Table 41 shows a summary of the freight flow market potential and actual usage forecasts in million tonnes per annum for each Rail Baltica section. As illustrated in the Table 41, starting from 2035 (year 8), Rail Baltica achieves its full market potential. Due to a lack of reliable comparative studies that would provide objective estimates for the induced freight flows, for prudency and conservative approach purposes, induced demand for freight has been assumed to be 0 (however, in reality actions can be taken to enhance the commercial potential of Rail Baltica that would draw induced freight demand), and induced effects (additional freight flows) have been considered as part of sensitivity analysis (see section 11.3). These forecasts are further explained in the following chapters.

Table 41 Freight forecasts summary (million tonnes)

			Tallinn-Parnu	Parnu-Salaspils	Salaspils-Panevezys	Panevezys-Kaunas	Kaunas-PL/LT border	Kaunas-Vilnius	Unique tonnes
Base case	2026	Potential modal shift	5.1	5.1	6.1	6.1	13.3	5.8	5.1
		Actual modal shift	0.7	0.7	0.8	0.8	1.8	0.8	0.7
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2035	Potential modal shift	5.8	5.8	5.8	5.8	14.9	6.5	5.8
		Actual modal shift	5.8	5.8	5.8	5.8	14.9	6.5	5.8
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2045	Potential modal shift	6.4	6.4	7.7	7.7	16.3	7.1	6.4
		Actual modal shift	6.4	6.4	7.7	7.7	16.3	7.1	6.4
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2055	Potential modal shift	7.0	7.0	8.5	8.5	17.6	7.6	7.0
		Actual modal shift	7.0	7.0	8.5	8.5	17.6	7.6	7.0
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low case	2026	Potential modal shift	4.0	4.0	4.9	4.9	10.7	4.7	4.0
		Actual modal shift	0.6	0.6	0.7	0.7	1.5	0.6	0.6
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2035	Potential modal shift	4.7	4.7	4.6	4.6	12.0	5.2	4.7
		Actual modal shift	4.7	4.7	4.6	4.6	12.0	5.2	4.7
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2045	Potential modal shift	5.1	5.1	6.2	6.2	13.1	5.7	5.1
		Actual modal shift	5.1	5.1	6.2	6.2	13.1	5.7	5.1
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2055	Potential modal shift	5.6	5.6	6.8	6.8	14.1	6.1	5.6

			Tallinn-Parnu	Parnu-Salaspils	Salaspils-Panevezys	Panevezys-Kaunas	Kaunas-PL/LT border	Kaunas-Vilnius	Unique tonnes
		Actual modal shift	5.6	5.6	6.8	6.8	14.1	6.1	5.6
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High case	2026	Potential modal shift	5.9	5.9	7.1	7.1	15.9	7.2	5.9
		Actual modal shift	0.8	0.8	1.0	1.0	2.2	1.0	0.8
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2035	Potential modal shift	6.9	6.9	6.9	6.9	18.1	8.0	6.9
		Actual modal shift	6.9	6.9	6.9	6.9	18.1	8.0	6.9
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2045	Potential modal shift	7.7	7.7	9.4	9.4	20.1	8.9	7.7
		Actual modal shift	7.7	7.7	9.4	9.4	20.1	8.9	7.7
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2055	Potential modal shift	8.6	8.6	10.6	10.6	22.1	9.7	8.6
		Actual modal shift	8.6	8.6	10.6	10.6	22.1	9.7	8.6
		Rail Baltica induced flows	0.0	0.0	0.0	0.0	0.0	0.0	0.0

To illustrate the market uptake more clearly, the Table 42 contains the forecasted freight flows over the first 10 years of operation.

Table 42 Freight forecasts summary for first 10 years of operation (million tonnes)

		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Base case	Tallinn-Parnu	0	0.7	1.4	2.2	3.8	4.7	5	5.3	5.7	5.7	5.8
	Parnu-Salaspils	0	0.7	1.4	2.2	3.8	4.7	5	5.3	5.7	5.7	5.8
	Salaspils-Panevezys	0	0.8	1.7	2.6	4.5	5.7	6	6.4	6.9	6.9	7
	Panevezys-Kaunas	0	0.8	1.7	2.6	4.5	5.7	6	6.4	6.9	6.9	7
	Kaunas-PL/LT border	0.0	1.8	3.7	5.7	9.8	12.2	12.9	13.6	14.7	14.8	14.9
	Kaunas-Vilnius	0.0	0.8	1.6	2.5	4.3	5.3	5.6	5.9	6.4	6.4	6.5
	Unique tonnes	0.0	2.0	4.2	6.4	10.9	13.7	14.4	15.2	16.5	16.7	16.9
Low case	Tallinn-Parnu	0	0.6	1.1	1.7	3	3.8	4	4.2	4.5	4.6	4.6
	Parnu-Salaspils	0	0.6	1.1	1.7	3	3.8	4	4.2	4.5	4.6	4.6
	Salaspils-Panevezys	0	0.7	1.4	2.1	3.6	4.5	4.8	5.1	5.5	5.6	5.6
	Panevezys-Kaunas	0	0.7	1.4	2.1	3.6	4.5	4.8	5.1	5.5	5.6	5.6
	Kaunas-PL/LT border	0	1.5	3	4.5	7.8	9.8	10.3	10.9	11.8	11.9	12
	Kaunas-Vilnius	0	0.6	1.3	2	3.4	4.3	4.5	4.7	5.1	5.2	5.2
	Unique tonnes	0.0	1.6	3.3	5.1	8.7	10.9	11.5	12.1	13.1	13.3	13.5
High case	Tallinn-Parnu	0	0.8	1.6	2.5	4.4	5.5	5.9	6.2	6.7	6.8	6.9
	Parnu-Salaspils	0	0.8	1.6	2.5	4.4	5.5	5.9	6.2	6.7	6.8	6.9
	Salaspils-Panevezys	0	1	2	3.1	5.3	6.7	7.1	7.5	8.2	8.3	8.3
	Panevezys-Kaunas	0	1	2	3.1	5.3	6.7	7.1	7.5	8.2	8.3	8.3
	Kaunas-PL/LT border	0	2.2	4.4	6.8	11.7	14.6	15.5	16.4	17.8	17.9	18.1
	Kaunas-Vilnius	0	1	2	3	5.2	6.5	6.9	7.3	7.9	8	8
	Unique tonnes	0.0	2.4	4.9	7.6	13.1	16.4	17.3	18.3	19.8	20.1	20.4

As it can be seen in the Table 42, the highest amount of freight volume goes through Poland- Kaunas section, which captures all Europe-bound import and export flows as well as the majority of transit to/from Finland and the 1520mm gauge system.

8.2.2.1 Detailed freight flow forecasts for the sections of Rail Baltica

The following subsections present the forecasted freight flows per each Rail Baltica section in the Base case scenario and subsequent comparison with high and Low case scenarios. The vertical axes represent the total forecasted annual number of tonnes in thousands at various time periods as indicated by the columns. The forecasted flows are separated into four groups representing the types of cargo flows – foreign trade of Estonia, Latvia, and Lithuania and transit (see Figure 72).

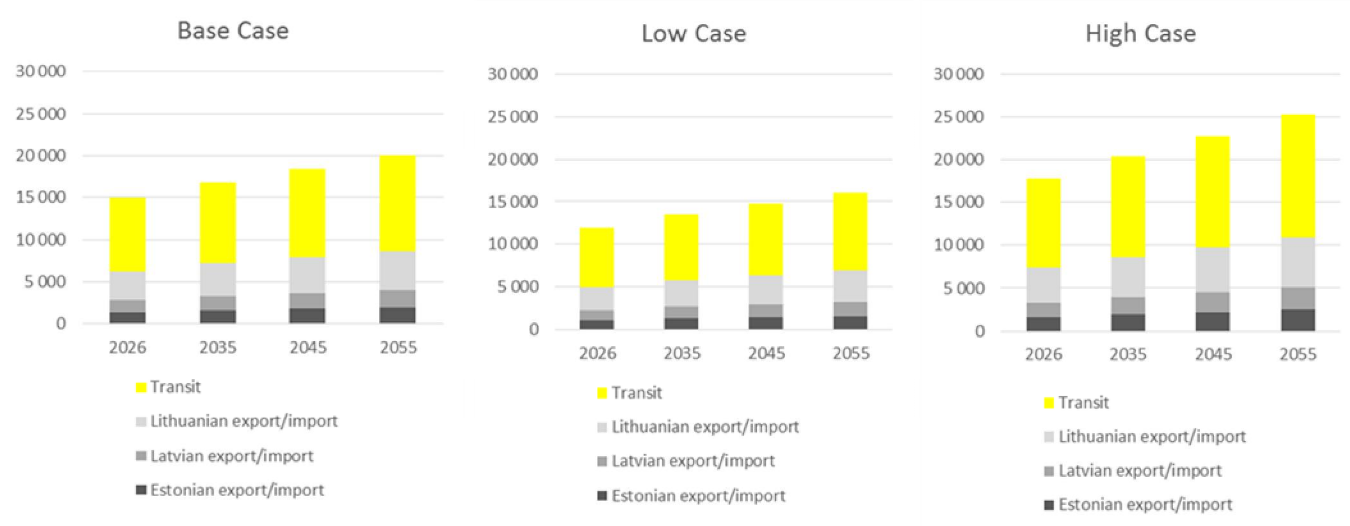

Figure 72 freight flows split by country

The forecasts show that Rail Baltica infrastructure will be more regularly used for transit freight flows, however, the proportion is rather similar, as the transit flows form approximately 57% of total flows and imports/exports of the Baltic States – 43%. The leader in the import/export category is Lithuania whose import/export flows exceed the flows of Estonia and Latvia combined (see Table 43). This derives from the observation that overall trade ties with selected trade partner countries are stronger for Lithuania.

Table 43 Serviced freight split by flow type for the Baltic States (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 majority of freight flows for Estonia are forecasted to be transit flows, however, compared to the other Baltic States, the proportion of transit in total flows is lower. This is because there is only one country remaining on the

N/S axis, Finland, for which a limited potential is considered due to the sea link, which requires additional goods transit time and transportation cost.

Freight flow dynamics in Latvia indicate that the majority of freight travelling through Latvia will be transit flows both on the N/S axis and S/E axis via Salaspils, as the intermodal terminal will provide a connection towards Russia, Central Asia and beyond (East).

In Lithuania, the majority of cargo transported via Rail Baltica will be transit cargo. According to the summary presented in this section, a noticeable part of the freight flow will be cargo travelling via Lithuania to/from Eastern direction, via Vilnius and Kaunas intermodal terminals.

8.2.2.2 The split of Rail Baltica freight by catchment area

In the Figure 73 the share of total Rail Baltica freight volume forecast by the defined catchment areas is provided. The figure on the left represents the share in tonnes, while the figure on the right – in ton-kilometres.

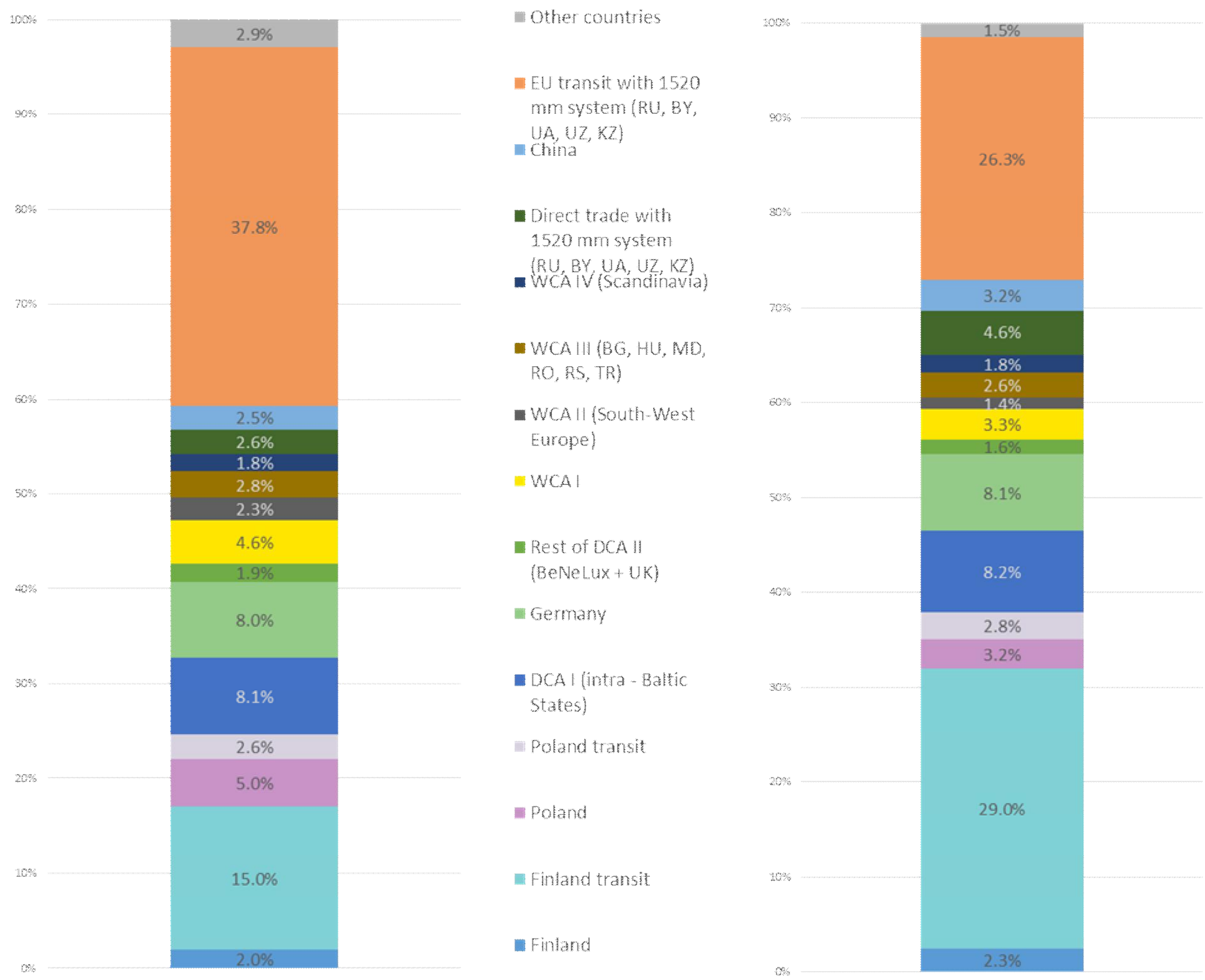

Figure 73 Split of freight origin/destination within Rail Baltica sections (left: tonnes, right: ton-km)

The summary of the forecasts data presented above indicates that the share of overall Poland and Germany freight volumes makes up 10-15% of the total Rail Baltica freight volumes, which is similar to the share of Finland transit. However, the largest share of Rail Baltica freight amount will be made up by servicing 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). At the same time, although the share in absolute volume appears high, in the terms of ton-km, which more appropriately represents the revenue for the freight carrier, the share of Finland transit exceeds the share of CIS transit due to the fact that the Finland transit trips 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. Direct Catchment Area I (The Baltic States, Finland, and Poland) would generate nearly a third of all the cargo carried, while Direct Catchment Area II (Germany, Belgium, Netherlands, United Kingdom) is expected to generate around 10% of all cargo carried. These shares are even higher if compared in ton-km terms.

While the freight flows from Russia and CIS countries in the region is considerable, it is expected that the current 1520mm rail infrastructure would still be primarily used to carry the historically serviced type of freight (in particular liquid and dry bulk).

8.2.2.3 The split of Rail Baltica freight by freight type

Rail Baltica will be primarily suited to carry general cargo freight, and the expected share of liquid bulk on average is less than 0.7%. The small share of liquid bulk is due to the fact that this type of cargo primarily originates in Russia or CIS countries and it is expected that this sort of cargo would be transported by the current 1520mm rail infrastructure. It is expected that general cargo (mainly in containerized or semi-trailer form) would be the primary type of freight carried by Rail Baltica. Total share of this freight type on average is expected to reach 93.2%, while dry bulk would on average remain around 6.1% (see Table 44).

Table 44 Serviced freight split by major cargo types

	DCA I (except FI & PL)	Poland	Finland	DCA II (except DE)	Germany	WCA I	WCA II	WCA III	WCA IV	World	1520 mm
General cargo	92.5%	96.2%	93.1%	94.7%	92.5%	88.6%	86.4%	62.2%	100.0%	88.8%	89.6%
Dry bulk	6.6%	2.6%	5.1%	5.0%	7.5%	11.3%	13.5%	37.8%	0.0%	11.1%	8.4%
Liquid bulk	0.9%	1.2%	1.8%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	2.0%

Summarizing the more detailed breakdown of the type of freight carried, the top 5 product positions would be Timber & Wood (51%), Manufactured goods (15.6%), Food & Beverages (12.2%), Iron & Steel (8.2%) as well as Pulp & Paper (3.1%). In total these five categories would compose around 82% of all freight carried and would reflect the typical goods or raw materials that are produced/sourced in the region. By taking into an account the freight categories and their specific volumes the most feasible carriage option would be to use 40 foot (two TEU's) containers with an average load of 15.5 tonnes.

8.2.3 Forecasted freight flows

The Figure 74 presents forecasted freight flows per each Rail Baltica section. For example, it is forecasted that in 2055, in the Base case, approximately 20 million tonnes of unique freight will be shipped using the Rail Baltica infrastructure (this volume represents unique shipments of cargo that are not double-counted by travelling over several sections).

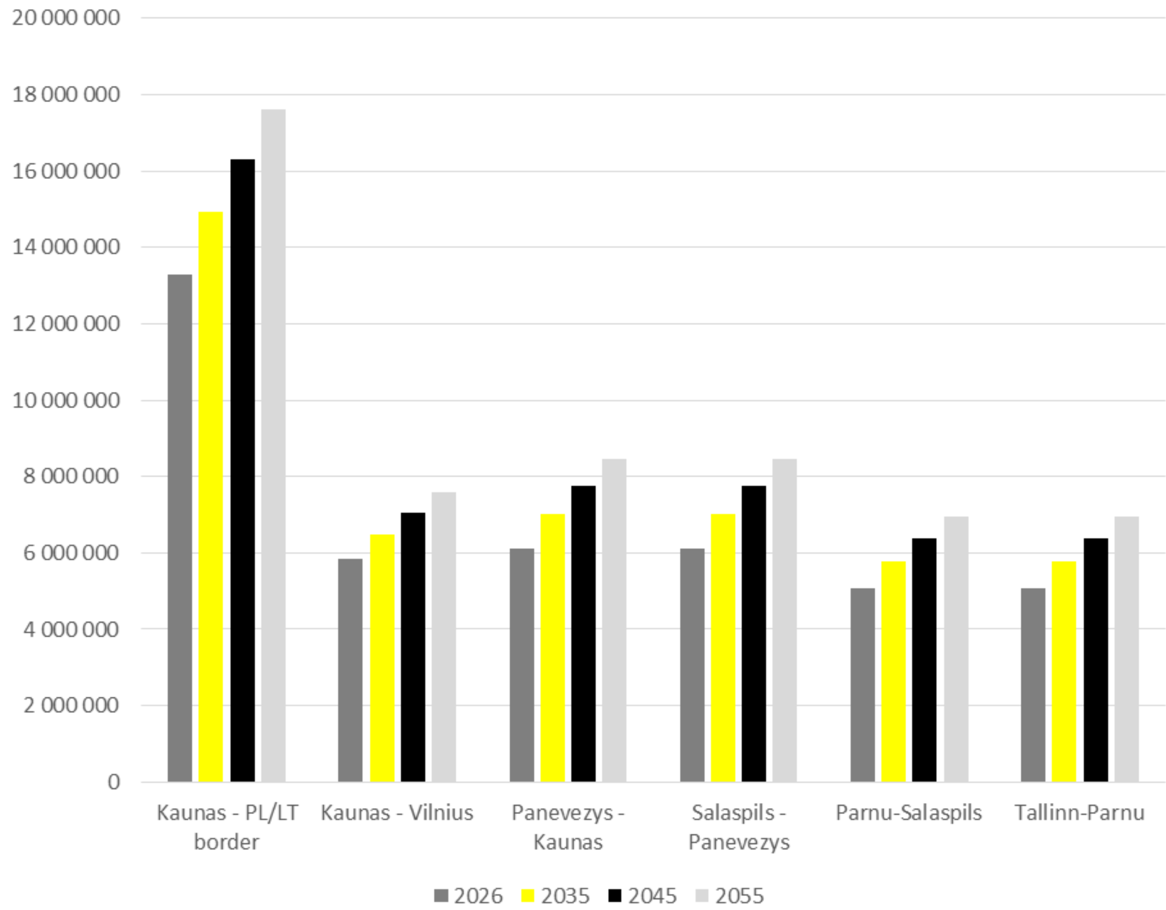

Figure 74 Rail Baltica freight flow forecast (Base case), tonnes

In the Base case it is forecasted that the highest freight traffic intensity will occur on the LT-PL border – Kaunas section due to the fact that the majority of forecasted freight will be trade of the Baltics with the rest of the Europe (travelling to/from southern direction). For other sections the flows are relatively balanced, representing the impact of the Finland's transit flows as well as 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 the different scenarios is summarized in Table 45.

Table 45 Serviced freight of Rail Baltica by section (million tonnes)

		Muuga-Salaspils	Salaspils - Kaunas	Kaunas - PL/LT 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

		Muuga-Salaspils	Salaspils - Kaunas	Kaunas - PL/LT border	Kaunas - Vilnius
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 ton reduction or increase against the Base case scenario in the most utilized section Kaunas – PL/LT border to approx. 1.5 million tonnes difference for the Estonian section.

8.2.4 Market share

In the Figure 75, the Rail Baltica share of total relevant freight volume (i.e., freight types relevant for shifting to Rail Baltica) per scenarios is depicted. For the majority of O/D pairs, market share is around or lower than 5% in the Base case. As it can be seen, the highest market share of 14% (or share of the total volumes of all alternative transport modes shifting to Rail Baltica) of the relevant freight to Germany and around 16% of the relevant freight to Adriatic corridor will be transported using Rail Baltica. The highest market shares to the WCAI reflect the less convenient accessibility of this catchment area from the Baltic or North Sea ports.

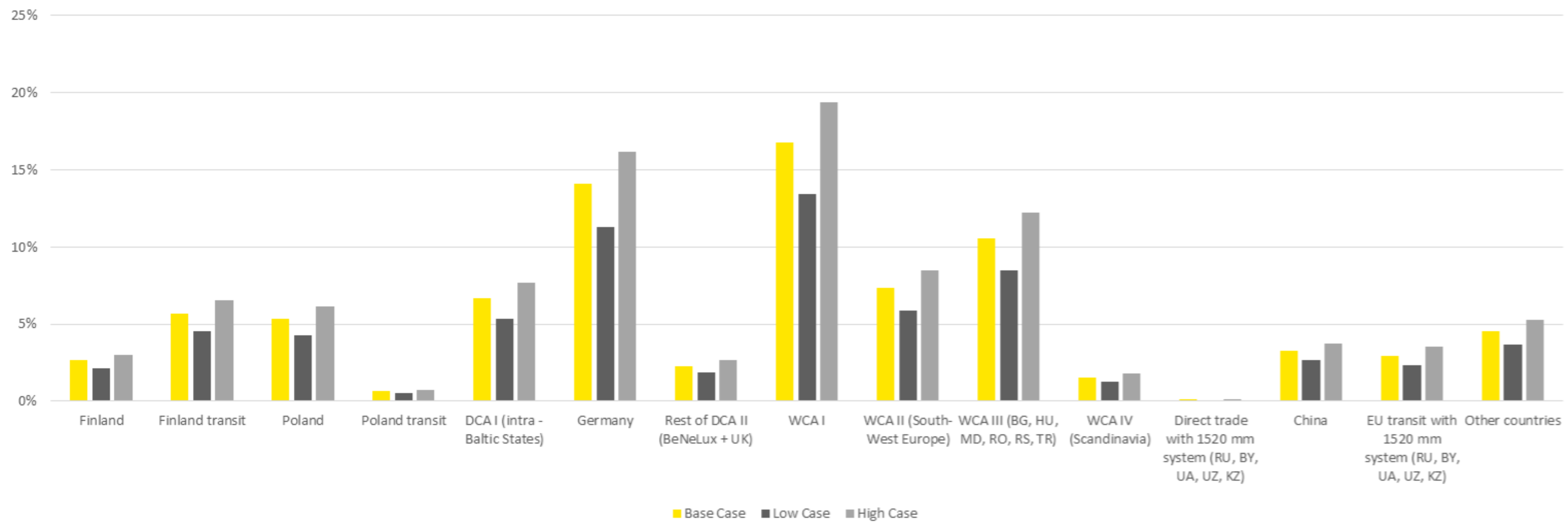

Figure 75 Freight market share by catchment area

8.2.5 Intermodal freight services vis-à-vis the 1520mm freight system

As illustrated in the freight forecasts overview section, significant part of the freight serviced by Rail Baltica is transit between the countries with 1520mm railway gauge system (CIS) and the EU. The volumes of freight serviced by Rail Baltica that relate to the 1520mm railway gauge system are presented in the Figure 76. According to our forecast modelling, the annual transit flows will grow from approx. 6.7 million tonnes to 8.5 million. tonnes during the forecast period, and are complemented by minor volume of trade originating or ending in the Baltic States of less than 450 thousand tonnes annually (such cargoes would occur in the case that Rail Baltica is used as part of the shipment, for example, Estonia's exports to Belarus would partially use Rail Baltica until intermodal terminals in Latvia or Lithuania where they would be trans-loaded onto the 1520mm railway gauge system).

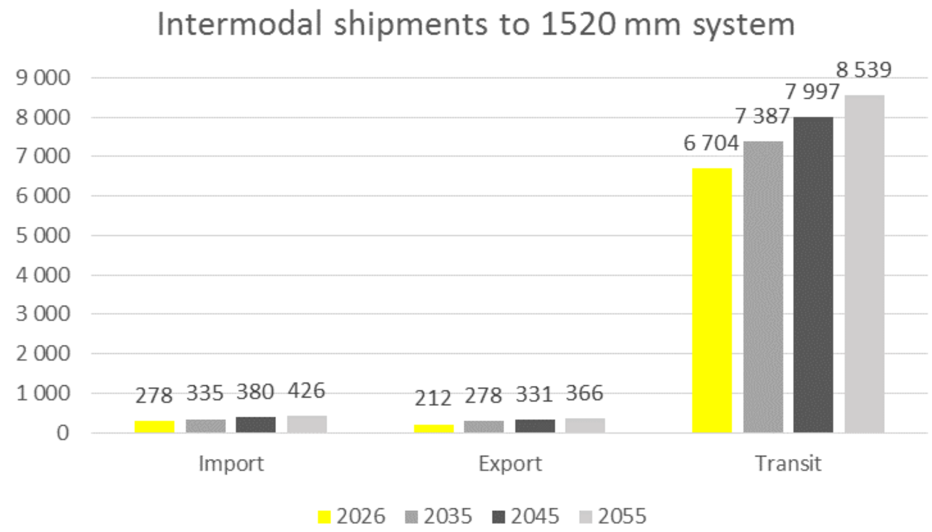

Figure 76 Intermodal freight services with 1520 mm railway gauge system (Base case), thous. tonnes

8.2.6 Freight traffic intensities and load factor

The Table 46 describes two-way freight carrier movements for each macroeconomic scenarios under consideration, split by each section of Rail Baltica. Figure 77 visualize the freight carrier intensities on a map.

Table 46 Freight carrier intensities per section (train pairs/per day)

	Base case			Low case			High case		
Section	2030	2040	2050	2030	2040	2050	2030	2040	2050
Tallinn-Parnu	9	11	12	7	9	10	10	13	15
Parnu-Salaspils	9	11	12	7	9	10	10	13	15
Salaspils - Panevezys	10	13	15	9	11	12	12	16	18
Panevezys - Kaunas	10	13	15	9	11	12	12	16	18
Kaunas - PL/LT border	22	28	31	18	23	25	26	34	38
Kaunas - Vilnius	10	12	14	8	10	11	12	15	17

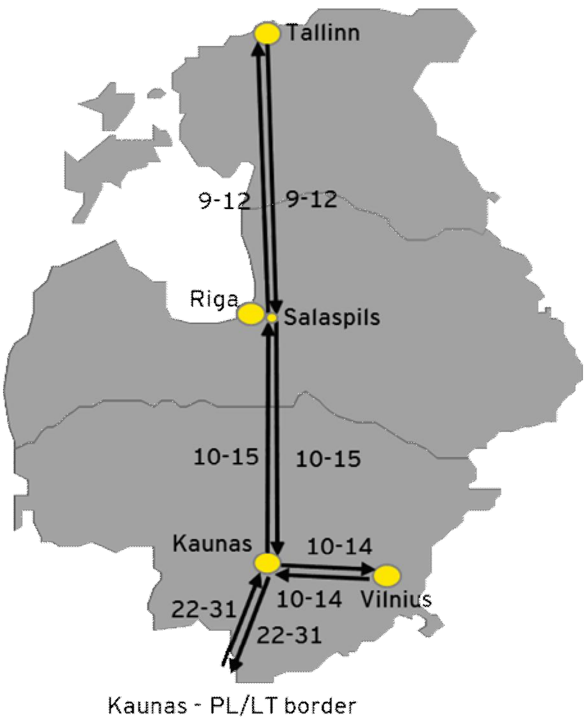

Figure 77 Map of freight carrier intensities per section (Base case)

The train schedule has been estimated from the train rolling stock load factor perspective (i.e., utilization rate of the train max weight; max weight has been assumed similar to the average observed train weights for selected infrastructure managers in Europe[128]). If demanded by the market, heavier bulk trains could be introduced that would allow transferring the freight with a less intensive train schedule.

Load factor data was used to identify the required capacity and consequent requirement of number of trains in each section. Considering the seasonal and daily fluctuations of the traffic flow, the train schedule was adjusted not to exceed a 70% load factor level on average. The resulting occupancy rates are provided in Figure 78 to Figure 80 that present train capacity utilization for each Rail Baltica section.

Considering the expected share of flows to/from each catchment area, the majority of trains farther from the PL/LT border would load/offload in Warsaw or go to the key hubs in Western Europe. The share of trains servicing the Adriatic Sea region is estimated at approximately 10% of total trains (the maximum of 2-3 train pairs per day).

[128] EY benchmarking against other existing EU railway infrastructure managers (CZ, DE, EE, LV, LT, NL, PL, BE, FI)

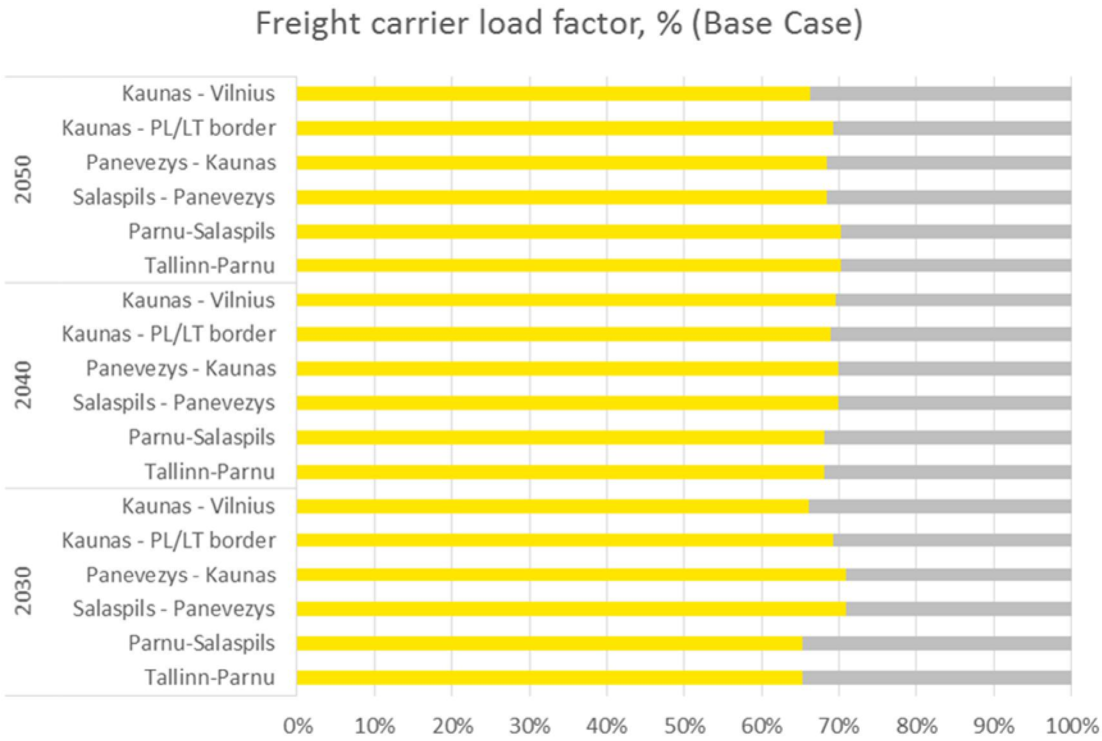

Figure 78 Freight carrier capacity utilization (Base case)

Figure 79 Freight carrier capacity utilization (Low case)

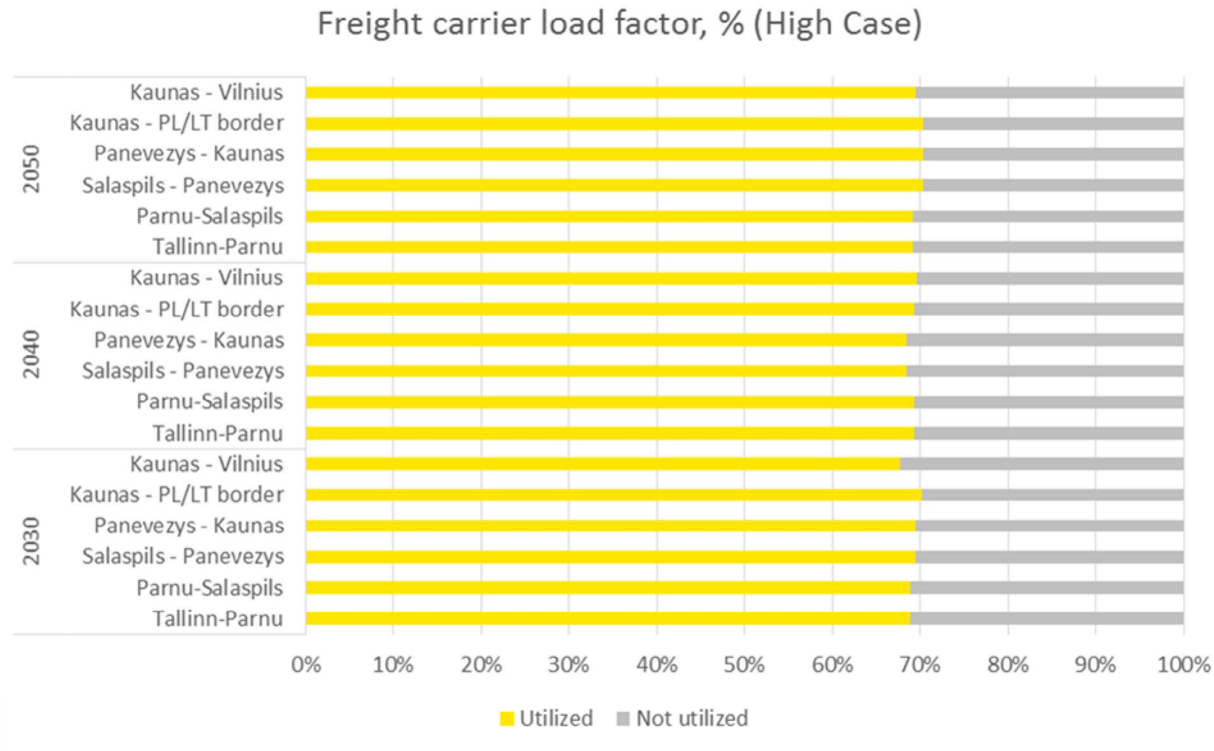

Figure 80 Freight carrier capacity utilization (High case)

9. Financial analysis

9.1 CBA assumptions

9.1.1 Core CBA assumptions

<table>
<tr><th>Category</th><th>Assumptions</th></tr>
<tr><td>Discount rates</td><td>Project’s discount rates are in real terms and based on the assumptions stated in the EC Guide to Cost-Benefit Analysis of Investment Projects[129]:
- Financial discount rate – 4%
- Socio-economic discount rate - 5%</td></tr>
<tr><td>Project construction period and life cycle</td><td>- Based on grant agreement, opening of the construction period is January 2019
- Planned completion of Tallinn-Riga-Kaunas-PL/LT border connection with a connection between Kaunas and Vilnius is December 2025
- Planned completion of Warsaw connection (not part of the Rail Baltica Global Project) is December 2030
According to EC guide to Cost-Benefit Analysis of Investment Projects[130], railway infrastructure project life cycle is 30 years after the construction. Project reference period is 41 years, including 11 years investment period (from 2015 to 2025).</td></tr>
<tr><td>Rail Baltica distance assumptions</td><td>The following table indicates the assumed distances for Rail Baltica sections[131]:
<table>
<tr><th>PAX section</th><th>Rail Baltica, km</th><th>Road, km</th></tr>
<tr><td>Tallinn-Parnu</td><td>136.98</td><td>128.00</td></tr>
<tr><td>Parnu - Riga</td><td>227.50</td><td>181.00</td></tr>
<tr><td>Riga-RIX</td><td>13.30</td><td>10.60</td></tr>
<tr><td>RIX-Panevezys</td><td>148.57</td><td>150.40</td></tr>
<tr><td>Panevezys - Kaunas</td><td>113.05</td><td>109.00</td></tr>
<tr><td>Kaunas - Vilnius</td><td>101.90</td><td>104.00</td></tr>
<tr><td>Kaunas - PL/LT border</td><td>88.50</td><td>121.00</td></tr>
<tr><th>Freight section</th><th>Rail Baltica, km</th><th>Road, km</th></tr>
<tr><td>Tallinn-Parnu</td><td>143.00</td><td>128.00</td></tr>
<tr><td>Parnu-Salaspils</td><td>213.07</td><td>190.00</td></tr>
<tr><td>Salaspils - Panevezys</td><td>131.12</td><td>144.00</td></tr>
<tr><td>Panevezys - Kaunas</td><td>103.43</td><td>109.00</td></tr>
<tr><td>Kaunas - Vilnius</td><td>101.90</td><td>104.00</td></tr>
<tr><td>Kaunas - PL/LT border</td><td>95.00</td><td>121.00</td></tr>
<tr><th>Total railway length per country</th><th>Rail Baltica, km</th><th></th></tr>
<tr><td>Estonia</td><td>213.25</td><td></td></tr>
<tr><td>Latvia</td><td>262.42</td><td></td></tr>
<tr><td>Lithuania</td><td>394.29</td><td></td></tr>
<tr><td>Total</td><td>870</td><td></td></tr>
</table></td></tr>
<tr><td>Transport capacities</td><td>For calculation purposes, transport capacity assumptions are the following:
<table>
<tr><th colspan="2">Passenger transport capacity assumptions</th></tr>
<tr><td>Maximum capacity per passenger train</td><td>402 persons[132]</td></tr>
<tr><td>Maximum capacity per passenger shuttle train</td><td>228 persons[133]</td></tr>
<tr><td>Average capacity utilized per car</td><td>1.45 persons[134]</td></tr>
<tr><td>Average capacity utilized per bus</td><td>29 persons[135]</td></tr>
<tr><td>Average capacity utilized per plane (on Region’s routes)</td><td>41 persons[136]</td></tr>
<tr><th colspan="2">Freight transport capacity assumptions</th></tr>
<tr><td>Heavy Truck average capacity utilized, net</td><td>13.7 tonnes[137]</td></tr>
<tr><td>Maximum freight train capacity, net</td><td>1 098 tonnes[138]</td></tr>
</table></td></tr>
</table>

[129] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf
[130] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf
[131] Based on the technical information provided by each country representative and Google maps
[132] https://eicpremium.intercity.pl/en/kompendium-eic-premium
[133] http://www.jarnvag.net/vagnguide/X3
[134] http://www.eea.europa.eu/data-and-maps/indicators/occupancy-rates-of-passenger-vehicles/occupancy-rates-of-passenger-vehicles
[135] https://luxexpress.eu/sites/default/files/quarter4_2016.pdf
[136] Based on air travel statistics and number of flights per year for intra-Baltic
[137] http://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Average_vehicle_loads_for_total_transport,_2011-2015_(tonnes).png&oldid=312049
[138] EY benchmarking study of existing freight carriers in Finland, Netherlands, Czech Republic, Germany and Poland

<table>
<tr><th>Category</th><th>Assumptions</th></tr>
<tr><td>Traffic intensity and flow potential</td><td>
Traffic intensity is calculated based on the capacity indicators and respective forecasted freight and passenger flows.
It is assumed that Rail Baltica will require 6 years to reach full forecasted passenger flow potential and 8 years to reach the full freight flow potential. Current up-take assumptions are based on Eurostar historical ramp-up rates, however for freight a delay of 2 years is assumed, in comparison to passenger flows.[139]
<table>
<tr><th>Flow type</th><th>Year 1</th><th>Year 2</th><th>Year 3</th><th>Year 4</th><th>Year 5</th><th>Year 6</th><th>Year 7</th><th>Year 8</th></tr>
<tr><td>Passengers</td><td>41%</td><td>69%</td><td>85%</td><td>89%</td><td>93%</td><td>100%</td><td>100%</td><td>100%</td></tr>
<tr><td>Freight</td><td>14%</td><td>27%</td><td>41%</td><td>69%</td><td>85%</td><td>89%</td><td>93%</td><td>100%</td></tr>
</table>
</td></tr>
</table>

9.1.2 Financial and socio-economic analysis assumptions

<table>
<tr><th>Category</th><th>Assumptions</th></tr>
<tr><td>Infrastructure charging principles</td><td>
As a base approach, in accordance with the EU Directive 2012/34/EU Article 32 Point 1, “In order to obtain full recovery of the costs incurred by the infrastructure manager a Member State may, if the market can bear this, levy mark-ups on the basis of efficient, transparent and non-discriminatory principles, while guaranteeing optimal competitiveness of rail market segments.”, infrastructure charge is calculated based on “what market can pay” principle, which defines infrastructure charge as a residual expense after the carrier has covered its operating costs and ensured sufficient revenue.
Based on ~ 700 comparable European freight and passenger carriers, the following EBIT margins are applied for return on capital calculation purpose[140]:

Freight carrier – 8.09%
Passenger carriers – 11.54%

In cases, when carrier’s revenue does not exceed the operating costs, it is assumed that the carrier covers only direct expenses caused to infrastructure manager, which are assumed at 30% level from total maintenance expenses. [141]
For comparative purposes, CBA indicators using existing infrastructure charging principles are presented in the sensitivity analysis section.
It is assumed that the maximum infrastructure charge payable is the sum of all maintenance and other costs of infrastructure manager, as well as a return of 4.31%[142] on proportion stations and facilities financed by the states.
</td></tr>
<tr><td>Passenger and freight carrier OPEX</td><td>
Calculation of carrier operating expenses calculation is based on average costs of the comparable EU passenger and freight carriers based on the EY benchmarking study on railway undertakings in Western and Central Europe since 2009. The benchmarks have been validated with the industry and applied in the other EU co-financed studies.
Table 47 Freight carrier OPEX assumptions
<table>
<tr><th>Position</th><th>Amount, EUR</th><th>Measure</th></tr>
<tr><td>Distance related cost component</td><td>6.73</td><td>EUR/km</td></tr>
<tr><td>Time related cost component</td><td>578.65</td><td>EUR/h</td></tr>
</table>
Table 48 PAX carrier OPEX assumptions
<table>
<tr><th>Position</th><th>Amount, EUR</th><th>Measure</th></tr>
<tr><td>Fixed cost component</td><td>192.40</td><td>EUR/trip</td></tr>
<tr><td>Distance related cost component</td><td>7.12</td><td>EUR/km</td></tr>
<tr><td>Time related cost component</td><td>1 179.73</td><td>EUR/h</td></tr>
</table>
</td></tr>
</table>

[139] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/370122/Review_of_HS1_demand_forecasts.pdf
[140] Based on the extraction from S&P Capital IQ database
[141]Cost Allocation of TRansport INfrastructure cost (CATRIN) Deliverable D1 (Cost Allocation practices in the European Transport Sector) January 2008 indicate that 21% to 30% of infrastructure costs are variable.
[142] WACC for European railway industry, based on A. Damodaran’s estimations

Category	Assumptions
Infrastructure manager maintenance expenses	Infrastructure manager maintenance expenses are assumed (adopted from Atkins "Rail Baltica Cost Estimation, Renewal & Maintenance and Benchmarking" study (2017)) to be the following: Position / Amount, EUR / Activity: Track: 18 747 EUR/km Interlocking & remote control: 3 774 EUR/km Traction: 15 538 EUR/km Power current Tele & IT, Buildings, etc.: 6 038 EUR/km Bridges/tunnels: 14 206 EUR/km Terminals: 2 442 EUR/km Depots, yard and service centre: 3 774 EUR/km Stations: 4 883 EUR/km Total: 69 402 EUR/km Infrastructure manager's maintenance expenses have been adjusted to the local price levels. It is assumed that infrastructure maintenance expenses will grow together with the increase of train traffic in line with the potential uptake of freight and passenger flows, as well as the labor part of the expenses has been adjusted per annum by the average pan-Baltic real growth rate of salary[143]
Other infrastructure manager operating expenses	Other infrastructure manager operating expenses are assumed to be at 20% of total maintenance costs.[144]
Investment expenses	Total investment expenses in each country are currently assumed to be the following: Country / Amount, EUR / Source: Estonia: 1 380 245 064 – National submissions adjusted by RBR Latvia: 1 968 411 610 – National submissions adjusted by RBR Lithuania: 2 425 818 888 – National submissions adjusted by RBR More detailed CAPEX breakdown can be seen in the financial analysis investment expenses section. RBR has based the estimates on previous studies (e.g. those establishing railway alignment, EIA, preliminary designs, etc.) and performed the following CAPEX expense adjustments: ► Reviewed and updated electrification, signalling and contingency costs ► Electrification cost are 400 000 EUR per km and are based on Latvian CAPEX calculation, Atkins proposal and actual cost for electrification in Denmark. In addition to that, substation are added to the total electrification cost. ► Interlocking cost are 250 000 EUR per point and based on latest similar costs per point in Latvian and Estonian projects. ► ERTMS cost are 150 000 EUR per km and based on ERTMS L2 average cost (without track circuit) proposed by study done by European Commission. ► Contingency cost are taken everywhere 5%. ► Reduction of some viaducts construction cost in the Kaunas- PL/LT border section based on similar structure costs in Latvian preliminary design.
Depreciation, renovation and residual value of infrastructure	Depreciation Infrastructure assets are split into three main categories and have the following depreciation assumptions: · Land – no depreciation · Renewable infrastructure – 25 years · Non-renewable infrastructure - 50 years Renovation

[143] Forecasted real salary growth taken from Oxford Economics
[144] EY benchmarking against other existing EU railway infrastructure managers (CZ, DE, EE, LV, LT, NL, PL, BE, FI)

<table>
<tr><th>Category</th><th>Assumptions</th></tr>
<tr><td></td><td>Renovation expenses are related to the investments required to renew existing infrastructure.
Annual renovation expenses for renewable infrastructure is assumed (adopted from Atkins “Rail Baltica Cost Estimation, Renewal & Maintenance and Benchmarking” study (2017)) at 700 000 EUR/km, and occurs once every 25 years.

