Co-financed by the European Union
Connecting Europe Facility

Prometni institut Ljubljana d.o.o.
Institute of Traffic and Transport Ljubljana l.l.c.

Alpine-Western Balkan
rail freight corridor

Transport Market Study

ALPINE-WESTERN BALKAN

RAIL FREIGHT CORRIDOR 10

Final Report

Ljubljana, June 2019

Project title:	Transport Market Study: Alpine-Western Balkan Rail Freight Corridor 10 (AWB RFC)
Contracting authority:	SŽ – Infrastruktura, d.o.o. Kolodvorska 11 1000 Ljubljana
Contract No.:	122/2018/22
Contractor:	Prometni institut Ljubljana d.o.o. Kolodvorska 11 1000 Ljubljana
Authors:	Aleksandar Dobrijević, M. Sc. Econ. Mihaela Fridrih Praznik, B. Sc. Laws Mateja Hočevar, B. Sc. Econ. Blaž Jemenšek, M. Sc. Econ. Tadeja Ključevšek, B. Sc. Traffic Vlasta Miklavžin, M. Sc. Eng. Klemen Ponikvar, M. Sc. Traffic Klara Zrimc, M. Sc. Econ.
Place and date:	Ljubljana, June 2019

Project Manager:	Manager:
Aleksandar Dobrijević, M. Sc. Econ.	**Peter Verlič, D. Sc.**

CONTENTS

1 INTRODUCTION

An efficient transport system is essential for the development of a country and of a region as it helps reduce travel time and production costs and improves competitiveness. It also improves access to markets and is a key aspect in preserving investors' interest in a region. Current global and European economic developments are driving an increase in demand for transport services. The continuous increase in demand for transport services results from both the higher consumption of the EU's population and the higher production of its manufacturing enterprises. The demand is also directly influenced by the need to transport the final and intermediate products from Asia to Europe and vice versa. Several European companies cooperate with companies in Asia, and their trading income, level of innovation and social benefits depend on their cooperation, all resulting in a larger market for transport services. There are many offers from several modes of transport in this market, where each mode of transport has its advantages and disadvantages for the transport process, customers, society and the environment.

Rail freight transport is an important part of the transport market and it is an important factor in sustainable development. Rail freight is considered to be the most environmentally friendly mode of transport for goods, and plays an important role in the freight transport market. It thus contributes to the development of human society and enables economic and social progress while respecting the environment. Due to factors both exogenous (e.g. competition in road and air transport, technological innovations oriented to other modes of transport, changes in transport requirements) and endogenous (e.g. inefficiency, overemployment, low level of innovation and modernisation, technological lags), rail freight lost competitiveness in the transport services market, resulting in a decrease in the transport performances of the rail sector. At the same time, a shift in transport performances to other more environmentally demanding modes of transport occurred. This has led to higher production of the negative external costs of transport, and a need for higher state subsidies to the related transport infrastructure from public funds. This unfavourable condition has to be addressed by individual states and the EU as a whole.

Within the framework of the European Union New Strategy for Jobs and Growth, the creation of an internal rail market, in particular with regard to freight transport, is an essential factor in making progress towards sustainable mobility.

Although the opening of the rail freight market has made it possible for new operators to enter the rail network, market mechanisms have not been and are not sufficient to organise, regulate and secure rail freight traffic. To optimise the use of the network and ensure its reliability it is useful to introduce additional procedures to strengthen cooperation among infrastructure managers on allocation of international train paths for freight trains.

In order to be competitive with other modes of transport, international and national rail freight services, which have been opened up to competition since 1 January 2007, must be able to benefit from a good quality and sufficiently financed railway infrastructure, one which allows freight transport services to be provided under good conditions in terms of commercial speed and journey times and to be reliable, so that the service it provides actually corresponds to the contractual agreements entered into with the railway undertakings. In this context, the establishment of international rail corridors for a European rail network for competitive freight on which freight trains can run under good conditions and easily pass from one national network to another would allow for improvements in the conditions of use of the infrastructure.

In order to establish international rail corridors for a European rail network for competitive freight, the initiatives already taken in terms of railway infrastructure show that the establishment of international corridors, which meet specific needs in one or more clearly identified segments of the freight market, is the most appropriate method.

In order to promote the competitiveness of rail freight transport, in particular in the areas of infrastructure quality, safety, time and administrative effectiveness, international cooperation, the EU has established the **European Rail Freight Corridors**. Rail freight corridors (RFCs) are defined by Regulation (EU) No 913/2010[1], together with measures to ensure their interoperability and commercial development. RFCs are part of EU strategic policy to create a European rail network for competitive freight by means of cooperation among rail infrastructure managers within the framework of each corridor. Each RFC has a dedicated governance structure to make the corridor functional.

Regulation (EU) 913/2010 contains the provisions for the creation of a European rail network for competitive freight. To this end, the regulation has established the procedures for the national rail infrastructure managers of the countries through which the RFCs pass in order to ensure the corridors' effective implementation. Among the main measures contained in the regulation are:

- the implementation of the RFC interoperability subsystems in order to allow trains to pass from one national network to another without encountering technical barriers;
- the coordination of investments to bring all lines in each RFC in line with the standards of the Technical Specifications for Interoperability (TSIs);
- the publication and updating of Corridor Implementation Plans describing the characteristics of the reference transport market, bottlenecks, investments and traffic management procedures suitable for improving the performance of competitive freight rail transport;

[1] Regulation (EU) No 913/2010 of the European Parliament and of the Council of 22 September 2010 concerning a European rail network for competitive freight.

- the creation of a single corridor entity responsible for the publication and allocation of capacity for international freight transport, called the One Stop Shop, a single point of contact for each corridor;
- the creation of pre-arranged paths (PaPs) in the RFC to promote international rail freight transport;
- the analysis of freight train performance and customer satisfaction by means of international freight train monitoring systems.

The establishment of the European Rail Freight Corridors should bring, in particular, better, more complete, more reliable and competitive rail services to railway undertakings. Such services of the single European railway infrastructure consequently contribute to the better services of the railway undertakings providing freight services. Increased commercial activity, along with reliable, fast, safe and cost competitive services, can lead to a shift from more environmentally demanding modes of transport to rail freight transport. In addition to its environmental advantage, rail freight transport can provide more reliable, safer, less expensive and faster transport services in the case of harmonising the transport and technological processes in comparison with other modes of transport. The shift to rail can thus lead to an overall decrease in the social costs (infrastructure owner costs, carrier costs and negative external costs of transport) generated by transport.

The aim of establishing European Rail Freight Corridors is to improve the efficiency of rail freight transport relative to other modes of transport. Coordination should be ensured among AWB RFC Member States and infrastructure managers in order to guarantee the most efficient functioning of freight corridors. To allow this, operational measures should be taken in parallel with investments in infrastructure and technical equipment, such as ERTMS, that should aim at increasing rail freight capacity and efficiency.

Increasing requirements with regard to the quality and availability of rail freight services in Europe had led to the intention to establish the new European rail freight corridor – the **Alpine-Western Balkan Rail Freight Corridor (AWB RFC)**, which connects four EU member states (Austria, Slovenia, Croatia, Bulgaria) and fully integrates the EU candidate state Serbia. The corridor connects Central Europe and South-East Europe, and also brings improvements to railway transport in the Central Europe-Turkey direction (and beyond). AWB RFC provides a natural link and shortest route from Central Europe to the Bulgarian/Turkish border for rail freight.

2 OBJECTIVE OF TRANSPORT MARKET STUDY

The establishment of the European Rail Freight Corridors should bring, in particular, better, more complete, more reliable and more competitive railway services for railway undertakings. Such services of the single European railway infrastructure consequently contribute to the better services of the railway undertakings providing freight services.

Increasing requirements with regard to the quality and availability of rail freight services led to the intention to establish the new European rail freight corridor, AWB RFC. The corridor connects Central and South-East Europe, and also improves railway transport in the Central Europe-Turkey direction (and beyond). The current situation, quality and efficiency of the new corridor need to be assessed and subsequently, based on the results of this, measures taken to increase the competitiveness and overall efficiency of the corridor.

Based on the above-mentioned facts, it is necessary to elaborate a Transport Market Study (TMS) for the AWB RFC, which will evaluate the current situation, prospects and effectiveness of the corridor.

The main objective of Transport Market Study (TMS) is to provide a clear understanding of the current conditions of the freight market along the AWB RFC together with short- and long-term freight traffic forecasts, and also to propose a measurement of the expected modal shift from road to rail. Based on the results of the transport market study, it will be possible evaluate the current state, perspective, prognosis and opportunities of the new corridor.

In order to achieve the main objectives of the TMS of the Alpine-Western Balkan Rail Freight Corridor, this publication has the following structure:

1. Introduction
2. Objective of Transport Market Study
3. Methodology of TMS preparation
4. Alpine-Western Balkan Rail Freight Corridor description
5. Analysis of socio-economic indicators
6. Analysis of transport and traffic indicators
7. Analysis of AWB RFC railway infrastructure
8. Development of rail freight traffic and major trade flows along the AWB RFC
9. Possibilities to shift cargo from road to rail
10. Prognosis of transport performance development
11. Connections with other RFCs and rail networks
12. Future investments in the Alpine-Western Balkan Rail Freight Corridor
13. Further recommendations for AWB RFC
14. Conclusions

3 METHODOLOGY OF TMS PREPARATION

3.1 BASELINES FOR THE TMS ELABORATION

The elaboration of all TMS tasks requires the analysis and processing of various technical, capacity and economic indicators. This requires a wide range of statistical and analytical information stemming from several sources:

- EU and national legislation of the AWB RFC member states,
- annual reports from the infrastructure managers and allocation bodies of AWB RFC member states,
- network statements from the infrastructure managers and allocation bodies of AWB RFC member states,
- traffic and transport performances provided by corridor infrastructure managers,
- traffic and transport performances from statistical offices of AWB RFC member states,
- data from Eurostat,
- data from the International Monetary Fund,
- data from the Organisation for Economic Cooperation and Development,
- data from the World Bank,
- economic indicators provided by the statistical offices of AWB RFC member states,
- reports and studies on TEN-T Core Network Corridors,
- other available economic, traffic and transport information necessary for study elaboration,
- data from questionnaires sent to infrastructure managers,
- Manual Update of the Handbook on External Costs of Transport (final report for the European Commission - 2014),
- sector publications (articles, reports, press releases, etc. with relevance for RFC),
- scientific literature.

The statistical and analytical data required for elaborating the individual parts of the TMS of the Alpine-Western Balkan RFC, with which it was possible to elaborate the individual parts of the study and then to propose the optimal strategy, are shown in the table below.

Table 3-1: Statistical and analytical indicators monitored in the TMS

Scope	Indicator
Technical parameters	Maximum length of train, allowed axle load on lines, maximum train load, signalling equipment, electrification system, loading gauge, average speed of train, speed limits, maximum gradient on lines, profile
Transport performances	Development of transport performances on corridor lines (national transport and international transport)
General indicators	Population, industry (the most important industrial areas in countries of the Alpine-Western Balkan RFC), transport infrastructure, imports and exports
Macroeconomic / microeconomic indicators	GDP development and prognosis in the EU and AWB RFC member states, GDP per capita in purchasing power parity, human development index, index of competitiveness of economies, index of economic freedom, transit times for railway transport on cross border sections
Modal split	Development of modal split between individual modes of transport (freight and passenger transport on national territories)
Capacity analysis	Development of transport capacity utilisation of individual corridor lines
Other indicators	Investment, technical and technological measures, proposal of extension of lines and terminals, etc.
Corridor indicators	Corridor benefits and opportunities

3.2 METHOD USED IN TMS ELABORATION

The individual partial objectives of the TMS of the Alpine-Western Balkan RFC were worked out using the following methods:

- method of investigating written sources used for selecting appropriate literature for processing the theoretical and legislative part of TMS,
- method of scientific abstraction – in examining the basic theoretical and legislative basis for establishment of the European freight corridors,
- method of information gathering and processing – used for information collection and its subsequent processing,
- benchmarking – in comparison of some transport and technical statistical data,
- method of analysis – in processing and searching the required transport and technical statistical data,
- method of graphic representation – used for graphic and visual layout of the acquired and processed statistical data and other results of the study,
- method of comparative analysis – comparison in the analytical part,
- method of synthesis – for summarising the information and data obtained,
- method of induction and deduction – used in all parts of the TMS, in creating logical judgements based on theoretical, legislative and empirical knowledge,
- brainstorming – consultations with practitioners,
- methods of statistical analysis – used in searching and processing the required transport, technical and economical statistical data,
- prognostic method – used in development of TMS prognostic scenarios.

4 AWB RFC DESCRIPTION

This part of TMS is aimed at the precise characteristics of the Alpine-Western Balkan RFC. The first part defines the legislative aspects of the establishment of the corridor in question. Consequently, the corridor routing in the individual railway infrastructures of the AWB RFC member states is graphically represented.

4.1 LEGISLATIVE ASPECT OF AWB RFC ESTABLISHMENT

A new rail freight corridor, the Alpine-Western Balkan (AWB RFC), has been formally established in accordance with the Regulation (EU) No 913/2010[2]. This regulation lays down rules for the establishment and organisation of international rail freight corridors with a view to the development of a European rail network for competitive freight.

In accordance with Article 5(5) of Regulation (EU) No 913/2010, the ministries from Austria, Slovenia, Croatia, Serbia and Bulgaria, responsible for rail transport, jointly sent a letter of intent to the European Commission with a proposal to establish this new rail freight corridor on the territory of these four EU member states and of Serbia. The Commission examined the proposal and adopted the implementing decision (EU) 2018/500[3], which represents the basis for the establishment of this corridor.

The new Alpine-Western Balkan principal route consists of the following lines:

- Salzburg-Villach-Ljubljana-/
- Wels/Linz-Graz-Maribor-
- Zagreb-Vinkovci/Vukovar-Tovarnik-Beograd-Sofia-Svilengrad (Bulgarian-Turkish border).

According to Regulation (EU) No 1315/2013[4], most of the length of the AWB RFC principal route lines on the territory of EU member states is part of the TEN-T core network, and, as regards Serbia, the indicative core network[5]. The other sections envisaged for implementing the principal route are part of the comprehensive network. In addition, the central part of RNE corridor C11 includes the main route of the proposed rail freight corridor from Salzburg to the Bulgarian/Turkish border. The railway infrastructure along the corridor is therefore subject to the EU TEN-T development legislation and technical interoperability standards

[2] Regulation (EU) No 913/2010 concerning a European rail network for competitive freight (OJ L 276, 20.10.2010).
[3] Commission implementing decision (EU) 2018/500 of 22 March 2018 on the compliance of the proposal to establish the Alpine-Western Balkan rail freight corridor with Article 5 of Regulation (EU) No 913/2010 of the European Parliament and of the Council (OJ L 82, 26.3.2018).
[4] 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 and repealing Decision No 661/2010/EU (OJ L 348, 20.12.2013).
[5] Commission Delegated Regulation (EU) 2016/758 of 4 February 2016 amending Regulation (EU) No 1315/2013 of the European Parliament and of the Council as regards adapting Annex III thereto (OJ L 126, 14.5.2016).

for railway infrastructure subsystems (INF TSI), Traffic Operation and Management (TOM TSI) and Telematics Applications for Freight Services (TAF TSI).

The establishment of the new Alpine-Western Balkan RFC is financed with funds from the Connecting Europe Facility (CEF). The four infrastructure managers from the EU Member states signed the Grant Agreement No INEA/CEF/TRAN/M2016/PSARFC10 in June 2018. According to the time plan set in the agreement, the new corridor will be established and fully functional by the 31st of December 2020.

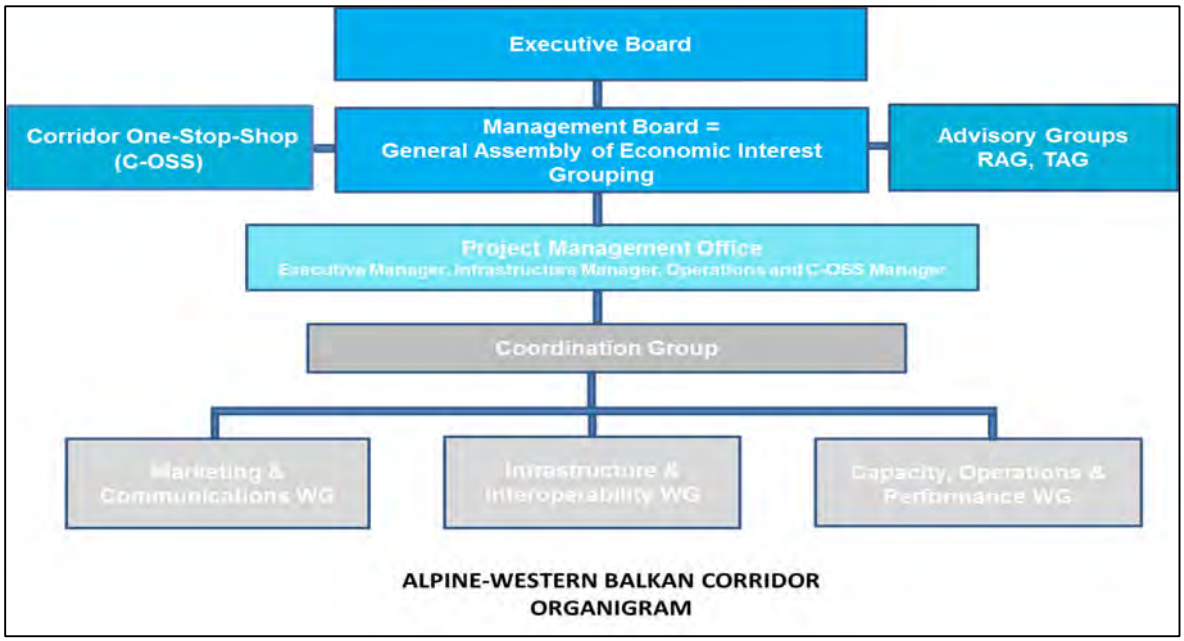
4.2 ALPINE-WESTERN BALKAN RFC GOVERANCE STRUCTURE

Regulation (EU) No 913/2010 concerning a European rail network for competitive freight defined the governance structure to be established for each freight corridor in order to stimulate coordination among the AWB RFC member states and the infrastructure managers, and to provide continuity along the corridor. According to Regulation (EU) No 913/2010, five essential bodies shall be established:

- Executive Board (ExBo),
- Management Board (MaBo),
- Railway Undertakings advisory group (RAG),
- Terminals (TAG) advisory group and
- One-stop shop.

The governance structure for the Alpine-Western Balkan Rail Freight Corridor – AWB RFC – is shown in the picture below and has been developed in accordance with the time plan set in the grant agreement NoINEA/CEF/TRAN/M2016/OSARFC10.

Figure 4-1: Organisational structure of Alpine-Western Balkan Rail Freight Corridor – AWB RFC



Source: AWB RFC.

The Executive Board is the AWB RFC's highest level body, composed of representatives of the authorities of the AWB RFC member states concerned with the corridor. It is responsible for:

- defining the corridor main objectives, supervising and taking measures,
- determination of the framework for infrastructure capacity allocation within the corridor,
- approval of the documents and plans elaborated by the Management Board,
- periodical analyses of the corridor implementation plan,
- submission of reports to the European Commission on the results of executing the implementation plan every two years starting from the corridor establishment.

The Management Board is established and constituted from the infrastructure managers along the AWB RFC. It is responsible for:

- the establishment of the AWB RFC governance and organisational structures,
- fulfilment of all Management Board tasks defined in Regulation (EU) No 913/2010 and other tasks defined by the decisions of the Management Board and the internal rules and procedures of the corridor,
- ensuring the organisational, technical and operational conditions to make AWB RFC operational on time,
- development of efficient services along the AWB RFC,
- management of the whole AWB RFC organisational structure,

- seeking good co-operation with the Executive Board of the AWB RFC, with the Advisory Groups and customers of the corridor and with the management boards of other RFCs.

Table 4-1: Rail infrastructure managers along the AWB RFC

State	Logo	Address
Austria	ÖBB INFRA	ÖBB-Infrastruktur Aktiengesellschaft Praterstern 3, Wien https://infrastruktur.oebb.at
Slovenia	SŽ-Infrastruktura	SŽ – Infrastruktura, d.o.o. Kolodvorska 11, Ljubljana www.slo-zeleznice.si/sl/infrastruktura
Croatia	HŽ INFRASTRUKTURA	HŽ – Infrastruktura Mihanovićeva 12, Zagreb http://www.hzinfra.hr/
Serbia	Инфраструктура железнице Србије а.д.	Infrastruktura železnice Srbije a.d. Nemanjina 6, Beograd http://infrazs.rs/
Bulgaria	NATIONAL RAILWAY INFRASTRUCTURE COMPANY	National railway infrastructure company Maria Luisa Boulevard 110, Sofia https://www.rail-infra.bg

The Management Board monitors the performance and quality of rail freight services within the corridor, and once a year publishes the results on the website of the corridor together with the results of the satisfaction survey of corridor users. In order to ensure non-discriminatory access to railway infrastructure and fair economic competition it cooperates with regulatory bodies of AWB RFC member states, and at the same time it performs the task of the AWB RFC's own Regulatory Body.

The activities of formation a **Permanent Management Office in Ljubljana** have been started and will be completed by end of May 2019. The fully functional Permanent Management Office (PMO) structure will be managed by three corridor managers:

- **the Executive Manager** responsible for the successful corridor management (planning, design, execution, monitoring, controlling),
- **the Railway Infrastructure Manager** responsible for collecting and keeping up-to-date corridor relevant documents/data including *inter alia*: CID, network statement, infrastructure parameters, investment plans and interoperability issues and
- **the Operations and C-OSS Manager** responsible for customers and marketing related issues, capacity allocation, timetabling operations and C-OSS.

The following two **advisory groups** are planned to be established in January 2019:

- **Railway operators advisory group (RAG)** for issuing an opinion on any proposal by the Management Board which has consequences for these undertakings or to issue its own-initiative opinions; and
- **Managers and owners of freight terminals advisory group (TAG)** for issuing an opinion on any proposal by the Management Board which has direct consequences for investment and the management of terminals or to issue its own-initiative opinions.

The Working Groups will be established within the Permanent Management Office in Ljubljana, and will provide all organisational support, coordination of activities and the performance of tasks assigned to the RFC management according to Regulation (EU) No 913/2010.

The Corridor One-Stop Shop (C-OSS) will be established as a single place and a single operation for application of infrastructure capacity and the allocation of prearranged paths in line with the provisions of Article 13 of Regulation (EU) No 913/2010. Applicants may request and receive infrastructure capacity for international freight trains on AWB RFC only at the C-OSS. The C-OSS will be responsible for performing the handling of capacity requests for international freight trains and for the related publication and allocation decisions.

4.3 ALPINE-WESTERN BALKAN RFC GRAPHICAL PRESENTATION

The European RFC corridors have been designed primarily on the basis of the direction of the main transport flows of goods within the EU and the whole of Europe in order to increase the attractiveness, reliability and efficiency of the rail system, taking utmost account of customer requirements. Each corridor has its specific role and strategic routing adapted to the transport requirements of the customers.

The next table presents the basic parameters of all the EU RFC corridors.

Table 4-2: Basic parameters of all the EU RFC corridors

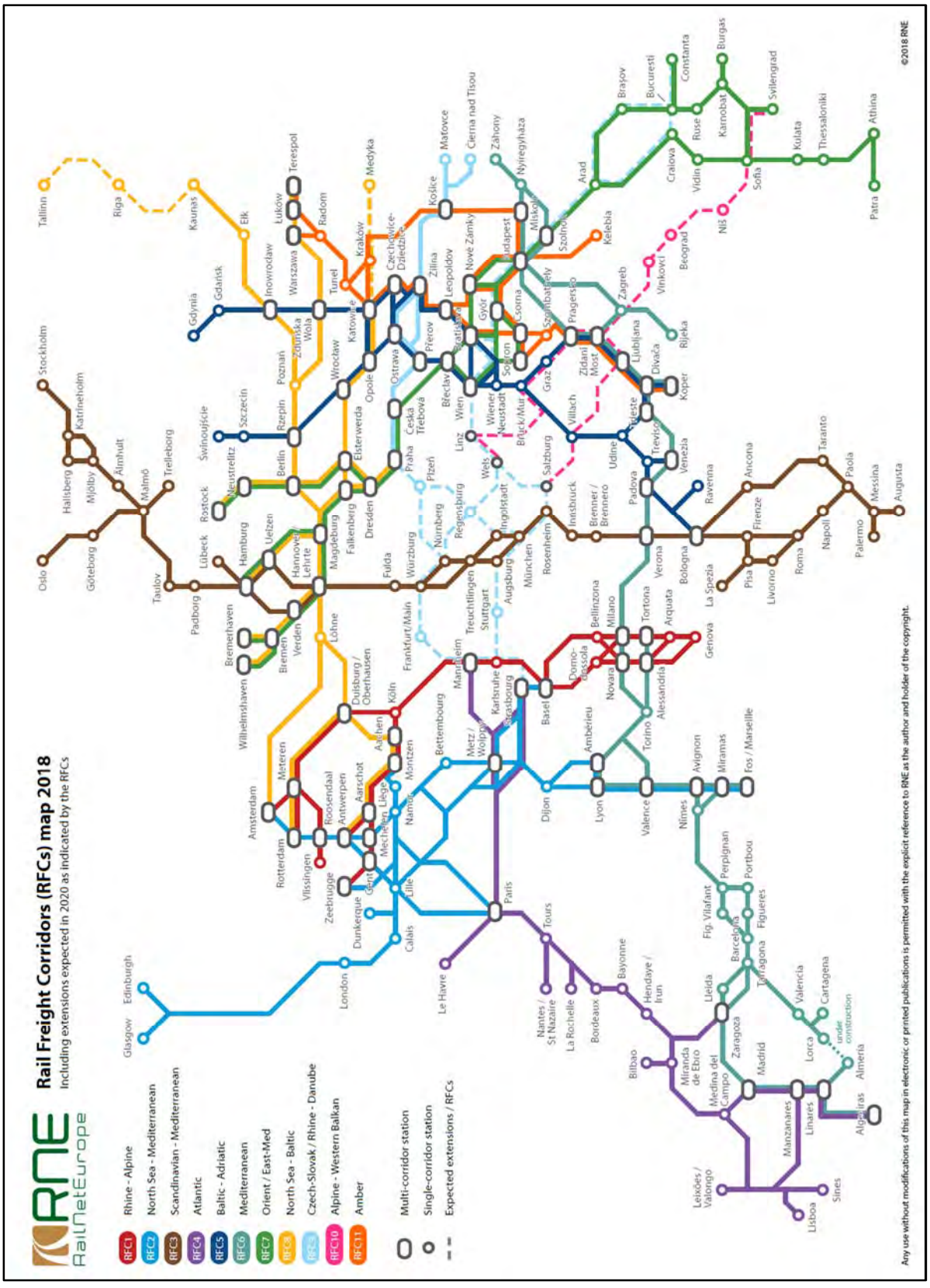
Corridor name	Number of countries	Length of lines in km
RFC 1: (Rhine-Alpine)	5	3.900
RFC 2: (North Sea-Mediterranean)	6	5.300
RFC 3: ScanMed	5	7.527
RFC 4: Atlantic	3	6.200
RFC 5: Baltic-Adriatic	6	4.825
RFC 6: Mediterranean	6	7.000
RFC 7: Orient/East-Med	8	7.700
RFC 8: North Sea-Baltic	5	6.045
RFC 9: Czech-Slovak	2	970
AWB RFC: Alpine-Western Balkan	**5**	**approx. 2.139**
RFC 11: Amber	4	approx. 3.400

Source: Annual reports of RFC corridors.

The European AWB RFC will have the second shortest length of railway lines compared to the other European RFC corridors. This fact, however, does not change the strategic importance of its routing. The short length of the lines included in the AWB RFC creates the most suitable conditions for coordination of property, ordering of transport routes and direction of investment activities leading to the provision of high quality and available services using the railway system.

The next figure shows a map of the European RFC produced by Rail Net Europe.

Figure 4-2: Graphical presentation of the European corridors, produced by Rail Net Europe



Source: Rail Net Europe

The next table presents the length of the railway network by state along the AWB RFC. AWB RFC includes five AWB RFC member states: Austria, Slovenia, Croatia, Serbia and Bulgaria.

Table 4-3: Length of AWB RFC by state

State	Length (km)	Percent (%)
Austria	527	25
Slovenia	294	14
Croatia	345	16
Serbia	601	28
Bulgaria	371	17
Total	**2.139**	**100**

Source: AWB RFC infrastructure managers

The total length of the AWB RFC is estimated to be 2.139 km, and it is one of the shortest RFC corridors. Serbia has the biggest share of the corridor – 600,9 km of lines or 28% of all lines on the AWB RFC. The second is Austria with 527 km of lines, or 25% of the total. Bulgaria, Croatia and Slovenia are at the bottom by share, with less than 18% each.

The AWB RFC starts in Salzburg (Austria) with an additional "east branch" from Wels/Linz to the railway station Zidani Most in Slovenia. The "east branch" only refers to Austria and Slovenia.

- Primary route:
  - AUSTRIA: Salzburg-Villach-Rosenbach border A/SLO (Jesenice)
  - SLOVENIA: (Rosenbach)-border A/SLO Jesenice-Zidani Most

- EAST branch:
  - AUSTRIA: Wels-Linz-Graz-Spielfeld-Straß border A/SLO (Maribor)
  - SLOVENIA: (Spielfeld-Straß) border A/SLO Maribor-Zidani Most

The Beograd hub has bypass lines separated for passenger and freight transport. The bypasses are presented in the following figures.