For calculation purposes renovation expenses are equally distributed on an annual basis between years 2048 and 2052.

Residual value
Based on EC Guide to Cost-Benefit Analysis of Investment Projects[145], residual value for railway infrastructure project has been calculated as residual asset balance sheet value at the end of the project’s life cycle.</td></tr>
<tr><td>VAT</td><td>Expenses are assumed to be net of VAT.</td></tr>
<tr><td>Eligibility rate</td><td>It is assumed that all investment costs are eligible for the EU co-funding.</td></tr>
<tr><td>Passenger carrier base tariff</td><td>For calculation purposes, in order to reflect the need for competitiveness during initial years, it is assumed that passenger carrier base tariff initially is 0.06EUR/km, which gradually increases up to 0.1044 EUR/km, proportionally to the passenger flow uptake assumptions The higher value is based on the benchmarking of the pricing of existing passenger carriers in the EU. The average benchmarked tariff has been adjusted to the local price levels based on GDP PPP.</td></tr>
<tr><td>Freight carrier base tariff</td><td>For calculation purposes, it is assumed that freight carrier base tariff per ton-km is 0.0401 EUR/tkm. The value is obtained based on the comparison of current road freight transportation tariffs, assuming 13.7t[146] average capacity per heavy truck and 0.8 EUR/km[147] tariff. The ton-km tariff is further reduced by the cost of two modal shifts, each of which are assumed to be 125 EUR per TEU[148].</td></tr>
<tr><td>Other transport mode tariffs</td><td>Personal car: 0.28 EUR/km[149] (adjusted for the excise tax losses)
Bus: Based on the public information from international bus operators for each section
Air: 0.309 EUR/km[150] (Based on the average cost of travel between Region’s airports)
Heavy truck: 0.0584 EUR/tkm[151]

For the purposes of cost of transport saving expense/benefit calculations, the rule of half has been applied, as suggested by the CBA methodology.[152]</td></tr>
<tr><td>Air pollution assumptions</td><td>The following assumptions (in 2015 prices) have been used:[153]
<table>
<tr><th></th><th colspan="7">EUR/vkm</th><th>EUR per LTO*</th></tr>
<tr><th></th><th>Intercity bus</th><th>City bus</th><th>Car</th><th>Heavy truck</th><th>Diesel freight train</th><th>Freight /PAX train</th><th>Air</th><th>Air</th></tr>
<tr><td>Within city</td><td>0.20</td><td>0.18</td><td>0.02</td><td>0.22</td><td>3.77</td><td>0</td><td rowspan="2">0.17</td><td rowspan="2">87.86</td></tr>
<tr><td>Outside city</td><td>0.09</td><td>0.08</td><td>0.01</td><td>0.10</td><td>1.50</td><td>0</td></tr>
</table>
*Landing and take-off
It is assumed that these costs would grow together with the forecasted real growth of average pan-Baltic GDP per capita. Based on the CBA methodology[154], a coefficient of 0.7 is applied to these growth rates.</td></tr>
</table>

[145] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf
[146] http://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Average_vehicle_loads_for_total_transport,_2011-2015_(tonnes).png&oldid=312049
[147] Value obtained is the average value mentioned in interviews by current logistics market players
[148] Based on interviews with the industry
[149] Based on national statistics and taking into account fuel costs and wear and tear of vehicles
[150] Based on the average cost of travel between Region’s airports (intra Baltic and Baltic connections to Warsaw)
[151] Information gathered from multiple logistics companies
[152] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf
[153] http://ec.europa.eu/transport/sites/transport/files/themes/sustainable/studies/doc/2014-handbook-external-costs-transport.pdf
[154] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf

<table>
<tr><th>Category</th><th>Assumptions</th></tr>
<tr><td>Climate change assumptions</td><td>The following assumptions (in 2015 prices) have been used:[155]
<table>
<tr><td>EUR/vkm</td><td>EUR/flight</td><td>EUR/vkm</td><td>EUR/vkm</td><td>EUR/vkm</td><td>EUR/vkm</td></tr>
<tr><td>Air</td><td>Air</td><td>Bus</td><td>Car</td><td>Heavy truck</td><td>Railway (PAX/Freight)</td></tr>
<tr><td>0.83</td><td>578.87</td><td>0.07</td><td>0.02</td><td>0.08</td><td>0.16</td></tr>
</table>
It is assumed that these costs grow together with the forecasted real growth of average pan-Baltic GDP per capita. Based on the CBA Guide[156], a coefficient of 0.7 is applied to these growth rates.</td></tr>
<tr><td>Noise assumptions</td><td>The following assumptions (in 2015 prices) have been used:[157]
<table>
<tr><td></td><td colspan="5">EUR/km</td><td>EUR per LTO</td></tr>
<tr><td></td><td>Bus</td><td>Car</td><td>Heavy truck</td><td>PAX train</td><td>Freight train</td><td>Air</td></tr>
<tr><td>Within city</td><td>0.125</td><td>0.025</td><td>0.229</td><td>0.320</td><td>0.568</td><td rowspan="2">31.12</td></tr>
<tr><td>Outside city</td><td>0.001</td><td>0.001</td><td>0.002</td><td>0.018</td><td>0.035</td></tr>
</table>
It is assumed that these costs grow together with the forecasted real growth of average pan-Baltic GDP per capita. Based on the CBA methodology[158], a coefficient of 0.7 is applied to these growth rates.</td></tr>
<tr><td>Existing transport mode financial indicators</td><td>For the purpose of estimating existing transport operator operating revenue losses caused by the diverted traffic from existing modes, as well as the excise tax losses from reduced fuel consumption, the following assumptions have been used:
Heavy truck EBIT margin: 6%[159]
Bus service EBIT margin: 5%[160]
Heavy truck fuel % of OPEX: 25%[161]
Bus fuel % of OPEX: 22%[162]

To provide comprehensive and balanced picture of the impact of the project on the profitability of the industry, passenger and rail carrier net operating profits have been added to the socio-economic benefits.</td></tr>
<tr><td>Average cost of time[163]</td><td>Passengers:
0.426 EUR/min for business travellers
0.195 EUR/min for personal purpose travellers
Freight:
0.195 EUR/min for freight (assuming that cost of business operations would be equal to the average cost of time for professional workers)

EY Mobility survey (2016) indicated that 27% of total Baltic travellers to/from the Rail Baltica catchment areas travel for business purposes, and 73% are private travellers.

For the purpose of time saving expense/benefit calculations, the rule of half has been applied, as suggested by the CBA methodology.[164]</td></tr>
<tr><td>Excise tax</td><td>Average assumed pan-Baltic excise tax is 44.8%[165]</td></tr>
<tr><td>Fiscal correction assumptions</td><td>In order to perform fiscal correction of CAPEX and maintenance costs, the following assumptions used:

Proportion of labour cost from total CAPEX (adopted from Atkins “Rail Baltica Cost Estimation, Renewal & Maintenance and Benchmarking” study (2017)) is assumed to be 50%

Proportion of the labour cost from infrastructure maintenance costs (adopted from Atkins “Rail Baltica Cost Estimation, Renewal & Maintenance and Benchmarking” study (2017)) is assumed to be 50%</td></tr>
</table>

[155] http://ec.europa.eu/transport/sites/transport/files/themes/sustainable/studies/doc/2014-handbook-external-costs-transport.pdf
[156] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf
[157] http://ec.europa.eu/transport/sites/transport/files/themes/sustainable/studies/doc/2014-handbook-external-costs-transport.pdf
[158] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf
[159] EY calculations based on public financial statements of heavy truck operating companies
[160] EY calculations based on public financial statements of bus service companies
[161] http://www.fta.co.uk/policy_and_compliance/fuel_prices_and_economy/fuel_prices/fuel_fractions.html
[162] EY calculations based on public financial statements of bus service companies
[163] Public wage rate statistics (average pan-Baltic)
[164] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf
[165] http://ec.europa.eu/eurostat/statistics-explained/images/8/80/Consumer_prices_of_petroleum_products%2C_end_of_second_half_2015_%28EUR_per_litre%29_YB16.png

<table>
<tr><th>Category</th><th>Assumptions</th></tr>
<tr><td></td><td>Average pan-Baltic personal income tax applicable is assumed to be 19.33%[166]

For all other items it is assumed that market values represent the economic values, therefore no fiscal corrections are made.</td></tr>
<tr><td>Travelling safety</td><td>Accidents per billion-km:[167]
Train – 0.156
Car – 11.04
Air – 0.101
Bus – 0.433

Average cost of one life (2015 prices) – 1 351 947 EUR[168]

It is assumed that these costs grow together with the forecasted real growth of average pan-Baltic GDP per capita. Based on the CBA methodology[169], a coefficient of 0.7 is applied to these growth rates.</td></tr>
<tr><td>Effective speed</td><td>The following assumptions have been used:

<table>
<tr><th>Transport mode</th><th>Average effective speed on sections (km/h)</th></tr>
<tr><td>Bus</td><td>59.9[170]</td></tr>
<tr><td>Air</td><td>350.8[171]</td></tr>
<tr><td>Car</td><td>74.7[172]</td></tr>
<tr><td>Heavy truck</td><td>60.7[173]</td></tr>
<tr><td>PAX train</td><td>172.6[174]</td></tr>
<tr><td>Freight train</td><td>104.5[175]</td></tr>
</table></td></tr>
<tr><td>Number of workers per km during the construction period (not part of core CBA result)</td><td>The following assumptions have been used:
15 workers per km[176]</td></tr>
<tr><td>GDP multiplier (not part of core CBA result)</td><td>The following assumptions have been used:[177]
GDP indirect and induced multiplier – 0.59
GDP induced multiplier – 0.72</td></tr>
<tr><td>Employment multiplier (not part of core CBA result)</td><td>The following assumptions have been used:[178]
Indirect multiplier – 2.39
Induced multiplier – 2.90</td></tr>
</table>

9.2 Financial analysis

9.2.1 Investment expenses

Rail Baltica investment expenses have been consolidated and adjusted by AS RBR, based on the CAPEX data estimates collected from national stakeholders. Investment cost items correspond to the project option analysis section and the Global project definition (see Table 49). Benchmarked CAPEX expenses are available in the Appendix Excerpts from Atkins assessment of potential CAPEX and OPEX level. Please note that some of the numbers might not add up due to rounding.

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[166] http://europa.eu/youreurope/citizens/work/taxes/income-taxes-abroad
[167] https://ec.europa.eu/transport/facts-fundings/statistics/pocketbook-2016_en
[168] http://ec.europa.eu/transport/sites/transport/files/themes/sustainable/studies/doc/2014-handbook-external-costs-transport.pdf
[169] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf
[170] Based on the publicly available information from international bus operators
[171] Based on the average time of travel between Region's airports (intra Baltic and Baltic connections to Warsaw), including 1 hour pre-departure arrival (RIX statistics of pre-departure time)
[172] Based on public information from global map and traffic estimates, does not include intermediate stops on the route (rest time)
[173] Based on public information from global map and traffic estimates, does not include intermediate stops on the route (rest time and similar). The effective speed will be lower
[174] Based on information provided by RBR, average speed in sections including 3 to 5 min stops in the stations
[175] Based on information provided by RBR, average speed on the section, without stopping time on passing loops, etc.). The effective speed point-to-point will be lower and will depend on the service provided by the freight carrier
[176] Based on estimates received from technical experts from Latvia Rail Baltica National Study
[177] Leontief's multiplier
[178] Leontief's multiplier

Table 49 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 cost	1 345.9	1 968.4	1 734.2	739.6	5 788.1

* Part of other expense elements

Investment costs have been summarised per country and distributed over the time period from 2015 to 2025, based on a preliminary project schedule inputs provided by RBR (see Table 50).

Table 50 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

The do-nothing scenario expenses have been gathered from each country, and used in the financial and economic analyses of the Rail Baltica project (see Table 51).

Table 51 Do-nothing CAPEX and OPEX savings

Item	Value	Measure	Period
LV 1520 airport connection CAPEX	133	M EUR total	2021 - 2023
LV 1520 airport connection OPEX	0.7	M EUR/annum	2024 - 2055
EE OPEX savings	1.5	M EUR/annum	2026 - 2055

9.2.2 Passenger carrier financial analysis

In order to calculate the forecasted infrastructure charge revenues, financial analysis of passenger and freight carriers has been performed. Carrier financial analysis included calculation of forecasted carrier revenues, as well as calculation of various carrier operational expenses. Expense assumptions are based on the benchmark data collected from the existing EU carriers and adjusted to the local price levels (see Figure 81).

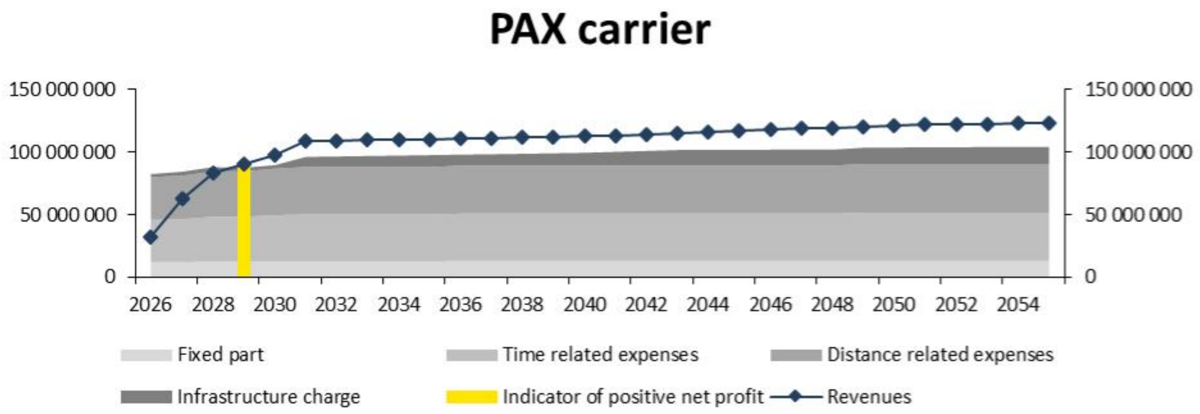

Figure 81 Passenger carrier financial performance (EUR)

An overview of the passenger carrier operational performance indicates that the carrier will be able to achieve a positive net profit starting from 2030, and will continue to be financially profitable thereafter . A detailed breakdown of the passenger carrier financial statement is presented in Table 52.

Table 52 Passenger carrier financial statement and performance metrics

M EUR	2030	2035	2040	2045	2050	2055
Revenues	97.8	110.5	112.5	116.9	121.4	123.1
Million PAX-km	965	1 057	1 077	1 119	1 162	1 178
Infrastructure access charge	2.9	9.5	10.2	12.5	13.1	13.6
Other OPEX	86.9	88.2	89.4	89.4	90.6	90.6
Operating profit	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 as % of total expenses	3.18%	9.76%	10.24%	12.29%	12.67%	13.02%
Infrastructure charge per train-km	0.55	1.80	1.89	2.33	2.41	2.48
Average train-km travelled per km of infrastructure	6 297	6 396	6 486	6 486	6 585	6 585

Additional passenger carrier performance metrics per pax-km are presented in the Table 53. It is forecasted that by 2030, passenger carrier will achieve around 950 million pax-km per annum, while by 2040 more than 1 billion pax-km will be achieved. On average, passenger carrier will earn around 0.103 EUR per pax-km, while average operating cost is forecasted to be around 0.087 EUR per pax-km (see Table 53).

Table 53 Passenger carrier performance metrics per pax-km

	2030	2035	2040	2045	2050	2055	Project life–cycle average
Thousand pax-km	965 086	1 057 462	1 077 389	1 118 809	1 162 135	1 178 231	
Revenue / pax-km	0.101	0.104	0.104	0.104	0.104	0.104	0.103
OPEX / pax-km	0.090	0.083	0.083	0.080	0.078	0.077	0.087

Figure 82 shows the comparison of the maximum and the actual infrastructure charge payable by the passenger carrier, as well as indicates how it affects the operating profitability of the passenger carrier.

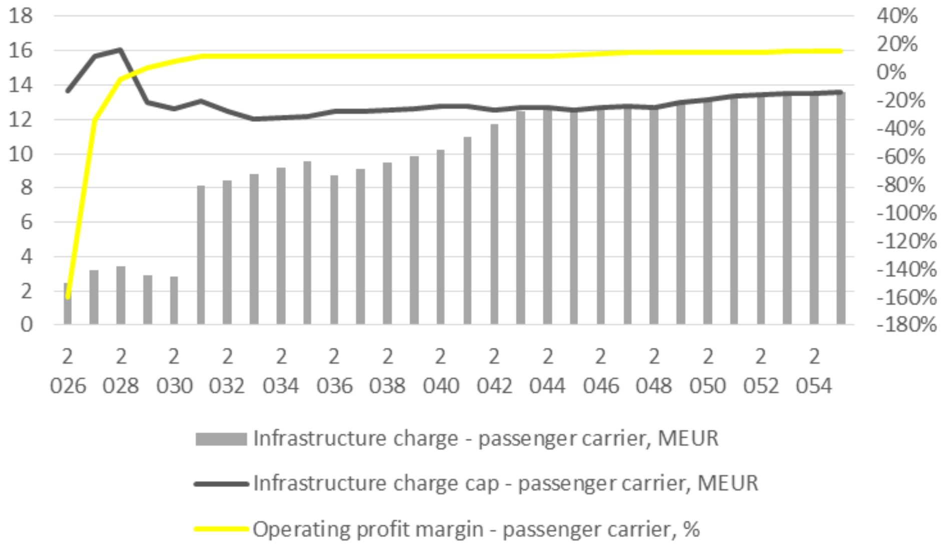

Figure 82 Infrastructure cap impact on passenger carrier profitability

9.2.3 Freight carrier financial analysis

Freight carrier financial analysis has been performed, in order to calculate the potential infrastructure access charge revenues for the infrastructure manager (see Figure 83).

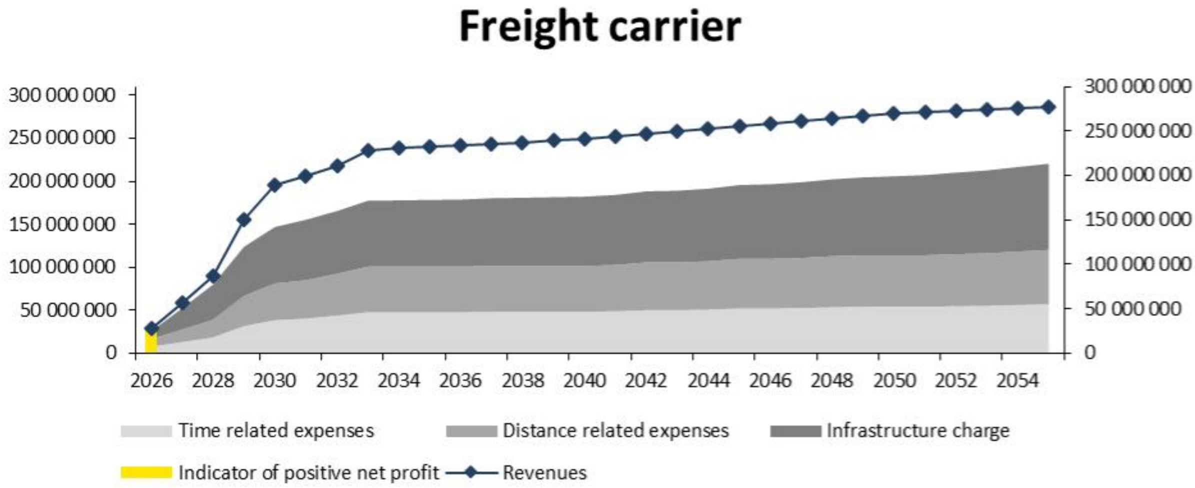

Figure 83 Freight carrier financial performance (EUR)

Freight carrier operational performance overview indicates that the carrier will be able to achieve a positive net profit starting from 2026 (see Figure 83), and will continue to be financially profitable thereafter. A detailed freight carrier financial statement breakdown is presented in Table 54.

Table 54 Freight carrier financial statement

M EUR	2030	2035	2040	2045	2050	2055
Revenues	189.1	232.1	240.9	255.0	270.0	277.3
Million Ton-km	4 710	5 781	6 001	6 351	6 725	6 908
Infrastructure access charge	65.7	77.6	80.6	85.7	91.8	100.1
Other OPEX	81.2	100.7	101.7	109.9	114.0	120.3
Operating profit	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 as % of total expenses	44.72%	43.52%	44.22%	43.80%	44.61%	45.43%
Infrastructure charge per train-km	10.39	9.89	10.18	10.00	10.34	10.68
Annual train-km travelled per km of infrastructure	8 027	9 968	10 056	10 874	11 274	11 910

Freight carrier performance metrics are presented in Table 55. It is forecasted that by 2030 freight carrier will achieve the level of around 5 billion ton-km per annum, reaching around 7 billion ton-km by 2050. On average, freight carrier will earn around 0.04 EUR per ton-km, while average operating cost is forecasted to be around 0.017 EUR per ton-km.

Table 55 Freight carrier performance metrics

	2030	2035	2040	2045	2050	2055	Project life-cycle average
Thousand ton-km	4 709 667	5 780 825	6 001 371	6 351 391	6 725 215	6 908 156	
Revenue / ton-km	0.040	0.040	0.040	0.040	0.040	0.040	0.040
OPEX / ton-km	0.017	0.017	0.017	0.017	0.017	0.017	0.017

Figure 84 shows the comparison of the maximum and actual infrastructure access charge payable by the freight carrier, as well as indicates how it affects the operating profitability of the freight carrier.

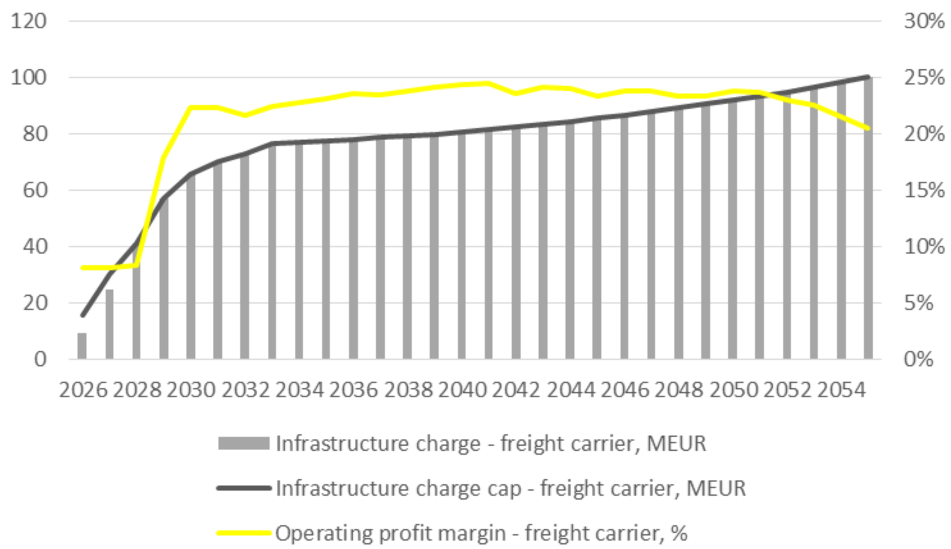

Figure 84 Infrastructure cap impact on freight carrier profitability

9.2.4 Infrastructure manager financial analysis

Infrastructure manager's financial analysis has been performed based on the infrastructure access charge revenues calculated from passenger and freight carriers, and projected operating expenses (see Figure 85).

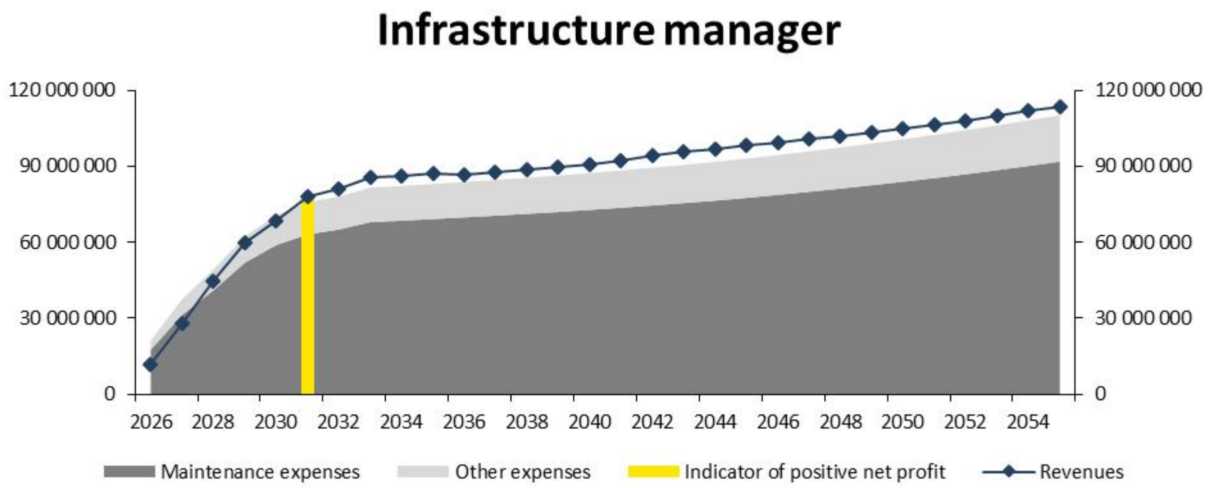

Figure 85 Infrastructure manager financial performance (EUR)

It is forecasted that infrastructure manager will achieve operating profitability in 2028, and will remain profitable thereafter. The Table 56 presents a detailed forecasted financial statement of the infrastructure manager. Benchmarked maintenance expenses are available in the Appendix Excerpts from Atkins assessment of potential CAPEX and OPEX level.

Table 56 Infrastructure manager financial statement

M EUR	2030	2035	2040	2045	2050	2055
Revenues	68.5	87.2	90.8	98.2	105.0	113.7
Revenue from PAX carriers	2.9	9.5	10.2	12.5	13.1	13.6
Revenue from Freight carriers	65.7	77.6	80.6	85.7	91.8	100.1
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
Operating profit	-2.2	4.1	3.4	5.1	4.2	3.4

The results indicate that in 2031 infrastructure manager will operate with positive operating profit, while in 2040 negative profitability will be achieved, due to increased maintenance and other costs. The Figure 86 presents benchmarked total infrastructure manager's costs per km in various countries. Wage, material and other expenses correspond to the cost items presented in the Table 56, while depreciation expense is the part of the depreciation, which is not co-financed by the EU. Since base assumption does not involve any leverage, thus current financing component for Rail Baltica is zero.

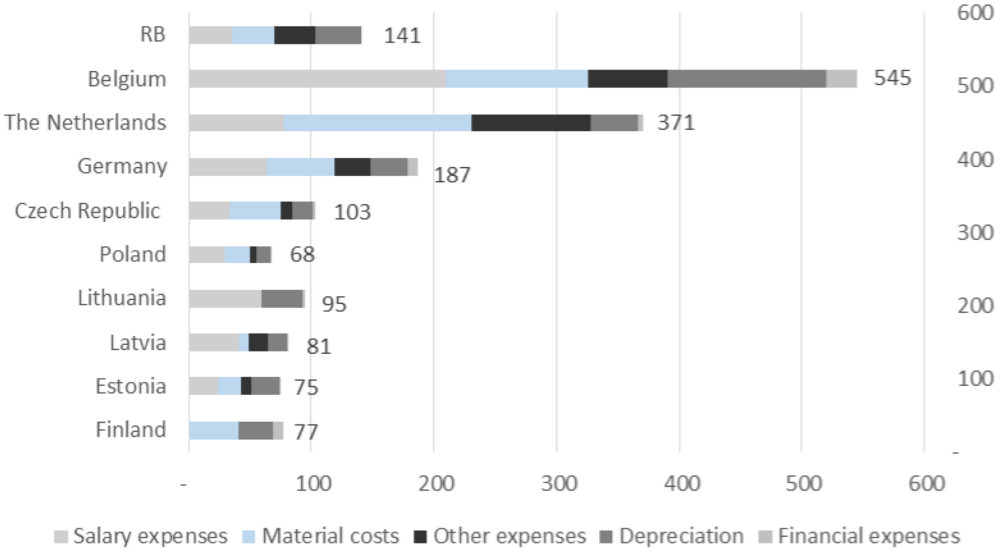

Figure 86 Infrastructure manager cost benchmarking (absolute values, EUR/km)[179]

9.2.5 Financial analysis results

The Table 57 shows the financial analysis of the Rail Baltica project. The do-nothing scenario expenses are indicated with a negative sign, since they have to be deducted from the investment amount.

Table 57 Rail Baltica financial analysis

Revenues	2 613	M EUR	Undiscounted
Revenue from infrastructure charges	2 613	M EUR	Undiscounted
Expenses	8 740	M EUR	Undiscounted
Total CAPEX	5 788	M EUR	Undiscounted
Do-nothing CAPEX savings	-133	M EUR	Undiscounted
Do-nothing OPEX savings	-67	M EUR	Undiscounted
Maintenance expenses	2 119	M EUR	Undiscounted
Other expenses	424	M EUR	Undiscounted
Investments in renewable infrastructure	609	M EUR	Undiscounted
Residual value of infrastructure	1 275	M EUR	Undiscounted
Net present value (NPV)	-3 957	M EUR	Discounted
Total revenues	898	M EUR	Discounted
Residual value of infrastructure	255	M EUR	Discounted
Total expenses	-5 111	M EUR	Discounted

Financial rate of return (FRR/C)	-5.48%	%
Financial net present value (FNPV/C)	-3 957	M EUR

Financial analysis shows that undiscounted revenues from the project are almost four times smaller than undiscounted expenses. As a result, the project is forecasted to have negative 5.48% financial rate of return, and negative financial net present value.

[179] EY benchmarking against other existing EU railway infrastructure managers (CZ, DE, EE, LV, LT, NL, PL, BE, FI)

Table 58 shows the calculated financial gap.

Table 58 Rail Baltica funding gap calculation

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%

Based on the inputs from the financial analysis, the funding gap rate has been calculated. In the Base case scenario, the financial gap rate is forecasted to be 94.18%. Financial analysis results for each macroeconomic scenario under analysis are presented in the Table 59.

Table 59 Financial analysis results for each macroeconomic scenario

	Base case	Low case[180]	High case
FRR/c	-5.48%	-5.93%	-5.43%
FNPV/c, M EUR	-3 957	-4 032	-3 929
Financial gap	94.18%	95.95%	93.52%
FIRR/k (return on national capital)	1.07%	0.79%	1.16%

The results indicate that the financial gap rate among scenarios varies between 93.52% and 95.95%.

[180] Low case scenario assumes that lower forecasted demand occurs due to a higher freight tariff, which for this scenario increases by 20%

9.2.6 Financing plan

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. Therefore, various EU co-financing rate scenarios for the period after 2020 have been analysed (see Table 60). Moreover, some alternative scenarios include an assumption that the proportion of CAPEX, which does not have a funding gap, will be covered by some other financing facility. For lower co-financing rates than 85%, financing the investment by high leverage rates amounts is not feasible, since these loans will need to be serviced with the help of State subsidies afterwards. Bridge financing facility is not estimated here as this element would be within the scope of subsequent Rail Baltica global project studies, such as the long-term project business plan.

Table 60 Investment expense per country breakdown for two EU financing periods (M EUR)

	Total	2015 - 2020	2021 - 2025
Total EE CAPEX	1 346	239	1 106
Total LV CAPEX	1 968	491	1 477
Total LT CAPEX	2 474	406	2 068

Table 61 presents Base case scenario results, which assumes that 85% co-financing rate will remain after 2020. Scenarios with lower co-financing rates after 2020 as well as scenarios with partial other funding source usage are presented in the tables below (see Table 61 to Table 72).

Table 61 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

Table 62 Financing plan, assuming 80% 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	273	834	0	321	1 025	0
Latvia	98	393	0	364	1 113	0	462	1 506	0
Lithuania	81	325	0	510	1 558	0	591	1 883	0
Total	227	909	0	1 147	3 505	0	1 374	4 414	0

Table 63 Financing plan, assuming 60% 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	481	625	0	529	817	0
Latvia	98	393	0	643	835	0	741	1 228	0
Lithuania	81	325	0	899	1 169	0	980	1 493	0
Total	227	909	0	2 023	2 629	0	2 250	3 538	0

Table 64 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

Table 65 Financing plan, assuming 20% 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	898	208	0	946	400	0
Latvia	98	393	0	1 199	278	0	1 297	671	0
Lithuania	81	325	0	1 679	390	0	1 759	714	0
Total	227	909	0	3 776	876	0	4 002	1 786	0

Table 66 Financing plan, assuming 0% 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	1 106	0	0	1 154	192	0
Latvia	98	393	0	1 477	0	0	1 575	393	0
Lithuania	81	325	0	2 068	0	0	2 149	325	0
Total	227	909	0	4 652	0	0	4 879	909	0

Table 67 Financing plan, assuming 85% EU co-financing after 2020 (the amount of other financing limited to the uncovered CAPEX by the funding gap, 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	142	886	78	190	1 077	78
Latvia	98	393	0	180	1 183	115	278	1 576	115
Lithuania	81	325	0	269	1 656	144	349	1 980	144
Total	227	909	0	591	3 724	337	818	4 634	337

Table 68 Financing plan, assuming 80% EU co-financing after 2020 (the amount of other financing limited to the uncovered CAPEX by the funding gap, 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	194	834	78	242	1 025	78
Latvia	98	393	0	250	1 113	115	348	1 506	115
Lithuania	81	325	0	366	1 558	144	447	1 883	144
Total	227	909	0	810	3 505	337	1 037	4 414	337

Table 69 Financing plan, assuming 60% EU co-financing after 2020 (the amount of other financing limited to the uncovered CAPEX by the funding gap, 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	403	625	78	451	817	78
Latvia	98	393	0	528	835	115	626	1 228	115
Lithuania	81	325	0	755	1 169	144	836	1 493	144
Total	227	909	0	1 686	2 629	337	1 913	3 538	337

Table 70 Financing plan, assuming 40% EU co-financing after 2020 (the amount of other financing limited to the uncovered CAPEX by the funding gap, 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	611	417	78	659	608	78
Latvia	98	393	0	806	557	115	904	950	115
Lithuania	81	325	0	1 145	779	144	1 226	1 104	144
Total	227	909	0	2 563	1 753	337	2 789	2 662	337

Table 71 Financing plan, assuming 20% EU co-financing after 2020 (the amount of other financing limited to the uncovered CAPEX by the funding gap, 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	820	208	78	867	400	78
Latvia	98	393	0	1 085	278	115	1 183	671	115
Lithuania	81	325	0	1 535	390	144	1 616	714	144
Total	227	909	0	3 439	876	337	3 666	1 786	337

Table 72 Financing plan, assuming 0% EU co-financing after 2020 (the amount of other financing limited to the uncovered CAPEX by the funding gap, 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	1 028	0	78	1 076	192	78
Latvia	98	393	0	1 363	0	115	1 461	393	115
Lithuania	81	325	0	1 924	0	144	2 005	325	144
Total	227	909	0	4 315	0	337	4 542	909	337

9.2.7 Sustainability analysis

Table 73 presents the sustainability analysis for the Rail Baltica project. The results indicate that the project in the long term is self-sustainable, however, initially it would require some level of additional financing (during 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 State support at that stage as well. It is estimated that this would amount to around 534 M EUR (see Table 73).

Table 73 Sustainability analysis (M EUR)

Year	Revenues	Costs	Renewable investments	Cash flow for the year	Opening cash balance	Closing cash balance	Closing after additional funding	Additional funding needed
2015	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
2024	0	0	0	0	0	0	0	0
2025	0	0	0	0	0	0	0	0
2026	11.6	-21.1	0	-9.6	0	-9.6	0	9.6
2027	27.8	-37.6	0	-9.8	0	-9.8	0	9.8
2028	44.6	-49.3	0	-4.7	0	-4.7	0	4.7
2029	60.0	-62.4	0	-2.3	0	-2.3	0	2.3
2030	68.5	-70.7	0	-2.2	0	-2.2	0	2.2
2031	78.3	-76.2	0	2.1	0	2.1	2.1	0
2032	81.3	-78.6	0	2.7	2.1	4.8	4.8	0
2033	85.5	-82.2	0	3.3	4.8	8.1	8.1	0
2034	86.3	-82.9	0	3.4	8.1	11.5	11.5	0
2035	87.2	-83.7	0	3.5	11.5	15.0	15.0	0
2036	86.7	-84.3	0	2.4	15.0	17.4	17.4	0
2037	87.7	-85.1	0	2.6	17.4	20.0	20.0	0

Year	Revenues	Costs	Renewable investments	Cash flow for the year	Opening cash balance	Closing cash balance	Closing after additional funding	Additional funding needed
2038	88.7	-86.0	0	2.7	20.0	22.7	22.7	0
2039	89.7	-86.9	0	2.8	22.7	25.5	25.5	0
2040	90.8	-87.9	0	2.9	25.5	28.3	28.3	0
2041	92.4	-89.0	0	3.3	28.3	31.7	31.7	0
2042	94.2	-90.2	0	4.0	31.7	35.7	35.7	0
2043	95.8	-91.4	0	4.4	35.7	40.1	40.1	0
2044	97.0	-92.6	0	4.4	40.1	44.5	44.5	0
2045	98.2	-93.9	0	4.3	44.5	48.8	48.8	0
2046	99.4	-95.3	0	4.2	48.8	53.0	53.0	0
2047	100.7	-96.7	0	4.0	53.0	57.0	57.0	0
2048	102.1	-98.2	-121.8	-117.9	57.0	-60.9	0	60.9
2049	103.5	-99.8	-121.8	-118.1	0	-118.1	0	118.1
2050	105.0	-101.4	-121.8	-118.2	0	-118.2	0	118.2
2051	106.6	-103.1	-121.8	-118.4	0	-118.4	0	118.4
2052	108.2	-104.9	-121.8	-118.5	0	-118.5	0	118.5
2053	110.0	-106.8	0	3.2	0	3.2	3.2	0
2054	111.8	-108.8	0	3.0	3.2	6.2	6.2	0
2055	113.7	-110.8	0	2.9	6.2	9.0	9.0	0

10. Socio-economic analysis

10.1 Socio-economic analysis

10.1.1 Socio-economic analysis detailed approach

Based on various transport investment impact assessment studies[181], our methodology covers the following impacts, each of which has multiple socio-economic benefits associated with it, as presented in Figure 87.

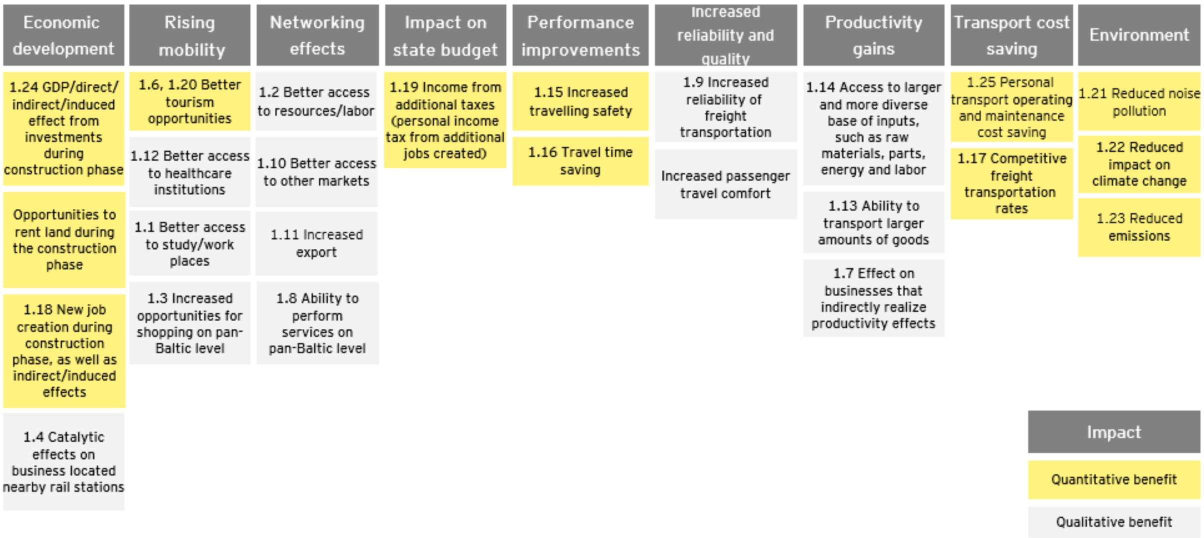

Figure 87 Socio-economic impact assessment framework

Each socio-economic impact is separately described in the sub-chapters below, and underlying benefits assessed either in a quantitative or qualitative way. A list of assumptions for each quantitative benefit covers source, methodology of calculation and monetized value used for the CBA calculation purposes.

Qualitative benefit descriptions are based on the framework proposed by Fraunhofer ISI[182], and includes real life examples as a basis for supporting the relevance of these benefits to the project, as presented Figure 88.

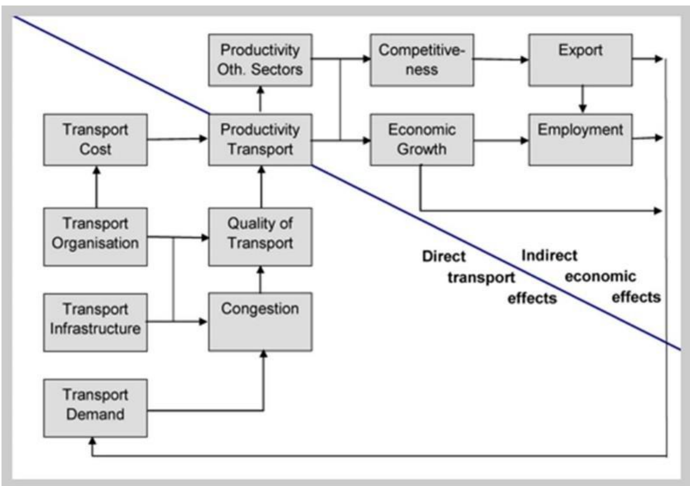

Figure 88 Linkage between direct transport effects and indirect economic effects

[181] http://www.edrgroup.com/pdf/models-to-predict-the-eco.pdf
[182] http://isi-projekt.de/wissprojekt-de/compete/

10.1.2 Qualitative socio-economic analysis

In this section, qualitative socio-economic effects are discussed within Fraunhofer framework focusing of three main aspects – increased connectivity, mobility and speed, as presented in Figure 89

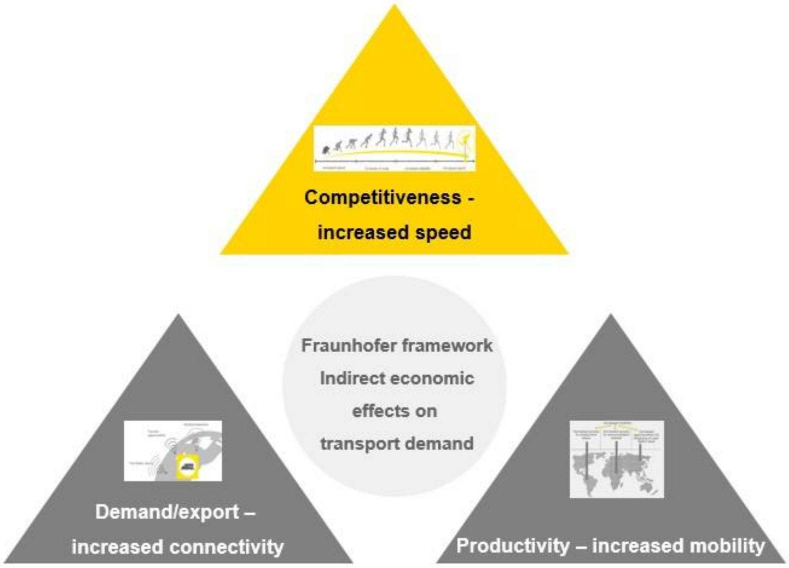

Figure 89 Grouping of qualitative socioeconomic benefits

As shown in Figure 90 productivity aspect is assigned to increased mobility which is further divided into:

- Increased access to study/work place
- Increased access to resource/labour market
- Increased opportunities for shopping on pan-Baltic level

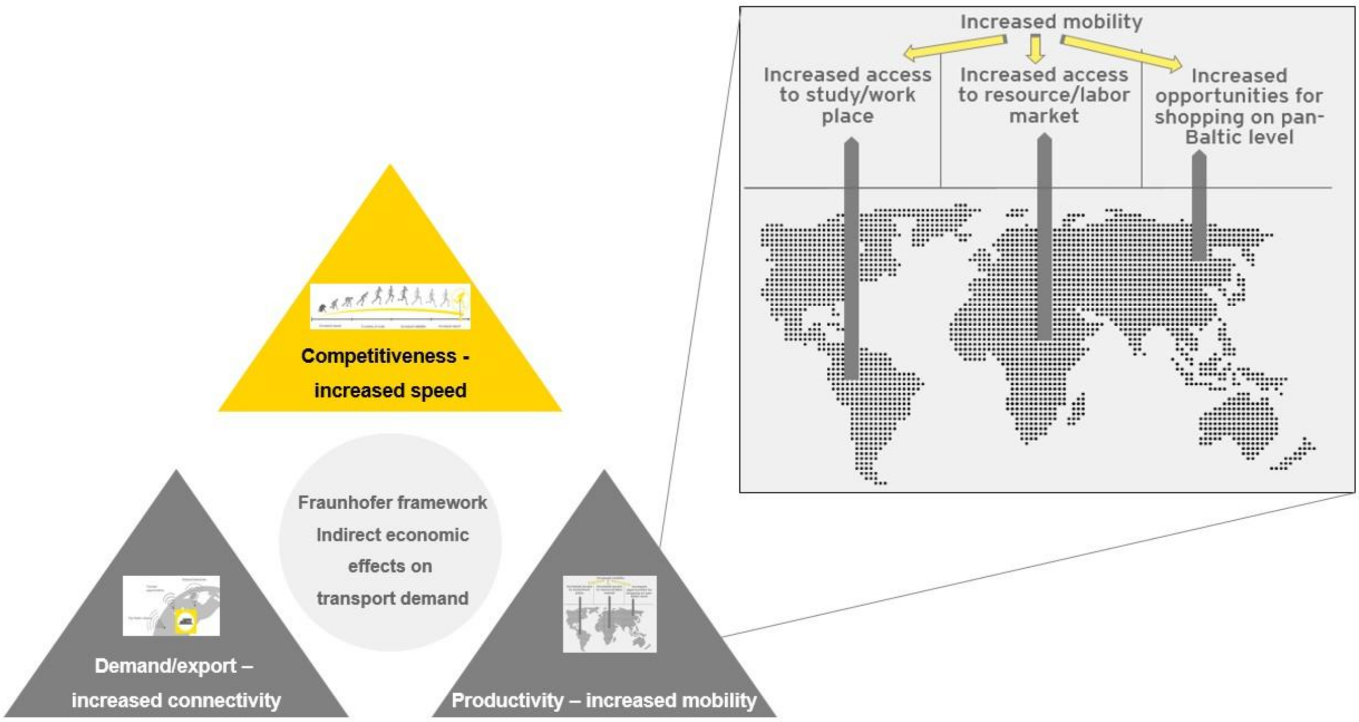

Figure 90 Benefits related to increased mobility

10.1.2.1 Better access to study/work place

Key messages:

- ► The travel time savings provided by the high speed rail bring communities closer together and provide inhabitants with an opportunities to have access to a more favourable study or work place without moving away from the current residence

Economic description of the socio-economic benefit

Better access to study/work places leads to an expansion of the employment market and wider variety of education opportunities. Additionally, travel time savings boost productivity and competitiveness. All the listed benefits lead to increase of employment and labour force mobility, thus leading to higher transport demand.