Figure 4-3: Graphical presentation of the AWB RFC route

Figure 4-4: Graphical presentation of AWB RFC in Austria

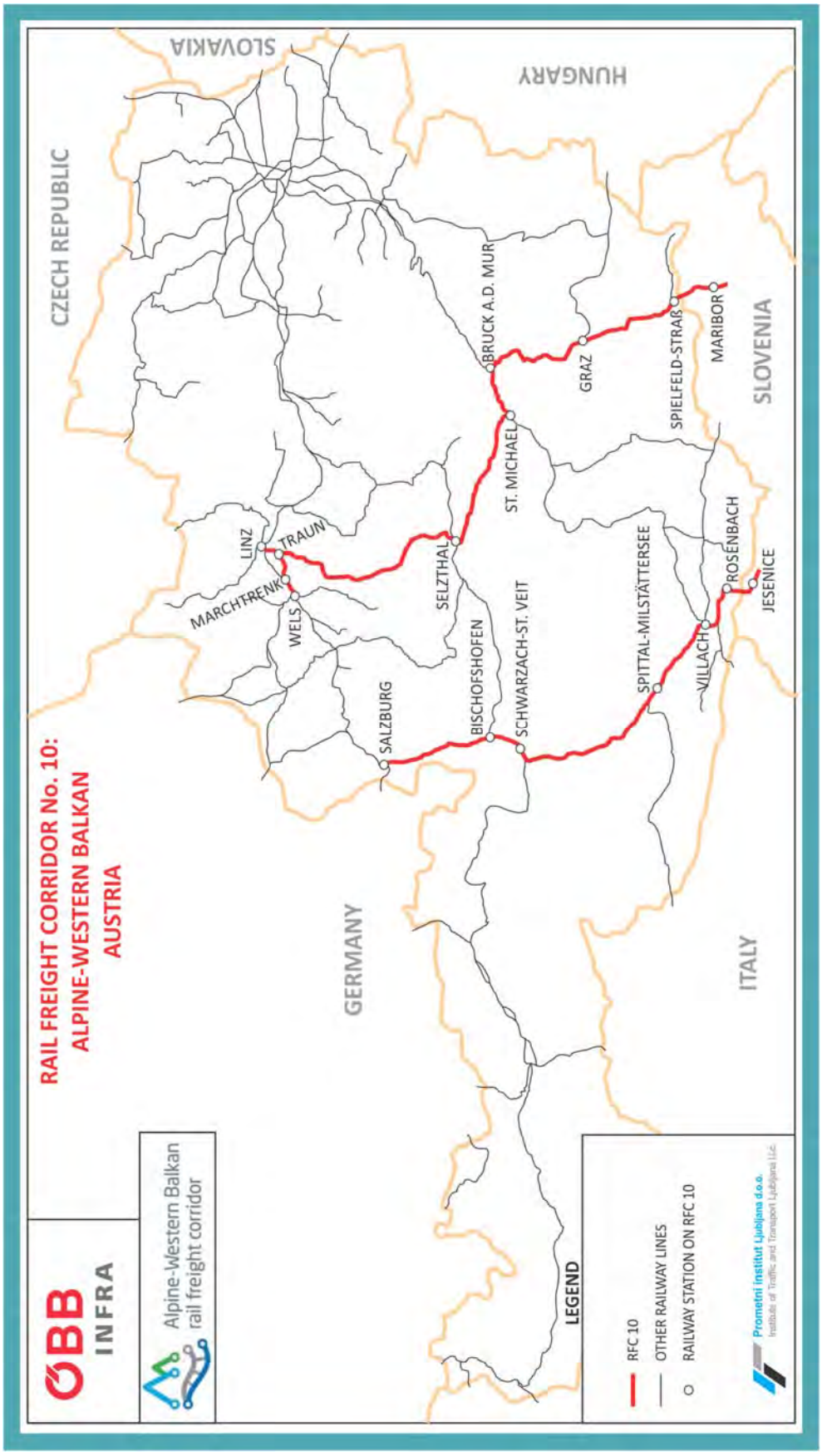


Figure 4-5: Graphical presentation of AWB RFC in Slovenia

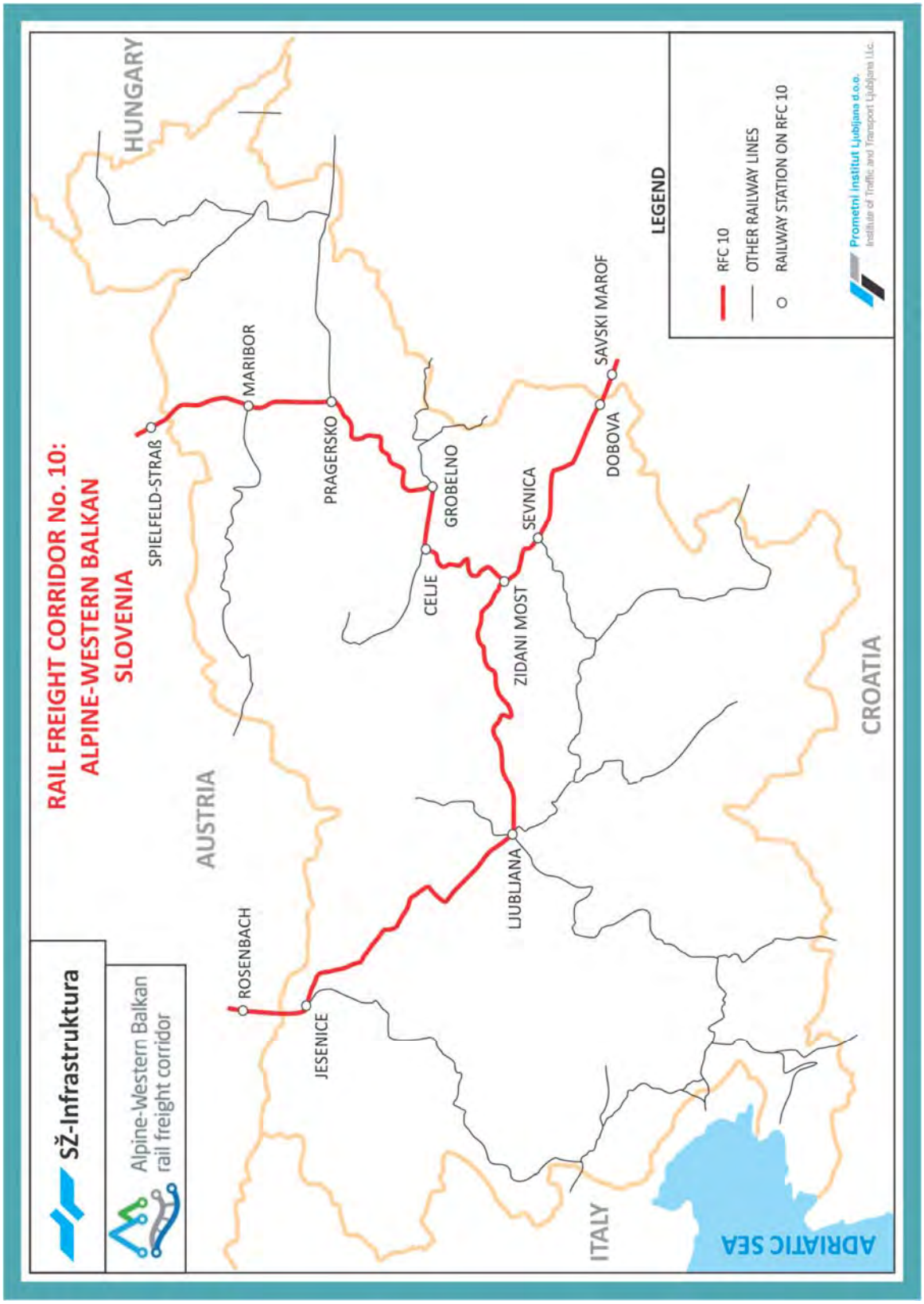


Figure 4-6: Graphical presentation of AWB RFC in Croatia

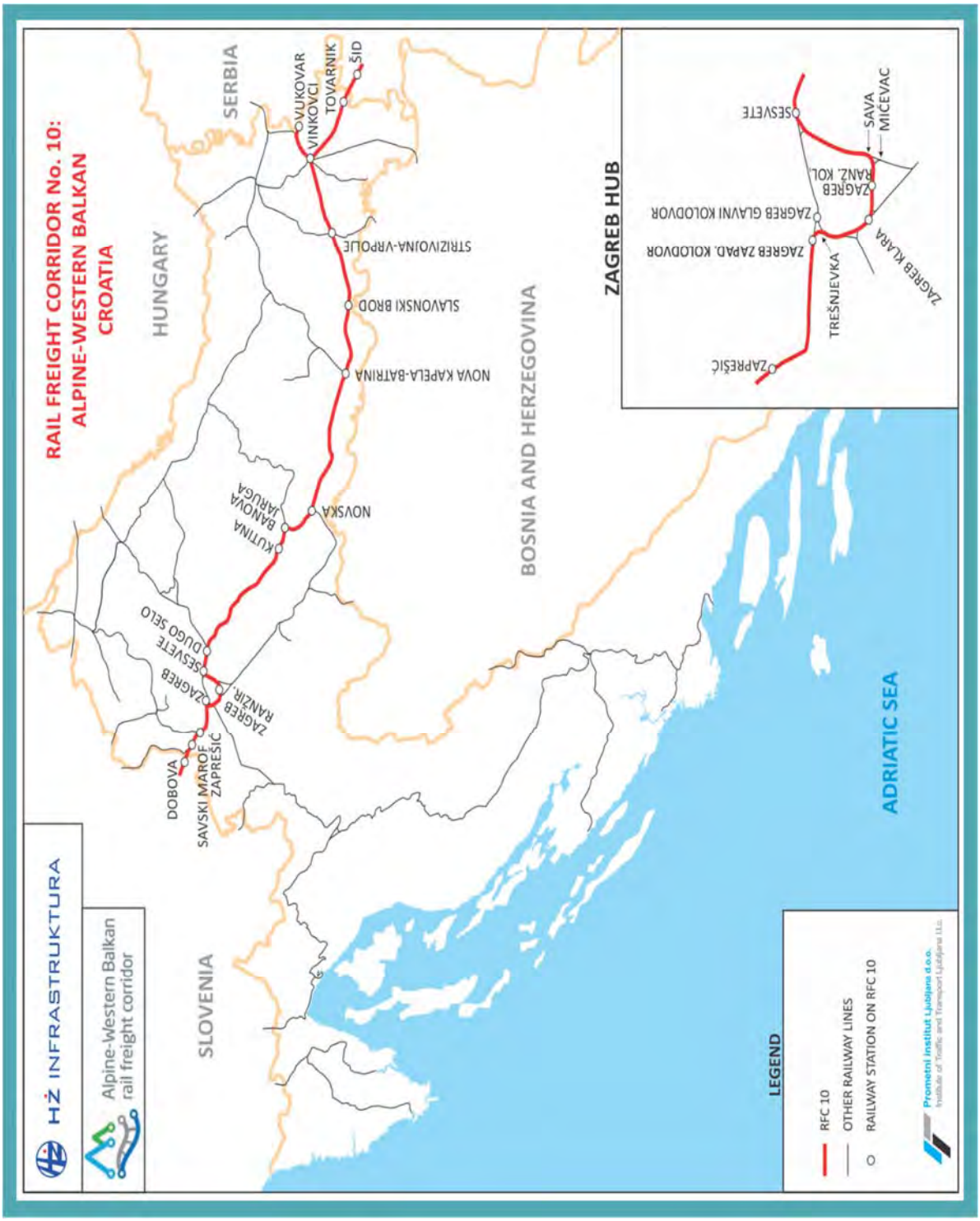


Figure 4-7: Graphical presentation of AWB RFC in Serbia

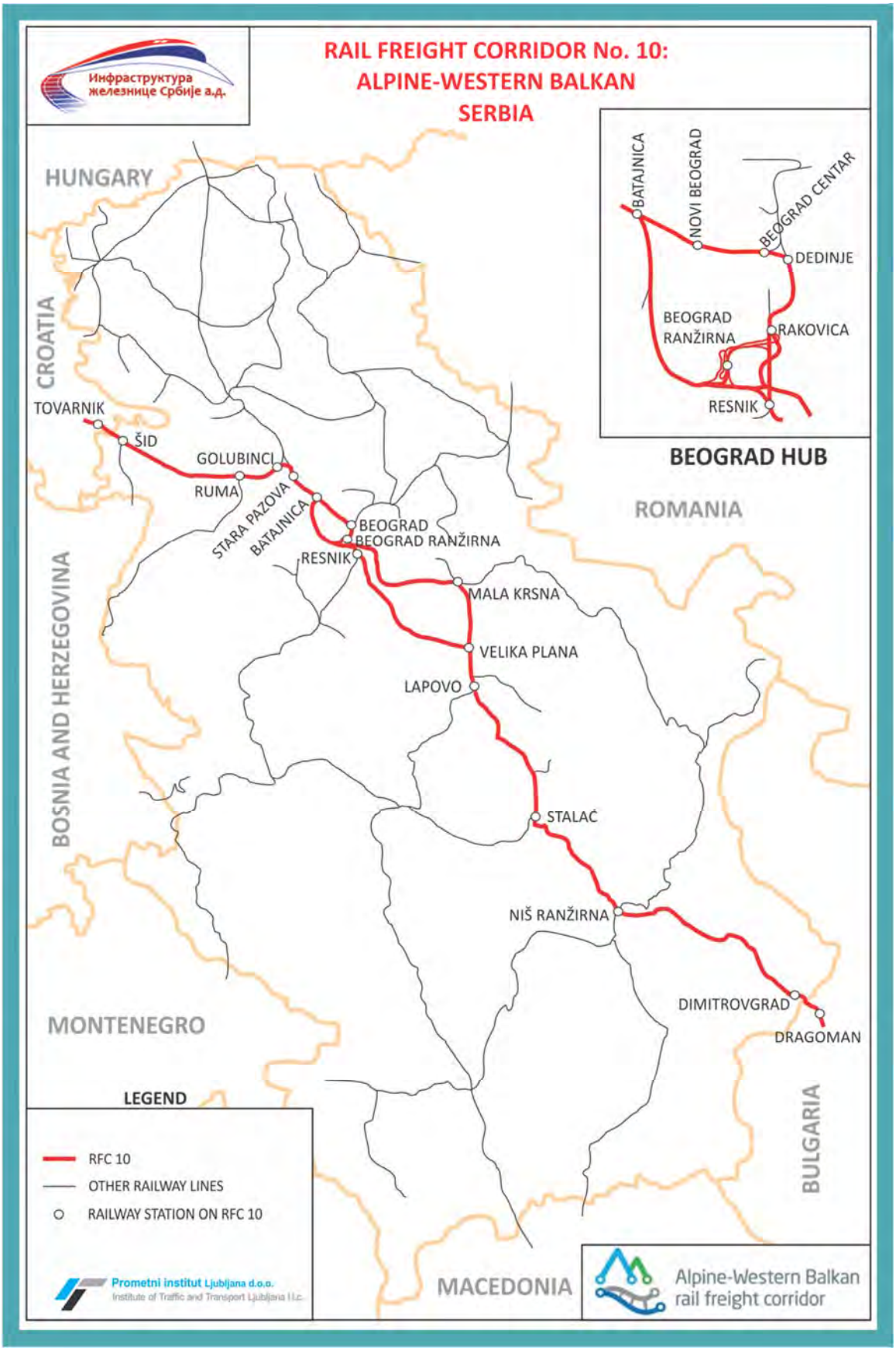
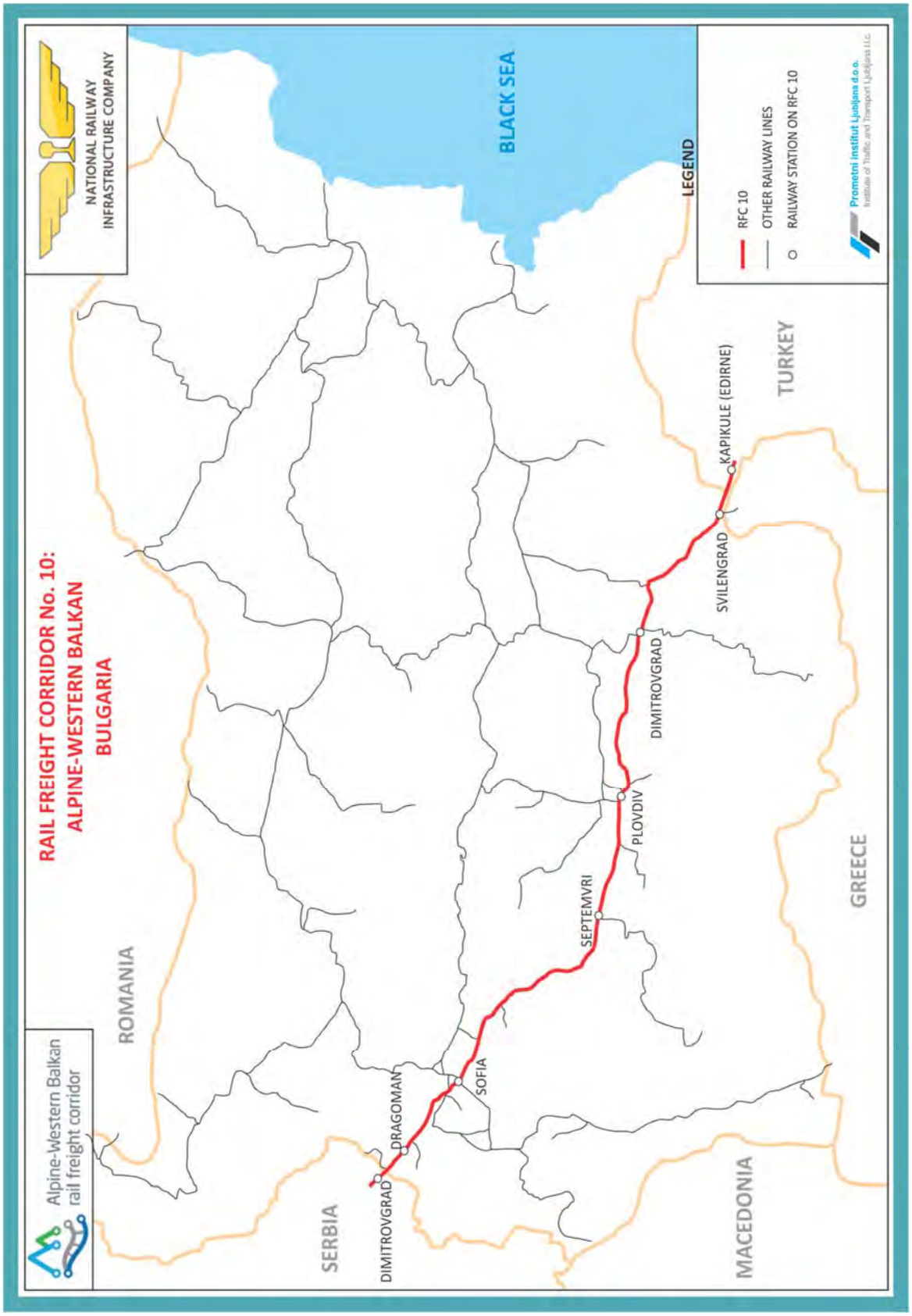


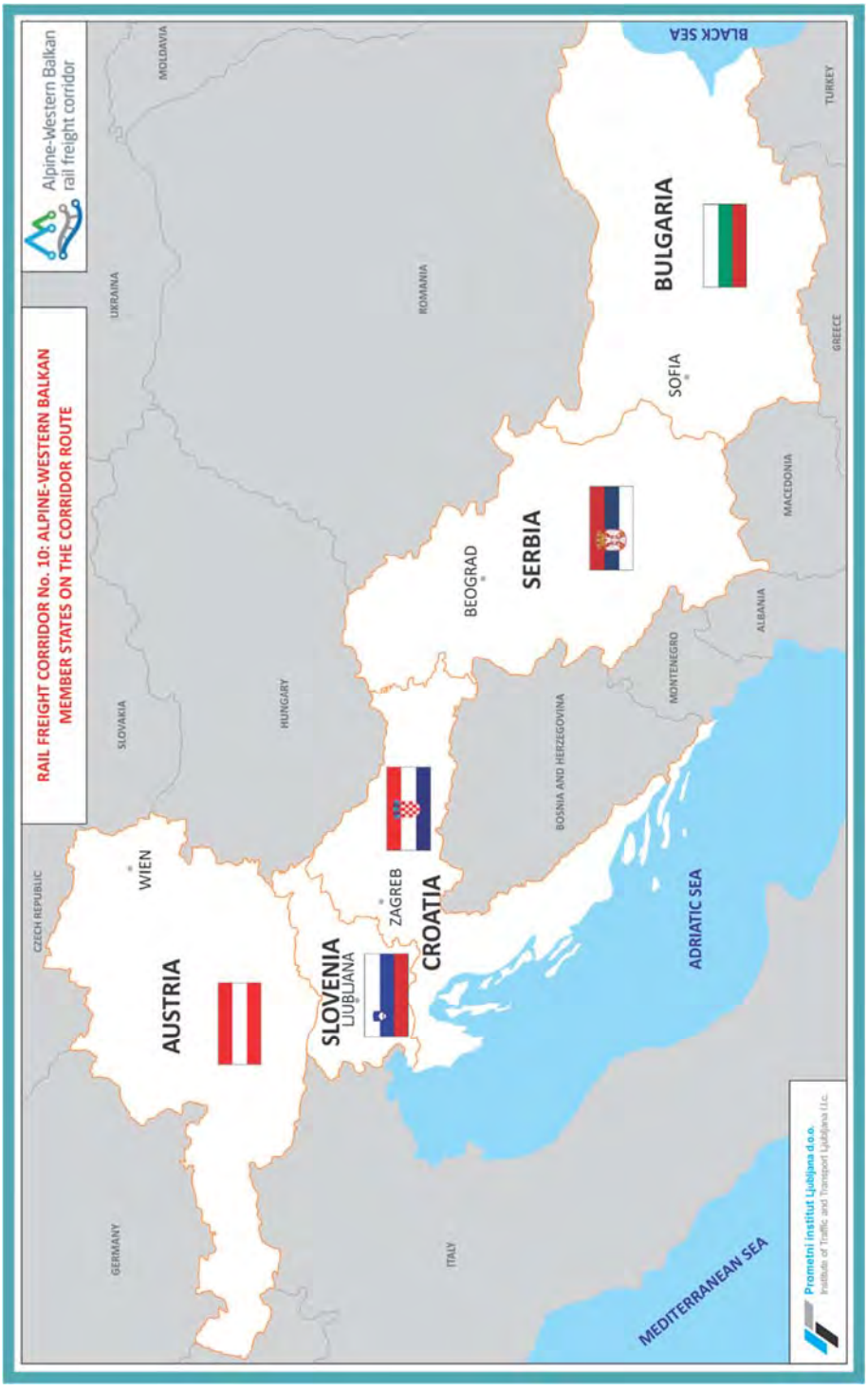
Figure 4-8: Graphical presentation of AWB RFC in Bulgaria



5 ANALYSIS OF SOCIO-ECONOMIC INDICATORS

The chapter that follows is focused on an analysis of selected socio-economic indicators that that have an impact on the growth of transport services.

Figure 5-1: Member states of the Alpine-Western Balkan RFC



5.1 BASIC CHARACTERISTICS OF THE COUNTRIES OF THE AWB RFC

The aim of this subchapter is to provide basic general data on all countries participating in the Alpine-Western Balkan RFC.

5.1.1 Republic of Austria

Country	Republic of Austria 
Capital	Vienna
Area	83.879 km^2
Population	8.751.000
Density	105 / km^2
Official language	German
Administrative divisions	9 states
Neighbouring countries	Italian Republic, Principality of Liechtenstein, Swiss Confederation, Federal Republic of Germany, Czech Republic, Slovak Republic, Hungary, Republic of Slovenia
Geographical location	Central Europe

Source: different sources.

5.1.2 Republic of Slovenia

Country	Republic of Slovenia 
Capital	Ljubljana
Area	20.273 km^2
Population	2.081.000
Density	103 / km^2
Official language	Slovene
Administrative divisions	12 statistical regions (no administrative function)
Neighbouring countries	Italian Republic, Republic of Austria, Hungary, Republic of Croatia
Geographical location	Central Europe

Source: different sources.

5.1.3 Republic of Croatia

Country	Republic of Croatia 
Capital	Zagreb
Area	56.594 km^2
Population	4.284.889
Density	76 / km^2
Official language	Croatian
Administrative divisions	20 counties and the City of Zagreb
Neighbouring countries	Republic of Slovenia, Hungary, Republic of Serbia, Bosnia and Herzegovina, Montenegro
Geographical location	South-eastern Europe

Source: different sources.

5.1.4 Republic of Serbia

Country	Republic of Serbia 
Capital	Belgrade
Area	88.361 km^2
Population	8.762.000
Density	100 / km^2
Official language	Serbian
Administrative divisions	Unitary state, composed of 145 municipalities, 29 districts and 2 autonomous provinces
Neighbouring countries	Hungary, Romania, Republic of Bulgaria, Republic of North Macedonia, Republic of Albania, Montenegro, Bosnia and Herzegovina, Republic of Croatia
Geographical location	South-eastern Europe

Source: different sources.

5.1.5 Republic of Bulgaria

Country	Republic of Bulgaria 
Capital	Sofia
Area	110.993 km^2
Population	7.000.039
Density	63 / km^2
Official language	Bulgarian
Administrative divisions	27 districts and metropolitan capital province Sofia
Neighbouring countries	Republic of Serbia, Romania, Republic of North Macedonia, Greece, Republic of Turkey
Geographical location	South-eastern Europe

Source: different sources.

5.2 ECONOMIC INDICATORS

Within the economic indicators, the indicators GDP current prices, GDP current prices in purchasing power parity, GDP growth rate, GDP per capita in purchasing power standard, GDP share and HDI, GCI, IEF and ETI indices for the individual countries of the Alpine-Western Balkan RFC are analysed in the following sections.

5.2.1 Gross Domestic Product (GDP)

Gross Domestic Product (GDP) is defined as the value of all final products and services produced by all units of the national accounting of the monitored territory over the given period. Within the above GDP indicator, the following table shows GDP for the individual countries included in the Alpine-Western Balkan RFC.

In 2017, the GDP of the selected countries amounted to 550.3 billion EUR at current prices.

Table 5-1: GDP, current prices, million EUR

	2013	2014	2015	2016	2017	2018
EU (28 countries)	13.596.777,90	14.072.020,70	14.828.642,40	14.958.293,00	15.382.590,60	15.887.040,20
Alpine - Western Balkan RFC area (5 countries)	482.213,40	492.472,30	508.731,70	528.085,90	552.734,70	581.471,60
Austria	323.910,20	333.146,10	344.258,50	356.237,60	369.899,20	386.093,80
Slovenia	36.239,20	37.603,30	38.863,30	40.357,20	42.999,70	45.947,60
Croatia	43.779,20	43.431,00	44.605,90	46.639,50	48.989,50	51.467,80
Serbia	36.426,70	35.467,50	35.715,50	36.723,00	39.183,30	42.780,20
Bulgaria	41.858,10	42.824,40	45.288,50	48.128,60	51.663,00	55.182,20

Source: Eurostat

Expressing GDP in PPP (purchasing power parity) eliminates differences in price levels between countries, and calculations on a per head basis allows for the comparison of economies significantly different in absolute size.

Table 5-2: GDP, current prices, million EUR purchasing power parity

	2013	2014	2015	2016	2017
EU (28 countries)	13.596.773,80	14.071.985,20	14.826.929,20	14.953.489,70	15.382.590,60
Alpine - Western Balkan RFC area (5 countries)	577.228,60	593.705,70	623.278,20	633.969,80	650.135,20
Austria	298.529,20	307.426,70	323.901,30	328.329,60	334.683,70
Slovenia	45.091,00	46.882,00	49.065,90	49.854,30	52.748,60
Croatia	68.175,80	68.974,30	72.670,80	74.478,90	76.578,50
Serbia	76.991,50	77.052,80	79.554,10	80.185,30	81.464,40
Bulgaria	88.441,10	93.369,90	98.086,10	101.121,70	104.660,00

Source: Eurostat

The following table shows the GDP growth rate in % for the individual countries included in the Alpine-Western Balkan RFC, including that forecast for 2019 – 2020.

Table 5-3: Real GDP growth rate and prognosis in %

	Real GDP growth rate (%)						Prognosis of GDP (%)	
	2013	2014	2015	2016	2017	2018	2019	2020
EU (28 countries)	0,3	1,9	2,4	2,1	2,7	2,1	1,6	1,7
Austria	0,0	0,8	1,1	2,0	2,6	2,7	2,0	1,7
Slovenia	-1,1	3,0	2,3	3,1	4,9	4,5	3,4	2,8
Croatia	-0,5	-0,1	2,4	3,5	2,9	2,7	2,6	2,5
Serbia	2,9	-1,6	1,8	3,3	2,0	4,4	3,5	4,0
Bulgaria	0,5	1,8	3,5	3,9	3,8	3,2	3,3	3,0

Source: International Monetary Fund

From the above-mentioned analysis of GDP growth rates, we can confirm the slowdown in economic growth in 2013 in all the analysed countries, except in Serbia. However, a return to GDP growth has been recorded since 2015. The GDP growth rate forecasts predict a positive growth trend above 2 % in 2018, as well as in 2019 and 2020, for all the monitored countries.

The following table shows the trend of index of GDP per capita in purchasing power parity in relation to the average of EU 28 that is equal to 100 for the period 2013 – 2017. If the

index of a country is higher than 100, the level of GDP per capita in the country under consideration is higher than EU average and vice versa. The basic data are expressed in purchasing power parity, i.e. common currency that eliminates differences in price levels between countries allowing meaningful volume comparisons of GDP between countries.

Table 5-4: GDP per capita in purchasing power parity

	2013	2014	2015	2016	2017
EU (28 countries)	100	100	100	100	100
Austria	131	130	130	127	128
Slovenia	82	82	82	83	85
Croatia	60	59	59	60	61
Serbia	38	37	36	37	37
Bulgaria	46	47	47	49	49

Source: Eurostat.

The highest index of GDP per capita in PPP among member states of the Alpine-Western Balkan RFC in 2017 was in Austria, at 128. However, there was a slight decline in the period 2013 – 2016 in Austria. GDP per capita in PPP in Slovenia, Croatia and Bulgaria has been stable since 2013, with a slight increase. In Serbia, there was a slight decline in the period 2013 – 2017. The steady trend of GDP per capita in purchasing power parity terms confirms there has been relative price stability in the analysed countries.

The next table analyses the share of GDP within primary, secondary and tertiary spheres of the national economy for the period 2013 – 2017 for the countries of the Alpine-Western Balkan RFC.

Table 5-5: Analysis of GDP share

Country	Item / Year	2013	2014	2015	2016	2017
Austria	Agriculture, value added (% of GDP)	1,3	1,2	1,1	1,1	1,1
	Industry, value added (% of GDP)	25,5	25,4	25,0	24,7	25,3
	Services, etc., value added (% of GDP)	73,2	73,4	73,9	74,2	73,6
Slovenia	Agriculture, value added (% of GDP)	1,8	2,0	2,0	1,9	1,8
	Industry, value added (% of GDP)	27,6	28,4	28,2	28,0	28,8
	Services, etc., value added (% of GDP)	70,6	69,6	69,8	70,1	69,4
Croatia	Agriculture, value added (% of GDP)	3,7	3,5	3,5	3,4	3,3
	Industry, value added (% of GDP)	22,5	22,5	22,3	22,1	21,8
	Services, etc., value added (% of GDP)	73,8	74,0	74,1	74,4	75,0
Serbia	Agriculture, value added (% of GDP)	7,9	7,7	6,8	6,5	6,0
	Industry, value added (% of GDP)	26,7	25,2	26,0	25,8	26,4
	Services, etc., value added (% of GDP)	65,5	67,1	67,3	67,7	67,6
Bulgaria	Agriculture, value added (% of GDP)	4,6	4,6	4,1	4,1	3,7
	Industry, value added (% of GDP)	23,8	23,6	24,1	24,4	24,5
	Services, etc., value added (% of GDP)	71,7	71,9	71,8	71,5	71,7

Source: World Bank.

On the basis of the data analysed in Table 5-5, we can confirm the high share of the tertiary sphere of the national economy in the total GDP of the surveyed countries. The data document the development of these countries and their potential for sustainable development, as the tertiary sphere of the national economy is less harmful to the environment.

5.2.2 Index of Economy Freedom (IEF), the Global Competitiveness Index (GCI) and Human Development Index (HDI)

The IEF index belongs to indicators aimed at measuring economic freedom in relation to the overall performance of the economy. More than 50 world institutions are involved in the creation of the index, which analyses indicators in the areas of the impact of state interventions in the economy, the protection of property rights, and the interventions in terms of conditions of entry into business. Based on the long-term monitoring of this index, it is confirmed that countries with a higher level of economic freedom achieve higher economic performance, higher GDP growth rates and higher GDP per capita compared to countries with a low level of economic freedom. The measure was created by the Heritage Foundation, and covers 180 countries with scores from 0 to 100, with 100 being the highest value of the economic freedom index.

According to the GCI index, it is possible to express how the quality of the business environment contributes to increasing the performance of the economy and this is assessed according to four basic areas, which are economic growth, government efficiency, business environment efficiency, and infrastructure efficiency. The World Economic Forum Global Competitiveness Index assesses 137 countries with scores ranging from 1 to 7, with 7 being the highest value.

The Human Development Index (HDI) index is currently used most often to compare the level of human development, and is considered to be the most comprehensive indicator of quality of life. The HDI assesses health and life expectancy, education and living standards. The index is also used by the United Nations Development Programme (UNPD). It is assessed within 188 countries and ranges from 0 to 1, with a higher value indicating a higher quality of life.

The following table analyses the IEF, GCI, HDI indicators separately for each country of the Alpine-Western Balkan RFC.

Table 5-6: Overview of analysed indexes for the countries of the Alpine-Western Balkan RFC

Index (Year)	IEF (2018)		GCI (2017 - 2018)		HDI (2018)	
Country	Score	Rank/180	Score	Rank/137	Score	Rank/188
Austria	71,3	32	5,25	18	0,909	20
Slovenia	64,8	64	4,48	48	0,896	25
Croatia	61,0	92	4,19	74	0,831	46
Serbia	62,5	80	4,14	78	0,787	67
Bulgaria	68,3	47	4,46	49	0,813	51

Source: The Heritage Foundation, World Economic Forum, and United Nations Development Programme.

By looking at the values for the Economic Freedom Index, Global Competitiveness Index and Human Development Index, it can be seen that Austria achieved the best ratings among the analysed countries. Austria ranks in 32nd place globally with regard to the Economic Freedom Index, 18th place for the Global Competitiveness Index and 20th for the Human Development Index. Overall, based on the data in Table 5-6 it is possible to confirm appropriate macro environments in all the analysed countries for the investment, business and innovations that contribute to economic development and the subsequent demand for transport services. The results also confirm the competitiveness of the economies of these countries in relation to other nations around the world.

5.2.3 Enabling Trade Index (ETI)

The Enabling Trade Index (ETI) index is created by the World Economic Forum in cooperation with the World Bank and various national institutions which ensure the availability of the necessary data. The index is made up of four sub-indexes assessing the following:

- Market access,
- Border administration,
- Transport and communications infrastructure,
- Business Environment.

Each of these sub-indexes is divided into pillars ranging from 1 to 7, composed of basic indicators (55 in total) as well as indicators that are specific for a given range. There are 136 countries in the ranking, with scores closer to 7 being better, and the best country being ranked at #1.

Table 5-7: Overview of ETI index and individual sub-indexes for Alpine-Western Balkan RFC countries

Country	Rank/136 (2016)	Score	Suindex scores			
			Market Access	Border Administration	Transport and communications Infrastructure	Business Environment
Austria	7	5,5	4,9	6,3	5,5	5,4
Slovenia	32	5,0	5,0	5,8	4,6	4,5
Croatia	44	4,8	5,0	5,4	4,4	4,2
Serbia	64	4,4	4,9	4,7	4,0	4,0
Bulgaria	53	4,5	4,8	5,0	4,1	4,2

Source: World Economic Forum, World Bank.

Based on the ETI index, we can confirm the above-average ranking of countries in terms of enabling business activities, while at the same time the above-average value of the sub-index in the area of transport and communications infrastructure has also been demonstrated. Appropriate measures by the EU and individual member states in the field of transport infrastructure, as well as by transport infrastructure managers, will again be reflected in the rankings of the analysed countries, whereby the overall value of the ETI index will be increased with better measures.

5.3 REVIEW OF AWB RFC STATE MARKETS

The transport services market is different in the analysed countries, with these differences mainly influenced by the geographical location, the deployment of industrial and logistics centres, as well as the main sectors of their economies. This subchapter provides information about the various industries in the in AWB RFC member countries (Austria, Slovenia, Croatia, Serbia, and Bulgaria).

5.3.1 Austria

Austria is a developed and highly industrialized country, economically tied to other EU members, especially Germany. The Austrian economy is characterised by an extensive service sector, a strong industrial sector and a small but highly developed agricultural sector.

The industrial sector in Austria is diverse, with many traditional forms of industry. The main industrial sectors are construction, mechanical engineering, automobile and automotive parts production, food processing, chemical processing, and the wood and textile industries. Industrial facilities are located near the raw materials needed for production. The textile industry is concentrated in the east of the country, where the glass and chemical industries and the production of electrical and electronic products are located. The heavy industry is located in the area of Vienna, Linz, Leoben and other river corridors. The Renewable Energy Sources (RES) sector, especially hydroelectric power plants, is booming and has already exceeded the efficiency of the tourism and construction sector.

The Austrian industrial sector accounts for 25 % of GDP and employs just over a quarter of the working population. The growth of industrial production in the year 2017 was 3,9 %. In the next two years analysts predict moderate growth in industrial production, at 2,4 % in 2019 and 1,5 % in 2020.

The annual value of the Austrian tourism industry is expected to reach EUR 36,5 billion in 2022, while the total annual growth rate is projected to be 2,2 % in the period 2018 – 2022.

Food services are the largest segment of the tourism industry in Austria, and account for 37,9 % of the total value of the industry. The segment of hotels and motels accounts for 22 % of the value of the industry.

In 2017, the value of exports of goods amounted to 138,7 billion EUR, while the value of imports amounted to 139,9 billion EUR. The trade deficit in trade in goods amounted to 1,2 billion EUR. Austria exported most of its exports to Germany (in 2017, 29 % of total exports), followed by Italy, the USA, Switzerland and Slovakia. Most of these exports were of machinery, electrical and electronic equipment, vehicles and pharmaceuticals. Austria imported most from Germany in 2017 (41,3 % of total imports), followed by Italy, Switzerland, the Czech Republic and the Netherlands. In 2017, most imports were of machinery, electrical and electronic equipment, vehicles, mineral fuels and plastic products.

Table 5-8: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Machinery	13,0	Machinery	17,7
Electrical and electronic equipment	11,6	Electrical and electronic equipment	12,4
Vehicles	11,3	Vehicles	9,3
Mineral fuels, oil	6,9	Pharmaceutical products	5,4
Plastics and plastic products	4,3	Plastics and plastic products	4,6

Source: www.izvoznookno.si, https://globaledge.msu.edu

Table 5-9: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
Germany	41,3	Germany	29,0
Italy	5,7	Italy	6,1
Switzerland	5,5	USA	6,1
Czech Republic	4,4	Switzerland	5,1
Netherland	4,1	Slovakia	4,8

Source: www.izvoznookno.si, https://globaledge.msu.edu

The following table shows the list of major business entities in Austria which are potential railway users (i.e., due to freight transport by rail).

Table 5-10: Major business entities in Austria which are potential railway users

FOSSIL FUELS ENERGY	AUTOMOTIVE INDUSTRY	COPPER MINING	WOOD INDUSTRY
Donaustadt 1, 2 ,3 Gas Power Plant	BMW Motoren - Steyr Car Engine Plant	Montanwerke - Brixlegg Copper Refinery	Binder - Fügen Sawmill
Dürnrohr Coal Power Plant	Delphi Packard - Großpetersdorf Auto Component Plant	**GRAIN INDUSTRY**	Binder - Jenbach Wood Processing Plant
Inzersdorf Gas Power Plant	Eybl - Gmünd Auto Component Plant ,Krems Auto Component Plant	Agrana - Aschach Starch Plant	Binder - Sankt Georgen bei Salzburg Plywood Mill
Kagran Gas Power Plant	Faurecia - Kennelbach Auto Component Plant	Agrana - Gmünd Starch Plant	Egger - Döllach Sawmill
Korneuburg Gas Power Plant	Georg Fischer - Altenmarkt Auto Component Plant	**IRON AND STEEL INDUSTRY**	H & H - Stainach Wood Pellet Plant
Leopoldau Gas Power Plant	KTM - Mattighofen Motorcycle Plant	Böhler Edelstahl - Kapfenberg Steel Mill	Haeupl - Vöcklamarkt Sawmill
Linz Süd Gas Power Plant	Liebherr - Korneuburg Train Component Plant	Breitenfeld Edelstahl - Sankt Barbara im Mürztal Steel Mill	Hasslacher - Arnoldstein Sawmill
Mellach Coal, Gas Power Plant	Magna Steyr - Albersdorf, Graz, Sinabelkirchen, Weiz	Voestalpine - Bruck an der Mur Wire Drawing Mill	Hasslacher - Liebenfels Sawmill
Riedersbach I,II Coal Power Plant	Man - Steyr Truck Assembly Plant	Voestalpine - Leoben Steel Mill	Hasslacher - Preding Sawmill
Salzburg Mitte, Nord Gas Power Plant	Opel - Wien Car Engine Plant	Voestalpine - Linz Integrated Steel Mill	Hasslacher - Sachsenburg Sawmill
Simmering Gas Power Plant	Robert Bosch - Hallein Auto Component Plant	**MACHINERY INDUSTRY**	Hot'ts - Mattighofen Wood Pellet Plant
Theiss Oil Power Plant	Rosenbauer - Leonding Truck Assembly Plant,Neidling Car Assembly Plant	Andritz - Graz Machinery Plant	Hutter - Sankt Martin Sawmill
Timelkam 3,4 Gas Power Plant	Siemens SGP - Graz Train Component Plant , Wien Train Assembly Plant	BRP-Rotax - Gunskirchen Machinery Component Plant	Hutter - Sankt Michael Sawmill
Weitendorf Gas Power Plant	**CEMENT INDUSTRY**	Engel - Dietach Machinery Component Plant	Kirchner - Radstadt Sawmill
Werndorf-Neudorf Oil Power Plant	Holcim - Bludenz, Wien Cement Plant	Engel - Schwertberg Machinery Plant	Lenzing Sawmill (Shutdown)
Zeltweg Coal Power Plant	Kirchdorfer - Kirchdorf Cement Plant	Liebherr - Bischofshofen Loader Assembly Plant	Maresch - Niederfladnitz Sawmill
ALUMINIUM INDUSTRY	Lafarge - Mannersdorf am Leithagebirge, Retznei Cement Plant	Liebherr - Nenzing Machinery Plant	Maresch - Retz Sawmill
AMAG - Ranshofen Aluminium Processing Plant	Leube - Gartenau Cement Plant	Liebherr - Telfs Loader Assembly Plant	Mayr-Melnhof - Frankenmarkt Sawmill
Georg Fischer - Herzogenburg Aluminium Processing Plant	Rohrdorfer - Gmunden, Kufstein Cement Plant	SKF - Steyr Machinery Component Plant	Mayr-Melnhof - Leoben Sawmill
HAI - Ranshofen Aluminium Processing Plant	Schretter - Kirchbichl Cement Grinding Mill	Steyr Traktoren - St. Valentin Tractor Assembly Plant	Neuschmied Sawmill
Nemak - Linz Aluminium Processing Plant	Schretter - Vils Cement Plant	Zumtobel - Donbirn Lightning Plant	Offner - Wolfberg Sawmill
Neuman - Marktl Aluminium Processing Plant	W&P - Leoben Cement Grinding Mill	**OIL REFINING**	Pfeifer - Imst Sawmill
Sapa - Nenzing Aluminium Processing Plant	W&P - Peggau Cement Plant	OMV - Schwechat Oil Refinery	Pfeifer - Kundl Sawmill
Speedline - Schlins Aluminium Processing Plant	W&P - Wietersdorf Cement Plant	**PAPER INDUSTRY**	Rubner - Rohrbach an der Lafnitz Sawmill

Treibacher Schleifmittel - Villach Specialty Alumina Plant	Wopfinger - Wopfing Cement Plant	Mayr Melnhof - Gunskirchen Cardboard Packaging Plant	Rumplmayr - Altmünster Sawmill
Tschirk Wintergarten - Neudörfl Aluminium Processing Plant		Mayr Melnhof - Wien Cardboard Packaging Plant	Rumplmayr - Enns Sawmill
		Mondi - Grünburg Paper Packaging Plant	RZ Holzindustrie - Wiesenau Sawmill (Shutdown)
		Mondi - Hilm Paper Processing Plant	Samonig - Fürnitz Sawmill
		Mondi - Möderbrugg Paper Packaging Plant	Schachl - Abtenau Sawmill
		Mondi - Neusiedler Paper Processing Plant	Stave - Schößwendter Sawmill
		Mondi - Sankt Gertraud Pulp and Paper Mill	Steininger - Rastenfeld Sawmill
		Mondi Bags - Zeltweg Paper Packaging Plant	Stora Enso - Bad Sankt Leonhard Sawmill
		Unterland Flexible Packaging - Langkampfen Paper Processing Plant	Stora Enso - Ybbs Sawmill
			Theurl Holz - Assling Sawmill
			Troger Holz - Vomperbach Sawmill

Source: https://www.industryabout.com/country-territories-3/28-austria

Figure 5-2: Major business entities in Austria which are potential railway users

Source: https://www.industryabout.com/austria-industrial-map

5.3.2 Slovenia

Among the most important industries in Slovenia there are the iron industry, automobile manufacturing and manufacturing of electrical devices. Slovenian industry is large share also based on wood and textiles, pharmaceuticals and chemicals, as well as engineering.

The agricultural sector has declined, reaching only 1,8 % of the GDP in 2017 (compared to 4,2 % in 1995). It employs around 3,7 % of the population.

The industrial sector represents about one-third of the GDP (28,8 %) and employment (31,7%). Historically, the dominant industries in Slovenia have been the forestry, textile and metallurgical industries. Since the 1980s, the mechanical industries (automobile, tool machines) and high value-added industries (electronics, pharmaceuticals and chemicals) have developed significantly.

The services sector remains the most significant in the Slovenian economy. This sector, which represented 69,4 % of the GDP and employed 64,6 % of the total workforce in 2017, has shown a strong growth pattern during the last ten years, especially in the fields of information and communications technology (ITC), financial and commercial services and retail business. The tourism sector is also very dynamic and is undergoing a period of strong development.

Slovenia's main export partners are Germany, Italy, Austria, Croatia and France, while the main exported product groups are road vehicles, medical and pharmaceutical products, electrical machinery and appliances, industrial machinery, metals, and iron and steel. The biggest share of imports are associated with road vehicles, followed by petroleum and petroleum products and electrical machinery, while the majority of products are imported from Germany, Italy and Austria.

Table 5-11: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Vehicles	11,2	Vehicles	12,8
Petroleum, petroleum products	10,1	Medical & pharmaceutical products	10,3
Electrical machinery, apparatus	6,0	Electrical machinery, apparatus	9,8
General industrial machinery	4,3	General industrial machinery	5,5
Medical & pharmaceutical products	4,3	Manufactures of metals	4,8

Source: www.izvoznookno.si, https://globaledge.msu.edu

Table 5-12: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
Germany	18,3	Germany	20,1
Italy	16,3	Italy	11,9
Austria	11,6	Austria	9,1
Croatia	4,8	Croatia	7,7
France	4,6	France	5,1

Source: www.izvoznookno.si, https://globaledge.msu.edu

The following table shows the list of major business entities in Slovenia which are potential railway users (i.e., could use freight transport by rail).

Table 5-13: Major business entities in Slovenia which are potential railway users

ALUMINIUM INDUSTRY	AUTOMOTIVE INDUSTRY
Talum - Kidricevo Aluminium Smelter	GKN Driveline - Zreče Auto Component Plant
IRON AND STEEL INDUSTRY	Goodyear Dunlop Sava Tires - Kranj Tyre Plant
SIJ - Jesenice Steel Mill	Renault - Novo Mesto Car Assembly Plant
SIJ - Ravne na Koroškem Steel Mill	
WOOD INDUSTRY	**CEMENT INDUSTRY**
LIP Bohinj - Bohinjska Bistrica Sawmill	Salonit - Anhovo Cement Plant
PAPER INDUSTRY	**FOSSIL FUELS ENERGY**
Vipap Videm - Krško Pulp & Paper Mill	Brestanica Gas Power Plant
	Ljubljana Coal Power Plant
	Šoštanj Coal Power Plant
	Trbovlje Coal Power Plant

Source: https://www.industryabout.com/country-territories-3/451-slovenia

Figure 5-3: Major business entities in Slovenia which are potential railway users

Source: https://www.industryabout.com/slovenia-industrial-map

5.3.3 Croatia

In Croatia the agricultural sector accounts for 3,3 % of GDP and employs about 2 % of the working population. The main agricultural products are wheat, corn, sugar beet, fruits, wine and olive oil.

The service sector contributes 75 % of GDP and employs over 70 % of the working population. Tourism is the most important in the service sector, which is in full bloom. In 2017, Croatia was visited by 18,5 million tourists. It is projected that the sector will be experiencing high growth in the coming years, as the state invests heavily in the development of modern infrastructure.

The Croatian industrial sector accounts for 22 % of GDP and employs 27,6 % of the total working population. Industrial production in Croatia, until the recession, had an important place in total production. The most prominent forms were manufacturing and the petrochemical industry, along with shipbuilding. Some companies were closed down in the process of transition, or were damaged in the war. This mostly applies to the textile, leather, metal and timber industries. There was also significant production in the construction and energy sectors. Some industries, however, still achieve positive results and are active in foreign trade.

According to their total revenues, the leading industrial branches lie the production of food, drinks, tobacco and wood, and these are followed by the chemical and oil industries. More than a third of Croatia's territory is covered by forests, which is why wood industry is one of the basic sectors. Other important sectors are the mechanical and paper industries, building materials industry, shipbuilding and the oil industry.

In 2017, Croatia recorded 1,4 % growth in industrial production. It is projected to increase by 2,8 % and 2% in 2019 and 2020.

The Croatian deficit in trade in goods is in 2017 amounted to 8,1 billion EUR, representing 16,6 % of GDP. In 2017, Croatia exported 11,6 billion EUR and imported 19,8 billion EUR. The most important trading partners of Croatia are Italy and Germany. Italy received 13,4 % of Croatia's exports in 2017, while 12,2% went to Germany. Beside Italy and Germany, other important export markets for Croatia are Slovenia, Bosnia and Herzegovina, and Austria. Croatia imported the most from Germany in 2017 (15,7 % of total imports), followed by Italy, Slovenia, Austria and Hungary. A total of 10,7 % of total imports were imported from Slovenia in 2017. Croatia mostly imports mineral fuels, machinery, electrical and electronic equipment, vehicles and pharmaceuticals. Among its major exports are mineral fuels, machinery, electrical and electronic equipment, vehicles and pharmaceuticals.

Table 5-14: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Mineral fuels, oil	13,4	Mineral fuels, oil	10,7
Machinery	9,7	Machinery	8,6
Electrical and electronic equipment	7,8	Electrical and electronic equipment	8,5
Vehicles	7,5	Pharmaceutical products	8,0
Pharmaceutical products	4,6	Wood and wood products	5,4

Source: www.izvoznookno.si, https://globaledge.msu.edu

Table 5-15: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
Germany	15,7	Italy	13,4
Italy	12,9	Germany	12,2
Slovenia	10,7	Slovenia	10,6
Austria	7,5	Bosnia and Herzegovina	9,8
Hungary	7,5	Austria	6,2

Source: www.izvoznookno.si, https://globaledge.msu.edu

The following table shows the list of major business entities in Croatia which are potential railway users (i.e., could use freight transport by rail).

Table 5-16: Major business entities in Croatia which are potential railway users

CEMENT INDUSTRY	FOSSIL FUELS ENERGY	OIL REFINING
Calucem - Pula Cement Plant	Jertovec Gas Power Plant	INA - Rijeka Oil Refinery
Cemex - Kaštel Sućurac Cement Plant	Osijek Gas Power Plant	INA - Sisak Oil Refinery
Cemex - Solin Cement Plant	Plomin Coal Power Plant	
Cemex - Solin Majdan Cement Plant	Rijeka Oil Power Plant	
Holcim - Koromačno Cement Plant	Sisak Oil Power Plant	
Nexe - Našice Cement Plant	Zagreb - El To Gas Power Plant	
	Zagreb - Te To Gas Power Plant	

Source: https://www.industryabout.com/country-territories-3/72-croatia

Figure 5-4: Major business entities in Croatia which are potential railway users

Source: https://www.industryabout.com/croatia-industrial-map

5.3.4 Serbia

Serbia is a country with high market potential, mainly due to dynamic domestic demand and openness to trade and foreign investors. The economic model developed by the Serbian authorities is now promoting exports, taking into account advantages such as geographical position, low-cost and skilled labour and free-trade agreements with the EU, Russia, Turkey and CEFTA member states.

The state benefits from support from the EU and international financial institutions (World Bank, EIB, EBRD), capable of mobilising more than 1 billion EUR a year to modernise infrastructure in the country and to support economic investment. Serbia has developed some form of dependence on foreign funding for these programs.

Serbia's industrial sector accounts for 26% of GDP and employs more than a quarter of the working population. The main industries are the mechanical, chemical, metal, food, furniture, textile and pharmaceutical industries. The automotive industry, which also attracts foreign investors, is becoming more and more promising.

In 2017, industrial production grew by 3,5%. In the next two years, analysts predict positive growth of industrial production, in 2019, 4 %, and in 2020, 5%.

The automotive industry is one of the most important sectors of the Serbian economy, representing more than 10 % of exports and around 14 % of the value of foreign investment in the country, along with more than 40.000 jobs.

The history of the Serbian automotive industry dates back to the end of the 1930s, when there was a great local interest in its development, and the Zastava factory made its first car under a license from Fiat. Thanks to its high quality production, Serbia later became a production centre for Mercedes, Opel, Ford and other manufacturers. However, the political situation in the 1990s and the dissolution of Yugoslavia reduced production and foreign capital. The situation in the automotive industry began to change after 2000, and in 2009 the industry was already comprised of six vehicle companies and around 70 car component suppliers.

Today, the Serbian automotive industry is booming. Favourable conditions attract many international investors to the country. About 60 companies from Europe, USA and Asia have invested a total of about 2 billion EUR in the industry and created around 30.000 new jobs. One of the biggest investors in the Serbian automotive industry is Fiat (FCA – Fiat Chrysler Automobile). The company produces more than 100.000 vehicles per year and exports them to the USA and EU markets. The most popular area for foreign investments is the production of motor components and brake pads. Since 2005, many companies have entered the Serbian market for motor components, and their investments have rapidly increased the value of automotive sector.