Case study

Socio-economic benefit analysis performed on the construction of Lötschberg Base Tunnel in Switzerland shows that the newly build infrastructure significantly decreased the travel time (from 30 to 60 minutes depending on transport mode), making it possible to live in Brig and work in Bern[183], which previously was not considered by the inhabitants of either city.

The case of High Speed One (HS1) railway construction in the United Kingdom shows that the new railway increased student mobility, showing an increase of student journeys from and to Canterbury where one of the top universities in the UK – University of Kent – is located[184].

Applicability to Rail Baltica project

Rail Baltica will function as the axis for further transport network improvement around its stations, thus creating possibilities to choose jobs in a wider area. There are Rail Baltica stations, which are located 1hr to 1hr 30min Rail Baltica train ride away from each other but relatively much further away in geographical or car travel terms. After implementation of Rail Baltica, smaller cities with Rail Baltica international stops could become suburbs for further geographical location, as, due to traffic congestions, similar travel time can be expected for shorter road routes used currently by car (as evidenced by the Lötschberg Base Tunnel).

Like the High Speed One project in the UK, Rail Baltica can increase the range within which the potential students search for education opportunities. Range increase could be considered within one or two Rail Baltica international stations.

10.1.2.2 Better access to resource/labour market

Key messages

- ► New railway increases the speed in which resources from different markets can be relocated thus reducing the need to stack-up inventory
- ► Rail Baltica will provide fast and reliable access to and from Northern/Eastern bulk resource markets to Central/Western-Europe markets

Economic description of the socio-economic benefit

Rail Baltica will create a new network between the Baltic region's countries, thus improving access to labour markets in other region countries and to resources like raw materials, parts or products. Better access to resource and labour markets increases economic growth by decreasing input costs and time spent unproductively during trips, increasing productivity, thus driving transport demand. Economic growth driven by better

[183]http://www.swisstravelsystem.com/en/gbt_slider/the-new-gotthard-base-tunnel.html
[184] https://www.canterbury.gov.uk/media/533824/HS1-Final-report-and-appendicies-2.pdf

investment of time and cost resources leads to further growth in the job market thus again leading to increased demand for transport services.

Case study

The studies carried out on the impacts of Oresund Bridge constructions between Denmark and Sweden show that the new bridge increased the number of Danes working in Denmark but relocating their residence to Sweden, since wages in Denmark are higher and living expenses in Sweden are lower. Bridge allowed to decrease living expenses and retain higher disposable income. In the period between 2001 and 2009, the number of Danes living in Malmo increased by approximately eight thousand[185] (accounting of approx. 3% increase in overall population). Changes in living arrangements were driven by the decreased travel time. Car trip over 16 km Oresund Bridge is approx. 10min long (trip from Copenhagen to Malmo is approx. 50 min)[186]; train trip from Copenhagen to Malmo is 35min long[187] and ferry trip from Copenhagen to Malmo lasts as long as 3hr 30min. This totals to approx. 2hr 40min (76%) saved for the car trip and approx. 3hr (85%) saved for the train trip.

Applicability to Rail Baltica project

Similarly to the Oresund Bridge case study, Rail Baltica, by providing new comfortable high-speed mobility services, will provide an opportunity for businesses and private individuals to retain daily activities in one country and own vocational property in another, if that is determined by a favorable difference in business environment, living conditions or cost. Even though length of the two infrastructure objects differs significantly, both objects provide logistics solutions that significantly save time in the scale that is similar to Rail Baltica. Therefore, similar trends in relocation due to better accessibility to workplace may be triggered.

10.1.2.3 Increased opportunities for shopping on pan-Baltic level

Economic description of the socio-economic benefit

Shopping as part of domestic consumption is one of the main economic growth drivers in the Baltic States for the past years. Increased connectivity via Rail Baltica will diversify shopping habits and markets, increasing economic activity. Economic growth has a direct link to transport demand.

Case study

The case of Channel Tunnel between the UK, and France, shows that retail industry is also affected by large infrastructure projects. Due to various reasons, like tax rates and currency exchange rates, number of UK residents shopping in France and Belgium increased significantly. Research found that the main purpose for 38% of travellers from UK to France was shopping[188].

Applicability to Rail Baltica project

Construction of Rail Baltica project would allow capitalizing on different VAT and other sales tax rates between counties. If Poland remains outside Eurozone, favorable currency exchange rate fluctuations can also drive pan-Baltic shopping opportunities to/from Poland.

As shown in Figure 91, increased connectivity aspect is further divided into:

- Pan-Baltic clients

[185] https://www.researchgate.net/publication/257427283_Ex_post_socio-economic_assessment_of_the_Oresund_Bridge
[186] http://www.aferry.com
[187] https://www.oresundsbron.com/en/node/6738
[188] https://www.kent.ac.uk/economics/documents/research/seminars/archive/SummaryReport.pdf

- Tourism opportunities
- Related industries

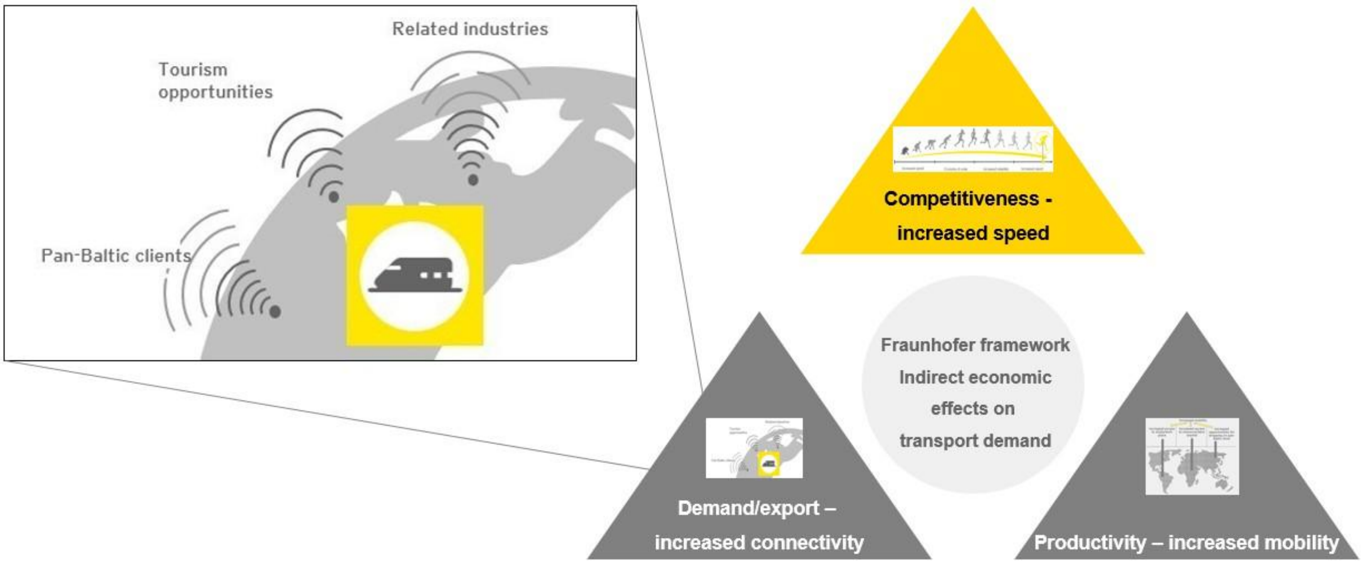

Figure 91: Benefits related to increased connectivity

10.1.2.4 Catalytic effect on businesses located near rail stations

Key message:

- Increased number of passenger movement has a positive effect on businesses around rail stations

Economic description of the socio-economic benefit

Increased passenger flows in the rail station areas will drive the growth of businesses located nearby. Competitiveness will increase further growth, which will directly lead to increased employment. Eventually rail stations will be seen as active social places, agglomerating businesses around them, thus improving the image of rail as it self and leading to increase in transport demand.

Case study

As research shows, investments in Sheffield Station (the UK) contributed to a 67% increase in the rentable property value within 400 meters of the stations between 2003 and 2008. This is three times the average increase for Sheffield over the same time period. Similarly, investments in Manchester Piccadilly Station led to investments in 60 000 square meter commercial property development with a new and refurbished office space[189].

Sheffield is a city of 563 thousand urban inhabitants and its train station passenger turnover in 2013 reached 8.6 mln. Manchester is a city of 2.5 mln inhabitants and Piccadilly Station passenger turnover in 2013 reached 24 mln passengers[190]. In comparison to the case study, Tallinn inhabits in the metropolitan area is around 553 thousand[191], Riga 1 168 thousand[192] and Kaunas 570 thousand people[193].

According to the Base case forecasts, in the first years of operations Tallinn can expect 430 thousand, Riga – 800 thousand and Kaunas – 680 thousand Rail Baltica passenger turnover. Even though train usage habits and

[189] https://cjag.org/2012/01/22/station-investment-can-help-stimulating-economic-growth/
[190] http://orr.gov.uk/statistics/published-stats/station-usage-estimates
[191] http://www.epomm.eu/endurance/index.php?id=2809&city=103
[192] http://nra.lv/latvija/riga/85248-rigas-aglomeracija-lielaka-baltija.htm
[193] https://www.citypopulation.de/Lithuania.html

railway networks differ between the Rail Baltica region and the United Kingdom, urbanization levels suggest that proportional benefits mentioned in case studies can be expected in the Baltics as well.

The case of TransMilenio bus way, a transport corridor serviced by buses within the city of Bogota (Colombia), has proven that large department stores, shopping centres and other businesses are quickly located around main stations as they provide high customer streams[194].

Applicability to Rail Baltica project

Similarly to case studies presented, it is planned to increase commercial space together with other improvements in all Rail Baltica stations. Development of Salaspils intermodal terminal, Muuga terminal (Tallinn) and Kaunas intermodal terminal together with other Rail Baltica supporting infrastructure will create the need for other business infrastructure like office space and dining areas thus further improving the station area.

10.1.2.5 Higher accessibility leads to a more efficient allocation of resources, which triggers productivity gains and stimulates growth

Key message

- ► Increase in the speeds for delivery of goods would provide an opportunity to diversify supply chains, which would provide an opportunity to save costs and allow for better allocation of resources, thus stimulating growth and competitiveness in the region

Better allocation and higher accessibility of resources saves time and costs, which can be invested in other activities with higher added value, thus raising productivity, which is one of the main drivers of competition and growth. Increased reliance on fast transport solutions for timely delivery of goods will have a direct impact on transport demand.

Case study

The Oresund Bridge project connecting Sweden and Denmark resulted in a deeper inter-regional integration and better allocation of resources. Swedish side of the bridge historically has been more focused on industrial and rural production while Danish side has a highly developed high-technology industry, overall 96% of the commuters using the bridge on a regular basis live in Sweden, but work in Denmark[195].

Applicability to Rail Baltica project

With the accessibility to higher speed train services, businesses in the Baltics would potentially gain access to the broader market of the countries within the catchment areas. Access to broader market would provide an opportunity to obtain goods and services at a more favourable prices than is currently offered on the local market. This would result in cost saving and growth, similarly to the case study. Railway would also increase inter-modality between transport modes allowing to diversify supply chains and procurement procedures further triggering productivity and growth.

10.1.2.6 Better tourism opportunities

Key messages

- ► Improved connectivity between the Baltic States would provide the tourists with the opportunity to maximize their time in each country, while minimizing the travel time between them. By facilitating accessibility to popular tourism destinations, increase in tourism activity can be expected

Economic description of the socio-economic benefit

[194] http://81.47.175.201/livingrail/index.php?option=com_content&view=article&id=710:impact-of-bus-rapid-transit-on-land-value-the-transmilenio-case&catid=37:technologies&Itemid=126
[195] http://www.orestat.se/sites/all/files/commuting_across_yresund.pdf

The new mode of transport available for travelling will increase the mobility in the region due to favourable travel times in comparison with road as well as air transport. This factor will promote the growth of tourism and related sectors. As tourism accounts for a sizeable part of the GDP, economic growth together with new employment opportunities can be expected to further stimulate the demand for transport.

Case study

Case of Channel tunnel between UK and France shows that cross-channel travel in period between 1993 and 1999 increased by over 8.1 mln (55%) and 40% of the increase can be attributed to the tunnel[196].

According to the proceedings of the conference "Building a Baltic Sea Tourism Region", one of the preconditions for further tourism industry growth in the Baltics is closing of missing infrastructure links, especially – rail connections to ensure better connectivity within the whole Baltic Sea Region[197].

Applicability to Rail Baltica project

Travel opportunities for tourists in the region would be significantly improved as it would be possible to conveniently reach the other Baltic States quickly. As a result, tourists could maximize their time in each country, while minimizing the travel time between them. Main Rail Baltica stations will be located in city centres with convenient connections to other modes of transport for trips to final destinations. As case study suggests, cross border travel can be promoted by investments in transport infrastructure to popular travel destinations. Even though length between Rail Baltica differs from the Channel Tunnel, travel time saving and increased convenience and connectivity characterize both infrastructure objects.

Competitiveness aspect is assigned to benefits of increased speeds which is further divided into (see Figure 92):

- Increased speeds
- Economy of scale
- Increase reliability
- Increased export

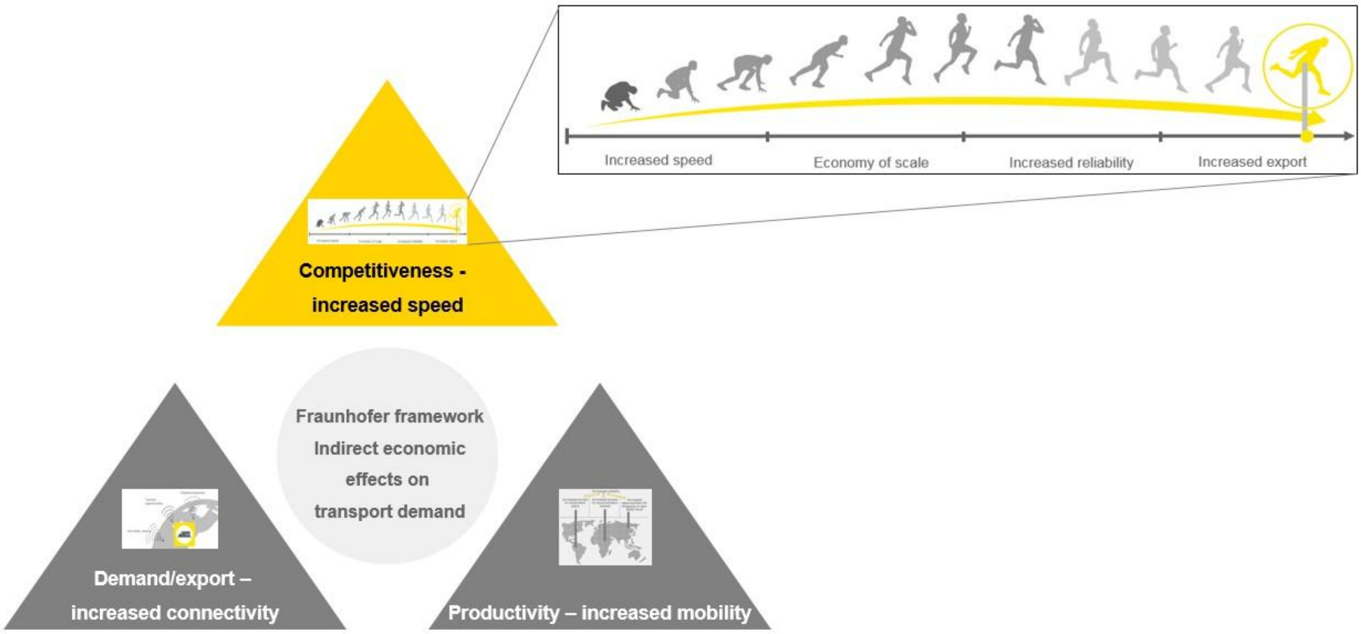

Figure 92: Benefits related to competitiveness

196 http://www.reading.ac.uk/web/FILES/geographyandenvironmentalscience/GP172.pdf
197 http://service.mvnet.de/_php/download.php?datei_id=115235

10.1.2.7 Indirect productivity effects on other business sectors

Key messages

- Fast mobility decreases travel time thus allowing to use time for productive activities
- Locating business outside city decreases costs allowing to invest money in other cash-generating units

Economic description of the socio-economic benefit

New transport links increase mobility and connectivity, thus creating a more productive and competitive business environment. Productivity improvements in one part of supply chain leads to further improvement for the whole chain, thus driving economic growth which is directly linked to increased transport demand.

Case study

In the case of Lille-Turcoing-Roubaix (France) tram system upgrade and creation of a new metro, specialized business parks were developed to capitalize on improved accessibility and engage other local resources (businesses, skills, infrastructure, etc.)[198].

Studies in the UK have shown that railway upgrades of 1970's in the North-west England have significantly improved the overall productivity of the region mainly by expanding the labour market.

The case of TransMilenio bus rapid transit system in Bogota (Columbia) shows that new means of transport increases accessibility of the city centre and increases employment, driving growth creating activities[199].

Applicability to Rail Baltica project

In case of Rail Baltica, new business parks specialized in cargo and passenger handling and other supporting activities can be built around or nearby Rail Baltica stations and its supporting infrastructure, especially intermodal terminals in each country.

Similarly to the case of UK rail system upgrade of 1970's, Rail Baltica would positively affect the businesses around Muuga, Tallinn, Parnu, Salaspils, Riga, Riga Airport, Panevezys, Kaunas, Vilnius as all of these places would experience an increase of either passenger or labour mobility, or both. Through increased export and from business activity around intermodal terminals, local municipalities will experience increased tax revenues, which will lead to further improvements in the city on which other businesses will be able to capitalize.

Rail Baltica will provide direct transport links to the largest Baltic city centres, thus, similarly to the case of TransMilenio bus system in Bogota, increasing the overall economic activity.

10.1.2.8 Ability to perform services on the pan-Baltic level

Key messages

- Improved transport networks create larger client catchment areas for businesses

Economic description of the socio-economic benefit

Expansion of markets increases export opportunities and drives economic growth simultaneously. Additionally, market increase drives employment opportunities and competitiveness. All factors mentioned creates indirect economic effects, which have a further direct link to higher transport demand.

Case study analysis

[198] http://www.rtpi.org.uk/media/816110/capturing_the_wider_benefits.pdf
[199]http://81.47.175.201/livingrail/index.php?option=com_content&view=article&id=710:impact-of-bus-rapid-transit-on-land-value-the-transmilenio-case&catid=37:technologies&Itemid=126

The case of Humber bridge (the UK) shows that multiple regional businesses now are able to provide goods and services on a pan-regional level. For 13 firms interviewed, the Humber Bridge made it possible to reach new destinations within the relevant constraints such as journey time, product freshness, and price[200]. The Humber Bridge connects Lincolnshire (population 170 thous.) and East Riding of Yorkshire (population 590 thous.). If sample car travel from Grimsby (Lincolnshire) to Hull (East Yorkshire) is considered, travel over the Humber Bridge takes approx. 50min (52km) in comparison to round trip of1hr 30min (125km); representing 44% time savings, as presented in Figure 93.

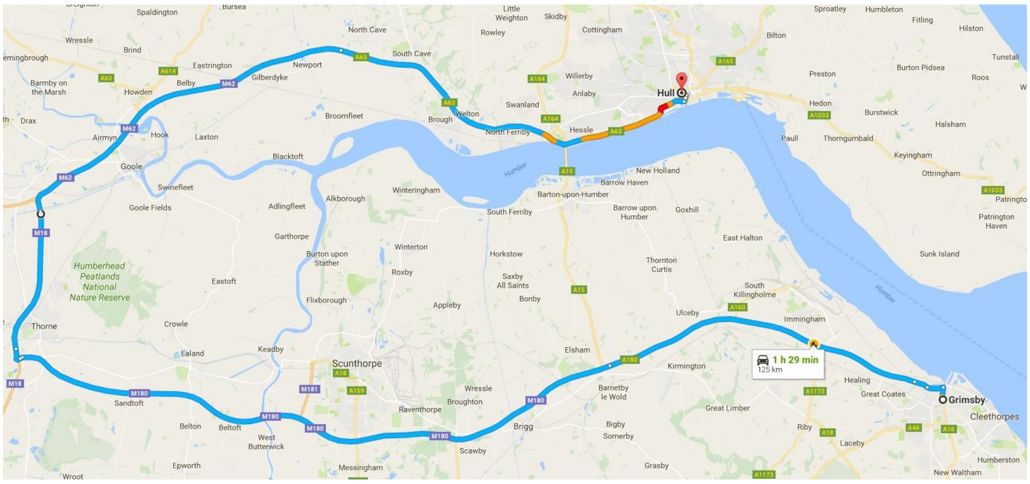

Figure 93 Hull - Grimsby

Applicability to Rail Baltica project

Even though Rail Baltica does not compare to the Hubmer Bridge in means of length, it presents similar gains in time saving and increased connectivity between cities. Therefore, similar results on the ability to perform services in wider geographical range can be expected in the Baltics as well.

10.1.2.9 Increased reliability of passenger and freight transport

Key messages

- Reliable transport drives economic growth by strengthening supply chains
- Speed, direct connectivity and low sensitivity towards weather conditions are key drivers of freight and passenger transport reliability

Economic description of the socio-economic benefit

Highly reliable freight transport creates a productive supply chain. The strength of a supply chain can be measured by how reliable is its weakest link. Strong supply chains increase productivity and drive economic growth which directly contribute to increased transport demand.

Case study analysis

Introduction of High Speed One railway (the UK) has shown that high speed trains are often more reliable than regular trains or even other modes of transport. Observations of the Office of the Rail Regulator (the UK) showed that even during severe winter weather conditions fast conventional train performed better compared to its other competitors[201].

The rail system expansion and development program of Bahn 2000 carried out by the Swiss Federal Railways included opening of several new rail lines, upgrading of rolling stock inventory and expansion of various stations,

[200] http://www.bath.ac.uk/e-journals/jtep/pdf/Volume_XX_No_3_377-384.pdf
[201] https://www.canterbury.gov.uk/media/533824/HS1-Final-report-and-appendicies-2.pdf

increased the capacity and reliability of the whole rail network. Even with higher passenger turnover and more frequent trips, the railway system remained high quality standards with 95.7% of all passenger trains having an arrival delay of 5 minutes or less[202],[203].

It is indicated that, rail transport is significantly less impacted by weather conditions in comparison to other modes of transport[204], however, weather also has an effect on railways, since bad weather conditions or weather-related technical damages are the main causes (approx. 60%) of all late arrivals[205].

Applicability to Rail Baltica project

Similarly to case of High Speed One railway in UK, Rail Baltica would be a reliable alternative for freight and passenger transportation between capital cities of the Baltics, since predominately road and air transport is used. Air traffic can be unpredictably disrupted by weather conditions and roads tend to have slower and unpredictable traffic due to large traffic flows (e.g. Via Baltica link Riga-Tallinn during large public events) or winter conditions.

10.1.2.10 Better access to other markets

Key messages

- ► Highly connected railroad infrastructure has the potential to increase the competition and facilitate economic development by connecting regions that have previously been segregated from the rest of transport infrastructure

Economic description of the socio-economic benefit

Better access to other markets (resource, labour, client, etc.) leads to a higher competition and economic growth. Bringing business closer to clients or vice versa increases business growth, thus creating more jobs. All these factors directly lead to an increase of transport demand.

Case study

High speed rail development around Copenhagen airport has significantly increased its catchment area. Current infrastructure connections to Copenhagen airport create a catchment area of the whole of Denmark and Southern Sweden, which accounts for 40% of the Swedish population[206].

In another case, by the end of 2015 China had built 19 thous. km of high speed rail, which is expected to double by 2025, with the goal of providing journey times in less than two hours between major urban areas[207]. Railway construction has not only been used as a tool for connecting urban areas, but also is planned to be a facilitator of economic development for the China's poorest regions[208].

The case of the Channel Tunnel between UK and France demonstrates a considerable increase of freight transport. Over the period of 5 years, there was a 55% increase in the number of road trucks moving from UK to France, and the tunnel accounted for 19% of that[209], meaning that businesses in both countries improved the accessibility of resources abroad.

Applicability to Rail Baltica project

[202] http://e-collection.library.ethz.ch/eserv/eth:30947/eth-30947-01.pdf
[203] http://alpsknowhow.cipra.org/main_topics/policy_landscape_alps/pdfs/Rail2000.pdf
[204] Emerging Challenges and Opportunities of High Speed Rail Development on Business and Society. Selladurai, L.Daniels, VandeWerken
[205] Extreme Weather Impacts on Freight Railways in Europe. Klæboe, Ludvigsen.
[206] http://www.stringnetwork.org/media/31991/report-high-speed-network_final_1_.pdf
[207] http://www.railwaygazette.com/news/infrastructure/single-view/view/chinese-high-speed-network-to-double-in-latest-master-plan.html
[208] http://news.xinhuanet.com/english/2017-02/19/c_136068507.htm
[209] https://www.kent.ac.uk/economics/documents/research/seminars/archive/SummaryReport.pdf

Riga International Airport is the largest and geographically central airport of the Baltics. As Rail Baltica will create a high-speed rail network passing through Riga International Airport, similarly to case of Copenhagen airport, mobility within catchment area for Riga International Airport will increase significantly. Other regional airports shall also be connected to Rail Baltica via spurs or light rail connections, contributing to their development. Therefore further development due to increased passenger connectivity can be expected.

Similarly to case of China's high speed and conventional railway construction program, Rail Baltica will bring higher speed connection from Riga to neighbouring countries and the whole Europe. Furthermore, with the integration of the European railway system, the exporters of the Baltic States would be able to penetrate the markets around the North Sea-Baltic Corridor and deeper in the mainland Europe, for instance Visegrad region, Southern Germany and Northern Italy. For instance, with implementation of Rail Baltica, it will be possible to diversify import of energy resources and bulk cargos from Central Europe via hinterland connection as well as potentially distribute transit freight provided by the establishment of Europe-Asia land bridge.

Similarly to the Channel Tunnel case study, Rail Baltica project would increase accessibility to the comparably large Poland's agriculture and technical equipment market, which is usually reached by road, thus productivity and speed increase is expected as well. In addition, newly reachable markets will be general and bulk cargo markets in Central and Southern Europe (especially economically developed areas with high people density as Southern Germany, Northern Italy etc.)..

10.1.2.11 Increased export

Key messages

- Better railroad infrastructure connectivity will provide new destinations for export, therefore increasing economic growth

Economic description of the socio-economic benefit

Export volumes are directly linked to economic growth and employment. Transport infrastructure breaks down the barriers for export and higher export further increases the demand for more transport infrastructure.

Case study

According to a study on Oresund Bridge between Denmark and Sweden, over a four-year span after the completion of the Oresund Bridge, companies from Malmo (Sweden) increased their exports by 42%, from Stockholm by 30% and from Gothenburg by 5%[210].

Applicability to Rail Baltica project

As suggested by the case study, better connectivity will allow the increase of export by creating new export destinations and providing better connectivity.

10.1.2.12 Better access to healthcare institutions

Economic description of the socio-economic benefit

Better access to healthcare institutions not only makes the healthcare institutions more competitive by increasing their catchment area, but also gives opportunity for people to choose the best available healthcare in a larger perimeter. From an indirect economic effect point of view, healthier people are more productive due to reduced illness leave. Productivity leads to economic growth and, thus, further increases transport demand.

[210] http://www.ifn.se/wfiles/wp/wp795.pdf

Case study

According to Eurobarometer[211], the satisfaction with healthcare quality between the Baltic States differs as much as 20%. There are surgeries and procedures that are not performed in one country but are performed in another due to the availability of facilities and experienced medical staff. Due to this aspect, pan-Baltic health tourism could emerge.

This view is further supported by, studies suggesting that healthcare tourism is rapidly growing in all three Baltic countries. With rising demand from Scandinavian, CIS and Western Europe countries, driven by competitive prices, well-educated experts and high quality of service, recently there has been an increase of established spa and therapeutic institutions in each of the Baltic State. All three counties have created national strategic development plans to raise the demand even further[212]. According to European Travel Commission's projections, the EU as a whole is expecting a stable overall increase in number of tourists from other parts of the world. Assuming that part of these tourists will visit wellness and medical facilities, increase in medical tourism can be expected as well[213]. Overall Rail Baltica is a safe and fast alternative for also for the health tourist with flying restrictions due to medical conditions.

Applicability to Rail Baltica project

According to statistics, for instance Eurobarometer, quality of healthcare differs in Baltic States as indicated by the satisfaction surveys of received healthcare. There are certain medical procedures performed or not performed in one or another country. Keeping in mind that certain medical conditions require special travelling comfort and speed, demand for Rail Baltica from this sector can be expected. Rail Baltica would provide a safe and fast travel alternative to reach the best healthcare solution within Baltics.

Medical tourism is developing in the Baltic State and further demand could be expected from Western Europe and Scandinavia. However, it is unlikely that international medical tourist flow will significantly impact Rail Baltica.

10.1.2.13 Increased transport capacity

Key messages

- ► Increased capacities of railways have the potential to increase the revenues and cost savings for supply chains

Economic description of the socio-economic benefit

Ability to transport large amounts of goods gives a competitive advantage due to capitalization on economies of scale. Productivity increase and cost saving boosts economic growth, thus leading to increased demand for transport.

Case study

The case of UK government railway investment program 2009-2014 shows that with increased capacities of railways, productivity of the freight sector and supporting sectors (the whole rail supply industry value chain) led to an estimated £1.1 bln in cost savings and additional income[214].

Applicability to Rail Baltica project

211 http://ec.europa.eu/health/patient_safety/eurobarometers/ebs_411_en.htm
212 http://wellnesseducation.pc.ut.ee/wp-content/uploads/2016/05/Baltic-Health-Tourism-Report.pdf
213 European Tourism 2015 – Trends & Prospects
214 http://www.raildeliverygroup.com/files/Publications/2015-02_freight_britain.pdf

Rail Baltica will save costs and potentially discover new markets in Central and Southern Europe for Baltic businesses exporting grain, wood (and wooden products) and other commodities that are currently being transported by sea, which requires additional link in the supply chain and is available only in countries with sea boarders. With rail connection to Central Europe, commodities will be delivered straight to distribution terminals with a wide catchment area leading to revenue increase and cost saving for the whole supply chain.

10.1.2.14 Access to a larger and more diverse base of inputs, such as raw materials, parts, energy and labour

Economic description of the socio-economic benefit

Better access to different markets benefits both sides as diversification of sources for inputs for a better price creates opportunities for businesses to increase competitiveness and productivity, thus driving further demand for transport.

Case study

As seen in the case study on Humber Bridge(UK) the impact on local economy shows that commercial activity in the region increased by 8.1-13.9%, depending on the business sector. The newly built bridge connected communities, which in turn allowed several firms already operating in the area, to expand the market by capturing shares of local competitors[215]. The Humber Bridge is 2.2km long and connects cities with combined population of 760 thousand people.

Applicability to Rail Baltica project

Rail Baltica will provide fast and reliable infrastructure for importing larger amounts of containerized raw materials from Poland and Western-Europe, which are now delivered either via sea routes, road or air. New destinations in Central or Southern Europe will allow to diversify procurement for goods not only locally, but also from abroad, thus saving costs for the buyer due to increased competition of the suppliers.

10.1.2.15 Induced impact of Ports

Economic description of the socio-economic benefit

Due to modal shift from road and sea to Rail Baltica, the turnover of Ports is expected to increase, thus creating spillover effects to local economy and companies operating in the port area.

Case study

According to studies conducted by EY in the Baltic States, transit industries provide positive induced effect on GDP, as the supply chain involves companies operating in various industries (transportation, supporting industries etc.).

Applicability to Rail Baltica project

One of core freight sources for Rail Baltica are southward exports from Finland, all of which are expected to be serviced via Tallinn port, as a result, there is a potential for a positive spillover effect in the Baltic States. The port turnovers are expected to rise noticeably, creating induced impact on the economy. In addition, Rail Baltica flows serve as a means of diversification of traditional freight flows via Baltic ports (transit freight from CIS to Western Europe).

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[215] http://www.bath.ac.uk/e-journals/jtep/pdf/Volume_XX_No_3_377-384.pdf

10.1.2.16 Better tourism opportunities

Estimation approach and economic justification

In estimating the impact to the tourism sector, the statistical data of average expenditure per traveller has been taken and multiplied by the statistical data of the average length of the trip. The result have been multiplied by the projected increase of tourists in each city after opening of Rail Baltica.

An illustration of the benefit is provided below (currently data for Latvia is provided as an example and is for a qualitative illustration only):

- One traveller's per day expenditure in 2014 amounted to EUR 74 on average[216].
- The average length of trip in 2014 was 1.50 nights.

Therefore, for example, if Rail Baltica would provide additional induced demand of 10 000 tourists per year, the impact on hospitality and retail industry turnover would amount to approx. 1.1 million EUR.

10.1.3 Quantitative socio-economic analysis

10.1.3.1 Improved travelling safety

Key messages
- Statistics show that fatality rate while traveling by train is 28.5 times lower in comparison to road vehicles and 2.7 times lower compared to public buses

Estimation assumptions

Shifting from other transport modes to rail will improve travelling safely, as rail is proven to be one of the safest modes of transport. Monetized impact of lives saved because of the modal shift from road to rail has been estimated.

For estimation of travel safety improvement, the key assumptions are presented in Table 74.

Table 74 Number of fatalities per passenger[217]

Type of vehicle	Fatalities per 1 billion vkm.
Train	0.156
Car	11.035
Bus	0.433
Air	0.101

As an example, it is also assumed that:

- 1 train has a capacity of 402 seats.
- 1 bus has a capacity of 29 seats (average utilized).
- 1 car has a capacity of 1.45 seats (average utilized).

The average estimated economic value of an individua in the Baltic States (2015 PPP prices) is 1 351 947 EUR[218]. This value has also been used in the calculation on monetized value of lives saved by Rail Baltica.

Estimation process

In order to estimate the monetized benefits of improved traveling safety, estimation process is created by comparing passenger traveling casualties between three transport modes – bus, train and car. The estimation

[216] http://data.csb.gov.lv/pxweb/lv/transp/transp__ikgad__turisms/?tablelist=true&rxid=cdcb978c-22b0-416a-aacc-aa650d3e2ce0
[217] http://www.era.europa.eu/Document-Register/Documents/SPR%202013%20Final%20for%20web.pdf
[218] http://ec.europa.eu/transport/sites/transport/files/themes/sustainable/studies/doc/2014-handbook-external-costs-transport.pdf

process is shown in Figure 94 while the calculation example (for illustrative purposes only and not reflecting the total savings caused by Rail Baltica) can be found in Figure 95.

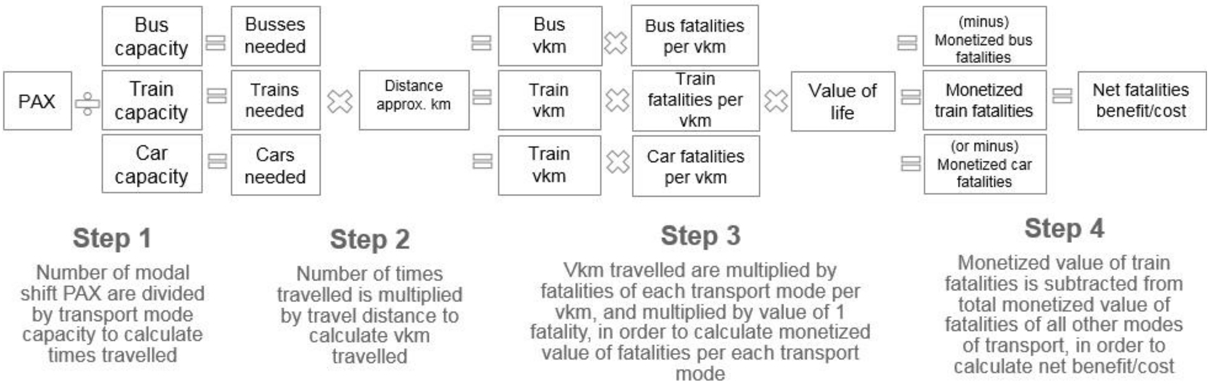

Figure 94 Estimation process

Passengers	Transport mode	Average occupancy per transport mode	Trips needed	Riga - Tallinn distance	vkm total	Fatality rate per pkm	Fatality rate Riga - Tallinn	Monetized value (EUR)	Monetized value of lives saved	Savings due to shift from car	Savings due to shift from bus
	Train	281	355	364	129 523	0.0000000002	0.00002		27	596	317 894
100 000	Bus	29	3 448	309	1 065 517	0.0000000004	0.00046	1 351 947	624		
	Car	1.45	68 966	309	21 310 345	0.0000000110	0.23516		317 921		

Figure 95 Estimation example

10.1.3.2 Travel time savings

Key messages

► For each person, time value can be expressed in a monetary form, thus time savings lead to cost savings or, if the new mode of transport increases the productive time of the travel, even increased income for the person

Estimation assumptions

Travel time savings benefits are driven the infrastructural capabilities of high-speed trains travel at close to maximum speed for extended periods of travel and have only a few stops. The amount and monetized value of time saved by a shift of transport mode to rail has been estimated. Monetized estimation of passenger time saving has been calculated based on expected time saved (current comparable time minus Rail Baltica expected) multiplied by the value of time. Estimated and publicly available information on comparable travel time has been used for the estimations (see Table 75).

Table 75 Estimation of passenger time savings

Route	Personal cars	ΔRB	Buses	ΔRB	Airplanes*	ΔRB	RB
Riga - Tallinn**	4:05	-2:10	4:20	-2:25	1:50	+0:05	1:55
Riga - Kaunas	3:19	-1:54	3:50	-2:25	-	-	1:25
Riga - Warsaw	8:20	-4:20	11:50	-7:50	2:30	+1:30	4:00
Riga - Berlin	15:40	-8:00	19:20	-11:40	3:00	+4:40	7:40
Riga - Vilnius	3:30	-1:30	4:00	-2:00	1:50	+0:10	2:00
Tallinn - Riga**	4:05	-2:10	4:20	-2:25	1:50	+0:05	1:55
Tallinn - Kaunas	7:24	-4:04	8:40	-5:20	-	-	3:20
Tallinn - Warsaw	12:10	-6:10	16:20	-10:20	2:40	+3:20	6:00
Tallinn - Berlin	17:00	-7:20	23:50	-14:10	3:20	+6:20	9:40
Tallinn - Vilnius	7:00	-3:05	8:50	-4:55	2:10	+1:45	3:55
Vilnius - Riga	3:30	-1:30	4:00	-2:00	1:50	+0:10	2:00
Vilnius - Tallinn	7:00	-3:05	8:50	-4:55	2:10	+1:45	3:55
Vilnius - Warsaw	6:00	-2:50	7:45	-4:35	2:10	+1:00	3:10
Vilnius - Berlin	11:20	-4:30	16:30	-9:40	3:00	+3:50	6:50
Vilnius - Kaunas***	1:10	-0:35	1:30	-0:55	-	-	0:35
Kaunas - Riga	3:19	-1:54	3:50	-2:25	-	-	1:25
Kaunas - Tallinn	7:24	-4:04	8:40	-5:20	-	-	3:20
Kaunas - Warsaw	5:30	-3:10	7:10	-4:50	-	-	2:20
Kaunas - Berlin	10:50	-4:50	14:20	-8:20	-	-	6:00
Kaunas - Vilnius***	1:10	-0:35	1:30	-0:55	-	-	0:35

* Including security check in and boarding time – 1 hour
** Currently there is a 1520 mm train operating between Tallinn – Tartu- Valga/Valka – Riga. Journey takes approximately 8 hours
*** Currently there is a 1520 mm train operating between Vilnius and Kaunas. The journey takes between 1:09 hours and 1:36 hours.

As presented in Table 75 Estimation of passenger time savings, air travel does not provide significant time saving and on the contrary, for most of the trips between neighbouring countries (which is the expected market of Rail Baltica), it takes less time to travel by rail than by air.

Figure 96 represents the comparable ride time calculations.

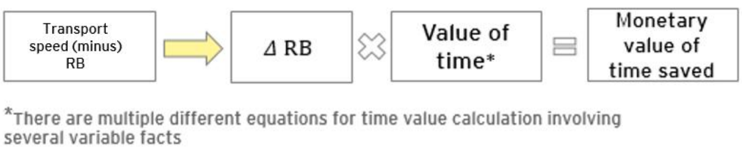

Figure 96 Comparable ride time

Case study: Edinburgh-Glasgow trains 'every ten minutes'

Between 2005 and 2015 the amount of carried passengers by trains in Scotland have increased by one-third, to 90 million annually, and is expected to reach 139 million by 2025. Accordingly, the route is undergoing a significant development program that includes:

- Electrification.
- Construction of 1 new station.
- Renovation of 3 stations.
- Construction of electric depot.
- Platform extensions at four stations.

As a result of the previous mentioned developments, this would yield into:

- Reduced journey time from 50 min. to 42 min.
- Increased passenger capacity by 30% by 2019.

Within the Rail Baltica context, this suggests that rail infrastructure development facilitates efficiency of the passenger transportation.

Case study: Total travel time vs productive travel time

Travel time is an important factor in deciding which mode of transport to use, however, a more objective measurement is the productive time against lost time during travel. The term 'productive time' is understood as the time that the traveller can spend on productive activities during the travel. Lost time, on the other hand, is the time during travel, which the traveller cannot dedicate to productive activities.

The analysis compares the travel time from productive/lost time standpoint for several means of transport in case of a single traveller. At the moment, two to three means of transport are available for reaching the destination. While air transport is the fastest option, large portion of the travel time (1.5 hours) is lost due to security checks and boarding time in the airport. Due to the fact that air transport is generally the more expensive option, for a typical traveller, the choice would fall between using either a car or a bus. For these two means of transport, the travel times are relatively similar, but the main difference lies in the fact that for a single traveller, the whole travel time would be lost due to the fact that he or she would need to exclusively concentrate on driving, hence no other value adding activity is possible, as presented in Figure 97.

With the introduction of Rail Baltica services, another mode of transport –rail- would become available. Use of this mode is strong, since the travel times are significantly reduced. In addition, the whole travel time can be used productively, which is not the case for airplane, which is now the only competing mode of transport that can provide similar total time of travel.

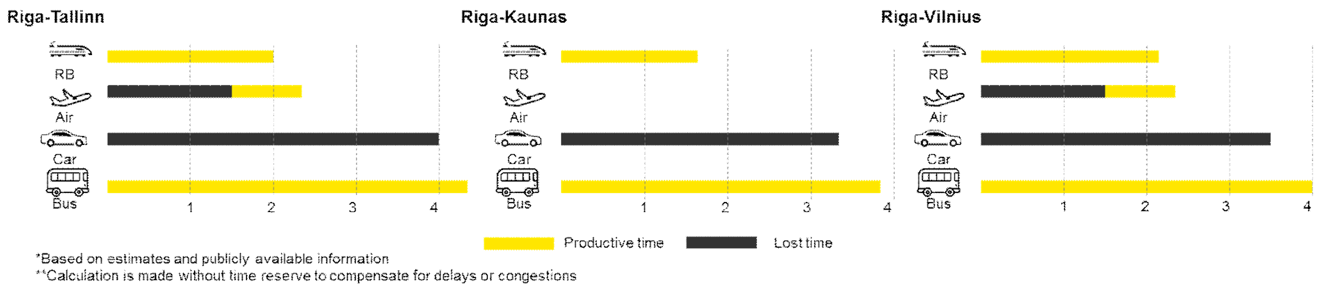

Figure 97 Productive travel time comparison

10.1.3.3 Competitive freight transportation rates

Estimation assumptions

Transportation costs savings for freight transportation have been determined, based on the chosen approach of Rail Baltica freight services pricing (EUR/tkm) that is set lower than road freight transport (for longer distance O/D pairs). For estimation purposes, the difference has been multiplied by cargo volumes estimated in previous research studies on the need for Rail Baltica connection.

Estimation approach

Table 76 shows the freight transportation costs.

Table 76 Freight transportation costs

Type of vehicle	EUR/tkm
Heavy vehicle/truck	0.058
Train	0.04
DifferenceEUR/tkm	+0.018

In order to estimate the net benefit of freight transportation by rail, following estimation process is applied (see Figure 98).