The interest of investors with regard to the automotive industry is also increasing rapidly. The government supports the development of the industry and strives to attract as many investors as possible. The automotive industry will therefore continue to remain a key sector of the Serbian economy in the future.

In 2017, Serbia exported 14,1 billion EUR worth of goods and imported about 18,1 billion EUR. The deficit in trade in goods thus amounted to 4 billion EUR, representing 10,8 % of GDP. In 2017, Serbia mostly imported goods, consumer goods, mineral fuels, machinery, electrical and electronic equipment and vehicles. The most important foreign trade partner is Germany, from where Serbia imported 12,7 % of total imports in 2017. In 2017, Serbia mostly exported electrical and electronic equipment, vehicles, hardware, plastics and rubber products. The most important export partner is Italy, accounting for 13,2 % of total exports, followed by Germany, Bosnia and Herzegovina, Russia and Montenegro.

Table 5-17: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Consumer goods	14,8	Electrical and electronic equipment	12,6
Mineral fuels, oil	10,4	Vehicles	8,3
Machinery	8,2	Machinery	6,7
Electrical and electronic equipment	8,2	Plastics and plastic products	4,9
Vehicles	7,4	Rubber products	4,7

Source: www.izvoznookno.si, https://globaledge.msu.edu

Table 5-18: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
Germany	12,7	Italy	13,2
Italy	10,1	Germany	12,6
China	8,2	Bosnia and Herzegovina	8,0
Russia	7,2	Russia	5,9
Hungary	4,8	Montenegro	4,8

Source: www.izvoznookno.si, https://globaledge.msu.edu

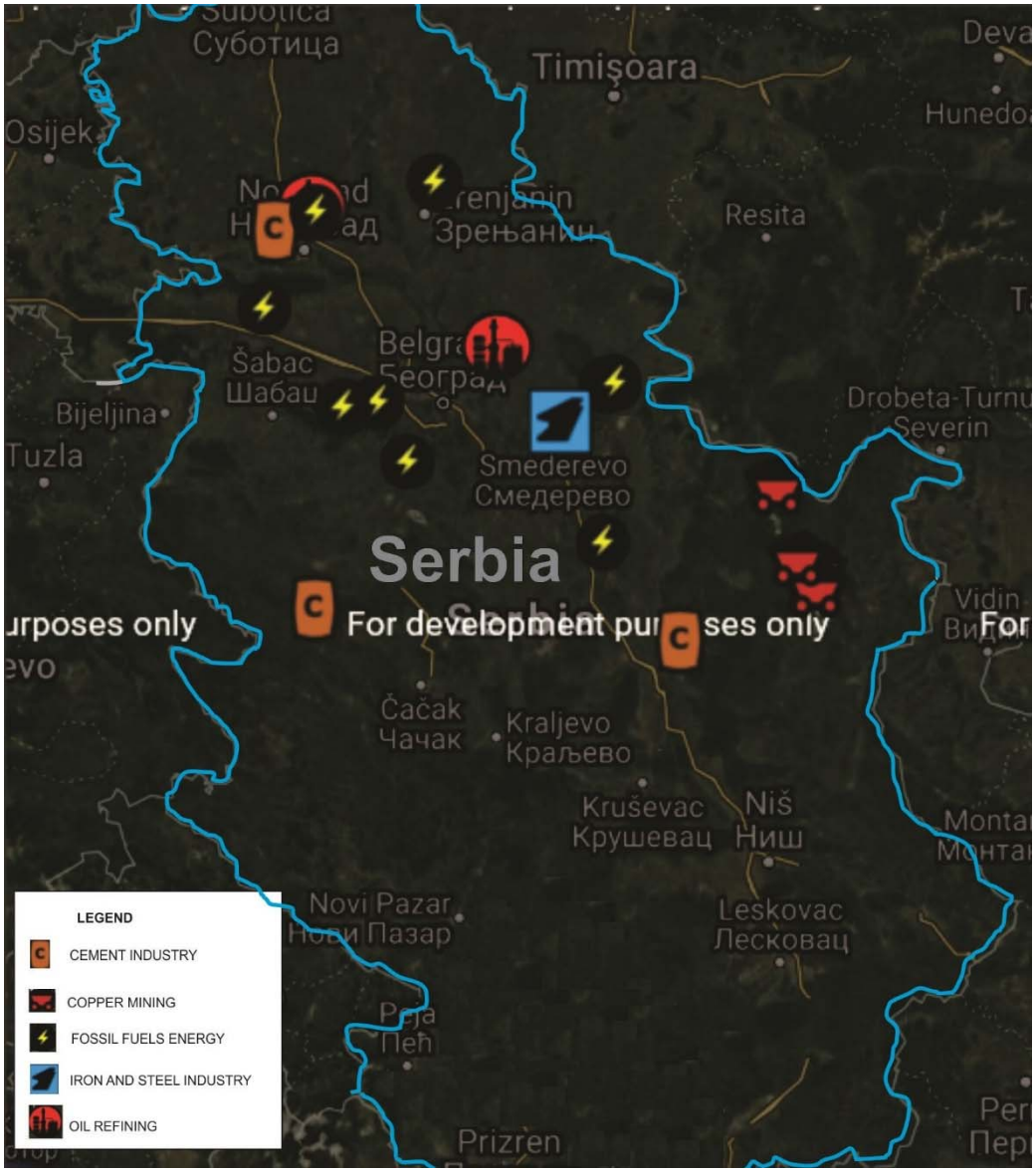
The following table shows the list of major business entities in Serbia which are potential railway users (i.e., could use freight transport by rail).

Table 5-19: Major business entities in Serbia which are potential railway users

CEMENT INDUSTRY	COPPER MINING	FOSSIL FUELS ENERGY	IRON AND STEEL INDUSTRY	OIL REFINING
Holcim - Popovac Cement Plant	Bor Copper Concentrator Plant	Kolubara Coal Power Plant	Hesteel - Radinac Integrated Steel Mill	NIS - Novi Sad Oil Refinery
Lafarge - Beočin Cement Plant	Cerovo Copper Mine	Kostolac A Coal Power Plant		NIS - Pančevo Oil Refinery
Titan - Kosjeric Cement Plant	Jama Copper Mine	Kostolac B Coal Power Plant		
AUTOMOTIVE INDUSTRY	Majdanpek Copper Concentrator Plant	Morava Coal Power Plant		
FIAT Srbija (FCA Srbija)	Majdanpek Copper Mine	Nikola Tesla A Coal Power Plant		
	RTB - Bor Copper Refinery	Nikola Tesla B Coal Power Plant		
	RTB - Bor Copper Smelter	Novi Sad Oil Power Plant		
	Veliki Krivelj Copper Mine	Sremska Mitrovica Gas Power Plant		
		Zrenjanin Gas Power Plant		

Source: https://www.industryabout.com/country-territories-3/213-serbia

Figure 5-5: Major business entities in Serbia which are potential railway users



Source: https://www.industryabout.com/serbia-industrial-map, modified by Prometni institut Ljubljana, d.o.o.

5.3.5 Bulgaria

Bulgaria's economy is growing steadily, with the drivers of growth shifting from the external sector to domestic demand. Bulgaria has developed from a traditional agricultural state to an industrial one. The country has a skilled and low-cost workforce, and almost a third of the population works in the industrial sector. The main natural resources in Bulgaria are bauxite, copper, lead, zinc, coal, lignite (brown coal), iron ore, oil and natural gas.

Bulgarian industry is still dependent on the heavy manufacturing industry, such as metallurgy, the chemical industry and the manufacturing of construction machinery. These were very developed in the times of socialism, and later joined by new industries. The most

dynamic sectors are the textile, pharmaceutical and cosmetic industries and, most recently, ICT.

The industrial sector accounts for 25 % of Bulgarian GDP, and employs 26,6 % of the working population. In 2017, the industrial sector grew by 3,6 %. In the next two years, growth is projected to increase by 3,2 % in 2019 and by 1,8 % in 2020.

In 2017, exports amounted to 25,8 billion EUR, while imports amounted 27,8 billion EUR. The deficit in trade in goods amounted to 2 billion EUR in 2017, representing 4 % of GDP. In 2017, Bulgaria mainly imported mineral fuels and oils, hardware, electrical and electronic equipment, vehicles and ores. The most important import countries are Germany (12,2 % of total imports), Russia, Italy, Romania and Turkey. For exports, the largest share is taken by electrical and electronic equipment, copper, hardware, mineral fuels and consumer goods. The leading export markets in 2017 were Germany (13,4 % of total exports), Italy, Romania, Turkey and Greece.

Table 5-20: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Mineral fuels, oil	14,2	Electrical and electronic equipment	9,9
Machinery	10,0	Copper and copper products	9,1
Electrical and electronic equipment	9,1	Machinery	8,1
Vehicles	6,9	Mineral fuels, oil	8,0
Ores, slag and ash	5,7	Consumer goods	4,1

Source: www.izvoznookno.si, https://globaledge.msu.edu

Table 5-21: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
Germany	12,2	Germany	13,4
Russia	10,2	Italy	8,3
Italy	7,3	Romania	8,2
Romania	7,1	Turkey	7,8
Turkey	6,7	Greece	6,4

Source: www.izvoznookno.si, https://globaledge.msu.edu

The following table shows the list of major business entities in Bulgaria which are potential railway users (i.e., could use freight transport by rail).

Table 5-22: Major business entities in Bulgaria which are potential railway users

BEVERAGE INDUSTRY	COPPER MINING	FOSSIL FUELS ENERGY
Coca-Cola - Kostinbrod Soft Drinks Plant	Assarel Copper Concentrator Plant	Bobov Dol Coal Power Plant
Mineral Water Bankia Water Bottling Plant	Assarel Copper Mine	Gabrovo Coal Power Plant
	Aurubis - Pirdop Copper Refinery	Galabovo Coal Power Plant
CEMENT INDUSTRY	Ellatzite Copper Mine	Maritsa 3 Coal Power Plant
Holcim - Beli Izvor Cement Plant	Mirkovo Copper Concentrator Plant	Maritsa Iztok Coal Power Plant
Holcim - Pleven Cement Plant (Shutdown)	Iron and Steel Industry	Plovdiv Gas Power Plant
Italcementi - Devnya Cement Plant	Stomana Industry - Pernik Steel Mill	Republika Coal Power Plant
Italcementi - Dimitrovgrad Cement Plant	**OIL REFINING**	Ruse Iztok Coal Power Plant
Titan - Zlatna Panega Cement Plant	Lukoil Neftochim - Burgas Oil Refinery	Sliven Coal Power Plant
		Sofia Gas Power Plant
		Sofia Iztok Gas Power Plant
		Varna Coal Power Plant
		Vidachim Coal Power Plant

Source: https://www.industryabout.com/country-territories-3/48-bulgaria

Figure 5-6: Major business entities in Bulgaria which are potential railway users

Source: https://www.industryabout.com/bulgaria-industrial-map

5.4 RELEVANT COUNTRIES WHICH ARE NOT PART OF THE AWB RFC

This subchapter provides information about industries in AWB RFC neighbouring states that may have an impact on freight transport across the AWB RFC (with a focus on Germany, Turkey, North Macedonia, Greece, Italy, and Hungary).

5.4.1 Germany

Germany is the largest European economy and the leading exporter of hardware, automobiles, chemicals and household appliances. Germany has a developed labour market, skilled workforce and well-developed infrastructure.

The agricultural sector contributes 1 % of GDP and employs 1,4 % of the working population. The sector has benefited greatly from state subsidies. The main agricultural products are milk, sugar beet and cereals.

The service sector contributes 68 % of GDP. The German economic model relies primarily on the network of small and medium-sized enterprises. These are over 3 million of these, employing over 74 % of the total working population.

The industrial sector in Germany accounts for 31 % of GDP and employs 24,2 % of the working population. The most important industries are the production of mechanical, electrical and electronic equipment and the automotive and chemical industries. The automotive industry is one of the largest industries in the country, and Germany is one of the largest car exporters in the world.

In 2017, Germany recorded industrial production growth of 3,3 %. For 2019, 1,9 % growth is projected, and 1,3 % in 2020.

In 2017, Germany exported 1.269,1 billion EUR of goods and imported 1.044 billion EUR. In 2017, it mainly exported vehicles, machinery, electrical and electronic equipment, pharmaceuticals and optical, technical and medical equipment. The most important export markets in 2017 were the USA (8,7 % of total exports), France, China, the United Kingdom and the Netherlands. In 2017, Germany mainly imported machinery, electrical and electronic equipment, vehicles, mineral fuels and pharmaceutical products. The most important import markets in 2017 were China (9,8 % of total imports), the Netherlands, France, the USA and Italy.

Table 5-23: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Machinery	12,8	Vehicles	17,8
Electrical and electronic equipment	12,6	Machinery	17,0
Vehicles	10,6	Electrical and electronic equipment	10,3
Mineral fuels, oil	8,2	Pharmaceutical products	5,8
Pharmaceutical products	4,6	Optical, medical and technical equipment	5,0

Source: www.izvoznookno.si

Table 5-24: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
China	9,8	USA	8,7
Netherlands	8,1	France	8,2
France	6,2	China	6,7
USA	6,1	United Kingdom	6,5
Italy	5,4	Netherlands	6,3

Source: www.izvoznookno.si

5.4.2 Turkey

Turkey's free market economy is largely driven by the industrial and service sectors, although the traditional agricultural sector still represents one-fifth of jobs.

About 20 % of the working population are employed in the agricultural sector, accounting for 7 % of GDP. It is characterised by low productivity and many small farms. The main crop is wheat. Turkey is the third largest tobacco exporter in the world, and the leading hazelnut producer, with 70 % of global production.

The service sector contributes 62 % of GDP and employs more than half of the working population. The leading service industry is tourism, which attracted 32,4 million visitors in 2017, and is one of the key sources of foreign exchange for the country. Turkey is one of the ten most visited countries in the world.

Turkey has plenty of mineral resources, but (as yet) these are not sufficiently exploited. Industrial production accounts for 31 % of GDP and employs 27 % of the workforce. The main activity is the textile industry, where one-third of all employees in the industrial sector work. Other important industrial sectors are the food, construction, automotive, wood, paper and oil industries. The Turkish government gives priority to large infrastructure projects, especially in the transport sector.

In 2017, industrial production grew by 8,6 %. For 2019, analysts predict growth of 6,2 %, and 5,9 % for 2020.

In 2017, exports of goods amounted to 147,1 billion EUR, while imports amounted to 199,2 billion EUR. In the same year Turkey mainly exported vehicles, machinery, precious stones and metals, clothing, iron and steel. The most important export markets were Germany (9,6 % of total exports), the UK, UAE, Iraq and the USA. In 2017, Turkey mainly imported mineral fuels, machinery, electrical and electronic equipment, precious stones, metals and vehicles. The most important import markets in 2017 were China (10,0 % of total imports), Germany, Russia, the USA and Italy.

Table 5-25: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Mineral fuels, oil	15,9	Vehicles	15,3
Machinery	11,6	Machinery	8,8
Electrical and electronic equipment	9,1	Pearls, precious stones, metals	6,9
Pearls, precious stones, metals	7,5	Clothing and clothing accessories	5,6
Vehicles	7,5	Iron and steel	5,0

Source: www.izvoznookno.si

Table 5-26: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
China	10,0	Germany	9,6
Germany	9,1	UK	6,1
Russia	5,1	UAE	5,5
USA	4,8	Iraq	5,4
Italy	3,5	USA	4,2

Source: www.izvoznookno.si

5.4.3 North Macedonia

North Macedonia has a small, open economy, whose further growth and development largely depend on its progress with regard to EU integration.

The agricultural sector accounts for 11 % of GDP and employs 16,6 % of the working population. Mostly rice, cotton, tobacco and fruit are produced. North Macedonia has some mineral wealth, especially iron, copper, and lead.

The service sector accounts for 60 % of GDP and employs 53,8 % of the working population. The most important segments are transport, telecommunications and energy.

Major industrial sectors of include the production and processing of steel, along with the chemical, machine and textile industries. The textile and clothing (mainly leather) industries are very important, as they employ many people and create new jobs. Industry and mining together account for 29 % of GDP. The industrial sector employs almost 30 % of the working population.

Industrial production in North Macedonia grew by 0,2 % in 2017. For 2019, 3,9 % is forecast, and for the year 2020 the 3,8 % growth is expected.

In 2017, exports of goods amounted to 4,1 billion EUR, while imports were 5,9 billion EUR. The North Macedonian trade deficit in 2017 thus amounted to 1,8 billion EUR. The most important goods in terms of imports are pearls and precious stones, electrical and electronic equipment, mineral fuels, hardware, iron and steel. The most important North Macedonian export markets are Germany and Serbia. North Macedonia exported 47 % of total exports in 2017 to Germany, and 8,4 % to Serbia. The most important import markets are Germany (11,8 % of total imports), the UK, Greece, Serbia and China.

Table 5-27: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Pearls, precious stones, metals	12,5	Chemical products	20,6
Electrical and electronic equipment	9,9	Electrical and electronic equipment	13,4
Mineral fuels, oil	9,8	Machinery	11,4
Machinery	6,8	Clothing and clothing accessories	7,3
Iron and steel	5,8	Iron and steel	6,5

Source: www.izvoznookno.si

Table 5-28: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
Germany	11,8	Germany	47,0
UK	10,1	Serbia	8,4
Greece	8,0	Bulgaria	5,9
Serbia	7,6	Greece	3,6
China	5,8	Belgium	3,5

Source: www.izvoznookno.si

5.4.4 Greece

The Greek economy is traditionally based on agriculture. The agricultural sector employs 13 % of the working population and generates 4 % of GDP. The main crops are tobacco (Greece is the largest European tobacco producer) and cotton (Greece is the fifth largest exporter in the world). In the coastal regions fishery is important.

The service sector in Greece is well developed, and this generates 80 % of GDP and employs 72,4 % of the working population. The key source of income is tourism, which contributes 18% of GDP.

The Greek industrial sector accounts for 16 % of GDP and employs 15 % of the working population. The main industrial sectors are the electronics, transport, construction, textile, food, and tobacco, chemical and metal-processing industries. Greece also has the largest fleet of ships in Europe.

In 2017, industrial production grew at 4,9 %. For 2019, industrial production growth is forecast at 3,1 %, and at 2,9% for 2020. The main industries in the Greek market are transport services and tourism.

The most important trading partners for Greece are Germany, Turkey, Italy, Bulgaria and Cyprus. In Greece, maritime freight plays an important role as the country has a very large number of islands. Due to its geostrategic position it has well-developed international maritime routes, and is an important maritime country in the region.

In 2017, Greece exported for 27,9 billion EUR of goods and imported 46,3 billion EUR. The deficit in trade thus amounted to 18,4 billion EUR, which is 10,4 % of GDP. The main export products are mineral fuels, aluminium, machinery and pharmaceutical products. The leading export markets are Italy (10,6 % of total exports), Germany, Turkey, Cyprus and Bulgaria. The most important import products are mineral fuels, hardware, ships and boats, pharmaceuticals and electrical and electronic equipment. The leading import markets are Germany (10,4 % of total imports), Italy, Russia, South Korea and Iraq.

Table 5-29: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Mineral fuels, oil	24,3	Mineral fuels, oil	31,6
Machinery	6,9	Aluminium and aluminium products	5,6
Ships, boats	6,1	Machinery	4,6
Pharmaceutical products	5,8	Pharmaceutical products	4,1
Electrical and electronic equipment	5,0	Plastic and plastic products	3,9

Source: www.izvoznookno.si

Table 5-30: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
Germany	10,4	Italy	10,6
Italy	8,1	Germany	7,1
Russia	6,8	Turkey	6,8
South Korea	6,3	Cyprus	6,5
Iraq	6,3	Bulgaria	4,9

Source: www.izvoznookno.si

5.4.5 Italy

Italy is the third largest economy in the euro area. The more developed northern part of Italy is where private companies are dominant, and the less developed southern part is where agriculture is dominant.

The agricultural sector contributes 2 % of GDP and employs almost 4 % of the working population. Italy is the largest European producer of rice, fruit and vegetables, as well as the world's largest producer and exporter of wine. Italy has limited natural resources and must therefore import most of the raw materials needed for production and more than 80 % of its energy resources.

The textile, fashion, automotive, chemical and pharmaceutical industries play an important role in the industrial sector, as does the production of luxury goods. The industrial sector contributes 24 % of GDP and employs 28,3 % of the working population.

The Italian automotive industry grew in the period 2013 – 2017, and generated 9 billion EUR in 2017. For comparison, French car production reached 36,4 billion EUR in 2017, while German car production reached the value of 78,9 billion EUR. The volume of Italian automobile production increased by 24,4 % between 2013 and 2017, reaching a total of 930.000 units in 2017. According to analysts' forecasts, the volume of production in the next five years will increase by 11 %, reaching 1,6 million units in 2022.

The service sector contributes 74 % of GDP and employs 67,8 % of the population. Tourism plays a major role in this sector, contributing 1,5 % of GDP in 2017.

In 2017, Italy exported goods worth 439,2 billion EUR and imported goods worth 383,2 billion EUR. The most important export goods are hardware, vehicles, electrical and electronic equipment, pharmaceuticals and plastics. The main export markets in 2017 were Germany, France, the USA, Spain and the UK. In 2017, Italy mainly imported oil and gas,

vehicles, hardware, electrical and electronic equipment and pharmaceuticals. Its most important import markets were Germany, France, China, the Netherlands and Spain.

Table 5-31: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Mineral fuels, oil	12,0	Machinery	19,8
Vehicles	10,8	Vehicles	8,7
Machinery	9,8	Electrical and electronic equipment	6,0
Electrical and electronic equipment	7,7	Pharmaceutical products	5,1
Pharmaceutical products	5,1	Plastic and plastic products	4,1

Source: www.izvoznookno.si

Table 5-32: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
Germany	16,3	Germany	12,5
France	8,8	France	10,3
China	7,1	USA	9,1
Netherland	5,6	Spain	5,2
Spain	5,3	UK	5,1

Source: www.izvoznookno.si

5.4.6 Hungary

Over the last few decades Hungary has shifted from a centrally planned to a market economy. Per capita income is about two thirds of the average of the EU member states. The Hungarian economy largely depends on exports, making it vulnerable to external market fluctuations. Hungary is a kind of European connection point, and many companies have their regional headquarters there, including the logistics services and research and development departments. There is also a lot of foreign ownership and foreign investment in Hungarian companies. The agricultural sector was once the leading sector in the economy, but today it presents only 4 % of GDP and employs just 4,9 % of the working population.

The industrial sector, which represents 31 % of GDP and employs 30,3 % of the working population, is very open to foreign investors. The automotive, electronic, food and chemical industries are the most important ones.

The service sector accounts for 65 % of GDP and employs 64,5 % of the workforce. The majority of foreign direct investment is in the this sector, in particular in the areas of telecommunications, retail trade and the finance.

In 2017, industrial production grew by 4,8 %. For 2019, industrial production is forecast to grow at 4,1 %, and for 2020 at 1,9 %.

In 2017, Hungary exported 87,3 billion EUR of goods and imported 85,1 billion. Approximately 80 % of Hungarian exports are directed to EU markets. The most important export market for Hungary is Germany (27,6 % of total exports), followed by Romania, Italy, Austria and Slovakia. The most important export products are electrical and electronic equipment, vehicles, pharmaceuticals and plastics. The most important import market for Hungary is Germany (25,4 % of total imports), followed by Austria, China, Poland and Slovakia. The most important imports are electrical and electronic equipment, vehicles, mineral fuels and plastics.

Table 5-33: Main import and export groups

The main import groups of goods in 2017	% of the total	The main export groups of goods in 2017	% of the total
Electrical and electronic equipment	20,5	Electrical and electronic equipment	20,9
Machinery	16,5	Machinery	18,6
Vehicles	10,8	Vehicles	14,8
Mineral fuels, oil	8,2	Pharmaceutical products	4,8
Plastic and plastic products	4,6	Plastic and plastic products	3,9

Source: www.izvoznookno.si

Table 5-34: Leading import and export markets

Leading import markets in 2017	% of the total	Leading export markets in 2017	% of the total
Germany	25,4	Germany	27,6
Austria	6,3	Romania	5,4
China	5,9	Italy	5,1
Poland	5,5	Austria	5,0
Slovakia	5,3	Slovakia	4,8

Source: www.izvoznookno.si

6 ANALYSIS OF TRANSPORT AND TRAFFIC INDICATORS

6.1 TRANSPORT INFRASTRUCTURE OF THE AWB RFC COUNTRIES

The sustainable economic development of the country depends, *inter alia*, on the quality, density and development of its transport infrastructure as a tool necessary for the movement of goods and people. Each country thus manages and invests in the development and construction of this, as a high-quality and accessible transport infrastructure contributes to the overall development of the national economy. Tables 6-1 to 6-3 show an analysis of the development of rail and road infrastructure of the Alpine-Western Balkan RFC countries.

Table 6-1: Railway infrastructure – length of railway lines (total), all tracks in km

Country	1995	2000	2005	2010	2013	2014	2015	2016	2017
Austria	5.672	5.563	N/A	5.828	5.531	5.531	5.522	5.491	5.527
Slovenia	1.201	1.201	1.228	1.228	1.209	1.209	1.209	1.209	1.209
Croatia	2.726	2.726	2.726	2.722	2.722	2.604	2.604	2.604	2.604
Serbia	N/A	3.809	3.809	3.809	3.809	3.809	3.809	3.809	3.809
Bulgaria	4.293	4.320	4.154	4.098	4.032	4.023	4.019	4.029	4.030

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database; Source for Serbia: https://www.nationmaster.com/country-info/profiles/Serbia/Transport/All-stats.

Table 6-2: Length of motorways (total) in km

Country	1995	2000	2005	2010	2013	2014	2015	2016
Austria	1.596	1.633	1.677	1.719	1.719	1.719	N/A	N/A
Slovenia	277	382	569	768	769	769	773	773
Croatia	302	411	1.016*	1.244*	1.289	1.290	1.310	1.310
Serbia	N/A	N/A	N/A	687	747	747	747	790
Bulgaria	N/A	324	331	437	605	610	734	740

** definition differs*

Source:EUROSTAT:https://ec.europa.eu/eurostat/web/transport/data/database; Source for Serbia: https://www.nationmaster.com/country-info/profiles/Serbia/Transport.

Table 6-3: Length of other roads (total), all categories (state, provincial, communal roads) in km

Country	1995	2000	2005	2010	2013	2014	2015	2016
Austria	104.716	104.997	105.663	112.871	122.872	122.869	N/A	N/A
Slovenia	14.513	37.866	37.293	38.106	37.922	37.932	37.939	38.005
Croatia	26.626	27.712	27.420	28.089	25.525	25.488	25.396	25.444
Serbia	N/A	37.574	38.616	43.673	43.997	44.406	44.995	45.410
Bulgaria	36.443	36.977	18.957	19.019	19.073	19.118	19.119	19.162

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database ; Source for Serbia: Statistical yearbooks of the Republic of Serbia.

Based on the statistical data in Tables 6-1 to 6-3, we can confirm the decline in the length of railway infrastructure in the monitored period in Croatia and Bulgaria. The same trend is evident in Austria, especially after 2010. In Slovenia the length of railway lines is mostly constant, the value only changing because of a change in the categorisation method. In contrast, increases in the length of the transport infrastructure is recorded for the motorways of all the countries. The trend of motorway construction is mainly influenced by performances in individual motoring and road goods transport. Less typical is changing the length of other roads. The most significant increase is recorded in Austria. In Bulgaria the increase is gradual, except between 2000 and 2005 when there was a great reduction for other reasons. In Slovenia the network of other roads in general increases with exceptions before 2005 and 2013. The opposite is true for Croatia, where the length of other roads slowly decreases, with exceptions before 2000 and 2010 and between 2015 and 2016.

The following table provides an analysis of expenditures on railway and road infrastructure investment in the Alpine-Western Balkan RFC countries.

Table 6-4: Expenditure on railway and road infrastructure investment in EUR for the period 2012 – 2016

	2012		2013		2014		2015		2016	
	Investment in railway infrastructure	Investment in road infrastructure	Investment in railway infrastructure	Investment in road infrastructure	Investment in railway infrastructure	Investment in road infrastructure	Investment in railway infrastructure	Investment in road infrastructure	Investment in railway infrastructure	Investment in road infrastructure
Austria	1.668.000.000	327.000.000	1.648.000.000	363.000.000	1.567.000.000	453.000.000	1.549.000.000	455.000.000	1.523.000.000	444.000.000
Slovenia	72.000.000	102.000.000	140.000.000	104.000.000	270.000.000	128.000.000	376.000.000	102.000.000	84.400.000	100.000.000
Croatia	61.824.419	478.640.661	183.137.617	424.198.443	130.720.666	279.516.936	60.021.014	238.376.675	44.329.418	197.358.816
Serbia	2.947.445	256.587.053	9.329.348	279.287.963	11.773.659	336.982.599	83.081.377	505.058.875	73.320.275	493.833.379
Bulgaria	114.019.838	387.565.191	123.734.533	359.443.706	167.195.010	252.582.064	301.155.537	252.582.064	301.155.537	252.582.064

Source: OECD.

Based on the data in the previous table, we can confirm that only in Austria was the investment in railway infrastructure much higher than that in road infrastructure for the period 2012 – 2016. During the period 2012 – 2016, in both Croatia and Serbia the investments in railway infrastructure were much lower than those in road infrastructure.

The absolute value of investment in rail infrastructure for 2016 was the highest in Austria (1,52 billion EUR), while the lowest absolute value of investment in rail infrastructure in 2016 was in Croatia (44,32 million EUR).

An efficient transport system is essential for the development of a country and region, as it helps reduce travel time and production costs and improves competitiveness. It also improves access to markets and is a key aspect in preserving the investors' interest in the region. However, a well-performing transport system is not enough to ensure the development of a region. The effect of transport infrastructure investments also depends on the capacity of this region to efficiently exploit such infrastructure, which explains, in part, the different returns on similar investments.

Rail infrastructure investments in Western European countries have gradually increased in recent years, while Central and East European (CEE) countries have focused more on road infrastructure. Due to the political commitment on the development of railways in Western European countries, the share of railway transport investments has constantly increased from around 20 % of that related to surface transport infrastructure (in 1975) to 30 % in 1995 and 40 % in 2010. Statistics show once more the difference between railway infrastructure grants in the west and in the east of Europe. Therefore, while Western European countries have directed their funds to railway infrastructure, CEE countries have focused on roads, where the share of road transport in surface transport has increased from 65 % (in 1995) to 82 % (in 2010).

Although railway transport is significantly promoted in Europe because people have become aware of the importance and benefits it brings to the economy, in real terms, the allocation of investments in infrastructure varies a lot. For the period 1995 – 2008 the figures show that investments in road infrastructure had priority over railway investments. In 2000 railway investments in CEE countries stood at 22,7 % of such infrastructure spending with road investments at 74,4 %, while in 2008 railway investments dropped to 17,9 %, while road investments increased to 79,7 % (source: www.railwaypro.com). If more is not spent on the railway infrastructure, them both freight volumes and passengers will continue to fall and shift to roads.

The following table provides an analysis of expenditures on railway and road infrastructure maintenance in the Alpine-Western Balkan RFC countries.

Table 6-5: Expenditure on railway and road infrastructure maintenance in EUR in period 2013 – 2016

	2013		2014		2015		2016	
	Expenditures on railway infrastructure maintenance	Expenditures on road infrastructure maintenance	Expenditures on railway infrastructure maintenance	Expenditures on road infrastructure maintenance	Expenditures on railway infrastructure maintenance	Expenditures on road infrastructure maintenance	Expenditures on railway infrastructure maintenance	Expenditures on road infrastructure maintenance
Austria	497.000.000	559.000.000	504.000.000	667.000.000	503.000.000	692.000.000	535.000.000	697.000.000
Slovenia	71.000.000	123.000.000	101.000.000	113.000.000	110.000.000	126.000.000	89.800.000	138.000.000
Croatia	102.124.291	208.998.549	105.702.984	257.380.871	100.735.487	245.074.862	87.729.776	234.388.480
Serbia	8.957.943	129.160.624	9.248.295	142.981.705	8.840.912	163.039.020	7.043.621	180.883.759
Bulgaria	41.926.577	95.613.048	49.596.073	92.545.250	32.723.182	92.545.250	32.723.182	92.545.250

Source: OECD.

The overall long-term trend in the growth of expenditures on the different kind of transport infrastructure maintenance in the monitored period is mainly influenced by the increase in transport performances, aging of transport infrastructure and, in some cases, by neglected diagnostics which has a preventive role in transport infrastructure maintenance. Maintenance costs for the transport infrastructure will continue to increase in the future, as an increase in the transport performances of rail and road transport is expected. The increasing trend of transport performances is influenced by the long-term economic development of the Alpine-Western Balkan RFC countries. The expenditures on maintenance will also be affected by the technical and technological parameters of the new and upgraded transport infrastructure, so that it can meet the conditions of a high quality and safe transport infrastructure.

6.2 ANALYSIS OF TRANSPORT INDICATORS

This subchapter is aimed at the analysis of the most important rail data that are necessary to determine the Alpine-Western Balkan RFC routing and a draft of its strategic direction. The data also serve as a basis for drafting the measures to promote rail freight transport. This subchapter also contains a modal split analysis.

All data contained in this subchapter was provided by EUROSTAT. An important indicator from the point of view of infrastructure managers is the development of transport performances in rail passenger and freight transport. The transport performances demonstrate the utilisation of railway infrastructure over time. On the basis of the above this, the modal split and traffic volume are presented for the five countries for the years 2000 – 2017.

The modal split for passenger transport include traveling by trains, buses or trams and cars. The modal split for freight transport is divided into rail, road and waterway transport. An important indicator for the transport potential of Alpine-Western Balkan RFC is railway transport volume. The passenger traffic volume represents the number of passengers,

passenger-km and passenger train-km. Freight traffic volume shows goods-tonnes, tonne-km, goods train-km and number of containers and swap bodies.

6.2.1 Austria

This subchapter analyses the development of total passenger and freight transport performances in the Republic of Austria for the years 2000, 2005, 2010, 2015, 2016 and 2017.

Modal split

Table 6-6: Modal split for passenger transport in Austria (%)

Transport mode	2000	2005	2010	2015	2016
Train	9,7	9,8	11,0	12,0	12,1
Bus, Tram	11,3*	10,8*	10,6*	10,2*	10,2*
Car	79	79,4	78,4	77,8	77,7

** estimated by Eurostat*

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

Table 6-7: Modal split for freight transport in Austria (%)

Transport mode	2005	2010	2015	2016
Rail	35,7	33,0	32,1	31,5
Road	61,0	63,0	65,0	65,5
Waterways	3,3	4,0	2,9	3,0

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

The tables above show a numerical comparison of the modal split in passenger and freight transport in 2000 (only passenger), 2005, 2010, 2015 and 2016. The comparison is made in bands of five years, giving a sufficient time span for the market response to the changes in modal split following the adoption of measures to support rail transport within the EU.

Based on the comparison of modal split in Austria, we can confirm the decrease in share of the freight transport performances in the rail transport system in favour of road goods transport. The situation in passenger transport is reversed, as train transport increases in relation to public and individual road transport.

Transport volume

Table 6-8: Volume of passenger transport in Austria

Parameter	2005	2010	2015	2016	2017
Passengers (thousand)	220.116	239.974	280.060	286.990	288.503
Passenger-km (million)	8.685	10.263	12.104	12.497	12.562
Passenger train-km (thousand)	94.757	106.513	111.517	112.153	114.784

** estimated by Eurostat*

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

Table 6-9: Volume of freight transport in Austria

Parameter	2005	2010	2015	2016	2017
Goods – tonnes (thousand)	101.829	107.670	100.163	102.835	107.579
Tonne – km (million)	18.957	19.833	20.814	21.361	22.256
Goods train-km (thousand)	49.160	45.318	41.878	41.558	41.624
Containers and swap bodies	738.589	1.057.070	1.079.800	N/A	N/A

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

The tables above show a numerical comparison of the traffic volume in passenger and freight transport in 2005, 2010, 2015, 2016 and 2017. The comparison is made in bands of five years, giving a sufficient time span for the market response to changes in the modal split following the adoption of measures to support rail transport within the EU.

The analysis of traffic volume performances in Austria shows the gradual increase in rail passenger transport (total: passengers, passenger-km and train-km). In goods transport in Austria we can see fluctuations with regard to the figures for tonnes, while tonne-km and number of containers both increase and train-km decreases.

6.2.2 Slovenia

This subchapter analyses the development of total passenger and freight transport performances in the Republic of Slovenia for 2000, 2005, 2010, 2015, 2016 and 2017.

Modal split

Table 6-10: Modal split for passenger transport in Slovenia (%)

Transport mode	2000	2005	2010	2015	2016
Train	2,9	2,7	2,4	2,1	2,0
Bus, Tram	14,2	11,7	10,8	11,8*	11,8*
Car	82,9	85,6	86,8	86,1*	86,2*

** estimated by Eurostat*

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

Table 6-11: Modal split for freight transport in Slovenia (%)

Transport mode	2005	2010	2015	2016
Rail	30,8	31,8	35,0	33,3
Road	69,2	68,2	65,0	66,7
Waterways	N/A	N/A	N/A	N/A

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

The tables above show a numerical comparison of the modal split in passenger and freight transport in for the years 2000 (only passenger), 2005, 2010, 2015 and 2016. The comparison is made in bands of five years, giving a sufficient time span for the market response to the changes in the transport market following the adoption of measures to support trends in transport within the EU.

Based on the comparison of modal split in Slovenia, we can confirm the decrease in the share of the passenger transport performances in the rail transport system and generally in public road traffic (with a slight increase after 2010) in favour of private driving due to large investments in road infrastructure. The situation in goods transport is reversed, as train freight transport increased in relation with road freight transport, except between 2015 and 2016.

Transport volume

Table 6-12: Volume of passenger transport in Slovenia

Parameter	2005	2010	2015	2016	2017
Passengers (thousand)	15.402	15.782	14.135	13.650	13.002
Passenger-km (million)	716	729	628	611	570
Passenger train-km (thousand)	10.758	10.717	9.562	10.290	10.283

** estimated by Eurostat*

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

Table 6-13: Volume of freight transport in Slovenia

Parameter	2005	2010	2015	2016	2017
Goods – tonnes (thousand)	16.344	16.234	17.832	18.595	21.275
Tonne – km (million)	3.245	3.421	4.175	4.360	5.128
Goods train-km (thousand)	7.877	7.871	8.171	8.530	9.641
Containers and swap bodies	91.796	202.887	281.041	287.714	305.325

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

The tables above show a numerical comparison of the traffic volume in passenger and freight transport for the years 2005, 2010, 2015, 2016 and 2017. The comparison is made with bands of five years, giving a sufficient time span for the market response to the changes of the transport market following the adoption of measures to support trends in transport within the EU.

The analysis of traffic volume performances in Slovenia shows the decrease in rail passenger transport after 2010, gradually lower number of passengers, passenger-km and in general train-km. For goods transport in Slovenia we can confirm an increase in tonne-km, goods train-km, number of containers and goods tonnes, especially after 2010.

6.2.3 Croatia

This subchapter analyses the development of total passenger and freight transport performances in the Croatia for years 2000, 2005, 2010, 2015, 2016 and 2017.

Modal split

Table 6-14: Modal split for passenger transport in Croatia (%)

Transport mode	2000	2005	2010	2015	2016
Train	5,1	4,3	5,6	3,1	2,7
Bus, Tram	13,5	11,9	10,7''	11,0	12,3
Car	81,4*	83,8*	83,7*	85,9	85,0

** estimated by Eurostat* *'' definition differs*

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

Table 6-15: Modal split for freight transport in Croatia (%)

Transport mode	2005	2010	2015	2016
Rail	20,0*	22,8	19,4	17,3*
Road	73,9*	69,0	72,8	75,5*
Waterways	6,1*	8,2	7,8	7,2*

**estimated by Eurostat*

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

The tables above show a numerical comparison of the modal split in passenger and freight transport for the years 2000 (only passenger), 2005, 2010, 2015 and 2016. The comparison is made in bands of five years, giving a sufficient time span for the market response to the changes of the transport market following the adoption of measures to support trends in transport within the EU.

Based on the comparison of modal split in Croatia, we can confirm the decrease in share of the passenger and freight transport performances in the rail transport system (except in 2010). Regarding road transport, it is evident that public passenger and freight transport was decreasing until 2010 and increasing after this, while individual road traffic in general increases.

Transport volume

Table 6-16: Volume of passenger transport in Croatia

Parameter	2005	2010	2015	2016	2017
Passengers (thousand)	39.706	69.421	21.649	20.709	19.803
Passenger-km (million)	1.227	1.711	941	827	736
Passenger train-km (thousand)	18.371	18.992	14.883	15.300	15.195

** estimated by Eurostat*

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

Table 6-17: Volume of freight transport in Croatia

Parameter	2005	2010	2015	2016	2017
Goods – tonnes (thousand)	14.333	12.203	9.939	N/A	12.178
Tonne – km (million)	2.835	2.618	2.184	N/A	2.592
Goods train-km (thousand)	7.693	6.782	4.833	N/A	5.819
Containers and swap bodies	36.877	47.816	25.264	N/A	N/A

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

The tables above show a numerical comparison of the traffic volume in passenger and freight transport for the years 2005, 2010, 2015, 2016 and 2017. The comparison is made in bands of five years, giving a sufficient time span for the market response to the changes of the transport market following the adoption of measures to support trends in transport within the EU.

The analysis of traffic volume performances in Croatia shows a decrease in rail passenger transport after 2010, a gradual lower number of passengers, passenger-km and in general train-km. Regarding goods transport in Croatia, we can confirm decreases in goods tonnes, tonne-km, goods train-km and number of containers until 2015, but in 2017 the volume of goods transported increased again.

6.2.4 Serbia

This subchapter analyses the development of total passenger and freight transport performances in Serbia for the years 2000, 2005, 2010, 2015, 2016 and 2017.