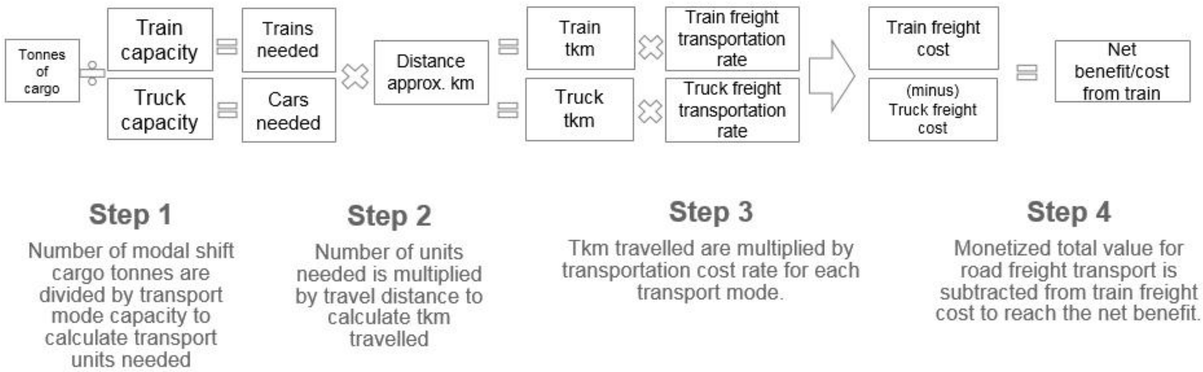

Figure 98 Estimation process

Table 77 shows that shifting from road to rail freight transport for carriage of thousand tonnes from Riga to Tallinn will have an effect of EUR 4 274.

Table 77 Estimation example

Tonnes of cargo (example)	Transport mode	Average load (t)	Trips needed	Riga -Tallinn distance	tkm total	Rate per tkm	Freight cost	Monetized effect of train
1 000	Train	769	1.3	356	356 072	0.040	14 295	4 274
	Truck	14	73	318	318 000	0.058	18 569	

10.1.3.4 Benefits to the environment – noise

Key messages

- ► Shifting from road transport to rail transport will reduce noise pollution costs due to reduction of vkm travelled

Estimation approach and economic justification

For the estimation of noise pollution, Update of the Handbook on External Costs of Transport (2014) has been reviewed and scientifically estimated costs of noise pollution per vkm have been extracted.

The Table 78 summarizes the monetized cost of noise for various transport modes[219].

[219] Update of the Handbook on External Costs of Transport, 2014. Here and in following chapters: due to the CBA approach using real prices (i.e., without inflation) the costs have been kept at the levels used in the Update of the Handbook on External Costs of Transport, 2014.

Table 78 Monetized cost of noise

Type of vehicle	EUR/vkm
Bus	
Urban area	0.0415
Outside urban areas	0.0003
Car	
Urban area	0.0083
Outside urban areas	0.0006
Heavy truck	
Urban area	0.0762
Outside urban areas	0.0006
Passenger train	
Urban area	0.2234
Outside urban areas	0.0123
Freight train	
Urban area	0.4543
Outside urban areas	0.0241

Estimation approach

In order to estimate the net benefit of noise reductions by rail, following estimation process is applied (see Figure 99).

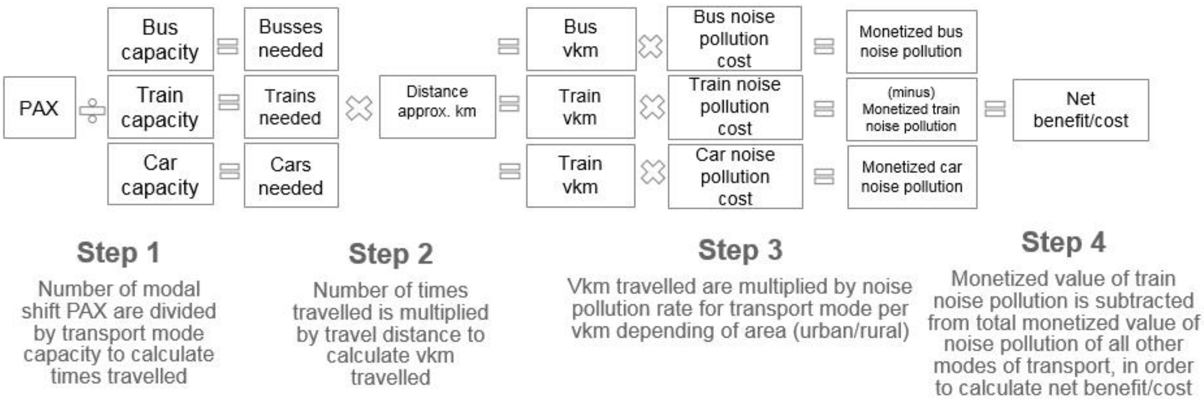

Figure 99 Estimation process

Table 79 shows that for every thousand passengers' shift from cars and buses to trains will decrease noise pollution costs by EUR 880.

Table 79 Estimation example (passenger transport)

Passegers	Mode of transport	Average passengers per transport	Trips needed	Riga - Tallinn distance	vkm driven	Rate per vkm (weighted)	Noise pollution costs	Noise pollution savings
1 000	Car	1	690	309	213 103	0.0036	766	880
	Bus	29	34	309	10 655	0.0178	190	
	Train	281	4	364	1 295	0.0587	76	

10.1.3.5 Benefits to the environment – climate change

Key messages

► Shifting to rail transport significantly reduces monetary effects from climate change due to economies of scale

Estimation approach and economic justification

Rail Baltica will also create climate change cost savings. For the estimation of climate change impact, Update of the Handbook on External Costs of Transport (2014) has been reviewed and scientifically estimated costs of climate change per vkm have been extracted.

The Table 80 summarizes costs of climate change of various transport modes[220].

Table 80 Costs of climate change

Type of vehicle	EUR/vkm
Bus (intercity)	0.0602
Car	0.0197
Heavy truck	0.0610
Train	
Passenger train	0.1267
Freight train	0.01267

Estimation approach

In order to estimate the net benefit of reduced monetary effects from climate change by rail, following estimation process is applied (see Figure 100).

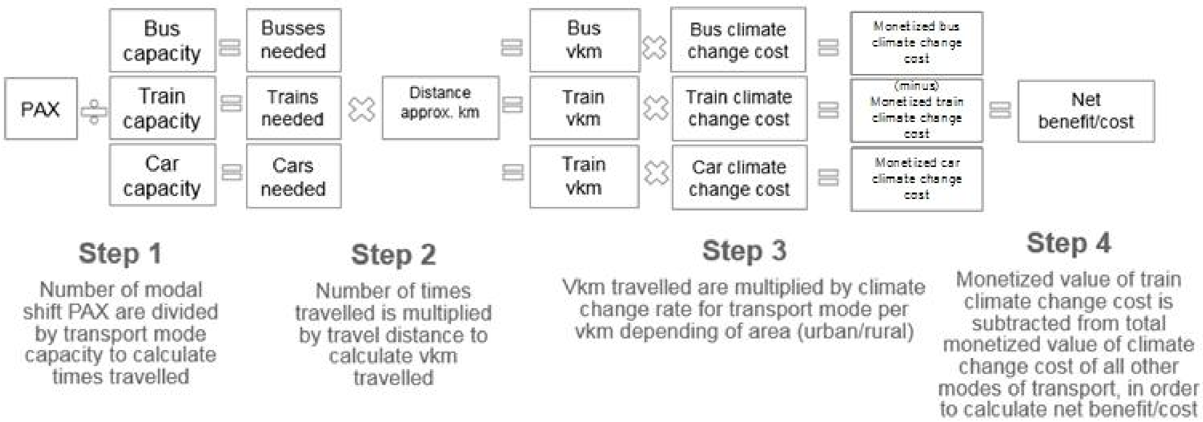

Figure 100 Estimation process

Table 81 shows that for every thousand passengers shifting from cars and buses to train, climate change costs will decrease by EUR 5 820.

Table 81 Estimation example (passenger transport)

Passegers	Mode of transport	Passengers per transport	Trips needed	Riga - Tallinn distance	vkm driven	Rate per vkm	Monitized climate change costs	Climate change savings
1 000	Car	1	690	309	213 103	0.0245	5 226	5 820
	Bus	29	34	309	10 655	0.0749	799	
	Train	281	4	364	1 295	0.1577	204	

10.1.3.6 Benefits to the environment – emissions

Estimation approach and economic justification

Rail Baltica will also create emission cost savings, since electric trains cause significantly less emission costs compared to other means of transport. For the estimation of emission impact, Update of the Handbook on

[220] Update of the Handbook on External Costs of Transport, 2014

External Costs of Transport (2014) have been reviewed and scientifically estimated costs of gas emissions per vkm have been extracted. The Table 82 summarizes costs of gas emissions of various transport modes.

Table 82 Costs of gas emissions

Type of vehicle	EUR/vkm
Bus (intercity)	
Urban area	0.13
Outside urban areas	0.06
Bus (city)	
Urban area	0.12
Outside urban areas	0.05
Car	
Urban area	0.01
Outside urban areas	0.00
Truck	
Urban area	0.15
Outside urban areas	0.07
Train	
Passenger train	
Urban area	0.00
Outside urban areas	0.00
Cargo	
Outside urban areas	0.00

As both passenger and cargo (electric) trains do not produce any emissions, calculation for train impact for comparative data can be skipped. The emission cost calculated for other modes of transport will represent the cost saving due to modal shift.

Estimation approach

In order to estimate the net benefit of freight transportation by rail, following estimation process is applied (see Figure 101).

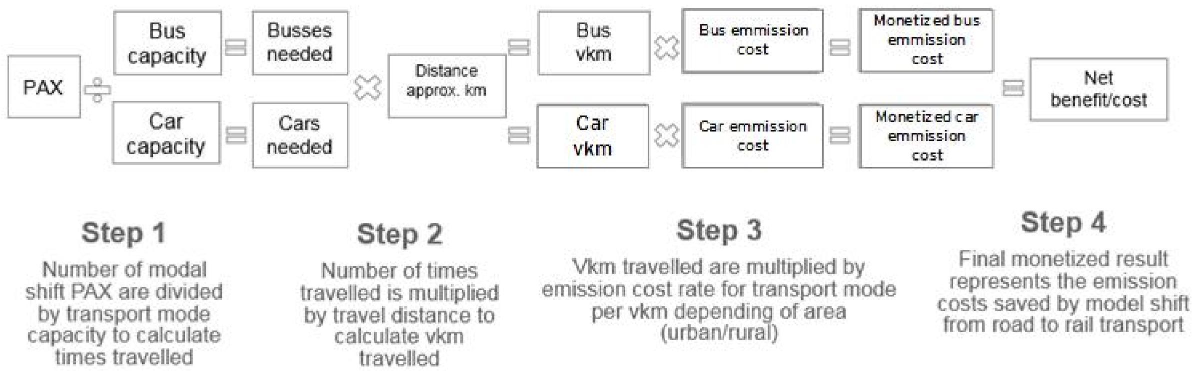

Figure 101 Estimation process

Table 83 shows that for every thousand passengers shift from cars and buses to train, emission cost will decrease by 2 949 EUR.

Table 83 Estimation example (passenger transport)

Passengers	Transport mode	Passengers per tranpsort	Trips needed	Riga -Tallinn distance	vkm driven	Rate per vkm	Emmsion cost	Emmission cost savings
1 000	Car	1	690	309	213 103	0.01	1 860	2 949
	Bus	29	34	309	10 655	0.10	1 089	
	Train	281	4	364	1 295	0.00	0	

10.1.3.7 Personal transport operating and maintenance cost saving

Key messages

- By choosing Rail Baltica, travellers save the expenses related to maintenance of personal vehicles

Estimation approach and economic justification

For the estimation of effects on passenger expenses from choosing Rail Baltica over personal vehicle or another mode of public transportation, rail ticket price has been subtracted from the cost of current mode of transport. For estimation purposes, publicly available information on bus ticket prices has been used. Cost of using personal vehicle has been calculated using the following aspects:

- Average consumption per 100km.
- Average km driver per year.
- Average price of fuel.
- Cost for annual inspection + annual tax.
- Cost for mandatory insurance.
- Estimate of repair and maintenance costs.
- Leasing costs.

For cost calculation, it is necessary to select a sample car – the estimated average privately owned car. The process and steps involved in selecting the sample car is shown in Figure 102, while Figure 103 demonstrates a practical example on defining the sample car.

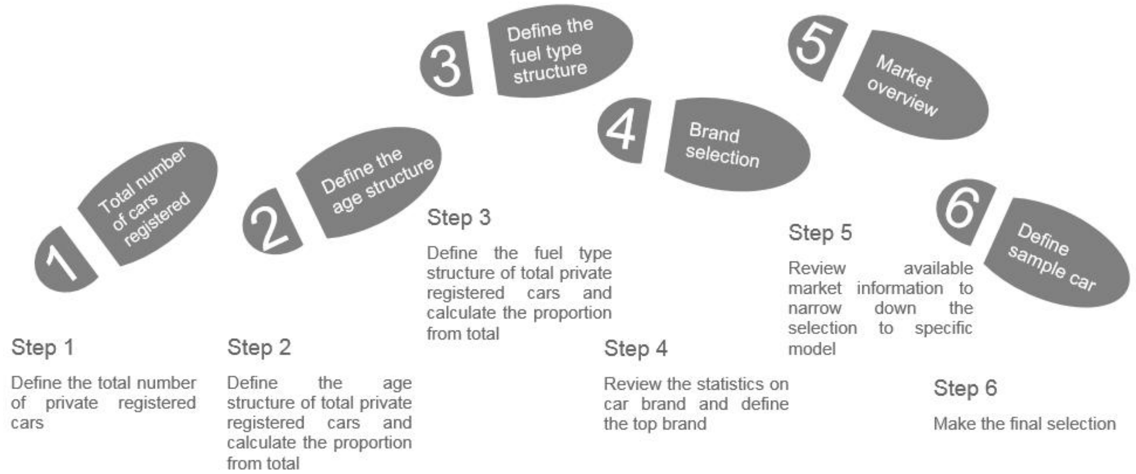

Figure 102 Sample car choice

Nr of cars registerd in Latvia, 2015	679 048
Nr of privately used cars register in Latvia, 2015	612 459
Private cars %	90%

Fuel type	Total	Private	Proportion
Gasoline	287 289	259 117	42%
Diesel	**337 453**	**304 362**	**50%**
Gasoline/Gas	54 062	48 761	8%
Gas	16	14	0%
Electricity	211	190	0%
Other	17	15	0%

Aging structure	Total	Private	Proportion
<2 years	21 790	19 653	3%
2-5 years	35 642	32 147	5%
6-10 years	126 886	114 443	19%
11-20 years	**345 111**	**311 269**	**51%**
20+	149 619	134 947	22%

Figure 103 Sample car choice example[221]

- The total cost is compared to projected rail travel ticket price. The result represents the total amount of money saved.
- Based on previous studies made by Aecom, it is assumed that ticket cost for Rail Baltica train Riga-Tallinn will be approx. EUR 22 excluding VAT[222].

[221] http://www.csb.gov.lv/sites/default/files/nr_29_transports_latvija_2016_16_00_lv_en.pdf
[222] Section 9.1.2 Financial and socio-economic analysis assumptions

Estimation approach

Figure 104 shows the calculation flow for the estimations of costs saved due to the modal shift.

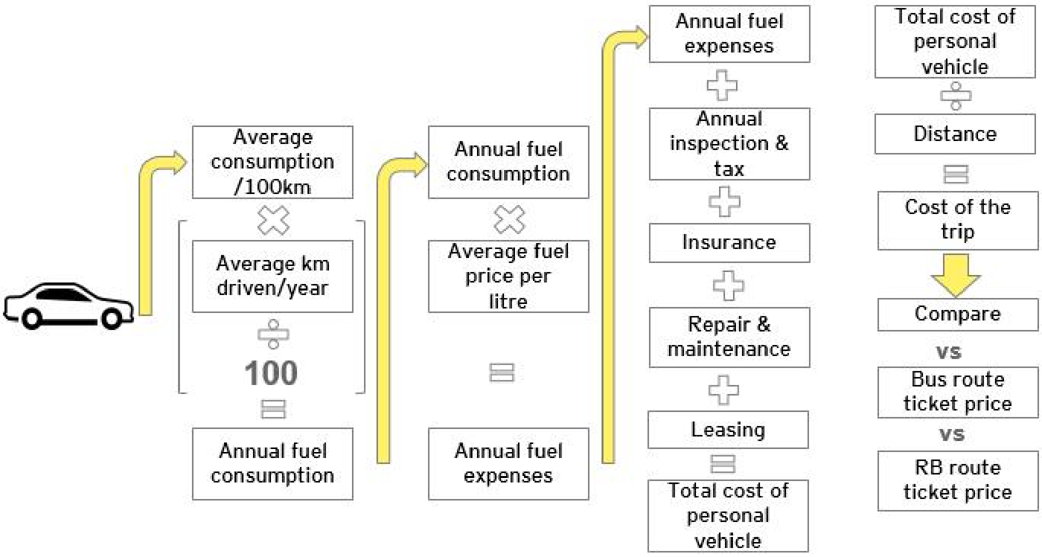

Figure 104 Estimation process

10.1.3.8 Socio-economic analysis results

A socio-economic analysis of the project has been performed. The Table 84 indicates the discounted and undiscounted revenue, expense and monetized socio-economic impact values, as used in the analysis.

Table 84 Rail Baltica socio-economic analysis

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			
Socio-economic benefits and costs	16 226	M EUR	Undiscounted
Air pollution reduction	3 268	M EUR	Undiscounted
Air pollution reduction	3 268	M EUR	Undiscounted
Climate change mitigation	3 024	M EUR	Undiscounted
Climate change reduction	3 024	M EUR	Undiscounted
Noise reduction	843	M EUR	Undiscounted
Noise reduction	843	M EUR	Undiscounted
Travel time savings	5 276	M EUR	Undiscounted
Freight time savings	2 866	M EUR	Undiscounted
PAX travel time savings	2 410	M EUR	Undiscounted
Travel safety increase	892	M EUR	Undiscounted
Safety improvement	892	M EUR	Undiscounted
Other socio-economic benefits/expenses	2 925	M EUR	Undiscounted
Additional personal transport savings/expenses	2 348	M EUR	Undiscounted
Freight carrier operating profit	1 528	M EUR	Undiscounted
Additional freight transportation savings/expenses	374	M EUR	Undiscounted
PAX carrier operating profit (incl. Shuttle)	307	M EUR	Undiscounted
Bus operating profit loss	-7	M EUR	Undiscounted
Excise tax loss - Bus	-11	M EUR	Undiscounted
Heavy truck operating profit loss	-516	M EUR	Undiscounted
Excise tax loss - Heavy truck	-1 098	M EUR	Undiscounted
Summary socio-economic cash flows			
Net present value (NPV)	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
Socio-economic impact	4 581	M EUR	Discounted
Economic internal rate of return (ERR)	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)

The socio-economic analysis shows that the discounted benefits to cost ratio for the project is above 1, and ERR is well above the 5% benchmark, therefore, the project brings social-added value and is eligible for EU co-financing.

Table 85 PAX travel time savings by source

PAX travel time savings	% of total	Effect, M EUR	Total, M EUR
Bus	13%	305.9	2 410
Car	89%	2 148.6	
Air	-2%	-44.2	

As Rail Baltica, on average, will be travelling faster than buses and cars, there are estimated savings of approximately 2.5 billion EUR from reduced PAX traveling time. However, the overall benefit from PAX time savings is expected to be reduced by planes (due to their faster travelling time), resulting into total savings of 2.4 billion EUR, over the project's life time (see

Table 85).

Table 86 Additional PAX expense savings by source

Additional PAX expense savings	% of total	Effect, M EUR	Total, M EUR
Bus	-2%	-52.1	2 348
Car	74%	1 734.9	
Air	28%	665.1	

In total, PAX traveling by Rail Baltica is estimated to be less expensive than by cars and planes, however, more expensive than by buses. As a result, this is projected to yield 2.3 billion EUR savings, over the project's life time (see Table 86).

Table 87 Freight travel time savings by source

Freight travel time savings	% of total	Effect, M EUR	Total, M EUR
Heavy truck	100%	2 866	2 866

There is an estimated approximately 2.9 billion EUR savings, over the project's life time, from reduced freight travel time savings by switching from heavy trucks to Rail Baltica (see Table 87).

Table 88 Additional Freight expense savings by source

Additional Freight expense savings	% of total	Effect, M EUR	Total, M EUR
Heavy truck	100%	374	374

There is an estimated approximately 0.4 billion EUR savings, over the project's life time, from reduced freight transporting expenses by switching from heavy trucks to Rail Baltica (see Table 88).

Table 89 Climate change reduction by source

Climate change reduction	% of total	Effect, M EUR	Total, M EUR

Bus	0.3%	9.7	3 024
Car	21.2%	641.7	
Air	23.0%	696.5	
Heavy truck	59.2%	1 790.5	
Rail Baltica	-3.8%	-114.3	

As Rail Baltica is more environmentally friendly compared to the other transport modes listed above, it is estimated to yield approximately 1.7 billion EUR savings from climate change reduction, over the Project's life time (Table 89).

Table 90 Air pollution reduction by source

Air pollution reduction	% of total	Effect, M EUR	Total, M EUR
Bus	0.412%	13.5	3 268
Car	7.092%	231.8	
Existing Train	0.002%	0.1	
Air	3.935%	128.6	
Heavy truck	88.559%	2 894.4	
Rail Baltica	0.000%	0.0	

As Rail Baltica will produce no air pollution compared to the other transport modes listed above, it is estimated to yield approximately 3.3 billion EUR savings from reduced air pollution, over the Project's life time (see Table 90).

Table 91 Noise reduction by source

Noise reduction	% of total	Effect, M EUR	Total, M EUR
Bus	0.28%	2.4	843
Car	11.33%	95.5	
Air	3.03%	25.5	
Heavy truck	93.01%	784.2	
Rail Baltica	-7.65%	-64.5	

As Rail Baltica, on average, will generate less noise compared to the other transport modes listed above, it is estimated to yield approximately 0.4 billion EUR savings from reduced noise, over the Project's life time (see Table 91).

Table 92 Improved safety by source

Improved safety	% of total	Effect, M EUR	Total, M EUR
Bus	0.24%	2.2	892
Car	62.21%	555.0	
Heavy truck	38.66%	344.9	
Air	0.17%	1.5	
Rail Baltica	-1.29%	-11.5	

As rail transport mode, on average, yields less accidents compared to the ones above, there is an estimated approximately 0.9 billion EUR net benefit from saved lives (see Table 92).

Table 93 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

The project yields significantly positive ENPV in the Base and High case scenarios (see Table 93). However, the Low case scenario produces ENPV slightly above zero.

10.1.3.9 Cost-benefit result division by countries

Disclaimer

The Global CBA has been prepared and the assumptions/considerations regarding passenger and freight flows and financial operations made with the consideration of single united infrastructure across the Baltic States not as a combination (sum) of national components. Therefore, based on the calculations there is not a single objective criterion or method how to split the results into three separate individual countries. Table 94 is simple arithmetic division of the benefits/costs, but no criterion can be considered as being more appropriate than any other.

Table 94 Cost-benefit summary by countries

			Split by Rail Baltica track distance		
			Estonia	Latvia	Lithuania
		Total	EE allocation	LV allocation	LT allocation
			25%	30%	45%
Funding needs	CAPEX, M EUR	5 788	1 346	1 968	2 474
	National investment, M EUR (undiscounted)	1 155	268	393	493
	National investment, M EUR (discounted)	776	179	266	331
	Initial cash needed for cash balance, M EUR	29	7	9	13
	Additional financing needed for renewable investments, M EUR	534	131	161	242
Socio-economic cash flows	Total net benefits, M EUR (undiscounted)	16 226	3 978	4 895	7 354
	Total net benefits, M EUR (discounted)	4 581	1 123	1 382	2 076
Financial cash flows	Infrastructure manager revenues (undiscounted)	2 613	641	788	1 184
	Infrastructure manager revenues (discounted)	703	172	212	319
	Infrastructure manager OPEX (undiscounted)	2 543	623	767	1 153
	Infrastructure manager OPEX (discounted)	693	170	209	314
	Investment expenses (undiscounted)	5 788	1 346	1 968	2 474
	Investment expenses (discounted)	3 889	896	1 334	1 659
	Other net financial benefits (undiscounted)	1 684	413	508	763
	Other net financial benefits (discounted)	178	44	54	81
Ratios	Undiscounted B/C	2.80	2.96	2.49	2.97
	Discounted B/C	1.19	1.26	1.07	1.25

	Discounted Benefits / National capital invested	5.91	6.28	5.19	6.27
	Undiscounted Benefits/ National capital invested	14.05	14.82	12.47	14.90

10.1.4 Additional quantitative socio-economic benefits

In addition to quantitative socio-economic benefits analysed above and recommended by the CBA guide, recognizing the strategic and economic importance of the project on the local economies, the induced macroeconomic benefits have been calculated and included as an additional scenario to obtain socio-economic resulting indicators with such wider economic benefits.

10.1.4.1 GDP direct/indirect/induced effect from investments during construction phase

Key messages

- Construction projects create three types of effects: direct, indirect and induced which significantly contributes to national GDP and employment

Estimation approach and economic justification

Benefits for the economy caused by the investments made during the railway infrastructure construction phase:

- GDP multiplier values (multiplied by investment amounts realized locally) are the following: direct and indirect effect - 0.59; induced effect - 0.72
- Currently estimated total project costs are 5.8bln EUR.
- For calculation of direct GDP effect, it is necessary to determine the percentage, which will contribute to local GDP from total investments.

Estimation approach

The process of estimating the direct/indirect impact as well as the induced impact is shown in Figure 105.

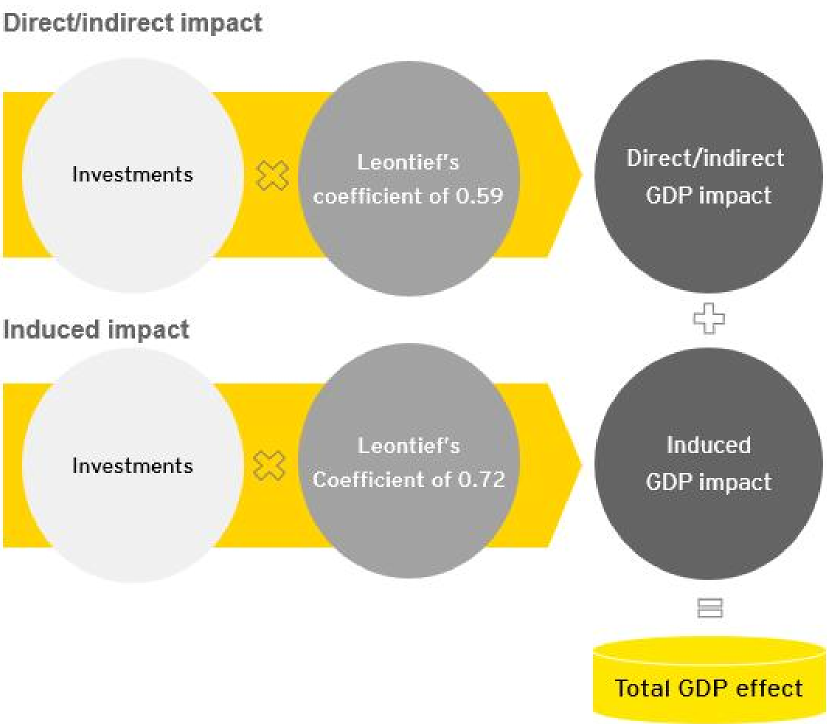

Figure 105 Estimation process

Calculated benefits from direct/indirect and induced effects on GDP are not included in calculations of economic performance indicators. Therefore, calculated benefits serve as an additional information for decision-makers.

10.1.4.2 Income from additional taxes (personal income tax from additional jobs created)

Key messages
- ► The construction phase will drive the increase of employment and increase in tax revenues

Estimation approach and economic justification

Additional income from the increase in PIT collected has been determined, based on the following assumptions:

- Average gross monthly wage for a worker in Estonia, Latvia and Lithuania.
- The Baltic average personal income tax rate of wages and economic activity: 19.33%[223].
- Personal Income Tax per employee EUR 2 196 on average per year.

Estimation approach

The estimation process is shown in Figure 106.

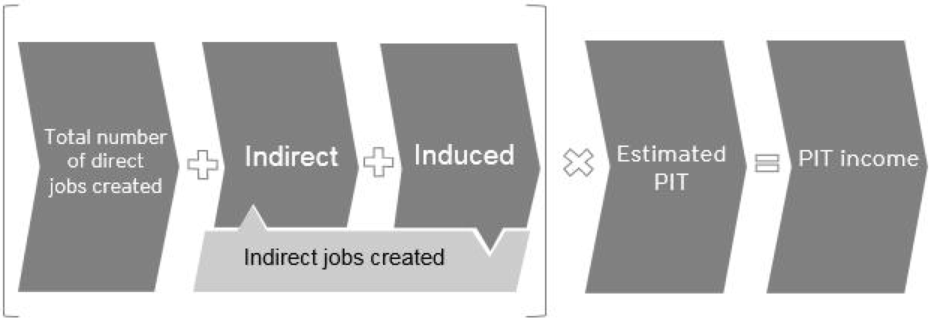

Figure 106 Estimation process

Figure 107 shows that for every 50 direct jobs created, state will increase its personal income tax revenues by EUR 382 104.

Number of construction site workers	Effect type	Coefficient	Jobs created	Total jobs created	Assumed annual PIT per employee	Additional tax income
50	Direct and Indirect	2.39	120			
				174	2 196	382 104
	Induced	2.90	26			

Figure 107 Estimation example

10.1.4.3 New job creation during construction phase, as well as indirect/induced effects

Key messages
- ► Besides the direct jobs created during the construction phase, there is also a significant influence on employment in other related sectors

Estimation assumptions

The total employment effect on the railway sector includes:

- Direct jobs in the construction industry from the investments made in railway infrastructure.
- Indirect jobs in related industries, driven by additional demand for products and services in the construction sector.
- Induced jobs resulting from the economy of additional consumption, driven by direct and indirect jobs.

The employment multiplier values (multiplied by direct jobs created during the construction phase) are 2.39 for the indirect effect and 2.90 for the induced effect.

[223] Section 9.1.2 Financial and socio-economic analysis assumptions

Estimation approach

The estimation process is indicated by Figure 108.

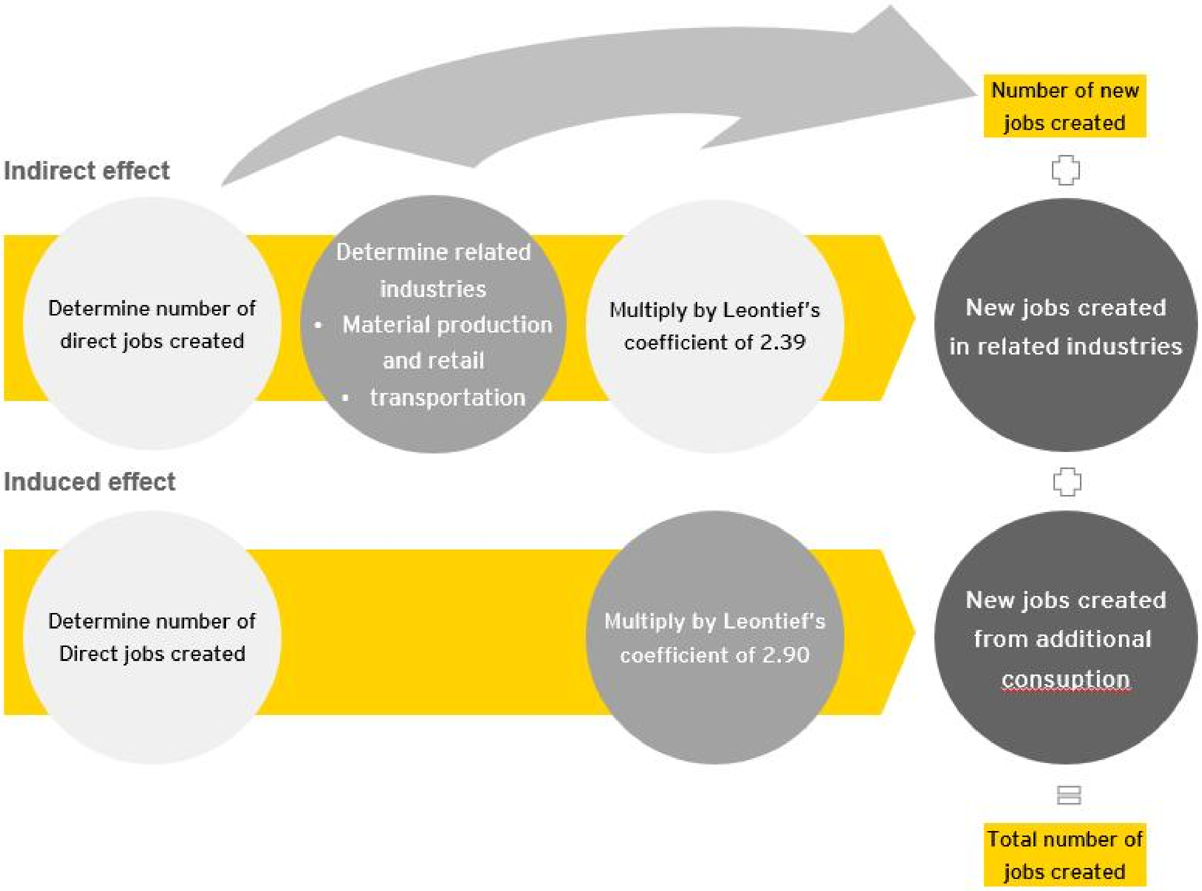

Figure 108 Estimation process

Figure 109 shows that for every 50 construction site jobs created, there are 120 new jobs created in the supporting industries and 145 new jobs created resulting from the economy of additional consumption, driven by direct and indirect jobs.

Number of construction workers	Effect type	Coefficient	Jobs created
50	Indirect	2.39	120
	Induced	2.90	145

Figure 109 Estimation example

11. Risk and sensitivity analysis

11.1 Approach to definition and assessment of risks

Project risk analysis is an integral part of the CBA. Risk analysis allows to determine project's potential risks before they occur and to perform risk mitigation activities.

In the beginning, , applicable risks from the overall risk matrix (full list of relevant risks for various stages of the project) have been identified and analysed. A particular focus has been put to risks and critical factors that are unique for each stage (incl. using the conclusions from sensitivity analysis).

Rail Baltica project is large and technically challenging, and it consists of several critical stages. In each of the project's critical stages there are risks that can substantially affect the Rail Baltica implementation process, as well as risks associated with newly constructed track and related infrastructure operations after the project is completed.

The risk analysis contains the key risks that have been identified during sensitivity analysis and evaluation sessions with stakeholders from RBR and the Steering Committee. Initial list (matrix) of risks for facilitation of discussion has been adopted from EY experience in risk assessment of large infrastructure project.

11.2 Summary of identified potential risks for Rail Baltica project

Table 95 Overall risk matrix of large infrastructure project risks

	Design and planning	Procurement	Construction	Implementation	Operation
Compliance risks	Non-compliance with national and EU laws and regulations, especially TSI Unexpected changes in laws and regulations Non-compliance with agreed internal design standards and guidelines	Non-compliance with national and EU laws and regulations Unexpected changes in laws and regulations Non-compliance with agreed cross-border standards Requirements to receive construction permit have not been met Complication with receipt of necessary permits	Non-compliance with national and EU laws and regulations, especially TSI Unexpected changes in construction laws and regulations Non-compliance with agreed internal design standards and guidelines Non-compliance with technical design	Non-compliance with national and EU laws and regulations, especially TSI Unexpected changes in construction laws and regulations Non-compliance with agreed internal design standards and guidelines Issues with testing and warranty wording in construction contracts	Unexpected changes in laws and regulations Non-compliance with TSI for railway operations Issues with the formulation in contracts with railway undertakings on infrastructure access
Technical/operational risks	Delay of completion due to prolonged cross-border agreement on specific details Technical design errors Technical design includes outdated technologies/design elements	Tender dossier not aligned with technical design Unreasonable qualification and selection criteria of participants Unclear qualification and selection criteria of participants Suboptimal procurement structure and procedure is applied Complaints from participants delay the signing of construction contract	Errors and lack of required level of detail in the technical design Delay of completion due to prolonged cross-border agreement on specific details Delay of completion due to complications or delays in land expropriation Difficulties with access to construction sites Environment and climate impact Interruptions in material and labour logistics Application of inappropriate technologies Force majeure Mismatch (both in terms of time and alignment) of access lines to high voltage network Inadequate competency of general contractor or specialists Cross-border integration of construction process	Defects detected during testing Delay of completion due to prolonged cross-border agreement on specific details Problems with cross-border operation of the line Certification is delayed	Defects appear that were missed during implementation phase Service level does not meet expected parameters (speed/ capacity etc.) Lack of available labour for infrastructure maintenance and operation Infrastructure does not meet the quality requirements of railway undertakings

	Design and planning	Procurement	Construction	Implementation	Operation
Financial risks	Choice of technical solution is not optimal from economic / LCC viewpoint Increase in estimated CAPEX Lower than needed financing from public sources Delayed confirmation of co-financing from public sources Certain share of costs are determined as non-eligible costs and financial corrections are made (local/ EU level)	Construction contract does not appropriately transfer risks to the contractor Lower than needed financing from public sources Increase in estimated CAPEX	General or sub-contractors cannot fulfil contract obligations Potential losses related to disruption of existing rail and road traffic Unexpected additional CAPEX Increase in estimated CAPEX Lower than needed financing from public sources Certain share of costs are determined as non-eligible costs and financial corrections are made (local/ EU level)	Delay of opening the track for operation due to technical reasons (delay of operating revenue) Changes in market environment and cargo flows relevant for Rail Baltica	Increase in estimated reinvestment and OPEX Lower competitive position of Rail Baltica than expected vs road and sea transport Lack of operating subsidies for the first years of operation Changes in market environment and cargo flows relevant for Rail Baltica Rail freight and passenger carrier entrance in the market slower then expected Market uptake curve slower than expected
Strategic risks	Changes in project's vision and strategic considerations Change in political environment Inadequate and/ or not optimum project management structure Best infrastructure management model not implemented Insufficient stakeholder involvement Key decisions by governments delayed	Changes in project's vision and strategic considerations Project's economic justification is challenged Political interests affect the procurement process Inadequate and/ or not optimum project management structure (especially legal competence in this stage) Best infrastructure management model not implemented Insufficient stakeholder involvement Key decisions by governments delayed	Changes in economic environment of the Baltics Decrease in estimated demand for Rail Baltica services Changes in project's vision and strategic considerations Project's economic justification is challenged Inadequate and/ or not optimum project management structure (especially technical competence in this stage) Change in political environment Complaints from population directly affected by construction process Best infrastructure management model not implemented Insufficient stakeholder involvement Key decisions by governments delayed	Changes in project's vision and strategic considerations Project's economic justification is challenged Inadequate and/ or not optimum project management structure (especially technical and market competence in this stage) Change in political environment Best infrastructure management model not implemented Insufficient stakeholder involvement Key decisions by governments delayed	Decrease in demand Expected operation levels are not met Complaints and counterproductive actions from competing modes of transport Changes in project's vision and strategic considerations Best infrastructure management model not implemented Insufficient stakeholder involvement Key decisions by governments delayed

11.3 Sensitivity analysis

In line with methodology described above, sensitivity analysis consists of assessment of the impact of variations of isolated variables (such as the amount of total CAPEX, cost and revenue rates etc.) as well as several sensitivity scenarios. The list of sensitivity scenarios is presented below:

- Variations in CAPEX:
  - Change of CAPEX schedule (prolongation, more intensive works initially).
  - Reduction of the share of local works in total CAPEX due to overlap with other major construction projects and limited capacity of local construction industries.
- Variations in freight and passenger demand:
  - Maximum potential scenario:

    The scenario encompasses a combination of potential positive developments that both drive the demand of transportation services in the region and North-South axis and increase the willingness of users to choose Rail Baltica over competing modes of transport. Potential developments include:

    1) fully commercialized Arctic corridor.
    2) e-commerce air-rail development (in the form of direct long-haul e-commerce air freight connections between Asia and the Baltic States with appropriate scale for Rail Baltica).
    3) Baltic States emerge as alternatives to the Brest (BY)/Małaszewicze (PL) route along the Russia/CIS/Central Asia/East Asia - Europe corridors, i.e. routing trains via Tallinn/Riga/Kaunas, used as regional consolidation and distribution hubs to serve Scandinavia by sea/road and Baltics & CEE by Rail Baltica.
  - Minimum potential scenario:

    The scenario encompasses a combination of potential adverse developments that act contrary to maximum potential scenario. Potential developments include disintegrated supply chains in the region that do not allow achievement of appropriate scale for Rail Baltica services as well as a lack of coordinated and impactful environmental actions by the EU to achieve parity across different competing transport modes. No induced demand is also assumed for the scenario.
- Variations in socio-economic gain parameters:
  - Reduction of value of time savings due to potentially lower number of business segment passengers and improvements in competing modes of transport that allow more productive time in journeys with car (e.g. driverless technologies), bus or airplane.

The sensitivity analysis is carried out by varying one variable at the time (in tables- described as change) and determining the effect of that change to financial and economic analysis outputs. The following tables represent the effects from each variable (see Table 96 to Table 107).

Table 96 CAPEX change sensitivity

Change	Value. M EUR	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)
50%	8 682	-5 931	-791	0.88	28.61
40%	8 103	-5 536	-457	0.93	28.61
30%	7 525	-5 141	-123	0.98	28.61
20%	6 946	-4 750	209	1.04	28.61
10%	6 367	-4 352	545	1.11	28.61
0%	5 788	-3 957	879	1.19	28.61
-10%	5 209	-3 563	1 213	1.29	28.61
-20%	4 630	-3 168	1 548	1.41	28.61
-30%	4 052	-2 773	1 882	1.55	28.61
-40%	3 473	-2 382	2 213	1.73	28.61
-50%	2 894	-1 985	2 549	1.97	28.61

Table 97 Other costs (as % of total maintenance expenses for the infrastructure manager)

Change	Value. %	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)
50%	40%	-3 981	764	1.16	50.24
40%	36%	-3 976	787	1.17	45.88
30%	32%	-3 971	810	1.17	41.51
20%	28%	-3 967	833	1.18	37.15
10%	24%	-3 962	856	1.19	32.78
0%	20%	-3 957	879	1.19	28.61
-10%	16%	-3 953	902	1.20	25.43
-20%	12%	-3 950	926	1.20	22.24
-30%	8%	-3 946	949	1.21	19.06
-40%	4%	-3 942	972	1.22	15.87
-50%	0%	-3 939	995	1.22	12.69

Table 98 Business value of time sensitivity

Change	Value, EUR/min	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)
50%	0.64	-3 957	1 034	1.23	28.61
40%	0.60	-3 957	1 003	1.22	28.61
30%	0.55	-3 957	972	1.21	28.61
20%	0.51	-3 957	941	1.21	28.61
10%	0.47	-3 957	910	1.20	28.61
0%	0.43	-3 957	879	1.19	28.61
-10%	0.38	-3 957	848	1.19	28.61
-20%	0.34	-3 957	817	1.18	28.61
-30%	0.30	-3 957	787	1.17	28.61
-40%	0.26	-3 957	756	1.17	28.61
-50%	0.21	-3 957	725	1.16	28.61

Table 99 Private value of time sensitivity

Change	Value,	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M

	EUR/min				EUR)
50%	0.29	-3 957	1 419	1.31	28.61
40%	0.27	-3 957	1 311	1.29	28.61
30%	0.25	-3 957	1 203	1.26	28.61
20%	0.23	-3 957	1 095	1.24	28.61
10%	0.21	-3 957	987	1.22	28.61
0%	0.19	-3 957	879	1.19	28.61
-10%	0.18	-3 957	771	1.17	28.61
-20%	0.16	-3 957	663	1.14	28.61
-30%	0.14	-3 957	556	1.12	28.61
-40%	0.12	-3 957	448	1.10	28.61
-50%	0.10	-3 957	340	1.07	28.61

Table 100 Minimum infrastructure charge sensitivity

Change	Value, %	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)
50%	45%	-3 953	879	1.19	21.17
40%	42%	-3 954	879	1.19	22.66
30%	39%	-3 955	879	1.19	24.15
20%	36%	-3 956	879	1.19	25.64
10%	33%	-3 956	879	1.19	27.12
0%	30%	-3 957	879	1.19	28.61
-10%	27%	-3 958	879	1.19	30.10
-20%	24%	-3 959	879	1.19	31.58
-30%	21%	-3 960	879	1.19	33.07
-40%	18%	-3 961	879	1.19	34.56
-50%	15%	-3 962	879	1.19	36.05

Table 101 Passenger carrier base tariff sensitivity

Change	Value, EUR/pkm	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)
50%	0.157	-3 924	1 114	1.24	19.40
40%	0.146	-3 924	1 067	1.23	19.40
30%	0.136	-3 927	1 020	1.22	19.40
20%	0.125	-3 932	973	1.21	24.08
10%	0.115	-3 939	926	1.20	26.29
0%	0.104	-3 957	879	1.19	28.61
-10%	0.094	-4 016	832	1.18	84.71
-20%	0.084	-4 023	785	1.17	88.87
-30%	0.073	-4 023	738	1.16	88.87
-40%	0.063	-4 023	691	1.15	88.87
-50%	0.052	-4 023	644	1.14	88.87

Table 102 Freight carrier base tariff sensitivity

Change	Value, EUR/tkm	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)
50%	0.060	-3 950	1 785	1.39	16.49

40%	0.056	-3 950	1 604	1.35	16.49
30%	0.052	-3 950	1 423	1.31	16.49
20%	0.048	-3 951	1 242	1.27	18.02
10%	0.044	-3 953	1 061	1.23	20.81
0%	0.040	-3 957	879	1.19	28.61
-10%	0.036	-3 967	698	1.15	44.24
-20%	0.032	-4 053	517	1.11	135.15
-30%	0.028	-4 265	336	1.07	553.41
-40%	0.024	-4 475	155	1.03	967.97
-50%	0.020	-4 570	-27	0.99	1 158.18

Table 103 Passenger base flow sensitivity[224]

Change	Value, %	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)
50%	50%	-3 924	2 359	1.52	19.40
40%	40%	-3 924	2 063	1.45	19.40
30%	30%	-3 926	1 767	1.39	19.40
20%	20%	-3 931	1 471	1.32	23.19
10%	10%	-3 938	1 175	1.26	25.75
0%	0%	-3 957	879	1.19	28.61
-10%	-10%	-4 016	583	1.13	84.71
-20%	-20%	-4 023	287	1.06	88.87
-30%	-30%	-4 023	-9	1.00	88.87
-40%	-40%	-4 023	-305	0.93	88.87
-50%	-50%	-4 023	-600	0.87	88.87

Table 104 Freight base flow sensitivity[225]

Change	Value, %	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)
50%	50%	-3 950	2 718	1.59	16.49
40%	40%	-3 950	2 350	1.51	16.49
30%	30%	-3 950	1 982	1.43	16.49
20%	20%	-3 951	1 615	1.35	18.02
10%	10%	-3 953	1 247	1.27	20.81
0%	0%	-3 957	879	1.19	28.61
-10%	-10%	-3 967	512	1.11	44.24
-20%	-20%	-4 053	144	1.03	135.15
-30%	-30%	-4 265	-224	0.95	553.41
-40%	-40%	-4 475	-591	0.87	967.97
-50%	-50%	-4 570	-959	0.79	1 158.18

Table 105 Passenger induced flow sensitivity

Change	Value, %	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)

224 Flows + 30% represent the maximum potential scenario
225 Flows + 30% represent the maximum potential scenario

50%	50%	-3 924	1 273	1.28	19.40
40%	40%	-3 925	1 185	1.26	19.40
30%	30%	-3 929	1 098	1.24	20.37
20%	20%	-3 935	1 011	1.22	24.08
10%	10%	-3 941	923	1.20	27.75
5%	5%	-3 957	879	1.19	28.61

Table 106 Freight induced flow sensitivity

Change	Value, %	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)
50%	50%	-3 950	1 786	1.39	16.49
40%	40%	-3 950	1 605	1.35	16.49
30%	30%	-3 950	1 423	1.31	16.49
20%	20%	-3 951	1 242	1.27	18.02
10%	10%	-3 953	1 061	1.23	20.81
0%	0%	-3 957	879	1.19	28.61

Table 107 Value of life sensitivity

Change	Value, EUR	FNPV (M EUR)	ENPV (M EUR)	B/C	Additional financing needed (M EUR)
50%	2 027 920	-3 957	996	1.22	28.61
40%	1 892 726	-3 957	973	1.21	28.61
30%	1 757 531	-3 957	949	1.21	28.61
20%	1 622 336	-3 957	926	1.20	28.61
10%	1 487 142	-3 957	903	1.20	28.61
0%	1 351 947	-3 957	879	1.19	28.61
-10%	1 216 752	-3 957	856	1.19	28.61
-20%	1 081 558	-3 957	833	1.18	28.61
-30%	946 363	-3 957	809	1.18	28.61
-40%	811 168	-3 957	786	1.17	28.61
-50%	675 973	-3 957	763	1.17	28.61

Sensitivity analysis enables the identification of the variables, which have the largest impact of the project’s financial and/or economic performance. In order to estimate by how much the variable must fall in order for the net economic present value of the project to become zero, switching value analysis is applied (see Table 108).

Table 108 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 base tariff	n/a	n/a
Freight carrier base tariff	0.0207	-49%
PAX base flow change	-29.71%	-29.71%

Freight base flow change	-23.92%	-23.92%

The scenario analysis indicates the change of key CBA indicators, in case of the emergence of various future scenarios (see Table 109).

Table 109 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
Historic infrastructure charge principles (full cost)	-3 902	879	1.19	92.9%	0.00
Real GDP per capital 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
GDP multiplier effect is added	-3 957	2 027	1.44	94.2%	28.61
GDP multiplier effect is added (with local 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:

- Although the project is robust to isolated drop in passenger or freight flows of up to 30%, the combined effect of both segments reducing simultaneously reduced the resilience significantly (ENPV becomes negative at combined reduction of 20%).
- 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. This is particularly important in the case of Low case scenario, where the increase of CAPEX mustn't exceed 1% in order to keep ENPV positive. Comparable effect is observable if looking at the combined effect of freight flow reduction by 20% and CAPEX increase.
- 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 historic "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.

11.4 Risk assessment

► Key identified risks that can be only partially mitigated are Increase in CAPEX, delayed construction and start of operation, lack or delay of public sources of financing (especially EU co-financing), and change in market conditions (adverse fluctuations in the overall passenger and freight flows and the uptake schedule)

The Table 110 presents the results of the qualitative risk analysis – only the risks with the highest combined impact have been included in the table.

Table 110 Risk analysis output table

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
Construction planning & design								
1	Construction planning & design	Finance	Underestimated costs	Moderate	Moderate	High	Update the CBA or other planning documents to assess the impact and viability of the project if additional funding is required. Collaborate with technical experts to understand the possibility of optimizing the CAPEX or staging the project, such as, delaying some part of the CAPEX until the period when the full market potential is acquired (i.e., not all elements required to the full capacity in the first years of operation). Seek additional funding for the additional costs that cannot be optimized, staged or avoided.	Medium
2			Economic feasibility of the project is questioned	High	Low	Moderate	CBA needs to be updated before key steps of project implementation and implications explained to the stakeholders	Low
3		Technical / operational	Delayed joint technical conditions	Moderate	Moderate	Moderate	Perform consultation with EUAR during ToR preparation, gathering EUAR approval before any ToRs are developed. Also perform step-by-step acceptance of on key the key technical elements that have the highest impact on first sections to be designed to mitigate errors.	Low
4		Compliance	Unexpected changes in legislation and requirements	Low	Moderate	Moderate	Maintain communication with national and EU level bodies to monitor the proposed changes in the legislation and assess the impact on project implementation and plan adequate contingencies for the project schedule.	Low

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
5			Rail design guidelines are of poor quality and delayed	Low	Moderate	Moderate	Perform consultation with EUAR during ToR preparation, gathering EUAR approval before any ToRs are developed. Also perform step-by-step acceptance of guidelines to mitigate errors.	Low
6			Railway safety concept is poorly developed	Low	Moderate	Moderate	Consultation with EUAR (during ToR preparation), gathering EUAR approval, step-by-step acceptance of guidelines	Low
7			Rail infrastructure needs & requirements poorly understood	Low	Moderate	Moderate	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements.	Low
8			Poor quality guidelines for required tests to commission the railway	Low	Moderate	Moderate	Consultation with EUAR (during ToR preparation), gathering EUAR approval, step-by-step acceptance of guidelines	Low
9			Poor railway management systems	Low	Low	Moderate	Deployment of specialized systems/IT solutions (already envisaged as a part of CEF3 activities)	Low
10		Strategic	Changes in political environment	Moderate	Moderate	High	Establish intergovernmental agreements that limit the impact of short-term political situation on the project process. Update CBA regularly so that understandable messages/implications for political stakeholders can be provided.	Low

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
11		Strategic	Economic feasibility of the project is affected by changes of scope of the Project	High	High	High	CBA needs to be updated before key steps of project implementation and implications explained to the stakeholders	Medium
12		Strategic	Environmental issues	Moderate	Moderate	Moderate	Attract experienced expertise from the EU Railway area to assist with environmental procedures. Allow appropriate contingency in the schedule for environmental issues.	Low
13		Finance	Land acquisition	High	High	High	Attract experienced local (incl. legal) expertise to assist with land acquisition procedures. Allow appropriate contingency in the schedule for land acquisition. For cases that endanger the overall project completion evaluate the option of negotiation to acquire the land for the value above the market price (as a non-eligible cost) if such option outweighs the lost benefits of project delay	Low
14		Strategic	Delayed decision making on the infrastructure management model	High	Moderate	High	Attract experienced expertise from the EU Railway area to assess the implications of the infrastructure management from the passenger/freight railway undertaking perspective. Ensure that irrespective of the infrastructure management model the railway undertakings will have "one-stop-agency" to contact for matters related to the whole infrastructure	Low
15		Strategic	Delayed and insufficient commercialization	Moderate	High	High	The project should aim to promote the highest standards of the EU railway legislation (including the 4th Railway Package) and unimpeded market access in a view of an efficient functioning of the Single European Railway Area and Single European Market, as well as seek involvement from the EU authorities if infringement risks are evident.	Medium

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
16		Finance	Insufficient funding and mandate of the joint venture	Moderate	High	High	Attract experienced expertise from the EU Railway area to assess the implications of the lack of joint project management body. Establish intergovernmental agreements that limit the impact of short-term political subjective impact on the project governance process.	Medium
17	CAPEX estimation and approval	Finance	Underestimated costs	High	Moderate	High	Update the CBA or other planning documents to assess the impact and viability of the project if additional funding is required. Collaborate with technical experts to understand the possibility of optimizing the CAPEX or staging the project, such as, delaying some part of the CAPEX until the period when the full market potential is acquired (i.e., not all elements required to the full capacity in the first years of operation). Seek additional funding for the additional costs that cannot be optimized, staged or avoided.	Medium

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
18		Strategic	Delayed and insufficient commercialization	Moderate	High	High	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements. Seek possibilities to adjust the capacity and maintenance costs of the infrastructure to the actual	Medium
19		Finance	Insufficient funding and mandate of the joint venture	Moderate	High	High	Attract experienced expertise from the EU Railway area to assess the implications of the lack of joint project management body. Establish intergovernmental agreements that limit the impact of short-term political subjective impact on the project governance process.	Medium

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
Construction works procurement								
20	Construction procurement	Compliance	Procurement documentation risks	Moderate	Moderate	Moderate	Attract experienced expertise from the EU Railway area to assist with procurement documentation preparation. Allow appropriate contingency in the schedule for potential disputes.	Low
21			Lack of expertise in the procurement assessment	Low	Moderate	Moderate	Attract experienced expertise from the EU Railway area to assist with procurement documentation preparation. Allow appropriate contingency in the schedule for potential disputes.	Low
22		Finance	EU Co-financing is delayed or not available	Moderate	High	High	Update the CBA or other planning documents to assess the impact and viability of the project if additional funding from national or loan sources is required. Collaborate with technical experts to understand the possibility of optimizing the CAPEX or staging the project, such as, delaying the procurement of some parts of the CAPEX until the period when the full market potential is acquired (i.e., not all elements required to the full capacity in the first years of operation). Seek additional national funding for the additional costs that cannot be optimized, staged or avoided.	High
23		Strategic	Delayed and insufficient commercialization	Moderate	High	High	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements. Seek possibilities to adjust the capacity and maintenance costs of the	Low

No.	Project’s phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
							infrastructure to the actual	
24		Finance	Insufficient funding and mandate of the joint venture	Moderate	High	High	Attract experienced expertise from the EU Railway area to assess the implications of the lack of joint project management body. Establish intergovernmental agreements that limit the impact of short-term political subjective impact on the project governance process.	Medium
Construction								
25	Track construction	Strategic	Economic feasibility of the project is questioned	Moderate	Low	Moderate	CBA needs to be updated before key steps of project implementation and implications explained to the stakeholders	Low
26			Stakeholders dissatisfied with the project implementation	Moderate	Low	Moderate	Update CBA regularly so that understandable messages/implications for stakeholders can be provided.	Low
27		Finance	EU maximum possible cofinancing rate is significantly reduced in the new planning period	Very High	Very High	Very high	Update the CBA or other planning documents to assess the impact and viability of the project if additional funding from national or loan sources is required (introduce new technical/operational options, if needed). Collaborate with technical experts to understand the possibility of optimizing the CAPEX or staging the project, such as, delaying the procurement of some parts of the CAPEX until the period when the full market potential is acquired (i.e., not all elements required to the full capacity in the first years	High

No.	Project’s phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
							of operation). Seek additional national funding for the additional costs that cannot be optimized, staged or avoided.	
28		Strategic	Delayed and insufficient commercialization	Moderate	High	High	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements. Seek possibilities to adjust the capacity and maintenance costs of the infrastructure to the actual	Medium
29		Finance	Insufficient funding and mandate of the joint venture	Moderate	High	High	Attract experienced expertise from the EU Railway area to assess the implications of the lack of joint project management body. Establish intergovernmental agreements that limit the impact of short-term political subjective impact on the project governance process.	Medium
30	Stations (and other non-track objects e.g. depots) construction	Technical / operational	Poor quality of technical design	Moderate	Moderate	Moderate	Attract experienced expertise from the EU Railway area to assist with the review and acceptance of technical design, especially complex objects. Allow appropriate time contingency to review and accept the technical design.	Low
31			Unforeseen issues not addressed in the technical design	Moderate	Moderate	Moderate	Closely monitor the project implementation schedule, especially critical elements that have higher risk of the delay due to unforeseen issues (complex construction areas, objects that influence the operations of 3rd parties (such as existing railways, public utilities etc.)). If delay is inevitable, ensure that the core infrastructure is in	Low

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
							place by the end of 2025 so that the market potential uptake level can be pursued (i.e., not all elements required to the full capacity in the first years of operation).	
32			Delayed construction	High	Moderate	High	Closely monitor the project implementation schedule, especially critical elements that have higher risk of delay (complex construction areas, areas of potential land acquisition disputes etc.). If delay is inevitable, ensure that the core infrastructure is in place by the end of 2025 so that the market potential uptake level can be pursued (i.e., not all elements required to the full capacity in the first years of operation).	Medium
33			Construction materials sourcing issues	Low	Low	Moderate	Material sourcing studies to be conducted, putting emphasis on objects that are expected to be most complex in terms of material requirement and access to construction site	Low
34		Finance	Poor construction delivery from contractors	Moderate	Moderate	High	Ensurance of proper appointment of construction supervisor (procurement procedure that ensures appropriate skills & experience). During construction align supervisory activities to mitigate the risk.	Medium

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
35			Underestimated costs	Moderate	Moderate	High	Update the CBA or other planning documents to assess the impact and viability of the project if additional funding is required. Ensure appropriate contingency reserve that matches the technical complexity of the particular objects. Collaborate with technical experts to understand the possibility of optimizing the CAPEX or staging the project, such as, delaying some part of the CAPEX until the period when the full market potential is acquired (i.e., not all elements required to the full capacity in the first years of operation). Seek additional funding for the additional costs that cannot be optimized, staged or avoided.	Low
36			EU Co-financing is delayed or not available	Moderate	High	High	Update the CBA or other planning documents to assess the impact and viability of the project if additional funding from national/municipal or loan sources is required. Collaborate with technical experts to understand the possibility of optimizing the CAPEX or staging the project, such as, delaying some part of the CAPEX until the period when the full market potential is acquired (i.e., not all elements required to the full capacity in the first years of operation). Seek additional national/municipal funding for the additional costs that cannot be optimized, staged or avoided.	Medium
37		Strategic	Economic feasibility of the project is questioned	Moderate	Low	Moderate	CBA needs to be updated before key steps of project implementation and implications explained to the stakeholders	Low

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
38			Changes in political environment	Moderate	Moderate	Moderate	Establish intergovernmental agreements that limit the impact of short-term political situation (especially on the municipal level) on the project process. Update CBA regularly so that understandable messages/implications for political stakeholders can be provided, in this case with particular emphasis on local induced/catalytic effects of the terminals or depots.	Low
39			Stakeholders dissatisfied with the project implementation	Moderate	Low	Moderate	CBA needs to be updated before key steps of project implementation and implications explained to the stakeholders	Low
40		Strategic	Delayed and insufficient commercialization	Moderate	High	High	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements. Seek possibilities to adjust the capacity and maintenance costs of the infrastructure to the actual	Medium
41		Finance	Insufficient funding and mandate of the joint venture	Moderate	High	High	Attract experienced expertise from the EU Railway area to assess the implications of the lack of joint project management body. Establish intergovernmental agreements that limit the impact of short-term political subjective impact on the project governance process.	Medium

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
Infrastructure testing and entry into operation								
42	Infrastructure testing & entry into operation	Compliance	Changes in legislation and requirements	Moderate	Moderate	Moderate	Maintain communication with national and the EU level bodies to monitor the proposed changes in the legislation and assess the impact on infrastructure entry into operation and perform corrective actions during the design and construction phases to ensure adequate entry into operation.	Low
43		Technical / operational	Defects found during testing	Moderate	Moderate	Moderate	Plan the project implementation schedule considering appropriate testing contingency from the experience from comparable complexity projects, especially critical elements that have higher risk of the delay due to defects found during testing (complex construction areas, objects that influence the operations of 3rd parties (such as existing railways, public utilities etc.)). If delay is inevitable, ensure that the core infrastructure is in place by the end of 2025 so that the market potential uptake level can be pursued (i.e., not all elements required to the full capacity in the first years of operation).	Low
44		Finance	Underestimated testing costs	Moderate	Low	Moderate	Plan the project implementation budget considering appropriate testing contingency from the experience from comparable complexity projects.	Low

No.	Project’s phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
45			Project commissioning is delayed	Moderate	Moderate	High	Closely monitor the project implementation schedule, especially critical elements that have higher risk of the delay of commissioning (complex construction areas, objects that influence the operations of 3rd parties (such as existing railways, public utilities etc.)). If delay is inevitable, ensure that the core infrastructure is in place by the end of 2025 so that the market potential uptake level can be pursued (i.e., not all elements required to the full capacity in the first years of operation).	Low
46		Strategic	Project’s economic feasibility is questioned	Low	Low	Moderate	Update CBA regularly so that understandable messages/implications for stakeholders can be provided.	Low
47		Strategic	Delayed and insufficient commercialization	Moderate	High	High	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements. Seek possibilities to adjust the capacity and maintenance costs of the infrastructure to the actual	Medium
48		Finance	Insufficient funding and mandate of the joint venture	Moderate	High	High	Attract experienced expertise from the EU Railway area to assess the implications of the lack of joint project management body. Establish intergovernmental agreements that limit the impact of short-term political subjective impact on the project governance process.	Medium
49	Commencement of operations by carriers	Technical / operational	Rolling stock is defected	Low	Moderate	Moderate	Conduct studies, prepare for construction period	Low

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
50			Insufficient capacity of equipment/depot & other infrastructure	Low	Moderate	Moderate	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements.	Low
51			Rolling stock n/a or acquired with delay	Moderate	Moderate	Moderate	Identify the source of rolling stock during business plan and commercialization study, allowing time buffer of 36 months to procure rolling stock as a fallout option	Low
52		Strategic	Adverse macroeconomic changes that impact the financial performance of the project	Moderate	Moderate	Moderate	Conduct commercialization study that would specify the sensitivity of particular freight/passenger segments to macroeconomic changes. Agree with national bodies on potential flexibility to provide discounts to particular segments on the basis that the revenue from attracted traffic exceeds the opportunity cost (i.e., maintaining the infrastructure with reduced traffic)	Medium
53			Economic feasibility of the project is questioned	Moderate	Low	Moderate	CBA needs to be updated before key steps of project implementation and implications explained to the stakeholders	Low
54		Strategic	Economic feasibility of the project is affected by market competition	High	High	High	Conduct commercialization study that would specify the sensitivity of particular freight/passenger segments to competition. Agree with national bodies on potential flexibility to provide discounts to particular segments on the basis that the revenue from attracted traffic exceeds the opportunity cost (i.e., maintaining the infrastructure with reduced traffic). Ensure that the project is economically viable even with low freight/passenger flow scenario	Medium

No.	Project’s phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
55		Strategic	Economic feasibility of the project is affected by inadequacy of initial financial assumptions and parameters	High	High	High	Conduct commercialization study that would specify the sensitivity of particular freight/passenger segments to cost of operations. Agree with national bodies on potential flexibility to provide discounts to particular segments on the basis that the revenue from attracted traffic exceeds the opportunity cost (i.e., maintaining the infrastructure with reduced traffic)	Medium
56		Strategic	Delayed and insufficient commercialization	Moderate	High	High	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements. Seek possibilities to adjust the capacity and maintenance costs of the infrastructure to the actual	Medium
57		Finance	Insufficient funding and mandate of the joint venture	Moderate	High	High	Attract experienced expertise from the EU Railway area to assess the implications of the lack of joint project management body. Establish intergovernmental agreements that limit the impact of short-term political subjective impact on the project governance process.	Medium
Operation								
58	Operating activities	Technical / operational	Not all defects identified during the testing	Low	Moderate	Moderate	External supervision, guarantee period	Low

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
59			Insufficient equipment for maintenance works	Low	Low	Low	Conduct infrastructure maintenance study with particular emphasis on the first years of operation that are the most sensitive to such risks. Consider cooperation with the infrastructure managers in the EU Railway area.	Low
60		Finance	Underestimated operating costs of the carriers	Moderate	Moderate	Moderate	Conduct commercialization study that would specify the sensitivity of particular freight/passenger segments to cost of operations. Agree with national bodies on potential flexibility to provide discounts to particular segments on the basis that the revenue from attracted traffic exceeds the opportunity cost (i.e., maintaining the infrastructure with reduced traffic)	Low
61		Strategic	Stakeholders dissatisfied with the results of the implemented project (technical capacities, operating parameters: speed, frequency, etc.)	Moderate	Low	Moderate	Collaborate with technical experts and stakeholders during the planning phase to understand the reuirements and the possibility of optimizing the CAPEX or staging the project, such as, delaying some part of the CAPEX until the period when the full market potential is acquired (i.e., not all elements required to the full capacity in the first years of operation).	Low
62		Strategic	Competition with existing railway network	High	High	High	Conduct commercialization study that would specify the sensitivity of particular freight/passenger segments to competition. Agree with national bodies on potential flexibility to provide discounts to particular segments on the basis that the revenue from attracted traffic exceeds the opportunity cost (i.e., maintaining the infrastructure with reduced traffic). Ensure that the project is economically viable even with low freight/passenger flow scenario	Low

No.	Project's phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
63		Strategic	Lack of interest by carriers or clients to use Rail Baltica due to various reasons	Moderate	Very High	High	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements.	Low
64		Strategic	New technology and Norms	High	Moderate	High	Collaborate with relevant education institutions to develop educational programmes timely (36 months before commencement of operations). Allow operations of the carriers from the EU railway area	Low
65		Strategic	Delayed and insufficient commercialization	Moderate	High	High	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements. Seek possibilities to adjust the capacity and maintenance costs of the infrastructure to the actual	Medium
66		Strategic	Legacy infrastructure managers' resistance and home market protectionism	High	High	High	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements. Focus initial efforts on the freight that does not require intermodal loading between 1435mm and 1520mm systems	Low
67		Finance	Insufficient funding and mandate of the joint venture	Moderate	High	High	Attract experienced expertise from the EU Railway area to assess the implications of the lack of joint project management body. Establish intergovernmental agreements that limit the impact of short-term political subjective impact on the project governance process.	Medium

No.	Project’s phase	Risk category	Risk	Probability	Severity	Risk level	Mitigation measures	Residual Risk
68	Infrastructure and rolling stock maintenance	Technical / operational	Shortages of skilled labour for operation/ maintenance	Moderate	Moderate	Moderate	Collaborate with relevant education institutions to develop educational programmes timely (36 months before commencement of operations). Allow operations of the carriers from the EU railway area	Low
69		Finance	Underestimated maintenance costs	Moderate	Moderate	Moderate	Conduct infrastructure maintenance study with particular emphasis on the first years of operation that are the most sensitive to the potential need of financing.	Low
70		Strategic	Delayed and insufficient commercialization	Moderate	High	High	Conduct commercialization study that would specify the needs of particular freight/passenger segments. Conduct pilot projects (shipments using existing network) to identify the practical needs & requirements. Seek possibilities to adjust the capacity and maintenance costs of the infrastructure to the actual	High
71		Finance	Insufficient funding and mandate of the joint venture	Moderate	High	High	Attract experienced expertise from the EU Railway area to assess the implications of the lack of joint project management body. Establish intergovernmental agreements that limit the impact of short-term political subjective impact on the project governance process.	Low

During risk analysis, the following risks have been identified to affect the project the most:

- Increase in CAPEX.
- Delayed construction and start of operation.
- Lack or delay of public sources of financing.
- Change in market conditions.

12. Conclusions and recommendations

12.1 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.

12.2 Recommendations

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 logistics centres) as the potential of freight flows uptake can only be achieved with the well-functioning ecosystem of logistics infrastructure and solutions provide competitive 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 implementation and capture of the potential benefits while keeping costs at the expected levels.

13. Appendix

13.1 Expected developments in the do-nothing option

13.1.1 Evaluation of described factors compare between transportation types

13.1.1.1 Lithuania

Key messages

- Current Lithuania's passenger and cargo rail transportation links with Latvia and Poland are relatively weak
- Lithuania has well developed road network, with significant internal traffic between key population centres
- There are four international airports in Lithuania, and airport infrastructure can be characterized as average in terms of infrastructure development
- Lithuania has a single port, which is located in Klaipeda, and it serves as the main sea transportation hub in Lithuania

The evaluation factors of compared transport types in Lithuania are shown in Table 111

Table 111 Evaluation of factors, compared to transportation types in Lithuania

Factors	Rail	Road	Air	Sea	Notes
Transport Volumes	++	+++	++	n/a	Road has the highest freight and passenger transportation volumes
Transit Time	++	++	+++	n/a	Air transportation has the shortest traveling time
Availability	++	+++	++	n/a	Road transportation is most frequent in term of daily transportation services
Punctuality	+++	++	+++	n/a	Air and Rail has the highest punctuality rating
Comfort	++	+++	+++	++	Road and Air transportation provides most up-to-date service quality
Quality of pre-trip services	++	+++	+++	++	In terms of pre-trip services, rail, road and air transportation provides similar services
Quality of on-trip services	++	+++	+++	+++	In order to retain its customers, road and air passenger carriers provide large option of services to choose from
Quality of post-trip services	+++	+++	+++	+++	All transportation

Factors	Rail	Road	Air	Sea	Notes
					carriers provided the same post-trip services
Available capacity	++	+++	++	n/a	Road transportation provides the most options to choose from in terms of transportation carriers
Utilized capacity	+	+++	++	n/a	Road transportation has the highest utilized capacity as it serves to passenger and freight transportation
State of infrastructure facilities	++	+++	++	++	Road infrastructure is well developed and maintained
Current tariffs	+++	+++	+	n/a	Rail and road transportation provides the lowest transportation tariffs
Foreseeable tariffs	+	+	+	n/a	There aren't any significant foreseeable tariffs.
All relevant elements affecting generalized costs of transport	++	++	++	++	All types of transportation carriers can be influenced equally.
Current and foreseeable state of development of the infrastructure	+	++	++	++	Both road and air and sea transport mode have large planned capital investments

13.1.1.2 Estonia

Key messages

- Estonia's railway network connection with Latvia has insignificant importance and doesn't serve as international passenger transportation route
- Estonia's road quality is average compared to most of the other EU countries
- Tallinn Airport is Estonia's main civil airport with almost all passenger and freight flow going through it
- Port of Tallinn is Estonia's main port authority in terms of trade and freight capacity and serves as main passenger port

The evaluation factors of compared transport types in Estonia are shown in Table 112

Table 112 Evaluation of factors, compared to transportation types in Estonia

Factors	Rail	Road	Air	Sea	Notes
Transport Volumes	+	+++	++	n/a	Road has the highest freight and passenger transportation volumes
Transit Time	+	++	+++	n/a	Air transportation has the shortest traveling time
Availability	++	+++	++	n/a	Overall 20 buses travel per day on

Factors	Rail	Road	Air	Sea	Notes
					route Tallinn - Riga
Punctuality	+++	+++	+++	n/a	Air, Road and Rail transportation has the highest punctuality rating
Comfort	++	+++	++++	+++	Road and Air transportation provides most up-to-date service quality
Quality of pre-trip services	++	++	+++	++	Air transportation has high prerequisites in order to ensure maximum services quality.
Quality of on-trip services	++	+++	+++	+++	In order to retain its customers, road, air and maritime passenger carriers provide large options of services
Quality of post-trip services	+++	+++	+++	+++	All transportation carriers provided the same post-trip services
Available capacity	+	+++	++	n/a	Road transportation provides the most options to choose from in terms of transportation carriers
Utilized capacity	+	++	+	n/a	Road transportation has the highest utilized capacity as it serves to passenger and freight transportation
State of infrastructure facilities	+	+	++	+	Tallinn Airport current state of infrastructure can be characterized as average in terms of conditions
Current tariffs	+++	+++	+	n/a	Rail and road transportation provides the lowest transportation tariffs
Foreseeable tariffs	++	+	+	n/a	There are no significant foreseeable tariffs.
All relevant elements affecting generalized costs of transport	++	++	++	++	All types of transportation carriers can be influenced equally.
Current and foreseeable state of development of the infrastructure	+	+	+++	+	Tallinn Airport has scheduled planned investment in infrastructure.

13.1.1.3 Latvia

Key messages

- Majority of rail passengers are satisfied with quality of services provided
- Latvia's road quality is the 2nd poorest amongst all the EU countries
- Riga International Airport is the biggest Baltic air traffic hub. In 2014, airport handled 4.8 million passengers (0.4% increase from 2013)
- Latvia's ports serve an important role in international freight transportation due to joint operations with railways

The evaluation factors of compared transport types in Estonia are shown in Table 113

Table 113 Evaluation of factors, compared to transportation types in Latvia

Factors	Rail	Road	Air	Sea	Notes
Transport Volumes	++	+++	+	n/a	Road has the highest freight and passenger transportation volumes
Transit Time	++	++	+++	n/a	Air transportation has the shortest traveling time
Availability	++	+++	+	n/a	Road transportation is most frequent in term of daily transportation services
Punctuality	+++	+++	+++	n/a	Air, Road and Rail transportation has the highest punctuality rating
Comfort	++	+++	+++	+++	Road and Air transportation provides most up-to-date service quality
Quality of pre-trip services	+++	+++	+++	++	In terms of pre-trip services, rail, road and air transportation provides similar services
Quality of on-trip services	++	+++	+++	+++	In order to retain its customers, road and air passenger carriers provide large option of services to choose from
Quality of post-trip services	+++	+++	+++	+++	All transportation carriers provided the same post-trip services
Available capacity	++	+++	++	n/a	Road transportation provides the most options to choose from in terms of transportation carriers
Utilized capacity	+	+++	++	n/a	Road transportation has the highest utilized capacity as it

Factors	Rail	Road	Air	Sea	Notes
					serves to passenger and freight transportation
State of infrastructure facilities	++	+	+++	++	Riga Airport current state of infrastructure can be characterized as above average in terms of conditions
Current tariffs	+++	+++	+	n/a	Rail and road transportation provides the lowest transportation tariffs
Foreseeable tariffs	+	+	+	n/a	There are no significant foreseeable tariffs.
All relevant elements affecting generalized costs of transport	++	++	++	++	All types of transportation carriers can be influenced equally.
Current and foreseeable state of development of the infrastructure	+	+++	+++	++	Both road and air transport mode have large planned capital investments

13.1.2 Railways (Rail transport) do-nothing option

Key messages

- Currently, Lithuania's rail links with Latvia and Poland are relatively weak both in terms of passenger and cargo flow
- Lithuania's quality of available rail services and state of infrastructure can be described as satisfactory
- Estonia's railway network connection with Latvia has insignificant importance and does not serve as international passenger transportation route
- Estonia's quality of available rail services and state of infrastructure can be described as satisfactory
- Railway network in Latvia plays an important role for both passenger and freight flow.
- In Latvia, majority of passengers are satisfied with quality of services provided

13.1.2.1 Lithuania

In Lithuania there are both 1520mm and 1435mm railway gauge in operation. The length of railway lines in year 2015 in Lithuania totalled 1 877.2 km, of which 1 762 km is 1520 mm broad gauge and 115.2 km is 1435mm standard gauge[226]. Lithuanian railways is the railway infrastructure manager as well as freight and passenger carrier. During 2014, the number of local passengers carried amounted to approximately 3 600 thousand locally and approximately 900 thousand internationally[227].

Transport Volumes

During 2014, the total number of passengers that travelled locally using railways is 3 672 000, internationally – 905 100. Table 114 presents the statistics on the number of trains per day and average number of passengers per day on the main sections with respect to Rail Baltica[228].

[226] http://infrastructure.litrail.lt/home
[227] Rail Baltica Global Project Cost-Benefit Analysis
[228] http://www.litrail.lt/en/reklamos-paslaugos1

Table 114 Passenger intensity on the main railway sections in Lithuania

Section	Passenger trains per day	Passengers per day (on average)
Vilnius – Kaunas	30	2 230
Vilnius – Siauliai – Klaipeda	6	1 300

Transit Time

Table 115 presents the current transit times for the main sections regarding the main sections related to Rail Baltica.

Table 115 Transit time for main railway sections in Lithuania

Section	Range of time for the trip
Vilnius – Kaunas	1 hour and 9 minutes – 1 hour and 36 minutes
Vilnius - Klaipeda	3 hours and 35 minutes – 4 hours and 35 minutes
Vilnius - Siauliai	2 hours and 7 minutes – 2 hours and 34 minutes

Availability

Regarding the rail transport for the relevant Rail Baltica sections, it has to be noted that existing rail tracks connect[229]:

- Vilnius and Kaunas.
- Vilnius and Siauliai.
- Siauliai and Panevezys.
- Klaipeda and Siauliai.

However, regarding the relevant Rail Baltica sections, remaining railway connections are not developed.

In 2015, Lithuanian Railways executed a project to implement a new information system related to train tickets. Among other implemented or updated features, the system introduced an online platform for ticket purchases. As a result, customers can now purchase their tickets are now available for purchase in these ways[230]:

- Using the online platform.
- In the train station.
- On the train.

Punctuality

Table 116 shows the percentage of delayed local trains in Lithuania

Table 116 Percentage of delayed local trains in Lithuania, 2014

	Less than 60 minutes	60 – 119 minutes	More than 120 minutes
Percentage	98.28%	1.48%	0.22%

[229] https://www.traukiniobilietas.lt/portal/routes-schedules
[230] http://www.litrail.lt/en/-/bilietai-i-traukinius-%E2%80%93-jau-ir-internetu;jsessionid=03DB11F33A2D545A34AB39EFD4F51B50#

Comfort

During 2014, Lithuanian Railways conducted a survey of its passengers that included researching passengers' opinion on their comfort during travel on railways. The Table 110 presents the main results regarding the rating of train comfort. Grade 1 indicates the percentage of passengers who answered that the train comfort is inadequate, grade 5 – passengers, who are completely satisfied[231].

Table 117 Results of passenger comfort survey in Lithuania

Track	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Vilnius - Kaunas	1%	3%	3%	48%	31%
Vilnius - Klaipeda	0%	3%	17%	46%	34%
Vilnius - Siauliai	5%	8%	26%	31%	29%

It has to be noted that the trains are cleaned at least twice a day, toilets are cleaned before and after each trip, trains are often equipped with:

- Air conditioning systems.
- Wireless internet.
- Availability to purchase snacks and beverages.

Quality of Pre-Trip (Accessibility)

Lithuanian Railways ensure the quality of pre-trip experience for its customers by providing easily accessible train tickets and plenty of relevant information regarding the trip. The tickets are offered for purchase in these ways: using the online platform; in the train station; on the train.

In 2015, Lithuanian Railways stated that a mobile app will be made available in the future, however as of today, there has not been any official news regarding the development of the mobile app.

During 2014, Lithuanian Railways conducted a survey that contained a question regarding the quality of information provided in the website and in train stations. The Table 118 and Table 119 present results of the survey, whereby Grade 1 indicates the percentage of passengers who answered that the information provided is inadequate, grade 5 – passengers, who are completely satisfied with the information provided[232].

Table 118 Results of the survey, regarding the quality of information provided on website in Lithuania

Track	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Vilnius - Kaunas	1%	4%	9%	27%	59%
Vilnius - Klaipeda	1%	1%	7%	29%	61%
Vilnius - Siauliai	0%	2%	8%	22%	63%

Table 119 Results of the survey, regarding the quality of information provided in trains in Lithuania

Track	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Vilnius - Kaunas	2%	3%	12%	31%	51%
Vilnius - Klaipeda	1%	2%	9%	19%	69%
Vilnius - Siauliai	0%	3%	8%	34%	54%

[231] http://www.litrail.lt/documents/10279/186574/DL+Kokybes+standartu+ataskaita+2014.pdf/8ee2c8cc-51bf-49ad-b952-867ac46ddd7c

[232] http://www.litrail.lt/documents/10279/186574/DL+Kokybes+standartu+ataskaita+2014.pdf/8ee2c8cc-51bf-49ad-b952-867ac46ddd7c

Quality of On-Trip Services

As was mentioned above in the comfort section, on average 31% and 42% of passengers travelling in the mentioned trains graded the comfort of the trains with the grades of 5 and 4 respectively. As was noted above, the quality of the trip in ensured, as many of the trains are equipped with:

- Frequent cleaning services (before and after each trip).
- Air quality assurance using air conditioners and air filters.
- Availability of free wireless internet.
- Availability of beverages and snacks on a train.
- Possibility to carry a pet on a train.
- Possibility to carry a bike on a train.
- Some of the trains are adjusted to accommodate wheelchairs[233].

Quality of Post-Trip Services and Assistance

Quality of post-trip experience is ensured by such services:

- The availability of information centres within the train stations.
- Secure storage of lost and found items, where the items are held.
- Possibility to leave reviews and complaints in Lithuanian, English and Russian language on the website, in a train station or on a train.

All the requests and complaints are evaluated no later than 1 month after its submission. If the term has to be extended, passenger is informed about the necessity to extend the term and is informed on the final deadline. During 2014, there were a total of 263 requests/complaints made by the customers of Lithuanian Railways. To each of these requests/complaints, the response to them, on average, was received in 10 days[234].

Available capacity

In 2014, the passenger rolling stock fleet consisted of the following vehicles[235]:

- 9 passenger locomotives
- 82 passenger buses
- 68 diesel train buses
- 43 electric train buses

The number of seats available for passengers within the fleet of passenger wagons – 3.800[236].

Utilized capacity

Given the above mentioned available capacity, in 2014 Lithuanian Railways carried approximately 3 700 thousand passengers locally.

[233] http://www.litrail.lt/documents/10279/186574/DL+Kokybes+standartu+ataskaita+2014.pdf/8ee2c8cc-51bf-49ad-b952-867ac46ddd7c
[234] Information retrieved from http://www.litrail.lt/
[235] http://www.litrail.lt/documents/10291/1488090/LG_2014_GB.pdf/e4462df0-04d3-4c17-86ba-2c14187fc923
[236] http://osp.stat.gov.lt/web/guest/statistiniu-rodikliu-analize?portletFormName=visualization&hash=2ddeb02e-7338-4c32-b15a-d965962f0f57

State of infrastructure facilities

In the summer of 2016, European Railway Agency (ERA) completed an audit of the state of Lithuanian Railways infrastructure. The auditors noted that the infrastructure and its maintenance is of high quality: constant implementation of innovative technologies, modernization projects. The auditors stated that the state of infrastructure is frequently assessed by qualified specialists with the focus on prevention and evaluation of the weakest infrastructure areas. EUAR also noted that Lithuanian Railways has taken extensive measures to install safety ensuring infrastructure and safety-related initiatives. EUAR concluded that the current Lithuania's railway infrastructure and the future investment projects are positive[237].

Current tariffs

The Table 120 indicates the ticket prices and subsequently the tariff per km (full undiscounted prices), using railways. It has to be noted that some discounts are available, such as:

- 100% discount for children up to 7 years of age.
- 50% discount for children between years 7 and 10.
- 50 – 80% discount for pensioners and passengers with disabilities.
- 50% discount for students.

Table 120 Current railway tariffs in Lithuania [238]

Track	Ticket price (EUR)	Track length (in kilometres)	Price per kilometre (EUR)
Vilnius - Kaunas	4.46 – 6.08	104	0.043 – 0.058
Vilnius - Klaipeda	13.77 – 18.05	376	0.036 – 0.048

Foreseeable tariffs

Current public information provided by the Lithuanian Railways does not indicate any developing projects that could alter the regular train ticket prices stated above. The most likely cause for the tariff change in the future is the regular economic fluctuations, such as employment, inflation, GDP growth and other similar elements.

All relevant elements affecting generalized cost of transport

The main elements affecting the cost of railway transport consist of investment costs and operating costs. Fixed costs contain: infrastructure; stations/ other fixed equipment; rolling stock. Operating costs contain: traction; depreciation; maintenance; salaries; access charges[239].

Current and foreseeable state of development of the infrastructure

In 2015, investment by Lithuanian Railways in the renewal and development of rail infrastructure amounted to EUR 97.983 million, including EUR 49.656 million allocated from the European Union funds. The key objectives of the infrastructure development cover raising speed limits, enlarging track capacity and maximum weight of freight trains, strengthening the subgrade, improving design

[237] http://www.litrail.lt/-/gelezinkeliu-infrastruktura-ir-jos-prieziura-ivertinta-teigiamai#
[238] https://www.traukiniobilietas.lt/portal/routes-schedules
[239] http://ac.els-cdn.com/S1877042814000895/1-s2.0-S1877042814000895-main.pdf?_tid=9eeff78a-7fc8-11e6-8deb-00000aacb361&acdnat=1474441211_cf63706bfd982b894867f44639d3c9ca

parameters, increasing axle load limits, reducing side slopes, raising the radii of curves on the routes, conducting the electrification of lines, and modernizing telecommunications and train traffic management systems.

Furthermore, according to the study by EC, Lithuania is 12th out of the 28 EU states, regarding the quality of its rail transport infrastructure[240].

Locations of current infrastructure shown through maps

Regarding the railway coverage of Lithuania, below you can find the graphical representation of the railway infrastructure (see Figure 110 Main railways in Lithuania Figure 110).

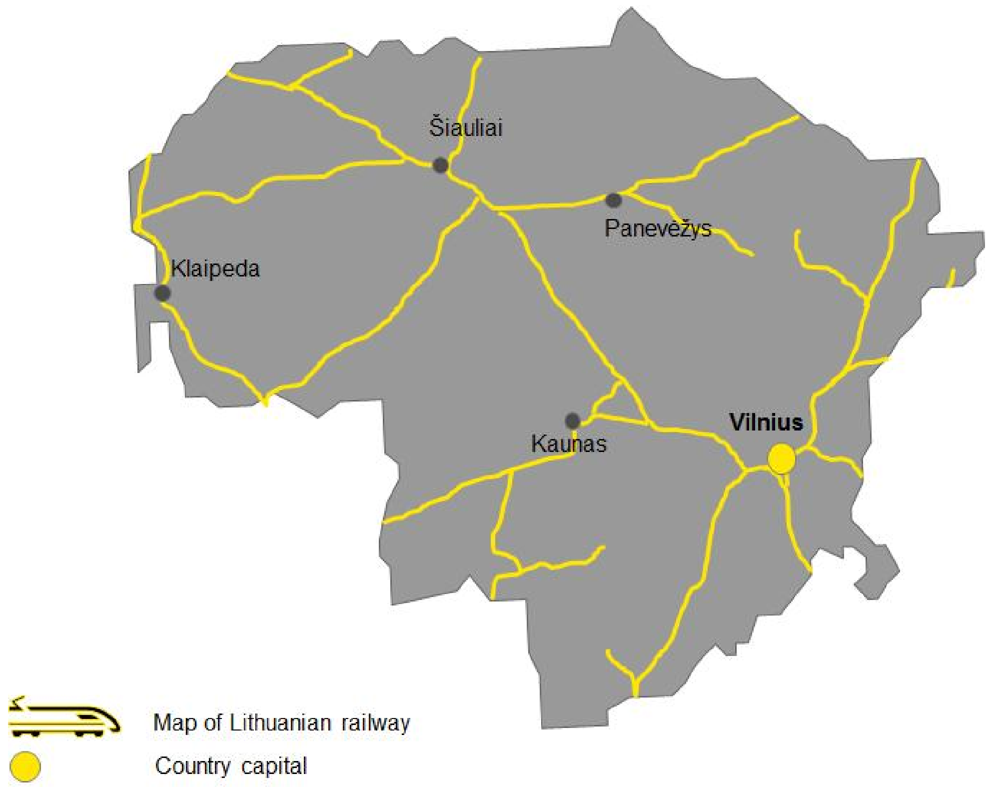

Figure 110 Main railways in Lithuania

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

The main investment plans, regarding rail infrastructure are[241]:

- Preparation and construction of 1435 mm gauge line with the state border with Latvia (Kaunas - LT/LV border). Project value – EUR 110 million.
- Construction of 1435 mm gauge railway and modernization of signalling equipment up to Palemonas (Kaunas – Palemonas/ Jiesia-Palemonas). Project value – EUR 93 million.
- Development of expected Rail Baltica European gauge line from Kaunas to Vilnius. Project value - EUR 1 050 million.

[240] http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/lithuania/investments-infrastructure/index_en.htm
[241] European Commission, Directorate-General for Mobility and Transport, Directorate B – European mobility network: STUDIES ON THE TEN-T CORE NETWORK CORRIDORS AND SUPPORT OF THE EUROPEAN COORDINATORS

13.1.2.2 Estonia

In Estonia there are two railway networks determined for public use, that are managed by AS EVR Infra (Eesti Raudtee) and Edelaraudtee Infrastruktuuri AS[242]. Main passenger carrier inland is "Eesti Liinirongid" JSC (ELRON)[243], while other passenger carrier Go Rail organizes trips from Tallinn to Moscow and St. Petersburg[244].

Transport Volumes

Tallinn-Parnu route, which is part of ELRON Southwest railway system and surrounds the planned Rail Baltica route, is used primarily for passenger travel with almost no freight transportation currently taking place on these tracks. The length of tracks between Tallinn-Parnu is 141.4 km and currently there are 4 passenger trains operating on Tallinn-Parnu-Tallinn routes daily. Traffic intensity, however, varies on different parts of the tracks as ELRON operates 33 daily passenger trains on their different Southwest routes (max number of trains on their Tallinn-Rapla-Tallinn route)[245].

Transit Time

Table 121 represents transit time for the main railway sections in Estonia. The transit time between two destinations depends on allowed maximum movement through suburbs and rural areas.

Table 121 Main railway section transit time in Estonia

No	Main railway sections	Length (km)	Transit time
1	Tallinn-Parnu	141.1 km [246]	2h 27 min[247]
2	Tallinn-Tartu	190 km	2h 45 min (Express 2h 22 min)
3	Tartu-Valga	82.9 km[248]	1h 9 min

Availability

Passenger train services are irregular, ranging from more than one per hour on the shorter routes at peak times to a twice per day on the long-distance routes (Tallinn-Parnu)[249].

Punctuality

In 2016, approximately 99% of trains in Estonia reached their destination on time[250].

Comfort

ELRON is the state owned transport company responsible for organizing passenger train transport in Estonia[251]. ELRON passenger trains are modern, convenient, and fast. ELRON trains provide such services: WC; free wireless internet access; computer desks with electric outlets; safety cameras;

[242] http://www.tja.ee/railway-sector-in-estonia-2
[243] http://elron.ee/en/elron/
[244] http://www.gorail.ee/en/about-company/
[245] http://elron.ee/wp-content/uploads/2016/03/Edelasuuna-p%C3%B5his%C3%B5iduplaan-5.-17.04.pdf
[246] Rail Baltica Global Project Cost-Benefit Analysis
[247] The main preferred public transport for Parnu and Tartu is the bus, which is faster, however, if the train connection becomes faster, it would become significantly competitive for majority of passengers.
[248] http://elron.ee/en/home/soiduplaan/
[249] http://elron.ee/en/home/soiduplaan
[250] http://elron.ee/elron/organisatsioon-2/
[251] http://elron.ee/en/elron/

bike racks for up to ten bikes; air-conditioner; information system with internal TV and sound; special entrances for wheelchair users and baby buggies/prams. The first class wagons in diesel trains also have: the possibility to book a seat online; wider seats; adjustable backrest, additional upholstery and more space around the seats; personal computer desk and power source outlet, and carpeted floors[252].