Modal split

Table 6-18: Modal split for passenger transport in Serbia (%)*

Transport mode	2000	2005	2010	2015	2016
Train	13,9	7,0	5,0	4,9	4,4
Bus, Tram	51,7	45,7	50,0	50,6	52,2
Car	34,4	47,3	45,0	44,5	43,4

*calculated on the basis of passenger km.
Source: Statistical yearbook of the Republic of Serbia.

Table 6-19: Modal split for freight transport in Serbia (%)

Transport mode	2000	2005	2010	2015	2016
Rail	55,1	60,2	57,9	45,8	37,2
Road	16,7	11,8	27,8	42,0	51,7
Waterways (inland)	28,2	28,0	14,3	12,2	11,1

*calculated on the basis of ton-kilometres.

The tables above show a numerical comparison of the modal split in passenger and freight transport for the years 2000, 2005, 2010, 2015 and 2016. The comparison is made in bands of five years, giving a sufficient time span for the market response to the changes of transport market following the adoption of measures to support trends in transport within the EU.

Based on the comparison of modal split in Serbia, we can confirm the decrease in the share of the passenger transport performances in rail transport system. Public road traffic is constant during the analysed period, while usage of private cars is increasing. The situation in goods transport is the same, astrain freight transport decreases in relation to road freight transport, with the later increasing.

Transport volume

Table 6-20: Volume of passenger transport in Serbia

Parameter	2000	2005	2010	2015	2016	2017
Passengers (thousand)	10.583	6.492	5.270	6.258	6.092	5.638
Passenger-km (million)	1.236	713	522	509	438	377
Passenger train-km (thousand)	16.499	17.843	13.894	16.256	10.930	16.644

Source: Statistical yearbook of the Republic of Serbia.

Table 6-21: Volume of freight transport in Serbia

Parameter	2000	2005	2010	2015	2016	2017
Goods – tonnes (thousand)	8.587	12.568	12.581	11.887	11.896	12.352
Tonne – km (million)	1.917	3.482	3.522	3.249	3.087	3.288
Goods train-km (thousand)	3.653	7.035	6.780	5.919	5.103	4.997
Containers and swap bodies (wagon stock)	15.254	10.561	8.980	8.486	7.277	6.781

Source: Statistical yearbook of the Republic of Serbia.

The tables above show a numerical comparison of the traffic volume in passenger and freight transport in the years 2000, 2005, 2010, 2015, 2016 and 2017. The comparison is made in bands of five years, giving a sufficient time span for the market response to the changes of transport market following the adoption of measures to support trends in transport within the EU.

The analysis of traffic volume performances in Serbia shows the decrease in rail passenger transport after 2000, with gradually lower numbers of passengers and passenger-km. Regarding goods transport in Serbia, there are increases in goods tonnes, tonne-km, goods train-km.

6.2.5 Bulgaria

This subchapter analyses the development of total passenger and freight transport performances in the Republic of Bulgaria for the years 2000, 2005, 2010, 2015, 2016 and 2017.

Modal split

Table 6-22: Modal split for passenger transport in Bulgaria(%)

Transport mode	2000	2005	2010	2015	2016
Train	7,8	4,8	3,6	2,3	2,2
Bus, Tram	31,4''	24,3	16,4	14,6	14,1
Car	6,8*	70,9*	80,0''	83,1*	83,7*

''break in time series **estimated by Eurostat*

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

Table 6-23: Modal split for freight transport in Bulgaria (%)

Transport mode	2005	2010	2015	2016
Rail	23,5*	17,0	17,9	17,1
Road	50,2*	49,4	54,7	55,7
Waterways	26,3*	33,6	27,4	27,2

**estimated by Eurostat*

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

The tables above show a numerical comparison of the modal split in passenger and freight transport for the years 2000 (only passenger), 2005, 2010, 2015 and 2016. The comparison is made in bands of five years, giving a sufficient time span for the market response to the changes of transport market following the adoption of measures to support trends in transport within the EU.

Based on the comparison of modal split in Bulgaria, we can confirm the gradual decrease in the share of the passenger rail and public road transport performances and also in goods rail transport after 2005, but from 2010 it has more or less a constant share of the freight rail transport system. Individual passenger road transport is also shown to increase, as does freight road transport after 2010, in contrast to the decline in waterway transport.

Transport volume

Table 6-24: Volume of passenger transport in Bulgaria

Parameter	2005	2010	2015	2016	2017
Passengers (thousand)	N/A	30.079	22.518	21.425	21.195
Passenger-km (million)	N/A	2.090	1.549	1.455	1.434
Passenger train-km (thousand)	N/A	23.069	20.905	21.354	20.089

** estimated by Eurostat*

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

Table 6-25: Volume of freight transport in Bulgaria

Parameter	2005	2010	2015	2016	2017
Goods – tonnes (thousand)	N/A	12.939	14.635	14.226	16.030
Tonne – km (million)	N/A	3.064	3.650	3.434	3.931
Goods train-km (thousand)	N/A	6.238	7.659	8.155	8.923
Containers and swap bodies	N/A	41.150	26.793	38.073	33.798

Source: EUROSTAT https://ec.europa.eu/eurostat/web/transport/data/database.

The tables above show a numerical comparison of the traffic volume in passenger and freight transport in 2005, 2010, 2015, 2016 and 2017. The comparison is made in bands of five years, giving a sufficient time span for the market response to the changes of transport market following the adoption of measures to support trends in transport within the EU.

The analysis of traffic volume performances in Bulgaria shows the decrease in rail passenger transport after 2010, and gradually lower numbers of passengers, passenger-km and in general train-km. Regarding goods transport in Bulgaria, we can confirm increased goods train-km and a general increase in goods tonnes, tonne-km, while the number of containers varied but in general decreased after 2010.

6.3 HISTORICAL ASPECT OF AWB RFC

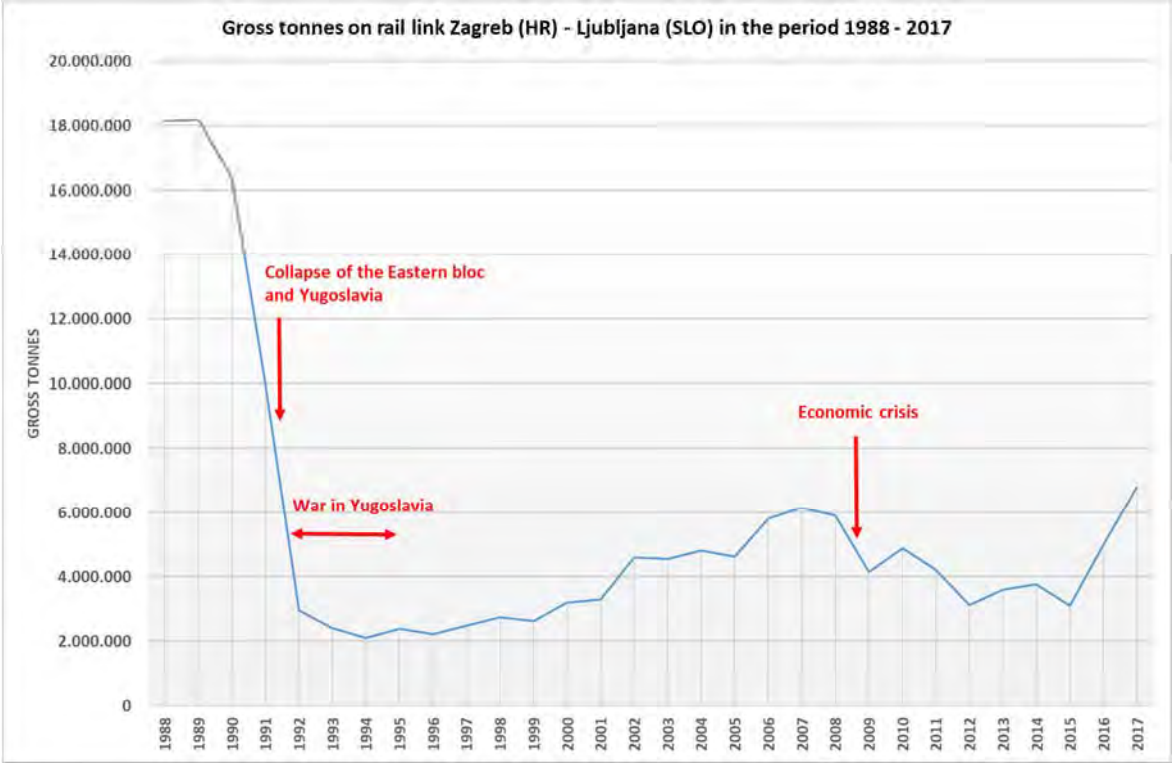
The historical aspect of the AWB RFC for freight and passenger transport is presented in the next two subchapters. Looking into history, the AWB RFC has been one of the most important rail links for freight and passenger transport. It was (and still it is) the shortest connection, in terms of distance, between Turkey and Central or Western Europe.

6.3.1 Freight transport

Freight transport has focused on the cross border sections of the AWB RFC between Croatia and Slovenia and between Slovenia and Austria for the last 30 years (between 1988 and 2017). In this period many political and economic changes have occurred, such as the collapse of the Eastern socialist bloc, war in Yugoslavia (Croatia, Bosnia and Herzegovina, Serbia) and economic crises at the beginning of the 1990s and 2008.

At the end of the 1980s the volume on the future route of the AWB RFC reached its highest level, and the section between Zagreb and Ljubljana transported over 18 million gross tonnes, presenting on the figure below.

Figure 6-1: Gross tonnes on rail link between Zagreb and Ljubljana in 1988 – 2017



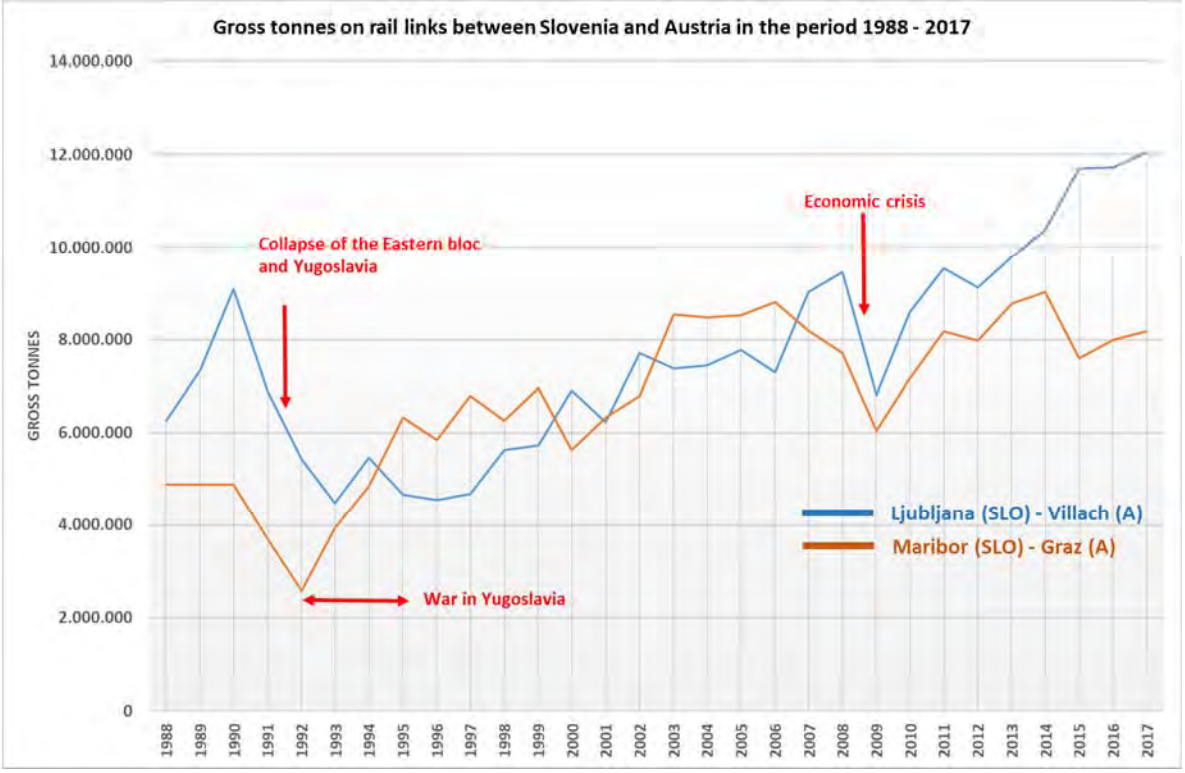
Source: SŽ-Infrastruktura, d.o.o.

The highest volume of cargo was before the Eastern bloc collapsed and the Yugoslav war begun. During the war in the Balkans only about 2 million gross tonnes were transported on the rail link Zagreb-Ljubljana. After the war stopped the cargo volume constantly and slowly

grew to about 6 million gross tonnes in 2007. After that a global economic crisis started. However, since 2015 the volume on the link has increased rapidly and reached the highest volume yet since the collapse of Yugoslavia.

The figure below presents the volume of gross tonnes on two railway links between Slovenia and Austria for the last 30 years. Both links Ljubljana-Villach and Maribor-Graz are part of the AWB RFC route.

Figure 6-2: Gross tonnes on rail links between Slovenia and Austria in 1988 – 2017



Source: SŽ-Infrastruktura, d.o.o.

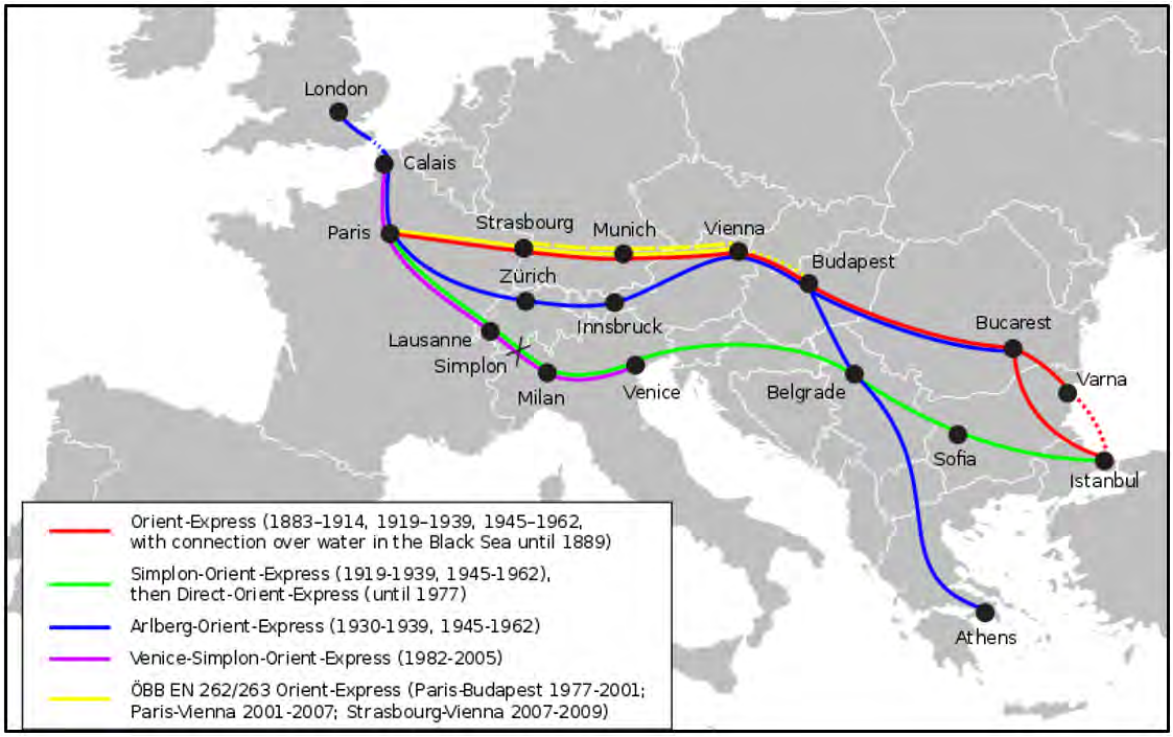
At the end of the 1980s, the volume on the future route of AWB RFC reached about 9 million gross tonnes on the Ljubljana-Villach link and about 5 million gross tonnes on the Maribor-Graz link. The total transported volume between Austria and Slovenia was about 14 million gross tonnes at the end of the 1980s.

During the war in the Balkans only about 8 million gross tonnes were transported on the rail links between Slovenia and Austria. After the war in Yugoslavia stopped the cargo volume constantly and slowly grew on both rail links to about 20 million gross tonnes in 2017, and reached the highest volume yet seen. The reason for this rapid growth in cargo volume is the Port of Koper and its transhipment role for Austria and Central Europe.

6.3.2 Passenger transport

The Orient Express was a long-distance fast passenger train service created in 1883. The route and rolling stock of the Orient Express changed many times. Several routes in the past concurrently used the Orient Express name, or slight variations of it. Although the original Orient Express was simply a normal international railway service, the name became synonymous with intrigue and luxury travel. The two city names most often associated with the Orient Express are Paris and Istanbul, the original endpoints of the timetabled service. The Orient Express was a showcase of luxury and comfort at a time when travelling was still rough and dangerous[6].

Figure 6-3: Historic routes of the Orient Express



* The cross denotes the Simplon tunnel

Source: https://en.wikipedia.org/wiki/Orient_Express, modified by Prometni institut Ljubljana, d.o.o.

On the AWB RFC route between Istanbul-Sofia-Beograd-Zagreb and Ljubljana, the international passenger train the "Simplon-Orient-Express" (green line on the figure above) operated in the years 1919-1939, 1945-1962 and until 1977.

[6] Source: https://en.wikipedia.org/wiki/Orient_Express

6.4 AWB RFC – RAIL TRANSPORT ANALYSIS

This subchapter is aimed at the analysis of the most important railway transport data that are necessary to determine the Alpine-Western Balkan RFC routing and draft of its strategic direction. The data also serve as a basis for drafting the measures to promote rail freight transport. The data has been provided by railway infrastructure managers along the AWB RFC, in ÖBB (Austria), SŽI (Slovenia), HŽI (Croatia), IŽS (Serbia) and NRIC (Bulgaria).

6.4.1 Cross border sections

From Austria to Turkey trains cross five state borders, presented in the following table.

Table 6-26: Border crossing sections along AWB RFC

From State	To state	From Station	To Station
Austria	Slovenia	Rosenbach (A)	Jesenice (SLO)
Austria	Slovenia	Spielfeld-Straß (A)	(Šentilj)Maribor (SLO)
Slovenia	Croatia	Dobova (SLO)	Savski Marof (HR)
Croatia	Serbia	Tovarnik (HR)	Šid (SRB)
Serbia	Bulgaria	Dimitrovgrad (SRB)	Dragoman (BG)
Bulgaria	Turkey	Svilengrad (BG)	Kapikule-Edirne (TR)

Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC

Transport volume depends to the different border crossings. The following table and figure presents the volume of gross tonnes and freight trains in 2017 on cross border sections.

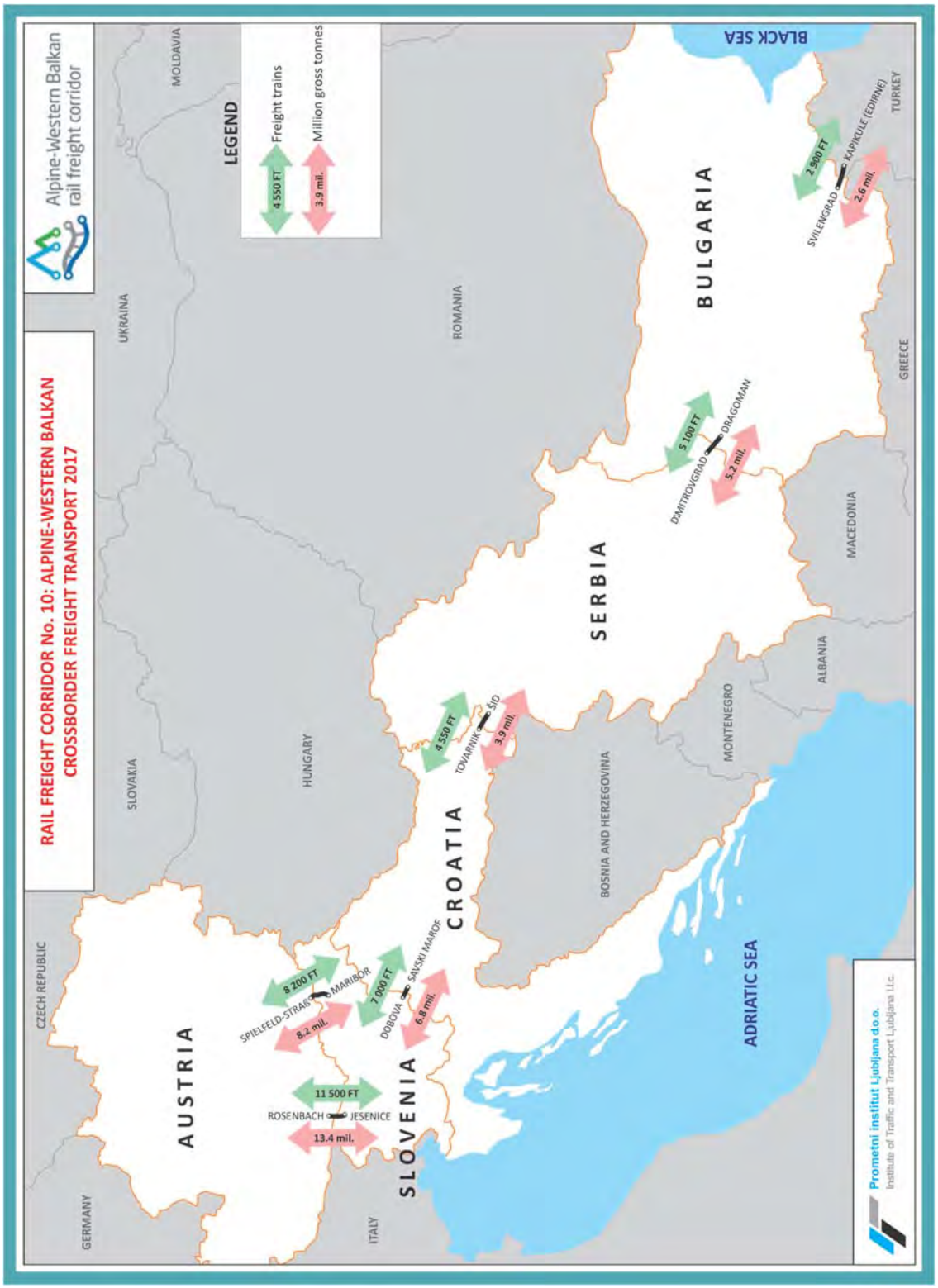
Table 6-27: Freight volume on border sections along AWB RFC in 2017

From Station	To Station	Freight trains	Mill. gross tons
Rosenbach (A)	Jesenice (SLO)	11.500	13,4
Spielfeld-Straß (A)	(Šentilj) Maribor (SLO)	8.200	8,2
Dobova (SLO)	Savski Marof (HR)	7.000	6,8
Tovarnik (HR)	Šid (SRB)	4.550	3,9
Dimitrovgrad (SRB)	Dragoman (BG)	5.100	5,2
Svilengrad (BG)	Kapikule-Edirne (TR)	2.900	2,6

Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC

The cross border section between Rosenbach (Austria) and Jesenice (Slovenia) has the highest freight transport volume for trains and gross tons. The lowest volume is between Bulgaria and Turkey.