Quality of Pre-Trip (Accessibility)

For domestic and international travellers, tickets can be purchased at the station ticket-offices, inside the train from the on-board conductor and through the website[253]. There is also a fare card, which is an electronic chip card, which can be used for loading money and buying tickets. Passengers can use the money on the card to pay for tickets on the train. In addition, the card gives a 10% discount to its users on all ticket prices[254].

In regards to the accessibility to information on timetables, ease of buying tickets and maintenance of railway stations, in EC survey of Europeans' satisfaction with rail services, more respondents in Estonia were satisfied with each of the services than dissatisfied. Although, the rate with all of the aspects remained a little ambiguous in the survey as more than half of the respondents say that they did not know how satisfied they are[255].

Waiting platforms and trains can also be conveniently used by passengers in wheelchairs. Located within the "C-area" of the train is a special safety belt equipped space for a traveller in a wheelchair, next to which is an SOS button, via which the train's driver can be contacted. ELRON trains are equipped with a lavatory meeting international standards, which is also accessible by wheelchair. If a passenger with special needs has provided advance notice of their need for assistance to an e-mail address at least 48 hours in advance of their planned trip, customer service representatives will provide the passenger – within reasonable limits and to the best of their ability – with assistance when entering and exiting the train[256].

Quality of On-Trip Services

ELRON trains provide these services:

- Lavatory.
- Free wireless internet access.
- Computer desks with electric outlets.
- Safety cameras.
- Bike racks (for up to ten bikes).
- Trains are air-conditioned.
- Information system with internal TV and sound.
- Special entrances for wheelchair users and baby buggies/prams.

[252] http://elron.ee/en/teenused/teenused-rongides/mugavus/
[253] http://elron.ee/en/piletid/
[254] http://elron.ee/en/piletid/elron-soidukaart/
[255] http://ec.europa.eu/public_opinion/flash/fl_382a_en.pdf
[256] http://elron.ee/en/teenused/

Quality of Post-Trip Services and Assistance

In the case of lost baggage and items, ELRON has a website where all lost & found items are presented. People can search for and find all of the items that have been collected by the railway transport company, also declare the lost items themselves[257].

Available capacity

ELRON train fleet consists of 18 electric trains and 20 diesel trains[258]. Electric trains have two configurations: 3-carriage and 4-carriage. The number of available seats is 196 and 274 accordingly (length 57.7m and 75m) and standing room of 160 and 222 people.

While diesel trains have three types of trains, such as: 2 to 4 carriages. The number of seats accordingly are 105 161 and 214 (length 45.5m; 59.9m; 74.3m) and standing room of 99 154 and 211 people[259].

Utilized capacity

The overall levels of freight transported has been decreasing in recent years with further decline taking place currently due to the EU-Russia sanctions. Freight transportation plummeted during the 2008-2009 economic crisis (see Figure 111) and has been struggling to get back to the high levels of mid-2000s. Between 2009 and 2011 trade volumes recovered, reaching 48.3 million tonnes in 2011. Nevertheless, by 2016 the volume has gradually slipped to 25.4 million tonnes.[260].

Figure 111 Freight transportation by rail in Estonia (in tonnes), 2008 - 2014[261]

The Estonia's railway system is oriented towards industry and freight transportation, and passenger travel has historically not been as high priority. Passenger transportation gradually decreased in the 2000s and early-2010s, but, as highlighted by Figure 112, there was a surge in passenger levels in 2014 when numbers peaked at 5.9 million. The main operator in passenger transportation is ELRON, which is a state-owned company. ELRON operates trains on all train routes inside Estonia

[257] http://lostnf.com/elron
[258] http://elron.ee/en/elron/rongidest/
[259] http://elron.ee/en/elron/rongidest/tehnilised-andmed/
[260] Statistics Estonia/Eesti Statistikaamet
[261] Statistics Estonia/Eesti Statistikaamet

and currently has 16 regular lines across Estonia. There are also limited international operators and routes in use. "GoRail" operates Tallinn-St.Petersburg and Tallinn-Moscow trains, while Pasazieru vilciens operates the Valga-Riga line.

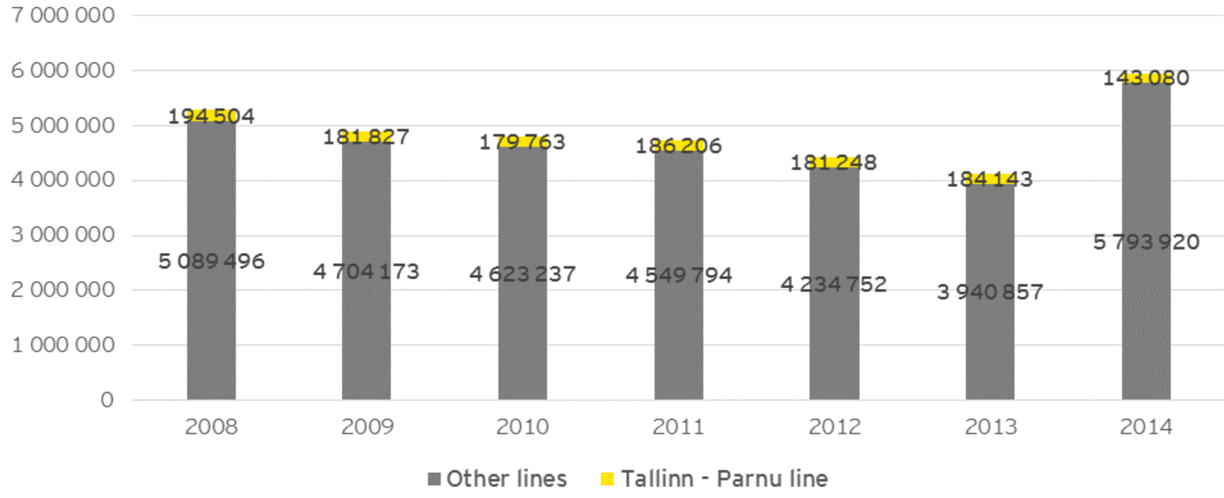

Figure 112 Passenger transportation by rail in Estonia, 2008 - 2014[262]

State of infrastructure facilities

Comparing the quality of railroad infrastructure between the EU member states, the quality of railroads in Estonia is at an average level (rated 3.71), which is a lot lower than the EU average (4.38) and is rated 18th of the 28 evaluated countries[263].

Current tariffs

Train traveling tariffs are consistent within a particular zone. Currently there are five different zones (in general, with longer travelling distance, the price gets more expensive) and the tickets can be chosen between one-way ticket (see Table 122) one day ticket or 30 day ticket and all of them have their discount versions for students, pensioners, etc[264].

Table 122 Ticket price per zone (one-way) in Estonia

Track	Ticket price (EUR)	Track length (in kilometres)	Price per kilometre (EUR)
Tallin - Narva	11.40	314	0.036
Tallin - Tartu	10.50 – 11.5	428	0.025 – 0.027
Tallin - Valga	16.20	510	0.032
Tallin - Parnu	7.90	141	0.056

Foreseeable tariffs

During the past years, ELRON has gradually increased the prices of tickets by 5-10%. The main reasons being the increase of service capacity by 6% and faster connections on the Narva and Tartu lines. Moreover, the increase of diesel fuel excise tax and railroad user fees affect tariffs[265].

[262] Statistics Estonia/Eesti Statistikaamet
[263] http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/estonia/investments-infrastructure/index_en.htm
[264] http://elron.ee/en/piletid/piletite-hinnad/
[265] Estonia's media publications. http://www.pealinn.ee/koik-uudised/elroni-rongipiletid-kallinesid-n25421

All relevant elements affecting generalized cost of transport

The increase of diesel fuel excise tax and railroad user fees have a direct effect on the tarrifs currently, and it will also have an effect in the future[266].

Current and foreseeable state of development of the infrastructure

Currently, for the period of 2014 – 2020, the government transport investment plan has 5 different measures to improve the state of railway infrastructure. The measures include different investments made to sections of railroads to make them more contemporary and safer, update of traffic management system (Tallinn-Keila-Paldiski line) to make it safer and secure and in accordance with the EU standards[267].

The foreseeable railway infrastructure investment plans at the moment more or less cover the infrastructure that are not related to Rail Baltica surrounding railways and the investments focus on sections that are behind in terms of development.

Locations of current infrastructure shown through maps

Main railway infrastructure of Estonia is shown in Figure 113.

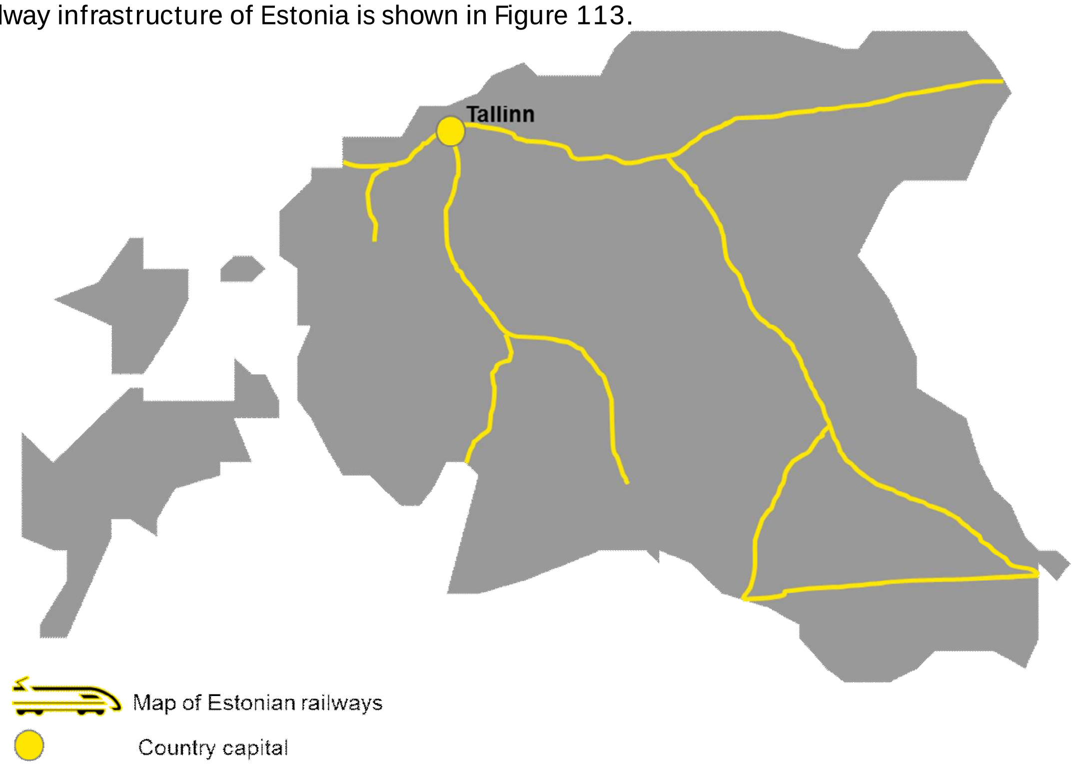

Figure 113 Main railways in Estonia, 2014

Information about scope and timing of planned/foreseeable interventions - new builds upgrades, reconstructions or major maintenance operations

Although no capital costs have been assigned to this alternative, ongoing operations and maintenance activities would continue. Under emergency conditions, work would occur.

[266] Estonia's media publications. http://virumaateataja.postimees.ee/3471475/veebruari-keskpaigast-tousevad-rongipiletite-hinnad

[267] https://www.riigiteataja.ee/aktilisa/3260/2201/5013/93klisa.pdf

13.1.2.3 Latvia

Railway network in Latvia plays an important role for both passenger and freight transportation. The total length of operational railway network is 1 860 km of which 251 km are electrified lines and 367 km are double and multitrack[268].

Largest operators for passenger transportation are JSC "Pasazieru Vilciens" and Ltd. "L-Ekspresis". As for the freight transportation, largest operators are Ltd. "LDZ Cargo", JSC "Baltijas Tranzita Serviss" and JSC "Baltijas Ekspresis".

Transport Volumes

Most intensively used railway sections, in terms of passenger traffic flow, are Riga – Jelgava (with 16 425 trains per year) and Riga – Aizkraukle (with 24 510 trains per year) as indicated by Table 123. These sections will maintain a high passenger flow as it's mainly used by daily commuters.

Whereas for freight traffic flow, most intensively used railway sections are Ventspils – Jelgava and Riga – Daugavpils, which are connected to ports and are serving an important role in transit cargo flow.

Table 123 Main railway sections in Latvia[269]

No	Main railway section	Length (km)	Track gauge (mm)	Passenger traffic flow (trains per year)	Freight traffic flow (trains per year)
1	Ventspils – Tukums II	108.3	1520	n/a	7168
2	Tukums – Jelgava	55.8	1520	n/a	7130
3	Riga – Jelgava	43.0	1520	16 425	3224
4	Jelgava – Meitene	32.9	1520	n/a	1 707
5	Riga – Sigulda	53.3	1520	7 519	2 351
6	Sigulda – Lugazi	113.1	1520	3 650	1 783
7	Riga – Aizkraukle	82.2	1520	24 510	14 829
8	Aizkraukle – Krustpils	46.8	1520	8 596	14 904
9	Krustpils – Daugavpils	88.4	1520	3 210	14 108
10	Krustpils – Rezekne	95.0	1520	2 466	9 329

Transit Time

The transit time between two destinations depends on allowed maximum movement speed in different areas (suburbs, rural), which is regulated by "LDz" Order No DT-3.2/35-2013. According to TEN, maximum allowed speed on public-use railway infrastructure for passenger trains is 120 km/h and 80 km/h for freight trains.

Total transit time for (currently available) main railway sections intersecting with Rail Baltica takes (Jelgava – Riga – Skulte) takes two hours, not including transfer waiting time.

Table 124 represents average transit time for all electric trains on passenger domestic routes.

[268] http://www.csb.gov.lv/sites/default/files/nr_29_transports_latvija_2016_16_00_lv_en.pdf
[269] Ministry of Transport of the Republic of Latvia

Table 124 Average transit time in Latvia[270]

No	Main railway section	Length (km)	Transit time
1	Riga – Tukums II	53.8	01:26 (AVG)
2	Riga – Jelgava	43	00:51
3	Riga – Aizkraukle	79.1	01:31 (AVG)
4	Riga – Skulte	47.7	01:09

Availability

Passenger train services are irregular, ranging from more than one per hour on the shorter routes at peak times to a few per day on most of the long-distance routes.

Public-use railway network has 151 stations – operating points of which 77 stations are open to freight operation – reception and delivery of freight, loading and unloading.

Only two current sections of current rail transport infrastructure intersecting with the planned geographical alignment of Rail Baltica route. Which are:

- Riga – Skulte
- Riga – Jelgava – Meitene

Regarding rail transport for relevant Rail Baltica sections, existing railway are:

- Riga – Skulte
- Riga – Jelgava

Punctuality

All freight trains are timetabled, taking into account, that late running is possible. 85 – 86% of freight trains approach Riga within 1 minute of the scheduled time[271].

95% of passenger trains approach Riga within 1 minute of the scheduled time[272].

In the EC survey of Europeans' satisfaction with rail services, over 74% of respondents in Latvia were satisfied with the punctuality of railway services[273].

Comfort

For all domestic trips, which are carried out by electric- trains, passengers can store their bicycle or luggage in the space provided. For long-distance trips, which are mainly carried out by diesel- trains, there is availability to travel in comfort class, which offers several on-board services:

- Free wireless internet access.
- Possibility to purchase beverages and snacks
- Possibility to receive a rug
- Access to electric outlet[274].

Quality of Pre-Trip (Accessibility)

[270] www.1188.lv
[271] https://s3.amazonaws.com/aecom-global/RPTH_FinalReport_English.pdf
[272] https://s3.amazonaws.com/aecom-global/RPTH_FinalReport_English.pdf
[273] http://ec.europa.eu/public_opinion/flash/fl_382a_en.pdf
[274] http://www.pv.lv/en/information-for-passengers/comfort-class/

For domestic and international travel, tickets can be purchased at the station ticket-offices, inside the train from the on-board conductor, through smartphone application and website.

In regards to the accessibility to information on timetables, ease of buying tickets and maintenance of railway stations, in EC survey of Europeans' satisfaction with rail services, more respondents were satisfied with each of the services than dissatisfied[275].

Nine train stations (Riga, Krustpils, Rezekne, Daugavpils, Jelgava, Saulkrasti, Sigulda, Dubulti and Vaivari) provides the possibility to get lifted in and out of the train, which is free of charge and can be provided if passenger have requested the service in advance.

Quality of On-Trip Services

As mentioned above, long-distance trains that are equipped with comfort class, provide free wireless internet access, possibility to buy non-alcoholic beverages and other small offerings, which are not provided on electric trains.

Electric trains provide the possibility to carry pets and on bicycles on the train.

Quality of Post-Trip Services and Assistance

For domestic travel, in case of lost and found baggage, passenger can submit a report to JSC "Pasazieru Vilciens" Customer Centre. Report can be submitted by telephone or visiting customer centre. If lost item is not collected in 72 hours, it is handed further on to the police.

Available capacity

Maximum freight train length is 850 meters.

Passenger trains on average do not exceed 160 meters and for long-distance trains (the sleepers) can be up to 400 meters long.

Utilized capacity

Freight in the Riga area runs to and from the Skirotava yards. On average, the schedules are:

- 27 to Jelgava.
- 5 to Bolderaja, using Tukums route from Tornakalans.
- 6 to Tukums.
- 3 – 4 from northern routes to Skirotava, not passing through Riga station - train pairs.

State of infrastructure facilities

From EC survey of Europeans' satisfaction with rail services, 69% of respondents were satisfied with the maintenance and cleanliness in railway stations. Comparing the quality of railway infrastructure among the EU member states, Latvia ranks 16th, with a score of 4.10, out of 26 Member States, whereby the EU average is 4.38[276].

Current tariffs

[275] http://ec.europa.eu/public_opinion/flash/fl_382a_en.pdf
[276] http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/latvia/investments-infrastructure/index_en.htm

Tariffs for travelling on the electric trains are determined for a particular zone. Currently, there are five operational routes (electric train only routes) where pricing according to zones is applied[277]. There are also prices for inter-zone traveling and depending of the length of journey, prices can vary between EUR 0.90 or EUR 1.00.

Table 125 shows ticket pricing per intercity routes serviced by diesel trains.

Table 125 Ticket price per intercity route[278]

Track	Ticket price (EUR)	Track length (in kilometres)	Price per kilometre (EUR)
Riga - Valga	5.6	166	0.034
Riga - Daugavpils	7.05	218	0.032
Riga - Rezekne 2	7.2	224	0.032
Riga - Zilupe	8.75	283	0.031
Riga - Liepaja	7.2	223	0.032

Foreseeable tariffs

Depreciation of old trains can increase operational costs, thus can increase passenger train tariffs, in case if new train procurement is delayed or cancelled.

All relevant elements affecting generalized cost of transport

As mentioned above, costs of maintaining old trains are exponentially increasing over the time, as old trains require larger capital investments in order to be a reliable mean of transport.

Current cost of one train km for passenger train with approximate 300 seats is EUR 12[279].

“Pasazieru Vilciens” JSC aims to have an interval schedule in the future between the capital city and surrounding cities – within 40 km radius – where waiting time for the next train is 15 minutes.

Current and foreseeable state of development of the infrastructure

“Pasazieru Vilciens” JSC intends to deploy new rolling stock units by 2020 that will allow increased frequency of services running at regular intervals on the key electrified routes.

Electrification is expected to be extended from Aizkraukle towards Daugavpils.

[277] http://www.pv.lv/en/zoning/
[278] http://www.pv.lv/en/tickets/ticket-calculator/
[279] Trade Union of Railway Transport of Latvia http://ldzsa.lv/lat/jaunumi/217.html

Locations of current infrastructure shown through maps

Figure 114 summarizes rail infrastructure in Latvia

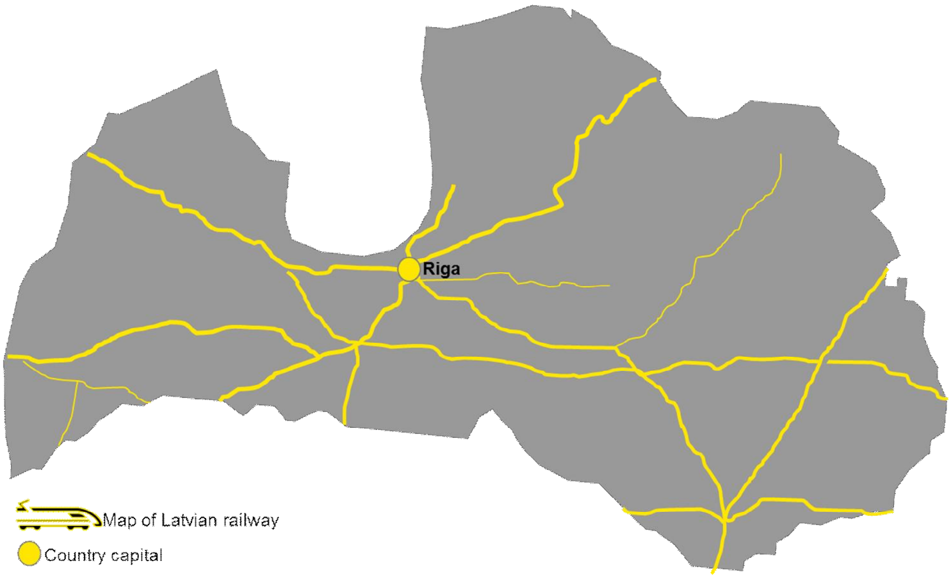

Figure 114 Main railways in Latvia

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

Although no capital costs have been assigned to this alternative, ongoing operations and maintenance activities would continue. Under emergency conditions, work would occur.

13.1.3 Roads (bus, truck, personal car) do-nothing option

Key messages

- Route E67 serves as the main passenger and freight transportation connection between Estonia, Latvia and Lithuania
- Available road transportation services in Estonia, Latvia and Lithuania have high quality performance
- Lithuania has well developed road network, with significant internal traffic between key population centres

13.1.3.1 Lithuania

All of the road in Lithuania are divided into national, local and urban road according to their capacity, social and economic significance. The total length of the road network is 82 000 km. National roads are divided in to the categories of main, national and regional roads. Exclusive property rights of the national roads belong to the national government. Also, Lithuania actively participates in the activities of the Transport Working Group created by the initiative of the EC. In addition, the selected direction of the development of the transport system infrastructure is the reconstruction of the existing roads and railway lines engaged in international carriages in accordance with the development principles of the international transport corridors[280].

Road transport - is the best and most flexible mode of transport to deliver goods to any destination. Goods transported by road account for about 50 per cent of total goods transport in Lithuania. Passenger transport by road accounts for about 97 per cent of total passenger transport.

[280] https://sumin.lrv.lt/en/sector-activities/roads-and-road-transport-1

Transport volumes

The road Vilnius – Kaunas – Klaipeda is the main highway of Lithuania, connecting the three biggest cities of Lithuania, and has the greatest total vehicle average annual daily traffic intensity (AADTI) – 16 873 (see Table 126). The road Kaunas – Marijampole – Suvalki has the greatest cargo vehicle AADTI and also has the greatest proportion of cargo vehicle AADTI to total vehicle AADTI of all the major roads considered - 38%. Also, the road Panevezys – Pasvalys – Riga has a significant proportion of cargo vehicle AADTI to total vehicle AADTI – 30%. The road A10 is the primary transport route connecting Lithuania and Latvia.

Table 126 Average road traffic intensity on the main roads in Lithuania [281]

Road route	Road distance, km	Total vehicle AADTI	Cargo vehicle AADTI	Bus AADTI	Light vehicle AADTI
Vilnius-Kaunas-Klaipeda	306	16 873	2 719	191	14 154
Kaunas – Marijampole - Suvalki	96	13 978	5 275	125	8 703
Vilnius-Panevezys	133	9 523	1 312	96	8 211
Panevezys-Siauliai	75	6 990	913	89	6 077
Panevezys-Pasvalys-Riga	151	7 294	2 232	118	5 062

International passenger transportation and local long distance passenger transportation sectors are predominantly concentrated in the hands of 3 key providers, which are detailed below. “Kauno autobusai” JSC provides services to the local market only, while ”Kautra” JSC and “Tolimojo keleivinio transporto kompanija” JSC provide local and international passenger transportation services. The yearly extent of passengers carried by each of the companies:

- “Kautra” JSC - Approximately 6 million passengers[282].
- “Kauno autobusai” JSC - More than 4 million passengers[283].
- “Tolimojo keleivinio transport kompanija” JSC - More than 2 million passengers[284].

Transit time

Table 127 presents the current road transport transit times for the main sections.

Table 127 Transit time using buses for the main sections in Lithuania [285]

Section	Range of time for the trip
Vilnius - Kaunas	1 hour and 25 minutes – 1 hour and 40 minutes
Vilnius - Klaipeda	3 hours and 45 minutes – 5 hours and 45 minutes
Vilnius - Siauliai	3 hours and 0 minutes – 4 hours and 30 minutes

Availability

Tickets for domestic and international travel with buses can be purchased through a website, in bus stations and on buses[286].

[281] http://lakd.lrv.lt/en/sector-activities/traffic-volumes
[282] http://www.kautra.lt/apie-imone/apie-mus/
[283] http://www.kaunoautobusai.lt/site/files/Kauno_autobusai/VeiklosViesinimas/finataskatos/2015/2015_m_tarpinis_praneimas.pdf
[284] http://www.toks.lt/apie-mus/
[285] https://www.autobusubilietai.lt
[286] Ibid.

To ensure the quality of service, passengers can also return the ticket or change the date of their trip, in case they purchased an e-ticket.

Punctuality

Regarding inter-city bus travelling, transport providers ensure timely departure and arrival for their customers. For instance, according to a punctuality evaluation survey, one of the main players in the market "Kautra" JSC provides a reliable service for its passengers – only 14.6% of the respondents answered that a delay occurred during the departure/arrival of their trip[287].

Comfort

The journey comfort of using buses is ensured by such services:

- Free wireless internet access (majority of buses are equipped).
- Installed air-conditioning.
- Some of the buses are equipped with toilets.

One of the main players in the market, "Kautra" JSC, is offering movie streaming services to its passengers, enabling them to watch movies using their mobile devices.

Quality of Pre-Trip (Accessibility)

As mentioned above in the availability part, tickets for domestic and international travel with buses are available for purchasing through a website, in bus station and on buses[288].

Passengers can also find information on the features that their chosen bus has (for instance, whether the bus is equipped with free wireless internet, whether passengers can take a bike on the bus and similar). Most of the major bus stations have information desks that can provide information regarding their trip and, if needed, further transition[289].

Quality of On-Trip Services

The above mentioned main players in the market offer similar services to ensure their passengers' comfort and quality of their on-trip experience. The main features include wireless internet access, audio systems, air conditioning and other air quality assuring systems are installed.

One of the main player in the market, "Kautra" JSC, is providing a movie streaming service on some of its buses, so that passengers can access it with their mobile devices[290].

Quality of Post-Trip Services and Assistance

The quality of post-trip services and assistance is ensured by:

- Passengers can leave their requests / complaints online regarding their trip experience.
- Bus stations ensure that all lost and found items are stored safely.

Available capacity

[287] http://apklausa.lt/f/imones-kautra-paslaugu-ivertinimas-rgaukkh/answers.html
[288] https://www.autobusubilietai.lt/
[289] http://www.kautra.lt/
[290] Ibid.

International passenger transportation and local long distance passenger transportation sectors are predominantly concentrated in the hands of 3 key providers, which are detailed in the Table 121. “Kauno autobusai” JSC provides services to the local market only, while “Kautra” JSC and “Tolimojo keleivinio transporto kompanija” JSC provide local and international passenger transportation services.

Table 128 Fleet of busses and yearly passenger carried in Lithuania

Company	Size of fleet	Number of yearly passengers carried
“Kautra” JSC[291]	almost 300 buses	Approximately 6 million passengers
“Kauno autobusai”[292] JSC	219 buses	More than 4 million passengers
“Tolimojo keleivinio transport kompanija” JSC[293]	90 buses	More than 2 million passengers

Utilized capacity

During 2014, all of the bus transport carriers in Lithuania carried more than 320 thousand passengers locally. It has to be noted that this number includes not only customers carried by the above mentioned main players in the market, but also by the smaller market participants.

State of infrastructure facilities

According to Global Competitiveness Report 2015 – 2026, Lithuania is 30th out of 140 countries (1st within Eastern and Central Europe), regarding the quality of roads in the country[294].

Despite the well-maintained state of the country’s roads, infrastructure of bus stations needs extensive renovation – approximately half of 51 bus stations present in Lithuania needs speedy repairs to ensure the highest quality[295].

Current tariffs

Table 129 present bus travel tariff estimates, calculated by taking the range of bus prices for the trips and dividing it by the distance between the cities.

Table 129 Bus transport tariffs of selected routes in Lithuania in Lithuania [296]

	Ticket price (EUR)	Distance between cities (kilometres)	Price per kilometre (EUR)
Vilnius - Kaunas	5.00 – 5.23	101	0.049 – 0.052
Vilnius - Klaipeda	13.78 – 17.58	310	0.044 – 0.056

Foreseeable tariffs

Based on publicly available information, currently there are no substantial projects underway that could significantly affect the regular transport tariffs noted above. As a result, one can conclude

[291] http://www.kautra.lt/apie-imone/apie-mus/
[292] http://www.kaunoautobusai.lt/site/files/Kauno_autobusai/VeiklosViesinimas/finataskatos/2015/2015_m_tarpinis_praneimas.pdf
[293] http://www.toks.lt/apie-mus/
[294] http://www3.weforum.org/docs/gcr/2015-2016/Global_Competitiveness_Report_2015-2016.pdf
[295] http://lzinios.lt/lzinios/Trasa/griuvancios-autobusu-stotys-teisinese-zabangose/225708
[296] https://www.autobusubilietai.lt/

that in the foreseeable future the change to bus tariffs will be mainly affected due to regular economic fluctuations, such as inflation, GDP growth and other similar changes.

All relevant elements affecting generalized cost of transport

The cost breakdown varies between the types of operation. In the case of informal small-scale operation using repaired or locally assembled buses, financed by overseas remittances, depreciation and interest costs are much less (only about 10% of total costs), while driver and other staff costs can be relatively more (20 - 30% or so), due to the higher number of people employed per unit of capacity (often including the owner).

Current and foreseeable state of development of the infrastructure[297]

Lithuania, even when compared with economically stronger countries, has a fairly well-developed road network. It is important to preserve, maintain and develop the road network so that it seamlessly integrates into the international European road network (matches the required capacity, safety and other standards). One of the main stimulus to develop the road network in the country is that Lithuania is a transit country with a number of roads crossing it from west to east and from north to south.

As part of the road network improvement efforts, there are a number of roads to be reconstructed so that they would meet the expectations of the road users as well as all modern technical, economic and environment requirements to make the road network fast, convenient and safe. Balancing the reconstruction needs with the mentioned requirements remains one of the major concerns for the road engineers in Lithuania for the present and nearest future.

Locations of current infrastructure shown through maps

Even compared with economically stronger countries, Lithuania has a fairly well-developed road infrastructure. In the Figure 115 Lithuania's road infrastructure and its coverage is graphically depicted. The graphical depiction presents the road freight transport traffic intensities, whereby the wider the green colouring, the greater the road freight traffic intensity. The road freight traffic intensities are consistent with the major road network of Lithuania, which includes the route that is the part of Via Baltica, such as Panevezys bypass, road connecting Panevezys, Pasvalys and Riga.

[297] Information retrieved from http://lakd.lrv.lt/

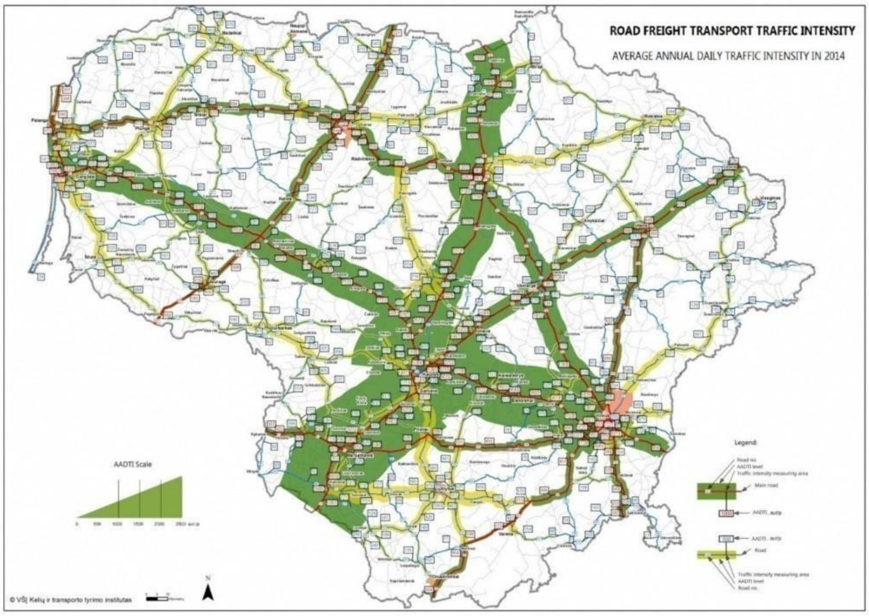

Figure 115 Map of main roads in Lithuania[298]

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

The largest projects related to the road transport infrastructure in Lithuania are:

- Road A5 Kaunas–Marijampole–Suwalki, section 17.34-56.83 km: construction of two additional lanes (2+2) in order to ensure traffic safety. Project value - EUR 172 million.
- Road A5 Kaunas–Marijampole–Suwalki, section 56.83-98.56 km: construction of two additional lanes (2+2) in order to ensure traffic safety. Project value – EUR 168 million.

13.1.3.2 Estonia

Transport in Estonia relies heavily on road and rail networks, thus making the quality of road networks critical to the daily lives of both ordinary Estonians and local businesses. The total length of the Estonia's road network is about 59 000 km, out of which 16 597 km, or 28%, are national roads[299].

Transport Volumes

In the period of 1998 – 2007, transport volumes continued to grow 6-10% per year on the main and secondary roads. The intensity of traffic lowered substantially in the years of 2008 - 2010, eventually remaining on a constant level during the years of 2011 - 2013. The traffic intensity continued to grow again in 2013 (by 2.0%) and 2014 (by 4.1%). In 2015, traffic intensity grew an additional 5.9% because of the substantial drop of fuel prices of 13.9%.

Traditionally, the highest traffic intensity roads in Estonia are located near the border of Tallinn. Surrounding Tallinn – Parnu – Ikla road (see Table 130), which is in line with the planned Rail Baltica direction (part of road 13 to 13.7 km to south of Tallinn), has the highest transport intensity in Estonia. Average amount of cars that pass though the road is 7 419 per day.

[298] Adjusted by the authors of the original diagram created by VŠĮ Kelių ir transporto tyrimo institutas.
[299] https://www.mnt.ee/eng/roads/estonian-road-network

Table 130 Main road sections and respective traffic intensities in Estonia[300]

Main road	Length (km)	Average traffic intensity (vehicles per day)	Average traffic intensity for personal vehicles (length <6m) (vehicles per day)	Average traffic intensity for heavy vehicles (length between 6-12m) (vehicles per day)
Tallinn-Narva (E20)	211	7 649	6 714	291
Tallinn-Tartu-Voru-Luhamaa (E263)	291	6 819	5 887	243
Johvi-Tartu-Valga (E264)	216	3 061	2 723	100
Tallinn-Parnu-Ikla (E67)[301]	193	7 419	5 855	256
Parnu-Rakvere-Someru	184	2 530	2 232	77
Valga-Uulu	125	1 819	1 585	60
Riia-Pskov/Pihkva (E77)	22	739	564	21
Tallinn-Paldiski (E265)	49	6 468	5 895	170
Aasmae-Haapsalu-Rohukula	81	4 374	4 058	165
Risti-Virtsu-Kuivastu-Kuressaare	144	2 206	2 020	84
Tallinn Ring Road (E265)	38	10 889	8 769	475
Tartu-Viljandi-Kilingi-Nomme	130	2 643	2 456	79

Transit Time

Table 131 represents approximate transit time between destinations intersecting Rail Baltica.

Table 131 Transit time for roads intersecting Rail Baltica in Estonia

No	Main State roads	Length (km)	By car	By regional bus	By heavy vehicles
1	Tallinn-Parnu	130	1.40h	Approx. 1.40-1.50h	2.02h
2	Parnu- Riga	181	2.30h	Approx. 2.35h	3.08h
3	Tallinn- Riga	308	4.10h	Approx. 4.20h[302]	4.54h[303]

Availability

Availability of scheduled bus trips varies among providers, but overall availability is good. International passenger carrier “Lux Express” provides 10 journeys per day on route Tallinn-Parnu and Tallinn-Riga. Overall 20 buses travel per day on route Tallinn-Riga[304].

The passenger load factor, for example for “Lux Express” Ltd. in 2014 was approximately 69-70% domestically and, depending on the quarter of the year, 48-61% for the Baltics[305].

Punctuality

[300] https://www.mnt.ee/et/ametist/statistika/liiklussageduse-statistika
[301] Section covered by RB
[302] https://www.tpilet.ee/en/timetable/tallinn/riga-coach-station?Scope=All&Date=09-29-2016&Transfer=None
[303] http://www.della.ee/distance/?cities=130111,9624
[304] https://luxexpress.eu/en/timetable
[305] https://luxexpress.eu/sites/default/files/2014_quarter_3.pdf?_ga=1.87809304.1453706980.1475153488

The punctuality rate of “Lux Express” Ltd. in 2014 was between 98.6 – 99.9%[306].

Comfort

Buses for domestic travel with larger capacities have accessible lavatory, and newer buses have free wireless internet access. Buses for international journeys, passenger carrier “Lux Express” provides[307]:

- Individual touch screen media systems (with videos, music, games, Internet).
- Reclaimable seats.
- Free wireless internet access.
- Power supply by every seat pair (220 V).
- Air conditioning.
- Opportunity to purchase a bottle of water.

Additionally some passenger carriers provide free bottle of spring water, air conditioning system, catering services[308].

Quality of Pre-Trip (Accessibility)

Information regarding timetables, journey times, routes, ticket fares and other information are available on information boards at the bus stations, as well as on websites.

Quality of On-Trip Services

As mentioned above, for international journeys, which are carried out by “Ecolines”, “Eurolines” and “Lux Express”, companies offer air conditioning, onboard entertainment system, coffee machine, free wireless internet access, chemical toilets and electric plugs. On some journeys, there is also a possibility to receive hot meals.

Quality Of Post-Trip Services And Assistance

Passengers can report lost or found items at the nearest bus terminal, bus terminal ensures that all lost and found belongings are safely stored.
Passengers can also leave their complaints at the bus terminal or on bus company websites regarding the trip experience.

Available capacity

International and domestic passenger transportations are concentrated in hands of providers listed in Table 132. Operators highlighted in Table 125 operate on the Tallinn-Parnu route, although the companies are active on all other routes domestically as well as internationally.

Table 132 Main domestic and international transportation companies in Estonia

No	Company	Size of fleet	Number of yearly passenger carried (domestically)
1	“Lux Express Estonia” Ltd.	Approx. 100	808 044[309]
2	“MK Autobuss” Ltd.	n/a	n/a

306 https://luxexpress.eu/et/tulemused
307 https://luxexpress.eu/en/lux-express-estonia-0
308 https://luxexpress.eu/en/lux-express
309 https://luxexpress.eu/et/tulemused

No	Company	Size of fleet	Number of yearly passenger carried (domestically)
3	"Estonian Lines" Ltd.	n/a	n/a
4	"Taisto Liinid" Ltd.	35 international, 40 domestic	n/a
5	"Taisto Express" Ltd.	35 international, 40 domestic[310]	n/a
6	"GoBus" Ltd.	250 (100 of those - larger buses)[311]	n/a

Utilized capacity

In order to utilize the maximum capacity, domestic routes are handled by buses with various capacities. Depending on number of tickets sold per hour and route, appropriate bus is assigned. Due to the trade secret policy, information regarding domestic and international passenger traffic flow is not publicly available.

As was mentioned before, passenger load factor for example for Lux Express AS in 2014 was approximately 69-70% domestically and depending on the quarter of the year 48-61% for the Baltics[312].

State of infrastructure facilities

Comparing the quality of roads between the EU Member States, the quality of roads in Estonia is at an average level (rated 4.39), which is slightly lower than the EU average (4.88), and ranks 18th out of the 28 evaluated countries[313].

Current tariffs

Currently, bus travel tariffs are constantly changing as the market is open and most of the providers are competing with each other in terms of price (see Table 133). There have been many new entrants into the market and this has reduced the ticket prices and other competing providers are being pressured to do the same[314].

Trucks that are transporting goods are affected by the Heavy Goods Vehicles Tax Act (RT I 2000, 81, 515)[315].

Personal cars have no additional road taxes and the amount of cars traveling is mostly affected by the fuel prices.

Table 133 Bus travel tariffs in Estonia

No	Main state roads	Length (km)	Ticket price (EUR)
1	Tallinn - Parnu	130	4 – 9 EUR[316]
2	Tallinn – Riga	308	10 - 14 EUR[317]

310 http://www.taistobussid.ee/company-2/
311 http://www.gobus.ee/en/fleet/fleet/
312 https://luxexpress.eu/sites/default/files/2014_quarter_3.pdf?_ga=1.87809304.1453706980.1475153488
313 http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/estonia/investments-infrastructure/index_en.htm
314 Estonia's media publications. http://tarbija24.postimees.ee/3311127/veel-uks-bussifirma-langetas-piletihinna-uhele-eurole
315 https://www.riigiteataja.ee/en/eli/531102013006/consolide
316 https://www.tpilet.ee/en/timetable/tallinn/parnu
317 https://www.tpilet.ee/en/timetable/tallinn/riga-coach-station?Scope=All&Date=09-30-2016&Transfer=None

Foreseeable tariffs

Bus ticket prices are affected by the decrease of passengers and increasing operating costs. The tariffs are also heavily influenced by the support of the government that is given in the form of Public Service Obligation (PSO). Due to this some of the commercial long distance routes (without PSO support) might be replaced with public regular lines.

All relevant elements affecting generalized cost of transport

The main aspects that affect road transport are: (variable costs) fuel; lubricating oil; tires; spares; (fixed costs) driver and included staff; other labor; depreciation and interests; overheads and other costs.

Current and foreseeable state of development of the infrastructure

State investments show a tendency of increasing maintenance and construction investments on, mostly, the main roads, and but also on the secondary roads.

International Roughness Index (IRI) shows improvement mostly in regards to the main roads. Secondary roads show minimal improvement, as not enough investments are made into these roads to improve their condition[318].

Locations of current infrastructure shown through maps

Figure 116 shows the road infrastructure of Estonia

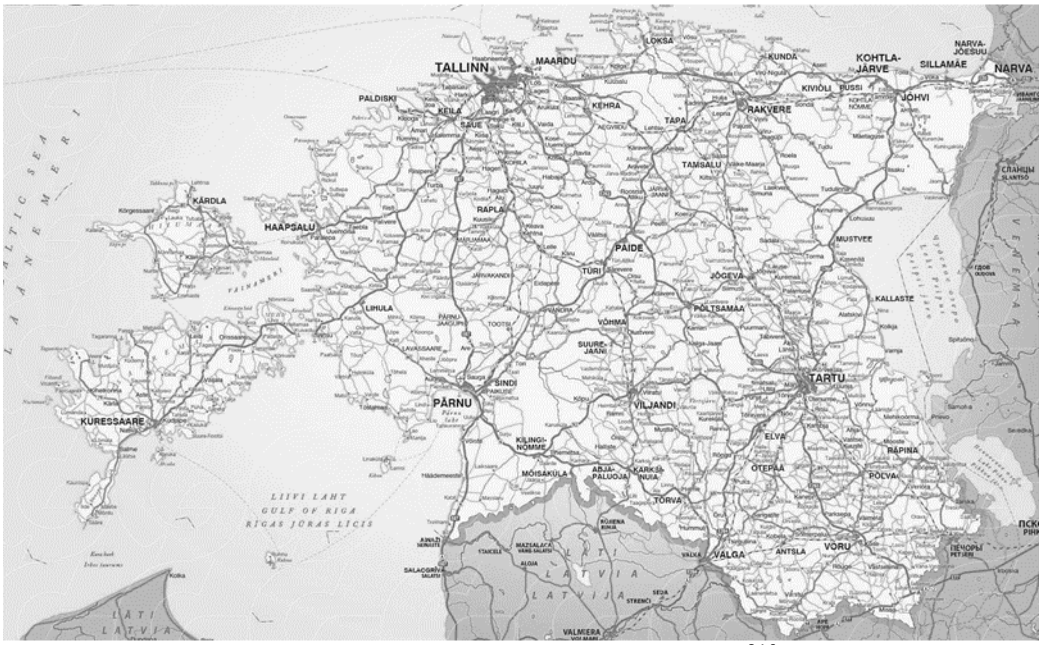

Figure 116 Map of main roads in Estonia[319]

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

The largest projects related to the road transport infrastructure in Estonia are[320]:

[318] https://www.mnt.ee/et/tee/eesti-teedevork/riigiteede-seisukord

[319] http://atlas.regio.ee/sites/default/files/styles/product_detail_large/public/product_images/atlas_2013_eesti_yldkaart_396x293.jpg?itok=tH0m6j-L

- Main road Tallinn-Tartu-Võru-Luhamaa, section 131.0 to 135.1 km: in order to raise level of road safety 2+1 overtaking zones and turn back solutions for access of the city limits will be built. Project value – EUR 4.7 million.
- Road Risti–Virtsu–Kuivastu–Kuressaare, section 11.062 to 21.435 km: renovation of the road surface in order to increase road safety and driving comfort. Project value – EUR 1.42 million.
- Road Peeterristi–Kudruküla, section 0.0 to 3.5 km: renovation of the road surface in order to increase road safety and driving comfort. Project value – EUR 0.76 million.
- Road Ahtme–Rausvere, section 4.6 to 7.2 km: renovation of the road surface in order to increase road safety and driving comfort. Project value – EUR 0.69 million.
- Road Kohtla-Järve–Kukruse–Tammiku, section 7.994 to 8.991 km: renovation of the road surface and building traffic directing lanes and traffic islands at intersections in order to increase road safety and driving comfort. Project value – EUR 0.40 million.

13.1.3.3 Latvia

Road transport is the main form of regional passenger and freight transportation. Total length of roads under the supervision of SJSC "Latvian State Roads" is 20 131 km.

Cargo transportation in Latvia is primarily carried out by companies originating from Poland, Lithuania and Germany, and is mainly transported in direction of the ports. Haulage companies of Russia find transportation to the EU countries more preferable through the territory of Belarus and Poland[321].

For domestic passenger travel, the most convenient mean of transport is bus. Largest operators in passenger transportation are "Rigas Satiksme" Ltd., "Liepajas Autobusu Parks" JSC, "VTU Valmiera" Ltd., "Ventspils Reiss" Ltd. For international travel, largest operators are "Ecolines", "Eurolines" and "Lux Express".

For freight transportation, largest operators are "Vervo" Ltd., "Kreiss" Ltd., "Kurbads" Ltd., "DSV" Ltd. and "Baltic Cargo Latvia" Ltd.

Transport Volumes

The highest traffic intensities in Latvia continue to be on roads that are passing through and around Riga.

In regards to freight traffic flow, "Via Baltica" (E67) continues to have high traffic due to the fact that it serves as the primary transit road between Lithuania border and Estonia border (see Table 134).

[320] https://www.mnt.ee/et/ehitusprojektid-tabelina?field_state_value=All&field_project_status_tid_i18n=21&field_project_type_tid_i18n=All&field_work_period_value%5Bvalue%5D%5Byear%5D=2020&=Otsi

[321] The Market Structure Analysis For International Road Freight Transport in Latvia- https://www.researchgate.net/publication/259895444_THE_MARKET_STRUCTURE_ANALYSIS_FOR_INTERNATIONAL_ROAD_FREIGHT_TRANSPORT_IN_LATVIA

Roads connecting Jurmala, Jelgava with Riga continues to have highest regional passenger traffic flow.

Table 134 Main road sections and respective traffic intensities in Latvia [322]

No	Main State roads	Length (km)	Minimum daily traffic intensity (cars)*	Minimum average daily traffic intensity (heavy vehicles)*	Maximum average daily traffic intensity (cars)*	Maximum average daily traffic intensity (heavy vehicles)*
1	Ventspils – Riga	187.8	2 537	476	12 226	1 478
2	Liepaja – Riga	217.6	2 993	714	10 857	1 534
3	Jelgava – Riga	45.1	9 148	1 845	25 643	3 242
4	Bauska – Riga (E67)	69.1	9 215	2 949	14 055	3 554
5	Bauska – Grenctale (E67)	15.0	4 990	2 595	4 990	2 595
6	Ainazi – Riga (E67)	114.7	4 399	1 804	23 343	3 942

**per day*

Transit Time

Table 135 presents the approximate transit time between destinations intersecting with Rail Baltica.

Table 135 Transit time for roads intersecting Rail Baltica in Latvia

No	Main State roads	Length (km)	By car	By regional bus	By heavy vehicles
1	Jelgava – Riga	45.1	00:49	00:55	01:02
2	Bauska – Riga	69.1	01:07	01:15	01:17
3	Bauska – Grenctale	17	00:15	00:15	00:17
4	Ainazi – Riga	101.8	01:37	02:20 – 02:45	01:58

Availability

Tickets for domestic and international routes may be bought at ticket desks at the bus stations during the office hours (between 6:00 am and 10:00 pm) or at the last minute from the bus driver, and through the website or ticket sales terminal or ticket machine at Riga International Bus Station[323].

Punctuality

Information in regards to bus service comparison of actual departure times with scheduled departure times at the bus stations or stops was not publicly available.

Comfort

Domestic travel buses do not have toilets, but on long routes include a stopover at a bus station with public toilets, and newer buses have free wireless internet access.

International travel buses offer a free bottle of spring water, free wireless internet access, air conditioning, and an on-board toilet[324].

In case of large luggage and pet transportation for domestic travel, passengers need to contact the service desk or a bus driver in advance.

[322] http://lvceli.lv/en/information-and-facts/#traffic-intensity
[323] http://www.latvia.travel/en/article/public-transport
[324] http://www.eurolines.lt/lv/

Quality of Pre-Trip (Accessibility)

Information in regards to timetables, journey times, routes, ticket fares and other information are available on information boards at the bus stations, as well on websites.

In case special assistance is necessary, passengers need to contact local bus stations or bus companies, if the required service is available.

There are no toll roads in Latvia, but drivers do need to pay EUR 2 to enter the administrative territory of Jurmala during the period April-September.

Quality of On-Trip Services

As mentioned above, for international journeys, which are carried out by – “Ecolines”, “Eurolines” and “Lux Express”, companies offer air conditioning, an on-board entertainment system, coffee machine, free wireless internet access, chemical toilets and electric plugs. On some journeys, there is also a possibility to receive hot meals.

Quality of Post-Trip Services and Assistance

Passengers can report lost or found items at the nearest bus terminal, and the bus terminal ensures that all lost and found belongings are safely stored.

Passengers can also leave their complaints at the bus terminal or on the bus company’s website regarding the trip experience.

Available capacity

Domestic transportation is concentrated in the hands of four service providers. The Table 136 presents the approximate capacity of the main service providers in the market.

Table 136 Main domestic passenger transportation companies in Latvia

No	Company	Size of fleet	Number of yearly passenger carried
1	“Rigas Satiksme” Ltd.	458 buses, 200 trams, 269 trolley	146 800 000
2	“Liepajas Autobusu Parks” JSC	138 Buses	12 700 000
3	“Ventspils Reiss” Ltd.	n/a	n/a

International transportation is concentrated in the hands of three providers (see Table 137).

Table 137 Main international transportation companies in Latvia[325]

No	Company	Size of fleet	Number of yearly passenger carried
1	“Ecolines”	More than 200	n/a
2	“Eurolines”	n/a	n/a
3	“Lux Express”	n/a	339 996

Utilized capacity

In order to utilize the maximum capacity, domestic routes are handled by buses with various capacities. Depending on the number of tickets sold per hour and route, the appropriate bus is

[325] http://www.autoosta.lv/partneri/pasazieru-parvadataju-uznemumi/

assigned. Due to the trade secret policies, information in regards to domestic and international passenger traffic flow isn’t publicly available.

State of infrastructure facilities

In comparison to the quality of the roads between the EU Member States, Latvia is ranked as having the second poorest road quality (rated 3.09) and is well below the EU average (4.88)[326].

Current tariffs

Since 1 July 2014, additional road usage fee for freight transporters has been introduced. The fee applies to vehicles with a gross weight exceeding 3 500 kg and are designed for road haulage. Fees are calculated accordingly to the use of road and can be calculated daily, weekly, monthly or annually[327]. Current tariffs are summarized in Table 138.

Table 138 Bus travel tariffs in Latvia [328]

No	Main State roads	Length (km)	Ticket price (EUR)	Price per kilometre (EUR)
1	Jelgava – Riga	45.1	2.30	0.05
2	Bauska – Riga	69.1	3.05	0.04
3	Bauska – Grenctale	17	0.75	0.04
4	Ainazi – Riga	101.8	5.00 – 5.20	0.05

Foreseeable tariffs

Based on publicly available information, there are no substantial projects underway that could influence transport tariffs.

All relevant elements affecting generalized cost of transport

The main aspects that affect road transport are: (variable costs) fuel; lubricating oil; tires; spares; (fixed costs) driver and included staff; other labor; depreciation and interests; overheads and other costs[329].

Current and foreseeable state of development of the infrastructure

Current pavement conditions can be characterized as satisfactory / poor as majority of bituminous pavements are in satisfactory condition (22%), poor condition (22.1%) and very poor condition (25.7%)[330].

There is currently no foreseeable road constructions planned that could intersect E67 and E77 route.

Locations of current infrastructure shown through maps

Figure 117 shows the road infrastructure of Latvia.

[326] http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/latvia/investments-infrastructure/index_en.htm
[327] http://likumi.lv/doc.php?id=185656
[328] www.1188.lv
[329]https://energiatalgud.ee/img_auth.php/d/d2/Road_transport_performance.pdf
[330] http://lvceli.lv/wp-content/uploads/2015/06/Latvijas_Valsts_Celi_2014_A4_LAT_ENG_20150617.pdf

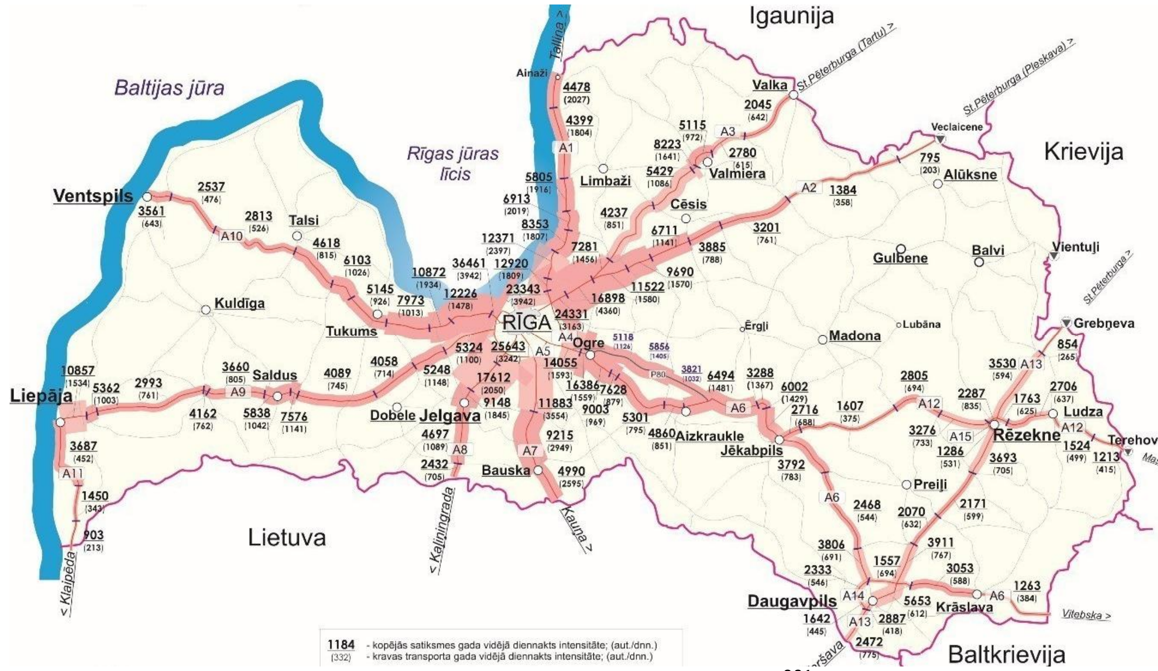

Figure 117 Map main roads in Latvia [331]

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

The planned road transportation infrastructure projects intersecting with Rail Baltica in Latvia are:

- Road E67/A1 Svetciems – Ainazi pavement reconstruction (increasing of bearing capacity), project value is 21.70 million EUR.
- Road E67/A4 Riga bypass, pavement reconstruction (increasing of bearing capacity), project value is 4.3 million EUR.
- Road E67/A4 Riga – Kekava, Kekava bypass construction, project value is 74 million EUR.
- Road E67/A4 Baltezers – Saulkalne. Riga bypass rebuilt from 2 to 4 lanes (two carriageways). Project value is 116 million EUR.
- Road E67/A5 section from A4/A6 node to Kekava bypass node. Project value 235 million EUR.
- Road E67/A1, Riga – Lilaste. Baltezers bypass construction and A1 rebuilding from 2 to 4 lanes (two carriageways) in section Adazi – Lilaste. Project value is 158.50 million EUR.
- Road E67/A7 Bauska city bypass construction. Project value is 118 million EUR.
- Road E67/A7 Iecava village bypass construction. Project value is 111 million EUR.
- Road E67/A7 Kekava – Iecava. A7 reconstruction from 2 to 4 lanes (two carriageways) in section Riga bypass to Iecava bypass. Project value is 141 million EUR.
- Via Baltica (E67/A1, A7). The creation of traffic information services in compliance with the EU requirements within the Via Baltica route with cooperation among Latvia, Lithuania and Estonia.

[331] http://lvceli.lv/informacija-un-dati/

13.1.4 Airports (aircraft) do-nothing option

Key messages

- There are four international airports in Lithuania and the airport infrastructure can be characterized as average in terms of infrastructure development
- Air transportation provides the shortest transit time among Estonia, Latvia and Lithuania
- Tallinn Airport is Estonia's main civil airport with almost all passenger and freight flow going through it
- Riga International Airport is the largest Baltic air traffic hub
- In regards to air freight flow, air as a transportation mode has insignificant role in Latvia's freight transportation industry, as it is mainly used to transport mail and perishable goods

13.1.4.1 Lithuania

In Lithuania there are three main airports carrying passengers – Vilnius, Kaunas and Palanga airports. During the 2016 summer season, Vilnius airport was operating 55 destination routes, Kaunas airport - 15 destination routes, and Palanga airport - 8 destination routes. Direct economic impact of air transport sector in Lithuania in 2013 reached up to 86 million EUR (or, barely 0.25 percent GDP), however, including the indirect impact (72 million euros), the total impact constituted 158 million euros (0.46% of the GDP)[332].

Transport Volumes

During 2016, the number of passengers traveling through the three main passenger-carrying airports in Lithuania were :

- Vilnius airport – 3 814 001passengers.
- Kaunas airport – 740 448 passengers.
- Palanga airport – 232 630 passengers.

The above mentioned number of travelling passengers were presented for all of the available destinations, however, in regards to the sections relevant to Rail Baltica, there are:

- 74 weekly flights between Vilnius and Riga.
- 52 weekly flights between Vilnius and Tallinn.

Transit Time

In regards to the sections related to Rail Baltica, the direct flight durations are[333]:

- Between Vilnius and Riga – 50 minutes.
- Between Vilnius and Tallinn – 1 hour / 1 hour and 20 minutes.

Availability

In regards to the sections, relevant for Rail Baltica, there are:

- 74 weekly flights between Vilnius and Riga.
- 52 weekly flights between Vilnius and Tallinn.

Passengers can purchase their tickets online and execute online check-in. On their websites, airless also provide all the necessary information regarding the chosen flight and their offered services.

332 http://www.vilnius-airport.lt/en/news/?id=1375510
333 https://lektuvubilietai.lt/

Punctuality

The two main companies, carrying passengers between Vilnius and Riga, Vilnius and Tallinn are airBaltic and Nordica on Adria Airways AOC. Regarding punctuality, both providers in the market are fairly well organized and do not experience flight delays frequently:

- airBaltic – statistics show that more than 90% of the total flights, operated by airBaltic, arrive on time. In fact, airBaltic has been ranked 1st globally in punctuality in 2014 by analysts, who tracked the performance of a total of 43.5 million flight records[334].
- Adria Airways – statistics show that approximately 83% of their operated flights arrive on time or experience a less than 15 minute delay[335].

Comfort

The two above mentioned airlines provide a number of services to ensure passenger comfort. Airlines provide:

- Necessary assistance for passengers with special needs.
- Unaccompanied minor service, available for children ages 5 and over.
- Availability to travel with pets.
- Availability of snacks and beverages.
- Magazines to read on planes.
- Air conditioners and other air quality ensuring equipment[336].

With the introduction of new CS300 aircraft to the fleet as of December 2016, also mood lighting, overhead displays with itinerary and flight info, Persons With Reduced Mobility (PRM) lavatory have been added to in-flight comfort level of air Baltic.

Quality of Pre-Trip (Accessibility)

As mentioned above, passengers are provided with a variety of departure time to choose from – there are 74 weekly flights between Vilnius and Riga, 52 weekly flights between Vilnius and Tallinn. Passengers can purchase their tickets online and execute online check-in. On their websites, airlines also provide all of the necessary information regarding the chosen flight and their offered services.

Quality of On-Trip Services

The two main airlines providing flights between Vilnius and Riga, Vilnius and Tallinn provide a variety of services during the flights, services include:

- Assistance for passengers with special needs.
- Unaccompanied minor service, available for children ages 5 and over.
- Availability to purchase extra baggage and cargo services.
- Availability to buy an extra seat.
- Availability to travel with pets.

[334] https://www.airbaltic.com/en/bottom_menu/press-room/press_releases/2015/airbaltic-best-for-punctuality-in-the-world
[335] https://tickets.pl/en/avia/rating/JP/punctuality
[336] https://www.adria.si/en/information/ and https://www.airbaltic.com/en-DE/index

- Snacks and beverages throughout the flight.
- Magazines to read on planes.
- Ability to purchase on-time arrival guarantee – in case the flight is late, passengers can obtain vouchers from the company.

Quality of Post-Trip Services and Assistance

The two main airlines provide a number of services and all of the necessary assistance related to post-trip experience[337]:

- Lost and found offices, that ensure quick solutions in case your luggage is delayed or was damaged during the trip.
- Availability to organize the transport from the airport to the necessary destination upon passengers' arrival at the airport, within the airline's website (for instance, rent a car).
- Airports offer information centres where departing and arriving passengers can get information about their trip / about their destination.
- Passengers can leave online requests / complaints regarding the experience of their trip.

Available capacity

Table 139 shows the capacities of Lithuania airports, excluding Siauliai. Vilnius is the biggest airport with the passenger capacity of 3.5 million per year, followed by Kaunas with the passenger capacity of 1 million per year. Palanga airport has limited passenger capacity and its activity is largely seasonal based, as Palanga is a one of the key destinations of summer tourism.

Table 139 Capacity of the main airports in Lithuania

Airport	Passengers, million	Cargo, t.
Vilnius (VNO)	3.5	18 000
Kaunas (KUN)	1.0	15 000
Palanga (PAL)	0.3	n/a

Utilized capacity

As detailed in Table 139, the airports in Lithuania are capable of handling approximately 4.8 million passengers annually. In 2014, these airports served approximately 3.8 million passengers departing and arriving from all available destinations. As a result, almost 80% of total passenger handling capacity has been utilized[338].

State of infrastructure facilities

According to the study by the EC, Lithuania is ranked only 22nd out of 28 evaluated the EU Member States, in regards to the quality of air transport infrastructure[339].

Despite its low air transportation infrastructure rating, during the period 2007 - 2013, the following air transport infrastructure projects were undertaken:

[337] Ibid.
[338] Statistics Lithuania
[339] http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/lithuania/investments-infrastructure/index_en.htm

- Modernization of Vilnius, Kaunas and Palanga airports - construction of passenger terminals, expansion and adaptation to Schengen requirements, renovations of airport platforms, runways, glide paths and taxiways.
- International Vilnius airport - new terminal was built for non-Schengen passengers taxiway 9.4 (“E”) was build and connected runway and glide way with main taxiway, reconstruction of whole airport platform, “D” and “F” taxiways and installation of taxiway lights is still on the way.
- International Kaunas airport - airport modernization project was implemented: runway and glide way has been renewed, aircraft platform was expanded and new taxiway was built, new passenger terminal was built, airport development plan is under preparation.
- International Palanga airport - undergoing reconstruction of passenger terminal, undergoing modernization of fuel base, the construction of emergency rescue works building has started, explosives detection equipment for the inspection of passenger luggage was obtained.

Current tariffs

Regarding the sections related to Rail Baltica, the direct flight ticket prices are[340]:

- Between Vilnius and Riga – between EUR 35 and EUR 61.
- Between Vilnius and Tallinn – between EUR 84 and EUR 94.

It has to be noted that the prices were evaluated for flights two months in advance for economy class seats.

Foreseeable tariffs

Based on the publicly available information, currently no substantial projects are being developed that could significantly affect the regular airplane ticket prices (tariffs) noted above. As a result, one can conclude that in the foreseeable future the change of airplane ticket prices (tariffs) will be mainly affected due to competition in the market, regular economic fluctuations such as inflation, GDP growth and other similar changes.

All relevant elements affecting generalized cost of transport

According to the study by EC, the main cost factors affecting the general cost of air transport consist of: staff; fuel; maintenance; airport costs; ATC costs; in-flight service; capital and leasing; marketing / sales; overheads[341].

Current and foreseeable state of development of the infrastructure

In the near future, Lithuania is planning to conduct the following key projects related to air transport infrastructure:

- Rehabilitation of the runway and the signal lights system of Vilnius International Airport in order to improve flight safety. Project value – EUR 28 million.

[340] https://lektuvubilietai.lt
[341] http://ec.europa.eu/transport/modes/air/doc/abm_report_2008.pdf

- Reconstruction of Vilnius airport apron. Project value – EUR 11 million.

Locations of current infrastructure shown through maps

Figure 118 graphically depicts the locations of the airports of Lithuania.

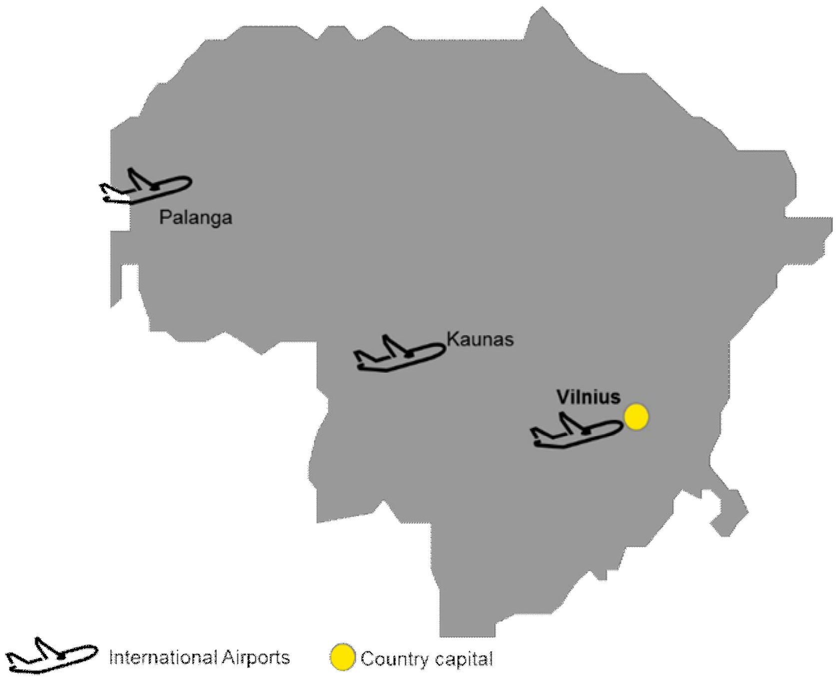

Figure 118 Main airports in Lithuania

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

The main projects related to air transport infrastructure in Lithuania are:

- Rehabilitation of the runway and the signal lights system of Vilnius International Airport in order to improve flight safety (EUR 28 million).
- Reconstruction of Vilnius airport apron (EUR 11 million).

13.1.4.2 Estonia

While there are 12 airports in total throughout Estonia, the most significant airport is Tallinn Airport from traffic and facilities standpoint. During 2013 the total number of serviced passengers amounted to 1.9 million and the total tonnes of cargo handled amounted to 20 976, while the total number of aircraft movements amounted to 37 856[342].

Transport Volumes

The freight carried by air transport according to Statistics Estonia was 13 932 tonnes in 2016, out of which goods constituted 12 045 tonnes and mail 1 887 tonnes. There was a substantial decrease in freight transportation after the economic crisis of 2008 - 2009, after which it plummeted from 42 104 tonnes in 2008 to 12 053 tonnes in 2010 (see Figure 119), recovering to 23 934 tonnes by 2012. However, the volume has dropped to 13 932 as of 2016.

[342] http://www.transit.ee/show/air.html

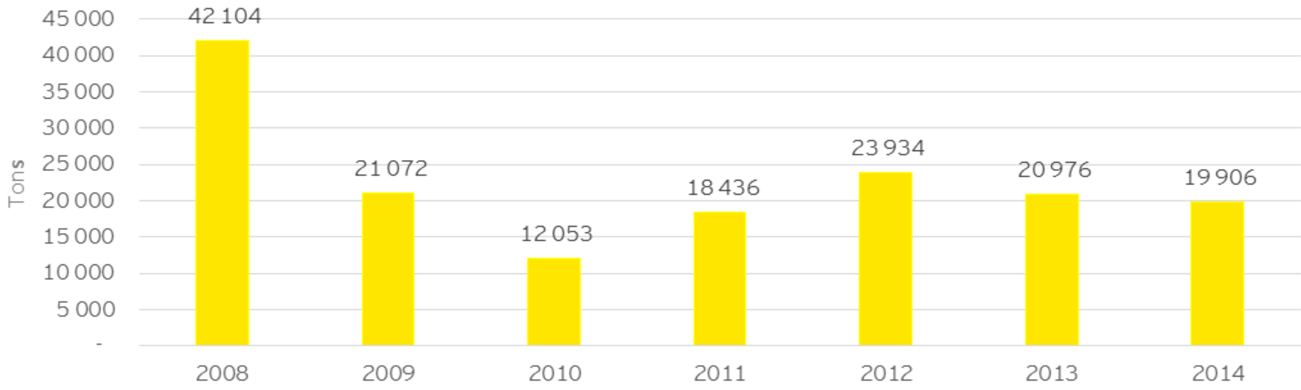

Figure 119 Freight transported by air in Estonia, 2008 – 2014[343]

Passenger travel, however, has been growing steadily in recent years. Although it decreased around the economic crisis, however, the decrease was not as great as for freight transportation (see Figure 120). In 2016, there were 2.22 million passengers travelling by air in Estonia[344].

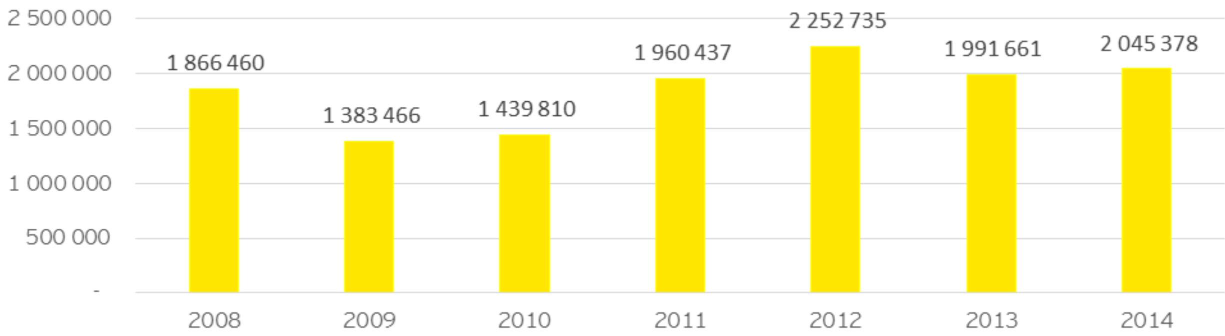

Figure 120 Passengers transported by air in Estonia, 2008 - 2014[345]

Transit Time

There are two air travel destinations relevant to Rail Baltica, and the average transit time between two destinations is 1 hour (see Table 140).

Table 140 Flights intersecting Rail Baltica in Estonia

No	Destination	Time	Flights per day	Flights per week
1	Tallinn-Riga	50min	Approx. 4-5	35[346]
2	Tallinn-Vilnius	1.00-1.20h	Approx. 3-5	35

Availability

In regards to the sections relevant for Rail Baltica, there are approximately 35 weekly flights between Tallinn and Riga and 35 weekly flights between Tallinn and Vilnius.

Punctuality

[343] Statistics Estonia/Eesti Statistikaamet
[344] Rail Batica Global Project Cost-Benefit Analysis
[345] Statistics Estonia/Eesti Statistikaamet
[346] http://www.flightstats.com/go/FlightStatus/flightStatusByRoute.do

According to FlightStats analysis, Latvia's only airline airBaltic and is ranked 1st in punctuality. Over 90% of airBaltic total flights arrive on time[347].

Tallinn Airport GH, as the ground handler, is following many management standards: ISO 9001:2008, ISO 14001:2004.

"Krediidiinfo" Ltd, an Experian company certifies that Tallinn Airport GH AS has achieved the rating "excellent" based on 2011 economic data. Moreover, Tallinn Airport GH was the nominee for the Tourism Deed 2014. Of the flights serviced by Tallinn Airport GH, 98% depart on time[348].

Comfort

In order to ensure the comfort of passengers, above mentioned airline provides services such as:

- Availability to travel with pets.
- Inflight catering were passengers have the availability to purchase snacks and beverages.
- Magazine to read on planes.
- Necessary assistance for passengers with special needs.

With the introduction of new CS300 aircraft to the fleet as of December 2016, also mood lighting, overhead displays with itinerary and flight info, PRM lavatory have been added to in-flight comfort level.

Quality of Pre-Trip (Accessibility)

Tallinn Airport is easily accessible by car, taxi and bus, which have direct services between the airport and the city centre. Flight tickets can be purchased on airline website, as well as execute online check-in.

Information in regards to timetables, journey times, routes, ticket fares and other information is available at Tallinn Airport or on its website.

airBaltic also provides services such as seat reservation, extra seat reservation, pre-ordering inflight meal, on-time arrival guarantee, and unaccompanied minor service[349].

Quality of On-Trip Services

As mentioned above, airBaltic provides on-board services such as availability to travel with pets, inflight catering, and magazine to read on planes.

Quality of Post-Trip Services and Assistance

Tallinn Airport offers plenty of post-trip services such as baggage lockers, safe deposit boxes, ATM-s and Wi-Fi. Moreover, bus stops, car parks and Taxi Park are close-by from the arrival entrances.

The airport bus stops are located on the ground floor in front of the passenger terminal. The 'Kiss & Fly' car park right in front of the entrance to the passenger terminal is very convenient if someone is coming to pick people up at the airport. Cars can be parked there for 15 minutes free of charge.

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[347] https://www.airbaltic.com/airbaltic-achieves-no-1-rank-in-punctuality

[348] http://www.tallinn-airport.ee/en/news/tallinn-airport-gh-nominee-for-the-tourism-deed-2014/

[349] http://www.airbaltic.com/

Car rentals are also nearby and the official taxi partners of Tallinn Airport are Tulika Takso, Tallink Takso and Tulika Business, whose cars will be waiting for passengers' right in front of the terminal doors[350].

Available capacity

Tallinn Airport's passenger terminal (28 000 m²) capacity is 2.5 million passengers annually.

State of infrastructure facilities

The quality of air transport infrastructure in Estonia, in comparison to the EU Member States, has been rated low (4.39), which is significantly lower than the EU average (5.07). This ranks the infrastructure the third from the bottom in the comparative index made by the EC[351], although it is important to note, that the main airport of Estonia, Tallinn, Airport has begun extensive operations of expanding the tarmac of the landing area and other expansion projects[352].

Current tariffs

In regards to the sections related to Rail Baltica, the direct ticket prices ranges are:

- Tallinn-Riga from EUR 58.99 up to EUR 164.99.
- Tallinn – Vilnius from EUR 84.99 up to EUR 174.99[353].

Foreseeable tariffs

Information in regards to flight tariffs in foreseeable future is not publicly available, and it is only possible to conclude that ticket prices can be affected by competition in the market, economic fluctuations and other similar changes.

All relevant elements affecting generalized cost of transport

Bank of Estonia forecasts that the Estonia's economy will grow by 2% in 2016. The period of 2016-2022 will be characterized by modest economic growth, low inflation, low interest rates and rapid decrease of employable population as well as rapid growth of labour costs of 5-7% a year. Low economic growth means that the number of passengers and revenue will increase in the same proportion. At the same time, services related to workforce and labour costs will grow notably faster. Competition in aviation is very tough and the pressure on already low airport fees remains very strong. Airport fees are not going to be increased notably to cover the growing costs. Key challenge in the coming years is maintaining the efficiency in operations without jeopardizing safety and security in finding additional revenue sources[354].

Current and foreseeable state of development of the infrastructure

As mentioned before, the air traffic area development project's goal of Tallinn Airport is to improve the airport's environmental conditions and its infrastructure.

[350] http://www.tallinn-airport.ee/en/transport/leaving-the-airport/
[351] http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/estonia/investments-infrastructure/index_en.htm
[352] http://www.tallinn-airport.ee/wordpress/wp-content/uploads/2016/05/Aastaaruanne_2015_eng_L-PLIK.pdf
[353] https://tickets.airbaltic.com/app/fb.fly
[354] http://www.tallinn-airport.ee/wordpress/wp-content/uploads/2016/05/Aastaaruanne_2015_eng_L-PLIK.pdf

The project sees the runway surface structure renewed and the runway itself lengthened to 3 480 meters. The navigation lighting system of the runway and the taxiway is to be swapped for more efficient LED-technology and higher category navigation system will be introduced (CAT III). East and South area water drainage systems are to be reconstructed and designated, snow melting area and snow melt water drainage and monitoring systems in compliance with the regulations will be constructed. Eastern part of the airport will also get a new de-icing area and an engine testing area in compliance with applicable regulations. Aircraft apron system will be improved, perimeter fence and patrol routes will be renewed, and runway maintenance equipment manoeuvring-waiting area will be created[355].

Locations of current infrastructure shown through maps

Figure 121 Map of airports in Estonia shows the map of main airports in Estonia

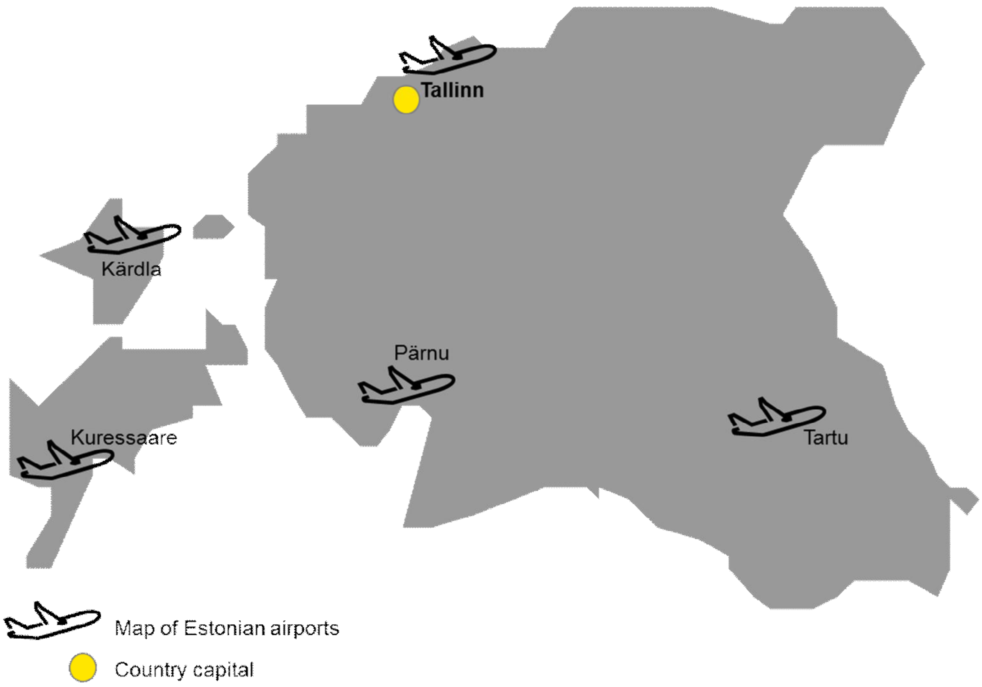

Figure 121 Map of airports in Estonia

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

The aforementioned renovations and construction works on the runway impose certain restrictions on air traffic. In order to ensure that more critical works are completed in due time and that Tallinn airport is fully functional in 2018, when Estonia holds presidency of the EU, the construction works will be implemented in two phases: Phase 1 in 2016-2017 and the Phase 2 in 2019-2020.

Moreover, Tallinn airport passenger terminal will also undergo expansion which will extend the passenger terminal to the south by 9 meters and bring 33 meters of the facade forward. More improvements are going to be made in the pre-flight security control area that will be more spacious

[355] http://www.tallinn-airport.ee/wordpress/wp-content/uploads/2016/05/Aastaaruanne_2015_eng_L-PLIK.pdf

and comply with modern requirements. On the ground floor, the VIP area and the outgoing baggage handling area is to be expanded and several office, storage and changing rooms are going to be built.

For airport passengers, there is going to be new light rail link. The convenience and traffic conditions will be improved in the upcoming years because the passenger terminal of the Tallinn Airport will be connected to a light rail line. Construction works will start in the spring 2016 and the light rail line will be completed by the end of 2017. The construction project is being coordinated by “Tallinna Linnatranspordi” Ltd.

In addition, a parking building will be built to alleviate the current shortage of parking spaces and to provide passengers more convenient parking service. The parkade will be completed at the end of 2017.

More business opportunities will be created also for the partners to increase revenue from the commercial property of Tallinn Airport and develop businesses. At the end of 2015 a memorandum was signed with AS Magnetic MRO to build an aircraft painting hangar. The hangar will have the capacity to serve aircraft the size of up to Boeing 737 MAX9 and Airbus 321 neo. The construction works at the hangar will start in 2016 and the building will be completed in 2017[356].

13.1.4.3 Latvia

The main international airport in Latvia is Riga International Airport, and there are also two regional airports in Liepaja and Ventspils. Riga International Airport is the biggest Baltic air traffic hub with 46% of the region’s passenger traffic.

The main passenger carrier in Latvia is airBaltic, whereby the state also holds 80.05% of the stock of the company. airBaltic provides 89 destinations in summer and 69 destinations in winter[357] and in 2014, 56% of passengers in Riga International Airport were handled by airBaltic.

Transport Volumes

In 2014, Riga International Airport transported 4.8 million travellers, out of which 2.4 million departed and 2.4 million arrived (see Table 141)[358]. 29% of total passenger traffic is transfer/transit passengers[359].

There are two relevant direct flight destinations to the Rail Baltica:

- Riga – Tallinn, with 185 088 thousand passengers flying on this route.
- Riga – Vilnius, with 176 117 thousand passengers flying on this route.

[356] http://www.tallinn-airport.ee/wordpress/wp-content/uploads/2016/05/Aastaaruanne_2015_eng_L-PLIK.pdf
[357] https://www.airbaltic.com/en-LV/index
[358] http://www.csb.gov.lv/en/dati/e-publikacijas/transport-latvia-2016-44231.html
[359] http://www.riga-airport.com/uploads/files/RIX_Gadagramata_2015_ENG.pdf

Table 141 Passenger and freight turnover at the Riga International Airport, 2014[360]

	Number of aircraft departure	Passenger departure, thous.	(of which by aircraft of Latvia's airlines)	Number of aircraft arrivals	Nu mber of arrival, thous.	(of which by aircraft of Latvia's airlines)	Freight and mail loaded, tonnes	Fr eight and mail unloaded. tonnes
Riga International Airport	32 912	2 403.1	1 394.4	32 907	2 408.9	1 383.9	22 860	9 975

Transit Time

As mentioned above, there are two destinations relevant to Rail Baltica. Currently, there are no available direct connection flights to Kaunas. The average transit time between destinations is 1 hour and 10 minutes (see Table 142).

Table 142 Main flight directions intersecting Rail Baltica in Latvia [361]

No	Destination	Time	Flights per day	Flights per week
1	Riga – Tallinn	00:50	5 – 7	35
2	Riga – Vilnius	00:50	5 – 7	55

Availability

Regarding the section relevant for Rail Baltica, there are 35 weekly flights between Tallinn and Riga and 55 weekly flights between Vilnius and Riga.

Punctuality

According to FlightStats analysis, Latvia's only airline airBaltic is ranked 1st in punctuality. Over 90% of airBaltic total flights arrive on time[362]. Whereas the ground handling at the Riga International Airport in 2014 attained high punctuality ratio in terms of passenger (99.55%) and aircraft handing (99.58%).

Comfort

In order to ensure the comfort of passengers, airBaltic provides various services such as:

- Availability to travel with pets.
- In-flight catering were passengers have the availability to purchase snacks and beverages.
- Magazine to read on planes.
- Necessary assistance for passengers with special needs.

With the introduction of new CS300 aircraft to the fleet as of December 2016, also mood lighting, overhead displays with itinerary and flight info, PRM lavatory have been added to in-flight comfort level.

Quality of Pre-Trip (Accessibility)

[360] http://www.csb.gov.lv/en/dati/e-publikacijas/transport-latvia-2016-44231.html
[361] http://www.riga-airport.com/en/main/flights
[362] https://www.airbaltic.com/airbaltic-achieves-no-1-rank-in-punctuality

Riga International Airport is accessible by passenger bus (No.22), which has direct services between the airport and the city center.

Tickets can be purchased on websites and execute online check-in.

Information in regards to timetables, journey times, routes, ticket fares and other information is available at Riga International Airport or on its website. airBaltic also provides services such as:

- Seat reservation.
- Extra seat reservation.
- Pre-ordering inflight meal.
- On-time arrival guarantee.
- Unaccompanied minor service[363].

Quality of On-Trip Services

As mentioned above, the national carrier airBaltic provides on-board services such as:

- Availability to travel with pets.
- Inflight catering.
- Inflight magazines.

With the introduction of new CS300 aircraft to the fleet as of December 2016, also mood lighting, overhead displays with itinerary and flight info, PRM lavatory have been added to in-flight comfort level.

Quality of Post-Trip Services and Assistance

Riga International Airport provides a shuttle bus, which leaves every 30 minutes from 10:30 am till 7:00 pm.

Lost and found luggage can be reported at lost and found offices. Office ensures that appropriate measures are taken in order to help passenger as quickly as possible.

Availability to organize the transport from the airport to the necessary destination upon passengers' arrival at the airport, within the airline website.

Riga International Airport provides short-term parking and two long-term car parks.

Available capacity

The available capacity of Riga International Airport is shown in Table 143.

[363] http://www.airbaltic.com/

Table 143 Airport descriptive in Latvia

No	Airport	Capacity (planes per day)	Commercial aircraft movement (1000 movements)	Max frequency (Movements per hour)	Capacity (persons)	Freight traffic flow (tonnes per year)
1	Riga International Airport	768	67.5	17	6 000 000	45

Riga International Airport's capacity is 6 million passengers per year. Cargo capacity is 50 000 tonnes, and warehouse space is 1 900 m^2.

Liepaja International Airport's annual capacity is 150 000 passengers. Airport has 2 check-in desks, 1 gate, 1 air-bridge, 50 short term parking spaces and 50 long term parking spaces. Cargo capacity is 1 800 tonnes and holds 100m^2 warehouse space.

Utilized capacity

In 2014, Riga international Airport handled 65 thousand aircrafts and 33 thousand tonnes of cargo (see Table 144)[364].

Table 144 Riga international Airport utilized capacity, 2014

	Cargo (tonnes)	Flights	Passengers
Riga International Airport	32 984	65 819	4 813 959

State of infrastructure facilities

During the period between 2010 - 2015, Riga International Airport has also completed the following projects[365]:

- Terminal expansions – creating new non-Schengen passengers departure/arrivals area.
- Improved passenger service in the terminal.

Current tariffs

Regarding the sections related to Rail Baltica, as of 6 October 2016 the direct ticket prices are:

- Riga – Tallinn from EUR 78.98 up to EUR 108.98.
- Riga – Vilnius from EUR 107.98.

Foreseeable tariffs

Information in regards to flight tariffs in foreseeable future is not publically available, and it is only possible to conclude, that ticket prices can be affected by competition in the market, economic fluctuations and other similar changes.

All relevant elements affecting generalized cost of transport

Based on the EC Airline Business Models report, aspect that affect transport costs are: maintenance, fuel, staff, Airport Costs, ATC costs, in-flight services, Capital and leasing, Marketing/Sales, overheads[366].

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[364] http://www.riga-airport.com/uploads/files/RIX_Gadagramata_2015_ENG.pdf
[365] http://www.riga-airport.com/uploads/files/Riga%20Airport%20Business%20Plan%20and%20Action%20Plan%20for%202016-2036.pdf

Current and foreseeable state of development of the infrastructure

According to the study by the EC, Latvia is ranked 16th out of the 28 EU Member States and is above the EU average, is regards to the quality of air transport infrastructure[367].

Riga International Airport has a major investment plan for the period 2016 – 2022, whereby investments in infrastructure development are planned. Major planned investment include:

- Airport infrastructure development – construction of the 2nd rapid exit taxiway, reconstruction of the technical services building, reconstruction of the storm water drainage system in the airport landside, installation of the axis lights on the apron taxiways, reduction of carbon dioxide emissions in the airport territory lighting infrastructure, improvements in aviation security. Implementation scheduled for 2016 – 2019, with planned costs of EUR 13.5 million.
- Terminal expansion (stage 5, phase 2) – 9 additional Schengen/non-Schengen boarding gates, new commercial areas, 7 walking stands and 3 air bridges. Implementation scheduled by end of 2016, with planned costs of EUR 9.1 million.
- Terminal expansion (stage 6). Planned construction 2020 – 2022, with estimated costs EUR 45 million.

Locations of current airport infrastructure shown through maps

Figure 122 shows the location of most significant airports in Latvia

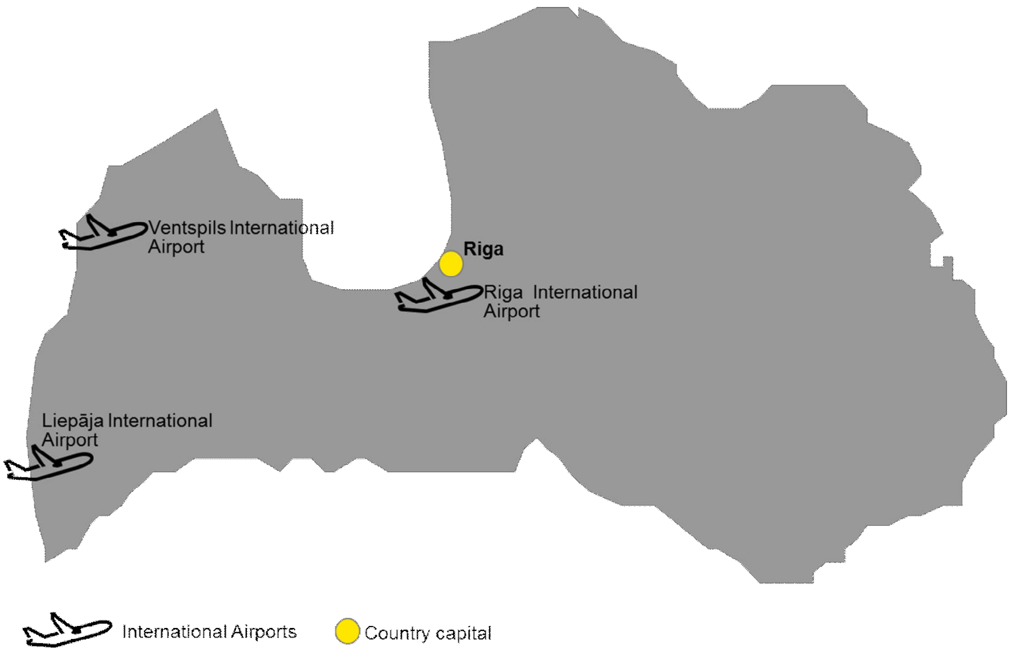

Figure 122 Map of airports in Latvia

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

366 http://ec.europa.eu/transport/modes/air/doc/abm_report_2008.pdf
367 http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/latvia/investments-infrastructure/index_en.htm

Riga International Airport has a major investment plan for 2016 – 2022 whereby investments of EUR 13.5 million in infrastructure development are planned to be executed between years 2016 – 2019.

Terminal expansions, implementation by end of 2016 with planned cost of EUR 9.1 million.

Terminal expansions, stage 6 – construction is planned in 2020 – 2022 and estimated costs are around EUR 45 million.

13.1.5 Ports (ships, maritime transport) do-nothing option

Key messages

- Current sea passenger carriers do not provide direct destinations between Estonia, Latvia and Lithuania, therefore information in regards to passenger transportation is not applicable
- Lithuania has a single port, which is located in Klaipeda, and it serves as main sea transportation hub in Lithuania
- Port of Tallinn is Estonia's main port in terms of trade and freight capacity and serves as the main passenger port
- Latvia's ports serve an important role in international freight transportation due to joint operations with railways

13.1.5.1 Lithuania

Lithuania has a single port, which is located in Klaipeda. About 800 economic agents are directly related to the operations of the Port of Klaipeda. The Port of Klaipeda and the enterprises related to its operations provide more than 58 thousand jobs and 6.3% of the Lithuania's GDP. The Port of Klaipeda is one of the most important transport hubs in Lithuania bringing together sea, road and railway routes from East and West. The Port of Klaipeda is the utmost northern ice-free port in eastern Baltic. Located on the crossroads of international freight corridors, the port serves as a bridge between the markets of CIS and Central Asia on the one hand, and European Union on the other[368].

Transport Volumes

The Table 145 Sea transport volumes in Lithuania presents the overall number of passengers carried and the volume of freight transported during 2014 within the Port of Klaipeda.

Table 145 Sea transport volumes in Lithuania

Passengers arrival and departure	280 thousand
Cruise passengers	58 thousand
TEU stevedored	47M tonnes

Transit Time

The primary passenger transportation destinations are Kiel (Germany) and Karlshamn (Sweden). However, there are no ferries connecting Klaipeda's port with Latvia or Estonia directly. In order to

[368] http://www.ljkka.lt/en/port-development/

have a reference point, regarding the potential transit time, the duration of trips between Klaipeda and Kiel, Klaipeda and Karlshamn are[369]:

- Between Klaipeda and Kiel – 19 hours.
- Between Klaipeda and Karlshamn – 12 hours.

Availability

In order to provide ease of purchasing ticket for its customers, the main carrier at the Port of Klaipeda DFDS seaways JSC, offers the following way to purchase tickets for its ferries – through websites, agencies and at the port[370].

Punctuality

The main passenger carrier at the Klaipeda's port – DFDS Seaways JSC takes extensive measures to ensure the punctual arrival and departure of all its ferries. As technical problems and accidents may lead to unplanned periods in dock, interruption of sailing schedules, DFDS Seaways has a systematic and comprehensive maintenance program for all ships, including periods in dock at regular intervals. As a result, company experiences very few delays that may occur primarily due to extreme weather conditions, strikes in ports and other similar causes[371].

Comfort

To ensure the comfort of its passengers, the DFDS seaways JSC offers a number of services on its ferries, such as:

- Possibility to provide necessary assistance for passengers with special needs.
- Possibility to book a private cabin.
- Possibility to travel with a pets.
- Catering on board (Bars, restaurants, shops).
- Playing room for children[372].

Quality of Pre-Trip (Accessibility)

The main passenger carrier at the Klaipeda's port, DFDS seaways JSC ensures the quality of pre-trip experience by[373]:

- Offering to purchase tickets on their website.
- Providing a travel guide on their website, regarding the relevant travel destinations.
- Providing extensive information on their website, regarding availability of extra services (such as booking a private cabin), extent of their services on ferries.
- Providing answers to frequently asked questions and offering a contact form for additional queries.

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369 http://www.dfdsseaways.lt/specialus-pasiulymai/klaipeda/vakaru-europos-gyventojams?gclid=CjwKEAjw34i_BRDH9fbylbDJw1gSJAAvIFqUlWnDkzthn49QMHocmGEe1QsKvr0DupKddux5rXcryxoCejfw_wcB
370 http://www.dfdsseaways.lt/informacija-keleiviams/
371 https://www.dfds.com/Downloadables/DFDS%20Annual%20Report%202015.pdf
372 http://www.dfdsseaways.lt/informacija-keleiviams/
373 Ibid.

Quality of On-Trip Services

To ensure the comfort of its passengers, the DFDS seaways JSC offers a number of services on its ferries, such as:

- Possibility to provide necessary assistance for passengers with special needs.
- Possibility to book a private cabin.
- Possibility to travel with a pets.
- Catering on board (Bars, restaurants, shops) bars.
- Playing room for children.

Quality of Post-Trip Services and Assistance

To ensure passenger satisfaction regarding their post-trip experience[374]:

- Port of Klaipeda is equipped with currency exchange facility, cafe, toilets and a car parking lot.
- Buses are scheduled to take passengers from the port.
- DFDS Seaways JSC offers its passengers travel guide on their website, regarding the relevant destinations.
- DFDS Seaways JSC also offers contact form and a live chat function to either request for information or leave a review / request.

Available capacity

As mentioned above, currently there are 2 main active sea transport destinations from Klaipeda's port – Kiel and Karlshamn. DFDS seaways JSC currently operates 4 ferries for these two routes[375]:

- Between Klaipeda and Kiel – 2 ferries with the passenger capacity of 550 and 328 passengers.
- Between Klaipeda and Karlshamn – 2 ferries with the passenger capacity of 1 000 and 500.

In regards to the overall available capacity of the Port of Klaipeda, due to stable investments and improvements of the port's infrastructure, the available capacity of the port now reaches up to 500 thousand passengers per year[376].

Utilized capacity

As mentioned above, the current capacity of Port of Klaipeda reaches almost 500 thousand passengers per year. During 2014, the port served approximately 280 thousand passengers (arriving and departing). Thus, around 56% of the port's capacity has been utilized.

State of infrastructure facilities

According to the study by EC, Lithuania ranks 16th out of the EU Member States, in regards to the quality of its sea transport infrastructure[377].

[374] http://www.dfdsseaways.lt/informacija-keleiviams/

[375] http://www.dfdsgroup.com/Investors/Reports/Documents/DFDS-Annual-Report-2014.pdf

[376] http://www.portofklaipeda.lt/news/5006/575/Centriniame-Klaipedos-terminale-veikla-pradejo-keltu-linija-Klaipeda-Karlshmanas/d,archyve

During the last 2.5 years, the Klaipeda State Seaport Authority invested approx. EUR 145 million into infrastructure. In 2013, there were investments of more than EUR 87 million. It is planned to further invest about EUR 350 million up to 2018.

More than half of the planned investments will be allotted to port dredging. One more aspiration of the Klaipeda State Seaport Authority in 2015 has been to solve railway infrastructure issues. In 2015, it planned to allot about EUR 4.4 million for railway constructions and repairs. It is intended to invest about EUR 3.3 million to the reconstruction of access roads and streets[378].

Current tariffs

Travelling between Klaipeda and Karlshamn, DFDS seaways JSC offers the following prices[379]:

- Between EUR 160 and EUR 180 for a single person, including a personal cabin.
- EUR 18 for a single seat on the ferry.

Travelling between Klaipeda and Kiel, DFDS seaways JSC offers the following prices:

- Between EUR 130 and EUR 150 for a single person, including a personal cabin.
- EUR 18 for a single seat on the ferry.

It has to be noted that the prices were estimated for a ferry two months in advance.

Foreseeable tariffs

Assessing the publicly available information, currently there are no significant projects planned that could alter the present sea transport prices. Thus, the transport tariffs are most likely to be affected by the regular economic fluctuations, such as inflation, employment, GDP growth and the market price fluctuation of the other sea transport prices affecting elements (for instance price of oil and competition).

All relevant elements affecting generalized cost of transport

The main elements, affecting the generalized cost of maritime transport costs are port infrastructure, price of oil, staff costs, time at sea and competition among carriers[380].

Current and foreseeable state of development of the infrastructure

Due to an efficient funding system, Port of Klaipeda's infrastructure is rapidly developing. Funding is allocated towards the development of port infrastructure, access roads, railways, maintenance and capital dredging of the port waters and the improvement of the security requirements.

During 2015 and 2018, Klaipeda State Seaport Authority will invest over EUR 351 million to port infrastructure[381].

Locations of current infrastructure shown through maps

The Table 134 graphically presents the location of the Port of Klaipeda.

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[377] http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/lithuania/investments-infrastructure/index_en.htm
[378] http://www.portofklaipeda.lt/uploads/Leidiniai/EN%20Brosiura%20(sumazinta).pdf
[379] http://www.dfdsseaways.lt/
[380] http://www.oecd.org/tad/benefitlib/trade-costs.htm
[381] http://www.portofklaipeda.lt/uploads/Leidiniai/EN%20Brosiura%20(sumazinta).pdf

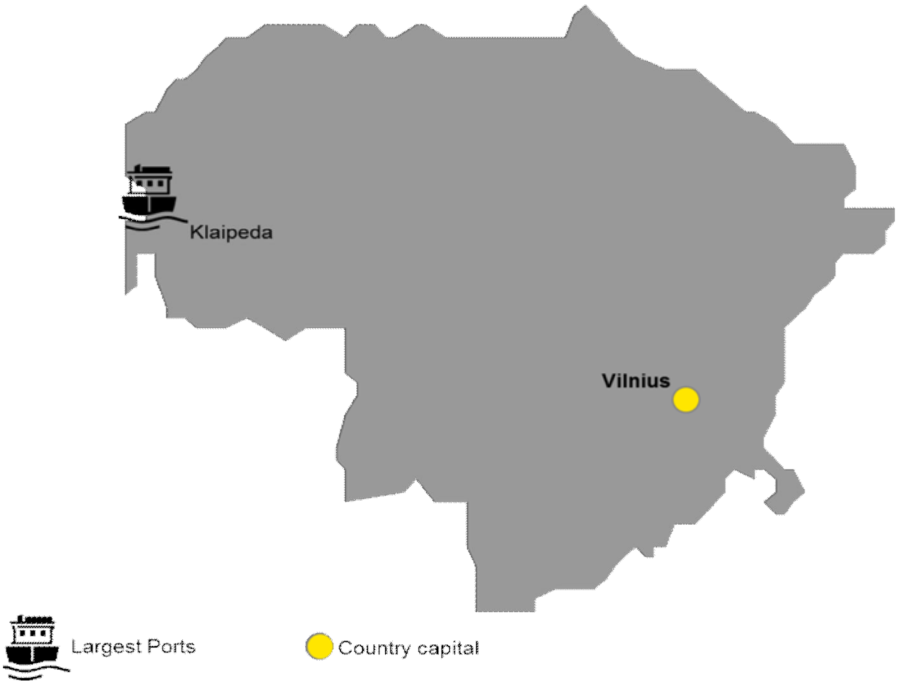

Figure 123 Main ports in Lithuania

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

The main projects related to the maritime transport infrastructure development in Lithuania during 2015 and 2018 (amounting to EUR 351 million) are:

- Reconstruction of quays No. 1-2 up to –16.5 m.
- Reconstruction of quays No. 10-11 up to –16.5 m.
- Reconstruction of quays No. 67-68 up to –14.5 m.
- Preparatory works, dredging and construction of quays No. 97-100 up to –16.5 m.
- Reconstruction of quays No. 143-143a up to –14 m.
- Reconstruction of breakwaters and reinforcement of the slopes of the Curonian Spit.
- Installation of common dock pit in the Malku Bay.
- Construction of marina (quay for small and pleasure boats), including dredging operations.
- Construction of breakwaters and quays of Sventoji State Seaport, and dredging of its port waters.
- Dredging of the Malku Bay, including installation of coastal protective wall.
- Improvement of the inner entrance channel. I phase – dredging up to –15 m.
- Construction of the two-level crossroad.
- Reconstruction of Nevezio street.
- Projects for construction and reconstruction of railways.
- Acquisition of a dredger / a suction dredger for maintenance dredging works.
- Acquisition of an oil-collecting vessel.

13.1.5.2 Estonia

With more than 1 000 km of sea border, sea travel and transportation has always been an important economic sector. Currently, there are officially 45 ports registered in Estonia. Out of all of the registered ports, six - the Port of Kunda, Paldiski North Harbour, the Port of Parnu, the Port of Sillamae, the Port of Tallinn and the Vene-Balti Port - are considered to be industrially critical sea ports with Port of Tallinn also being the main passenger port.

Transport Volumes

Sea is an important mode of transportation for passengers. Figure 124 highlights the total number of passengers, which includes both national and international lines. More passengers, however, take international trips rather than national. For instance, out of 8.68 million passengers in 2014, 4.84 million or 55.7% travelled internationally. This is different from road travel, where most trips are taken locally in Estonia.

The biggest passenger transportation company in Estonia is “Tallink Grupp” JSC whose annual revenue in 2014 was EUR 921.5 million. The total number of passengers carried by “Tallink Grupp” JSC during the 2014 financial year was 8.88 million, with about 4.5 million travelling on their Tallinn-Helsinki[382] route meaning that their ships carried approximately 55% of passengers and 61% of ro-ro cargo on the route between Tallinn and Helsinki.

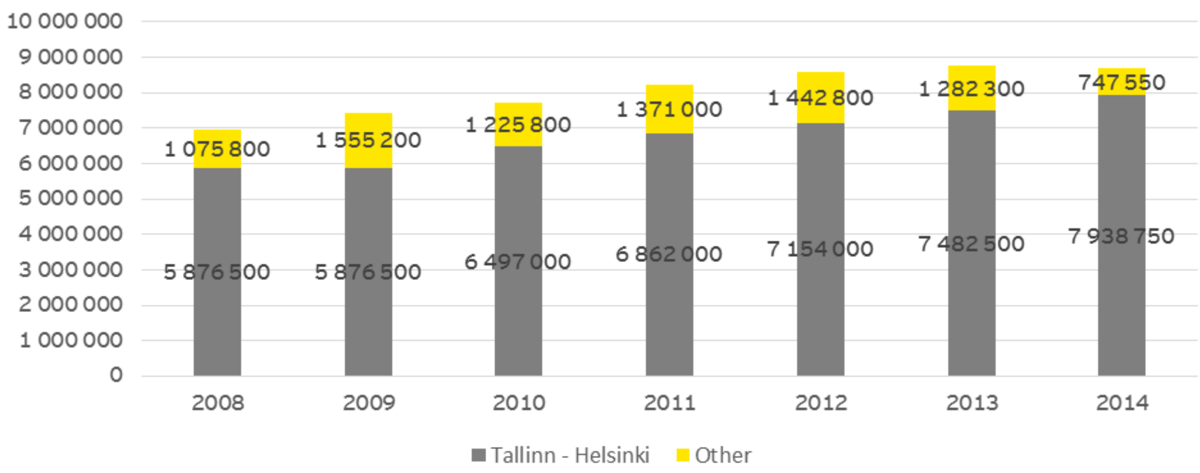

Figure 124 Passengers transported by sea in Estonia, 2008 – 2014[383]

Port of Tallinn is the largest port authority in Estonia and provides these services:

- Cargo and activities related to handling it.
- Passengers and activities related to serving them.
- Real estate development.
- Shipping.

[382] AS Tallink Grupp annual report 2014
[383] Statistics Estonia/Eesti Statistikaamet

In 2014, turnover in goods was 28 135 thousand tonnes. Table 146 represents goods handled in the main Estonia's ports.

Table 146 Main Estonia's ports volumes of goods, 2016 (thousand tonnes)[384]

Ports	2016
Tallinna Sadam	20 120
Sillamäe Sadam	6 320
Paldiski Põhjasadam	2 500
Pärnu Sadam	1 914
Tallinna Sadam	1 490

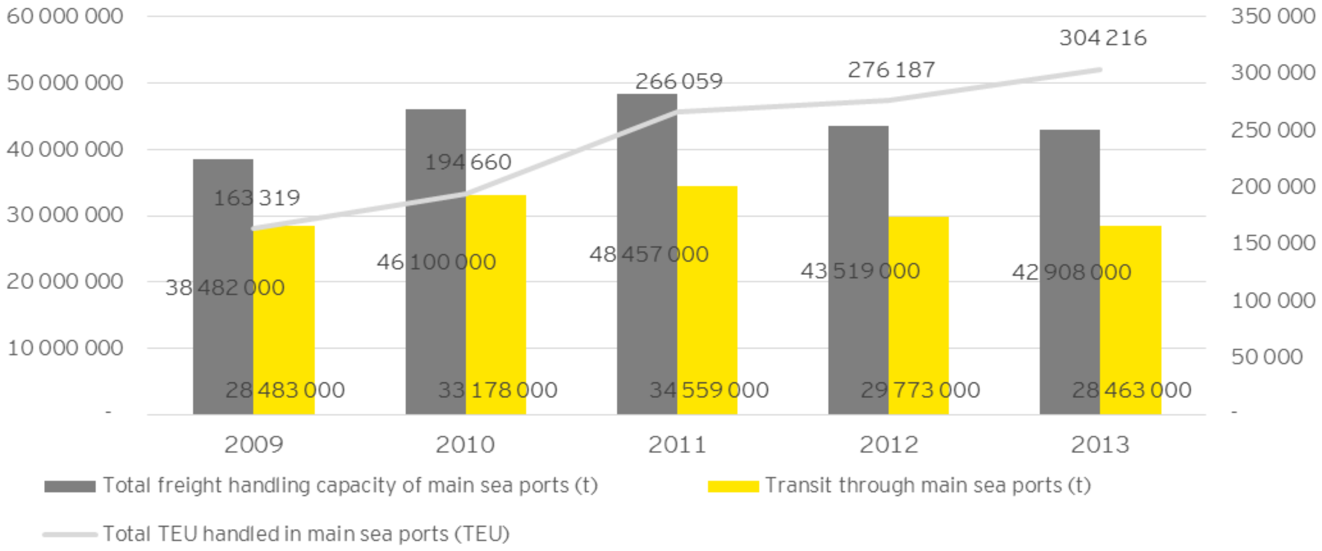

Figure 125 Freight transportation by sea in Estonia, 2009 - 2013

When comparing Table 146 and Figure 125, it becomes clear that Port of Tallinn (consisting of several ports) is the main port through which freight is being transported. In 2013, out of all containerized cargo handled (304 216 TEUs), 254 000 TEUs, or 83.5%, went through the Port of Tallinn.

[384] http://www.estonianports.com/statistics/

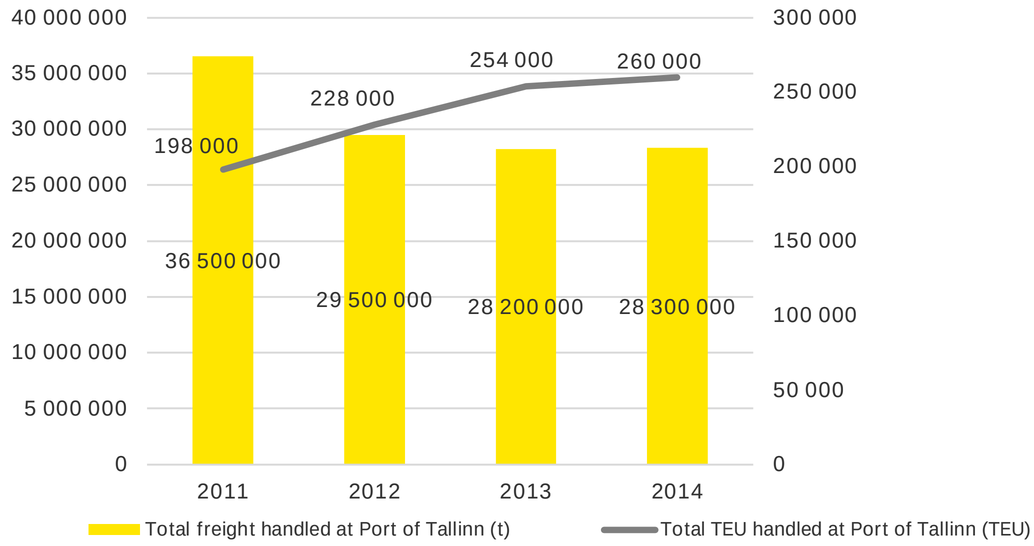

Figure 126 Freight transportation through port of Tallinn, 2011 - 2014[385]

Transit Time

Transit time for passengers traveling between Tallinn and Helsinki with most ferries is approximately 1.5 hours (Linda Line) and 2 or 2.5 hours or more (Viking Line, Tallink)[386].

Availability

Passengers can purchase ferry tickets through companies' office desks, websites or through agencies.

Punctuality

No publicly available information.

Comfort

Port of Tallinn has a lot of comfort services, such as:

- Internet access.
- Lost and found system to contact the workers.
- Option to travel with pets and providing the necessary guidelines in the port.
- Luggage boxes.
- Parking in the harbour, etc. [387].

To ensure the comfort of its passengers, the main passenger carriers from Tallink (Star, Superstar, Baltic Queen) traveling between Tallinn-Helsinki provide many services, such as:

- On-board restaurants.
- Entertainment events.
- Shopping.
- Relaxation centres.

[385] Port of Tallinn Annual Reports 2011-2014
[386] http://laevagraafik.ee/eng
[387] http://www.portoftallinn.com/good-to-know

- Ability to travel with car.
- Possibility to book a private cabin.
- Possibility to provide necessary assistance for passengers with special needs[388].

Quality of Pre-Trip (Accessibility)

Information in regards to timetables, journey times, routes, ticket fares and other information are available on passenger carrier “Tallink Grupp” JSC website. Tickets can be purchased or booked in advance.

Quality of On-Trip Services

As mentioned above, passenger carrier “Tallink Grupp” JSC provides a large variety of on-board services, such services include:

- Restaurants.
- Gift shops.
- SPA centres.
- Entertainment events.
- Room services.
- Bars.

There is a possibility to request necessary assistance for passengers with special needs. Also, in case of necessity, passengers can receive medical attention.

Quality of Post-Trip Services and Assistance

Tickets can be purchased at newsstands in the terminal for EUR 0.96 or from the driver for EUR 1.6 for the bus No. 2, which runs between the harbour and airport via city centre. There is also a red hop-on/hop-off bus stopping in the harbour. In addition, a tram (tram lines 1 and 2) stop in the proximity of the harbour area.

Taxi stands are located next to the passenger terminal buildings. Passengers can choose any of the available taxis at a taxi stand. Taxis can also be ordered by phone or hailed in the street.

“Velotaxes” (bicycle taxis) provide an environment-friendly way of getting around the city centre and harbour area. They operate from March to October. Prices in city centre are approximately EUR 2.30 for an adult and EUR 1 for child[389].

Available capacity

There are four main companies operating on the Tallinn-Helsinki route for passengers - Tallink, Viking Line and Eckerö Line, Linda Line.

Approximately 77 passenger ships in total are going weekly from Tallinn to Helsinki, which is approximately 11 ferries per day.

Utilized capacity

[388] http://www.tallink.ee/et/liinireis-tallinn-helsingi#firstTabs-content-1
[389] http://www.portoftallinn.com/good-to-know

During 2015, the cumulative passenger count for Port of Tallinn harbour was 9.79 million passengers which was 2.3% higher than the year before (9.57 million).

Meanwhile, in 2015, the cargo volumes passing through the ports of AS Tallinn Sadam (consisting of a group of five ports (harbours): Old City Harbour, Muuga Harbour, Paldiski South Harbour, Paljassaare Harbour, Saaremaa Harbour) declined by 5.9 million tonnes (21%) to 22.4 million tonnes, i.e. to the lowest level within the last 15 years, as a result of a drop in the volume of liquid bulk, the cargo having the largest proportion in total cargo volumes[390].

State of infrastructure facilities

The quality of port infrastructure has been rated very high in Europe. Data collected from the World Economic Forum survey showed that regarding the average time to import and export goods by sea, Estonia is one of the two top performers in the EU[391].

Current tariffs

Travelling between Tallinn and Helsinki, Tallink regular line ferries offers prices between EUR 13 and EUR 180 for a single person.

Foreseeable tariffs

Based on the publicly available information, currently there are no substantial projects underway that could significantly affect the regular transport tariffs noted above.

All relevant elements affecting generalized cost of transport

Maritime transport costs are affected by factors such as port infrastructure, price of oil, time at sea, competition among carriers[392].

Current and foreseeable state of development of the infrastructure

Largest share of the investment projects for upcoming years is associated with Muuga and Paldiski harbours and the adjacent areas[393].

In 2015, the Tallinn port group total investment in new infrastructure assets, acquisition of non-current assets and improvement of existing infrastructure assets amounted to EUR 11.9 million, i.e. somewhat down on the total investment in 2014. Construction of ferries was financed in the amount of EUR 53.3 million, which has been recorded as a prepayment for non-current assets and has not been included in the amount of investments figure in 2015.

Major investments in 2015 were made in the Old City Harbour in the total amount of about EUR 7.7 million to develop vessel accommodation and passenger service facilities, communications and to build a new traffic solution together with electronic entrance facilities that will provide innovative

[390] 2015 annual report. http://www.portoftallinn.com/annual-reports
[391] EC Infrastructure indicators. http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/estonia/investments-infrastructure/index_en.htm
[392] http://www.oecd.org/tad/benefitlib/trade-costs.htm
[393] http://www.portoftallinn.com/development-plans

traffic areas for cars to get on and off board. Investments in other ports and harbours were smaller and directed mostly into reconstruction of quays and berths[394].

Locations of current infrastructure shown through maps

Figure 127 shows the location of most significant ports in Estonia

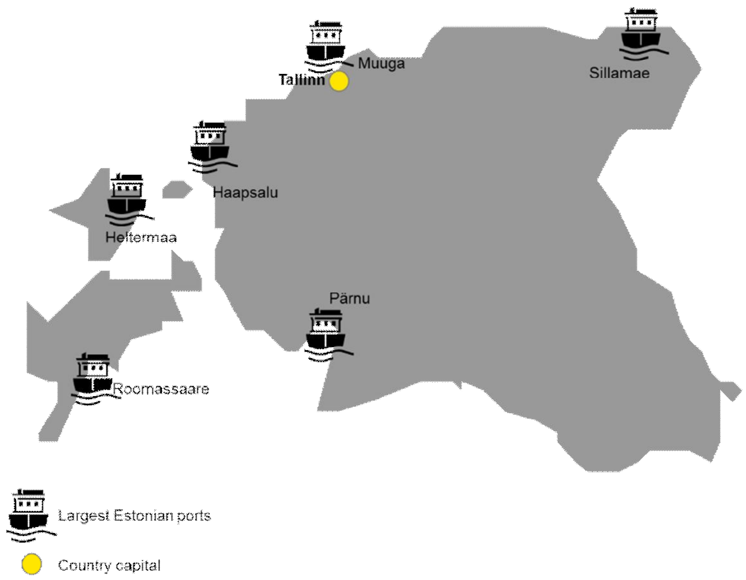

Figure 127 Main ports in Estonia

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

In order to handle the ever increasing flow of cruise tourists, the Port of Tallinn is planning to construct an additional quay for cruise boats. The development plans of the Port of Tallinn envisage the Old City Harbour being converted fully into a passenger port and, therefore, the cargo handling has been gradually moved out from the Old City Harbour and relocated into the Muuga and Paldiski South Harbours[395].

13.1.5.3 Latvia

Latvia has three large ports, were two of them are located in Baltic Sea and one is in gulf of Riga.

Largest stevedoring companies are "Rigas Centralais Terminalis" Ltd., "Ventspils Nafta Terminals" Ltd., "Ventbunkers" JSC, "Strek" Ltd.

There are two major passenger carrier operators – "Tallink Grupp" JSC and"Stena Line" Ltd.

Transport Volumes

Table 147 presents the overall number of passengers carried and the volumes of freight transported during 2014.

Table 147 Main port descriptive in Latvia [396]

[394] 2015 annual report. http://www.portoftallinn.com/annual-reports
[395] http://www.portoftallinn.com/old-city-harbour
[396] https://www.searates.com/maritime/latvia.html

No	Main port	Area (km2)	Passenger per year	Freight Traffic Flow (tonnes per year)	Maximum draught (m)- natural and dredged	Infrastructure manager
1	Riga	63.48	800 000	36 700 000	14.5	Freeport of Riga Authority
2	Ventspils	24.51	1 325	30 000 000	15	Freeport of Ventspils authority
3	Liepaja	39.79	n/a	5 600 000	10.8	Port of Liepaja

Transit Time

In Riga passenger terminal, "Tallink Grupp" JSC ensures passenger, vehicles and cargo transport between Latvia and Sweden every day. Riga Passenger Port is also one of the piers for many cruise ships from around world. There are registered more than 60 visits per year[397]. "Tallink Grupp" JSC only ensures the trip between Riga and Stockholm, approximate transit time between two destinations is 17 hours[398].

In Port of Ventspils, "Stena Line" operates 2 regular ferry lines. It ensures passenger and freight traffic from Ventspils port to Sweden 7 days per week and to Germany once per week. "Stena Line" provides destination from Ventspils – Nynashamn (Sweden). Transit time between two destinations is 10 hours[399].

Availability

Passengers can purchase ferry tickets through companies office desks, website or through agencies.

Riga Passenger Terminal also provides services for ferries. It provides 2 berths with ramps, 15 000 m^2 open storage, 300 m^2 warehouse and stevedoring services. For motor and sailing yachts, there is a greater than 450 meters long quay line, fresh water access and shore power available upon request[400].

Riga Container Port has developed railway infrastructure (with a total length of 19.5 kilometers) and railway station with a throughput of 600 wagons per day. There also are available bulk and general cargo containerization facilities (with capacity up to 50 containers per day)[401].

Punctuality

Main passenger carrier "Tallink Grupp" JSC takes extensive measures to ensure that it does not deviate from the intended arrival and departure times.

Comfort

To ensure the comfort of its passengers, the main passenger carrier "Tallink Grupp" JSC provides these services:

- On-board restaurants.

[397] http://rigasosta.lv/en/pasazieruosta/
[398] http://www.tallinksilja.com/lv/web/lv/find-a-cruise
[399] http://www.stenaline.lv/musu-marsruti/ventspils-nineshamne
[400] http://www.rigapt.lv/services/ship-services/
[401] http://www.rigact.lv/en/about-the-company/about-us/

- Entertainment events.
- Shopping.
- Relaxation centres.
- Ability to travel with car.
- Possibility to book a private cabin.
- Possibility to provide necessary assistance for passengers with special needs[402].

Quality of Pre-Trip (Accessibility)

Information in regards to timetables, journey times, routes, ticket fares and other information are available on passenger carrier “Tallink Grupp” JSC website. Tickets can be purchased or booked in advance.

Quality of On-Trip Services

As mentioned above, passenger carrier “Tallink Grupp” JSC provides a large variety of on-board services, these services include:

- Restaurants.
- Gift shops.
- SPA centres.
- Entertainment events.
- Room services.
- Bars.

There is a possibility to request necessary assistance for passengers with special needs. Also, in case of necessity, passengers can receive medical attention.

Quality of Post-Trip Services and Assistance

For a short stay, passengers have the ability to rent a SIXT bicycles in Riga Passenger Terminal.

Since 2010, Riga Passenger Terminal provides a charging pillar for electric and hybrid cars.

Passenger carrier “Tallink Grupp” JSC also provides shuttle buses from terminal to “Tallink Hotel”.

Available capacity

The Freeport of Riga lies on both banks of the river Daugava, covering 15 km in length. Cargo trans-shipment capacity at the terminals of the Freeport of Riga accounts for 58.2 million tonnes annually. The technical characteristics of the Freeport of Riga are summarized in Table 148.

Table 148 The Freeport of Riga characteristics [403]

Description	Units
Maximum permissible vessels draft by the berth	14.5 meters
Warehouse area	370 979 m2
Cargo storage site area	1 926 362 m2
Freezer capacity	25 500 tonnes
Tank capacity	665 063 m3

[402] http://www.tallinksilja.com/lv/web/lv/find-a-cruise
[403] http://www.rop.lv/en/about-port/facts-a-figures.html

Utilized capacity

Main types of cargo handled at the Freeport of Riga are containers, various metals, timber, coal, mineral fertilizers, and chemical cargo and oil products. The Table 149 presents overall volume of freight handled during 2014 in the Freeport of Riga.

Table 149 Cargo Traffic in the Freeport of Riga

No	Type of Cargo	Thousand tonnes
1	Bulk cargo	23 728.7
2	Liquid cargo	10 280.3
3	General cargo	7 071.4

State of infrastructure facilities

According to the study of EC, the quality of Latvia's port infrastructure ranks in 12th place out of the evaluated 23 EU Member States, and scores 5.22, which is just below average 5.23[404].

Current tariffs

Travelling between Riga and Stockholm, "Tallink Grupp" JSC offers prices between EUR 88 and EUR 131 for a single person, including a cabin. Prices also change according to seasonality.

Foreseeable tariffs

Based on the publicly available information, currently there are no substantial projects underway that could significantly affect the regular transport tariffs noted above.

All relevant elements affecting generalized cost of transport

Maritime transport costs are affected by factors such as port infrastructure, price of oil, time at sea, and competition among carriers[405].

Current and foreseeable state of development of the infrastructure

The long-term development plans for Riga Container Terminal are to provide a value-added specialized terminal for general and bulk cargo handling. The current development plan for 2014 - 2020 foresees the following main developments:

- Acquire specialized berth equipment for handling vessels with loading capacities of up to 4 000 TEU's.
- Build a railway access track infrastructure for rail cargo handling (2 kilometres, two container trains).
- Set up a new container (handling) area.
- Build a warehousing complex[406].

The Freeport of Riga Authority has initiated a project to transfer general cargo, Ro-Ro and dry bulk cargo terminals of the Freeport of Riga from Andrejosta and Eksportosta, which are located in the vicinity to the historical centre of the city of Riga, to Krievu sala (Out of city centre).

[404] http://ec.europa.eu/transport/facts-fundings/scoreboard/countries/latvia/investments-infrastructure/index_en.htm
[405] http://www.oecd.org/tad/benefitlib/trade-costs.htm
[406] http://www.rigact.lv/en/about-the-company/development/

Locations of current infrastructure shown through maps

Figure 128 shows the most significant ports of Latvia

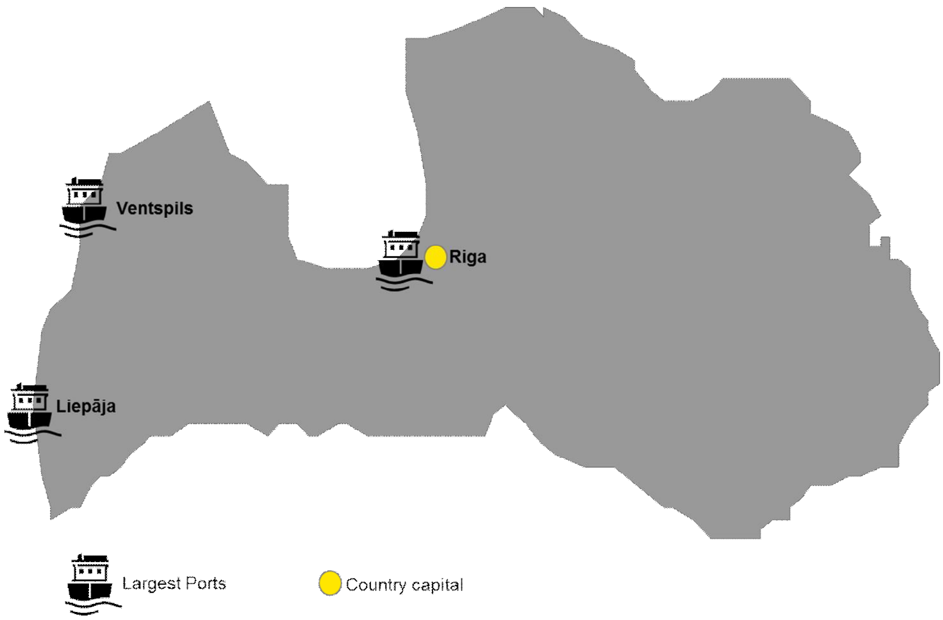

Figure 128 Map of largest ports in Latvia

Information about scope and timing of planned/foreseeable interventions - new builds, upgrades, reconstructions or major maintenance operations

The long-term development plans for Riga Container Terminal are to provide a value-added specialized terminal for general and bulk cargo handling. The current development plan for 2014 – 2020 foresees the following main developments:

- Acquire specialized berth equipment for handling vessels with loading capacities of up to 4 000 TEU's.
- Build a railway access track infrastructure for rail cargo handling (two kilometers, two container trains).
- Set up a new container (handling) area.
- Build a warehousing complex[407].

13.2 Excerpts from Atkins assessment of potential CAPEX and OPEX level

Table 150 as well as Figure 129 and Figure 130 have been extracted from the Atkins "Cost Estimation, Renewal & Maintenance and Benchmarking" (2017) report.

Table 150 Estimated yearly costs on Rail Baltica concerning adjusted maintenance and renewal and in total (calculated for distance of 902 km)

[407] http://www.rigact.lv/en/about-the-company/development/

Adjusted maintenance and renewal cost for Rail Baltica							
Subject	**Construction costs in million €*** **	**Unit/percentage Maintenance**	**Maintenance in million €/year**	**Unit/percentage/- lifetime renewal**	**Renewal in million €/year**	**Consumer price index/- Baltic labor level Adjustment**	**Total (maintenance and renewal) in million €/year**
Track	-	20000€/km/year	18,0	500000€/km/30 years	15,0	Consumer price index =138; Baltic labor level = 34%	**30,6**
Interlocking & remote control*	-	-	4,8	-	23,0	Baltic labor level = 34%	**18,7**
Traction	361	Substations = 2%/year; Catenary = 2%/year of construction costs	14,4	Catenary Economic life = 20 years; Investment = 0,2 million€/km	9,0	No adjustment	**23,5**
Power current Tele & IT, Buildings etc*	-	-	8,0	-	4,4	Baltic labor level = 34%	**8,3**
Bridges/tunnels	1.284	1% of construction costs/year	12,8	Investment = 1.284 million €; Economic life = 100 years	12,8	No adjustment	**25,7**
Terminals (4)	109	2% of construction costs/year	2,2	Investment = 109 million €; Economic life = 50 years	2,2	No adjustment	**4,4**
Depots, yard and service center (8)	168	2% of construction costs/year	3,4	Investment = 168 million €; Economic life = 50 years	3,4	No adjustment	**6,7**
Stations (9)	222	2% of construction costs/year	4,4	Investment = 222 million €; Economic life = 50 years	4,4	No adjustment	**8,9**
Total			**68,1**		**74,3**		**126,6**

* Estimated numbers (no robust data available)
** We have estimated catenary + substations/km to 0,4 million €/km
*** Construction costs are including horisontal costs - planning, builder, design, contractor and uncertainty

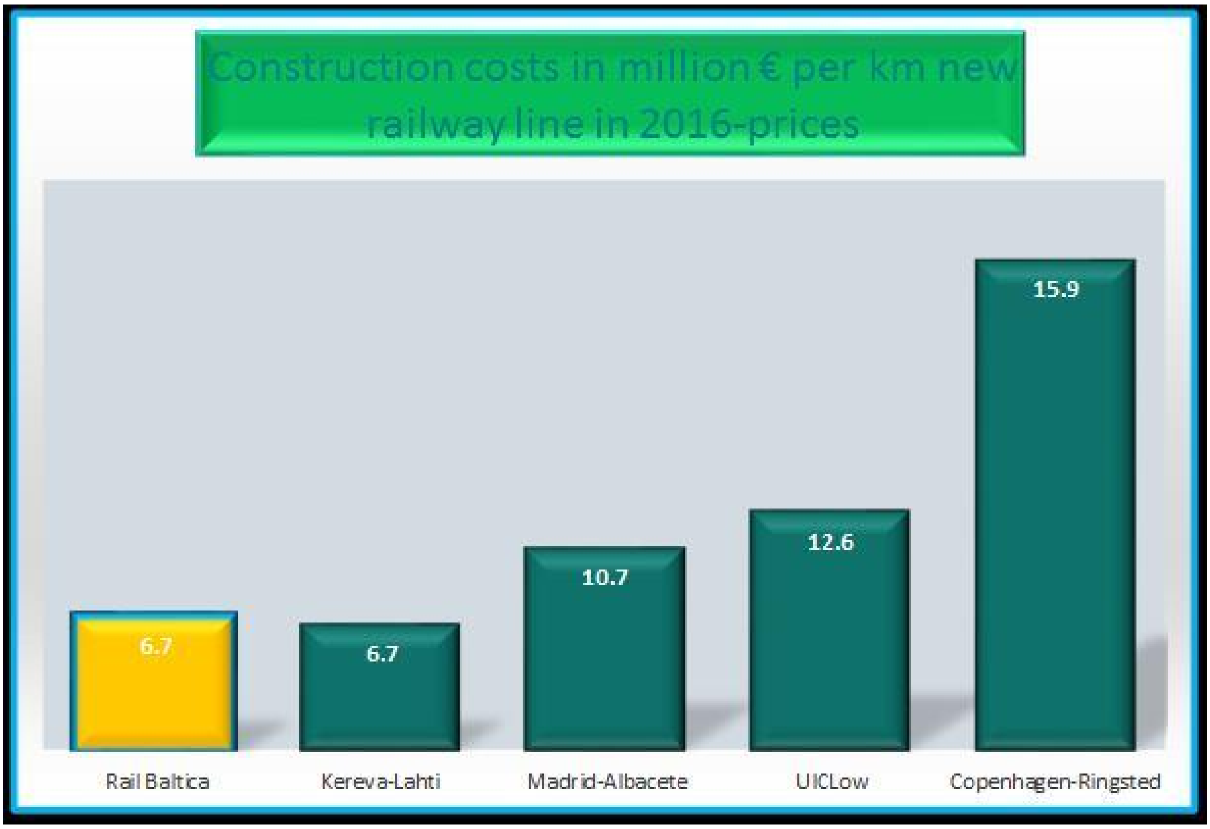

Figure 129 Average construction costs in million € per km railway in different countries (Rail Baltica in Estonia/Latvia/Lithuania benchmarked up against railways in; Finland, Spain, UIClow and Denmark).

Figure 130 Average Maintenance cost in € per km railway in different countries. The * indicates that it is unknown to what degree it is maintenance alone or maintenance + renewal and whether it is rail track and rail system alone or the whole infrastructure system.

13.3 Macroeconomic forecasts used for the economic analysis

The following forecasts have been used for the economic analysis part of the CBA:

Table 151 Real salary and real GDP per capital forecasts (2016-2035)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Source
Real salary growth (EE)	8.0%	8.0%	8.0%	8.0%	2.6%	2.6%	2.6%	2.6%	2.6%	3.4%	3.4%	3.4%	3.4%	3.4%	3.8%	3.8%	3.8%	3.8%	3.8%	4.2%	Oxford Economics
Real salary growth (LV)	2.2%	2.2%	2.2%	2.2%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	Oxford Economics
Real salary growth (LT)	5.5%	5.5%	5.5%	5.5%	0.4%	0.4%	0.4%	0.4%	0.4%	2.3%	2.3%	2.3%	2.3%	2.3%	2.5%	2.5%	2.5%	2.5%	2.5%	2.8%	Oxford Economics
Real GDP per capita growth (EE)	1.9%	3.0%	4.2%	4.2%	4.2%	4.2%	4.2%	4.0%	3.9%	3.5%	3.3%	2.9%	2.7%	2.7%	2.7%	2.8%	2.8%	2.8%	2.7%	2.6%	Oxford Economics
Real GDP per capita growth (LV)	2.4%	3.6%	5.0%	5.1%	4.8%	4.3%	4.3%	4.1%	3.7%	3.4%	3.1%	2.6%	2.3%	2.3%	2.4%	2.4%	2.5%	2.5%	2.5%	2.6%	Oxford Economics
Real GDP per capita growth (LT)	3.8%	4.2%	5.0%	5.0%	4.8%	4.6%	4.5%	3.9%	3.5%	2.7%	2.5%	2.2%	1.9%	1.8%	1.8%	1.7%	1.6%	1.6%	1.6%	1.7%	Oxford Economics

Table 152 Real salary and GDP per capita forecasts (2036-2055)

	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	Source
Real salary growth (EE)	4.2%	4.2%	4.2%	4.2%	4.7%	4.7%	4.7%	4.7%	4.7%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	Oxford Economics
Real salary growth (LV)	1.4%	1.4%	1.4%	1.4%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	Oxford Economics
Real salary growth (LT)	2.8%	2.8%	2.8%	2.8%	3.1%	3.1%	3.1%	3.1%	3.1%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	Oxford Economics
Real GDP per capita growth (EE)	2.5%	2.4%	2.4%	2.4%	2.4%	2.4%	2.3%	2.3%	2.4%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	Oxford Economics
Real GDP per capita growth (LV)	2.8%	2.7%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	Oxford Economics
Real GDP per capita growth (LT)	2.0%	2.0%	1.9%	1.9%	2.0%	1.9%	1.9%	1.8%	1.8%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	Oxford Economics

13.4 List of interviewed Stakeholders

Country	List of Stakeholders interviewed
FI	National Emergency Supply Agency of Finland
FI	Schenker OY
FI	Metsa
FI	Port of Helsinki
FI	Devlog Oy
FI	Finavia
FI	Finnish Logistics Companies' Association
EE	Estonian Ports Assiciation
EE	Port of Tallinn
EE	Tallinn University of Technology
EE	Ramboll Finland
EE	AS Tallinna Sadam
EE	Helsinki-Uusimaa Regional Council
EE	Turku School of Economics
EE	AS Transiidikeskus
EE	Ramboll Finland
EE	Municipality of Sodankylä
EE	Tallinn University of Technology
EE	Baltic Rail AS
EE	Estonian Railways Ltd
EE	Association of Estonian International Road Carriers
EE	TU Tallinn University
EE	TTU Institute of Logistics
EE	PROLOG - Estonial Purchasing and Supply Chain Management Association
EE	Estonian Railways
EE	Ministry of Economic Affairs and Communications
EE	ACE Logistics Group
LV	Rīgas brīvostas pārvalde
LV	Ventspils Brīvostas pārvalde
LV	MSC Latvia SIA
LV	Riga Fertilizer Terminal SIA
LV	Riga Container Terminal
LV	Lux Express
LV	GEFCO Baltic SIA
LV	Autopārvādātāju asociācija "Latvijas Auto"
LV	Pasažieru vilciens
LV	Schenker SIA
LV	Latvijas dzelzceļš
LV	LDZ Cargo SIA
LV	Latvijas Pasts
LV	Starptautiskā lidosta Rīga
LV	SIA Rimi Baltic
LT	Lithuanian Confederation of Industrialists
LT	Lithuanian Road Administration
LT	Lithuanian National association of forwarders and logistics "Lineka"
LT	Lithuanian National Road carriers Association "Linava"
LT	JSC Lietuvos Geležineliai
LT	UAB DSV Trasnport
PL	ADAMPOL SA