Figure 6-4: Cross border freight transport in 2017



An analysis of conditions and procedures for rail freight at border crossings shows that huge improvements could be made, *inter alia*, by streamlining procedures at such locations. The average stopping times of freight trains at the AWB RFC border crossings are generally in the range of several hours. An in-depth analysis of operational conditions at the border crossings showed clear reasons for this: many of the border crossings in the south-eastern part of the corridor are less efficiently organised than the Central European ones. There is significant potential to implement specific improvements to facilitate cross-border train operations, including measures such as mutual trust agreements or a closer cooperation in border and customs controls at border stations.

Various different operations and procedures are carried out at border stations: customs clearance, police procedures, locomotive changes, etc. The next table and figure present the waiting times at border stations for both freight and passenger trains. The change of locomotive for diesel traction at Niš station for the section Niš-Dimitrovgrad is also presented in the table.

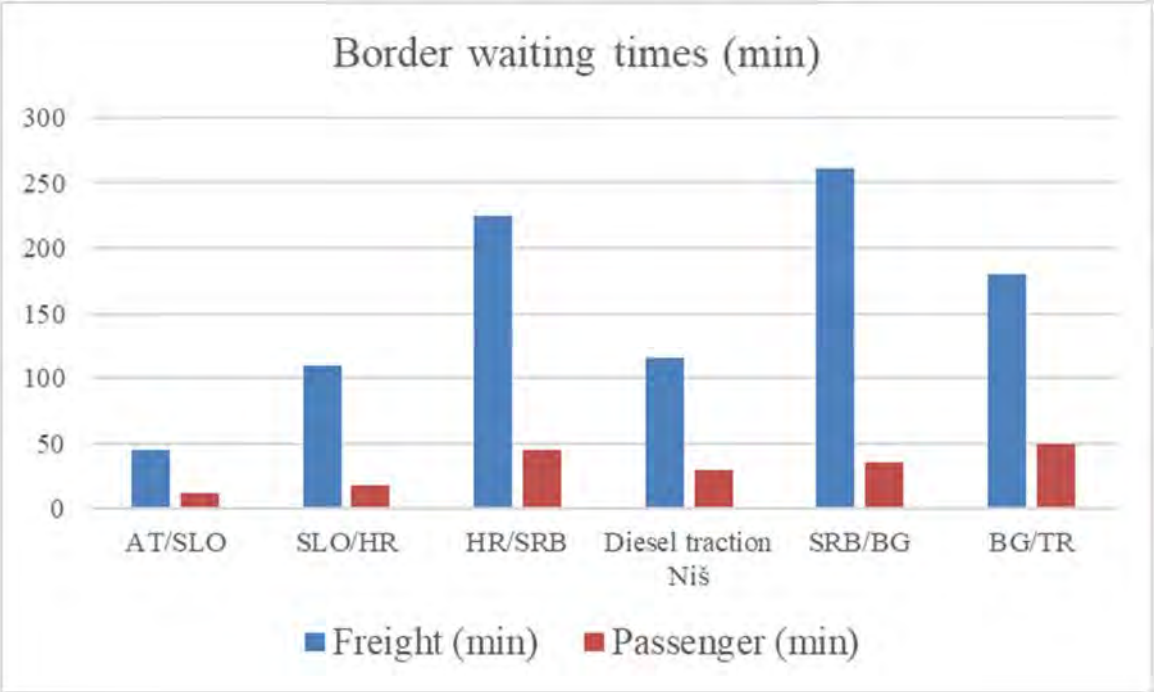
Table 6-28: Border waiting times along the AWB RFC

Border	Freight (min)	Passenger (min)
AT/SLO	45	12
SLO/HR	110	18
HR/SRB	225	45
Diesel traction Niš	115	30
SRB/BG	261	35
BG/TR	180	50
Total (min)	**936**	**190**
Total (hours)	**15,60**	**3,17**

Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC.

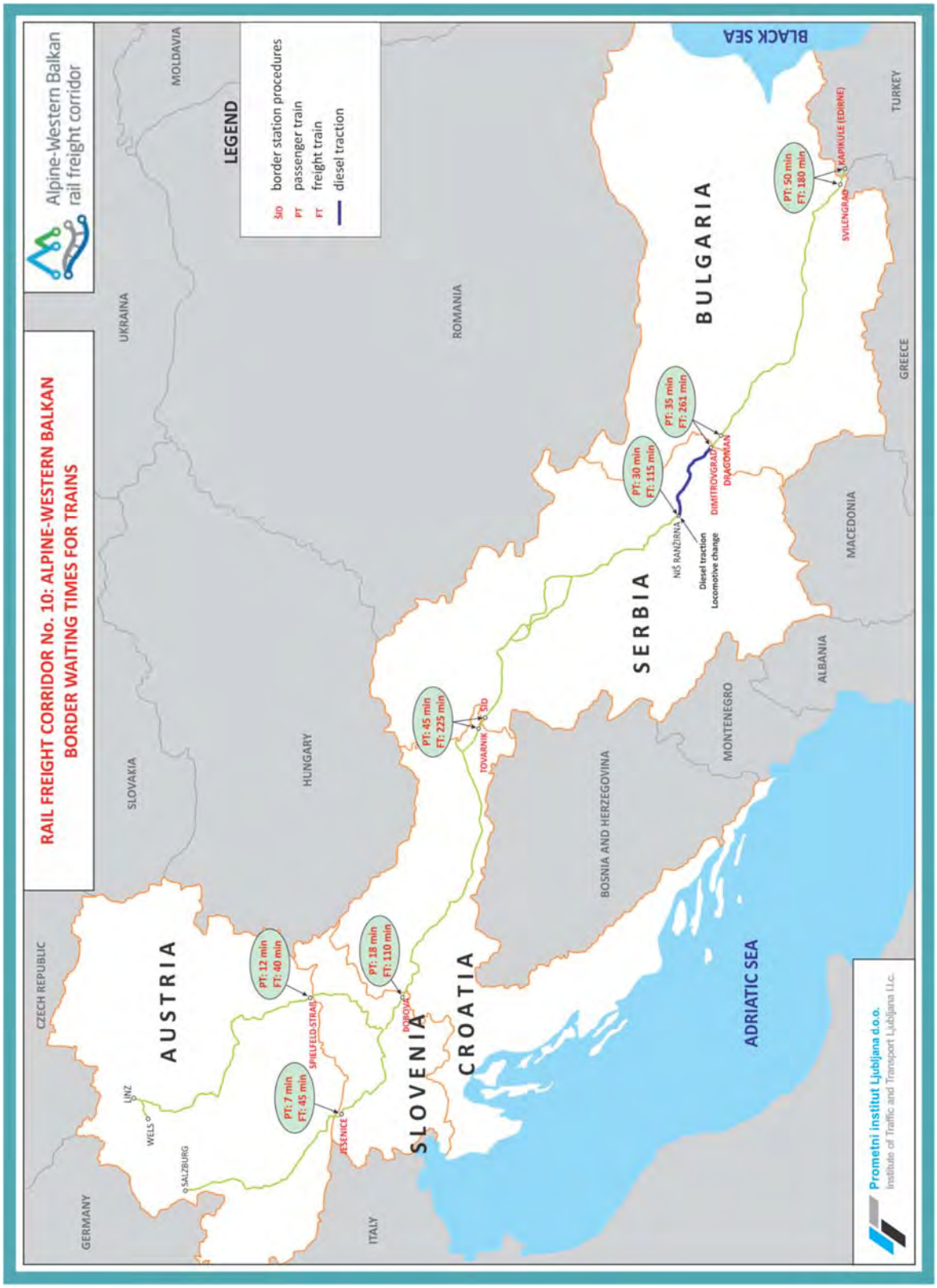
A freight train from Austria to Turkey needs about 15.60 hours for different border procedures. For the same route an international passenger train needs about 3,17 hours.

Figure 6-5: Graph of waiting times along the AWB RFC



Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC.

Figure 6-6: Border waiting times along the AWB RFC



6.4.2 Freight volume

A freight train (goods train) is a group of freight wagons (cars) hauled by one or more locomotives on a railway, transporting cargo on a complete route or a part of it between the shipper and intended destination as part of a logistics chain. The locomotives on the freight trains may haul bulk material, intermodal containers, general freight or specialised freight in purpose-designed cars.

The AWB RFC sections with over 50.000 trains in 2017:

Austria

- Salzburg-Schwarzach-St. Veit
- Wels-Marchtrenk
- St. Michael-Graz

Slovenia

- Ljubljana-Zidani Most

Croatia

- Zaprešić-Zagreb

Serbia

- Batajnica-Beograd

The following two figures present:

- volume of all trains along the AWB RFC in 2017
- freight trains share along the AWB RFC in 2017

Figure 6-7: Volume of all trains along the AWB RFC in 2017

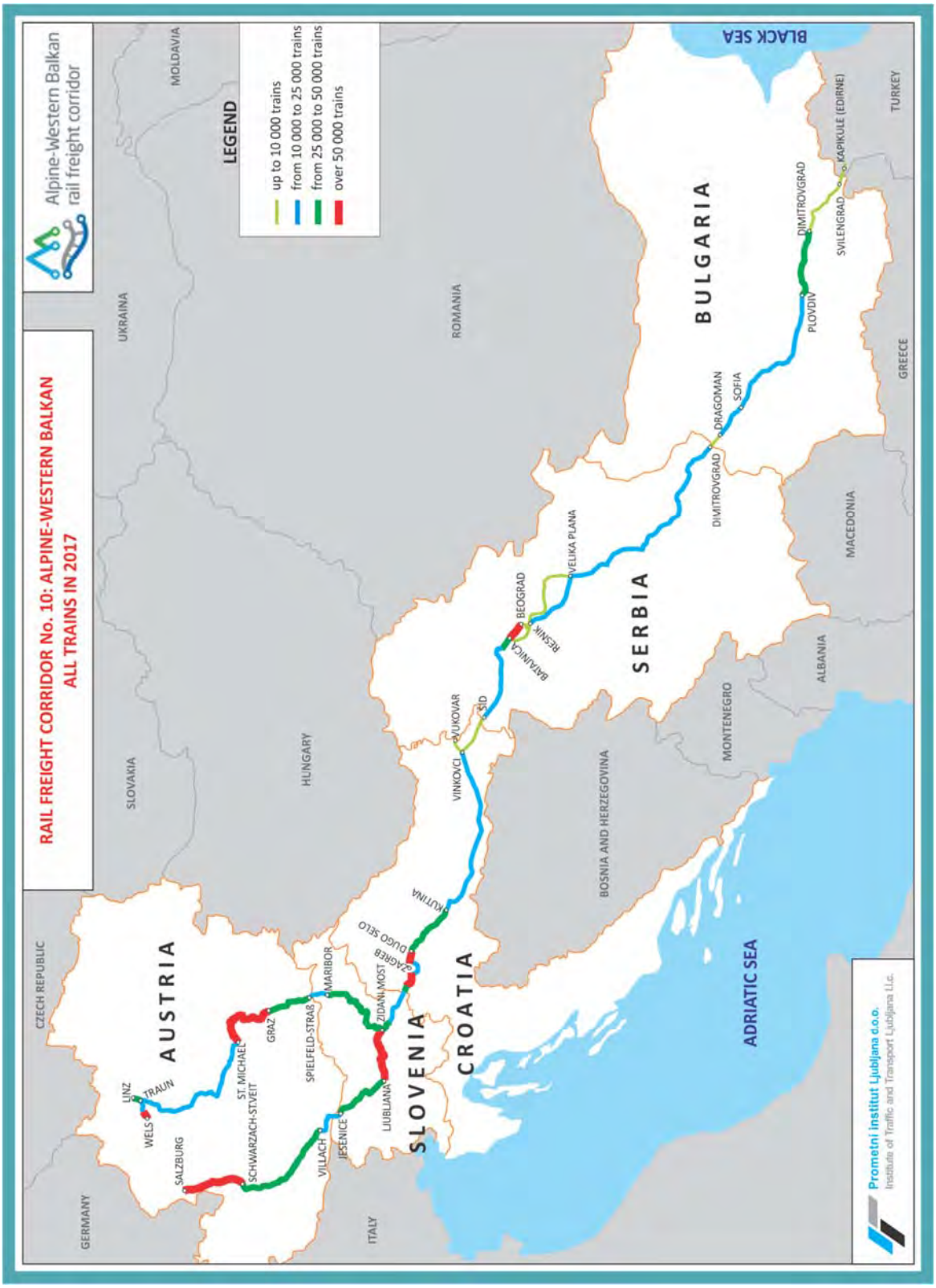


Figure 6-8: Freight trains share along the AWB RFC in 2017

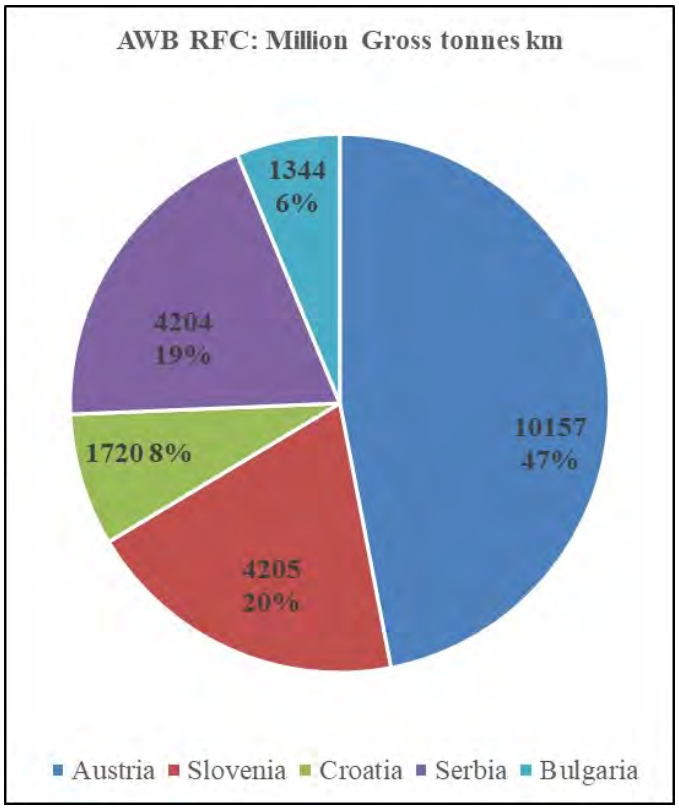
A gross tonnes kilometre is a unit of measure of freight transport which represents the transport of one tonne of goods (including packaging and tare weights of intermodal transport units) by a given transport mode (road, rail, air, sea, inland waterways, pipeline etc.) over a distance of one kilometre. Gross tonnes km for the AWB RFC are presented in the following table and graph.

Table 6-29: Volume of gross tonnes km along the AWB RFC in the period 2014 – 2017

State	AWB RFC: Million Gross tonnes km			
	2014	2015	2016	2017
Austria	9.972	9.525	9.356	10.157
Slovenia	3.631	3.552	3.839	4.205
Croatia	1.511	1.430	1.512	1.720
Serbia	3.661	3.811	3.345	4.204
Bulgaria	1.264	1.329	1.374	1.344
Total	**20.039**	**19.647**	**19.426**	**21.630**

Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC.

Figure 6-9: Volume of gross tonnes km along the AWB RFC in 2017



Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC.

A total of 47 % of the gross tonnes km on the AWB RFC in 2017 was made in Austria, 20 % in Slovenia, 19 % in Serbia and less than 10 % in Croatia and Bulgaria.

The next table presents the share of gross tonnes km on the AWB RFC compared to all the national railway networks.

Table 6-30: Share of gross tonnes km on the AWB RFC compared to all the national rail networks

State	AWB RFC share of gross tonnes km		
	2015	2016	2017
Austria	46 %	44 %	46 %
Slovenia	85 %	88 %	82 %
Croatia	65 %	65 %	66 %
Serbia	76 %	76 %	75 %
Bulgaria	36 %	40 %	34 %

Source: EUROSTAT and railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC.

The share of applied gross tonnes km on the AWB RFC in Austria, compared to that on the whole national rail network, is less than 50%. In Slovenia the share is over 80 % in Croatia about 65 %, in Serbia about 76 % and in Bulgaria less than 40 %.

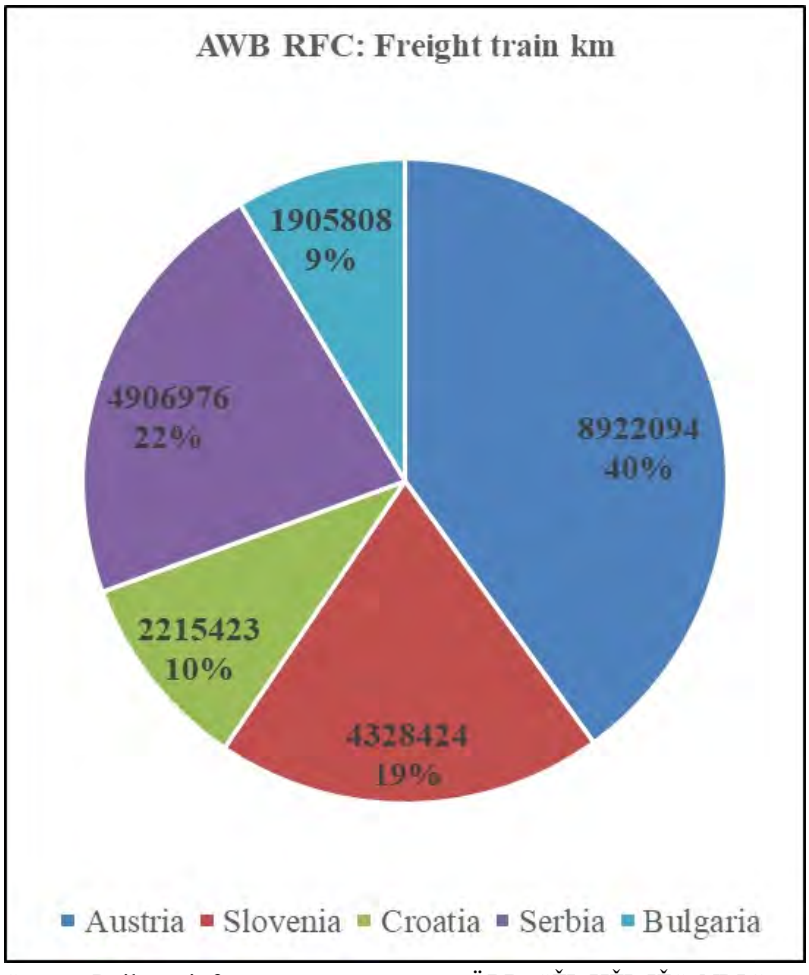
The following table and figure presents the freight train kilometres along AWB RFC.

Table 6-31: Volume of freight train km along the AWB RFC in the period 2014 – 2017

State	AWB RFC: Freight train km			
	2014	2015	2016	2017
Austria	8.038.148	7.725.358	7.556.102	8.922.094
Slovenia	3.940.631	3.789.766	4.103.074	4.328.424
Croatia	1.478.695	1.391.359	1.552.706	2.215.423
Serbia	4.338.150	4.471.073	3.866.123	4.906.976
Bulgaria	1.891.443	1.971.021	2.065.301	1.905.808
Total	**19.687.067**	**19.348.578**	**19.143.306**	**22.278.726**

Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC.

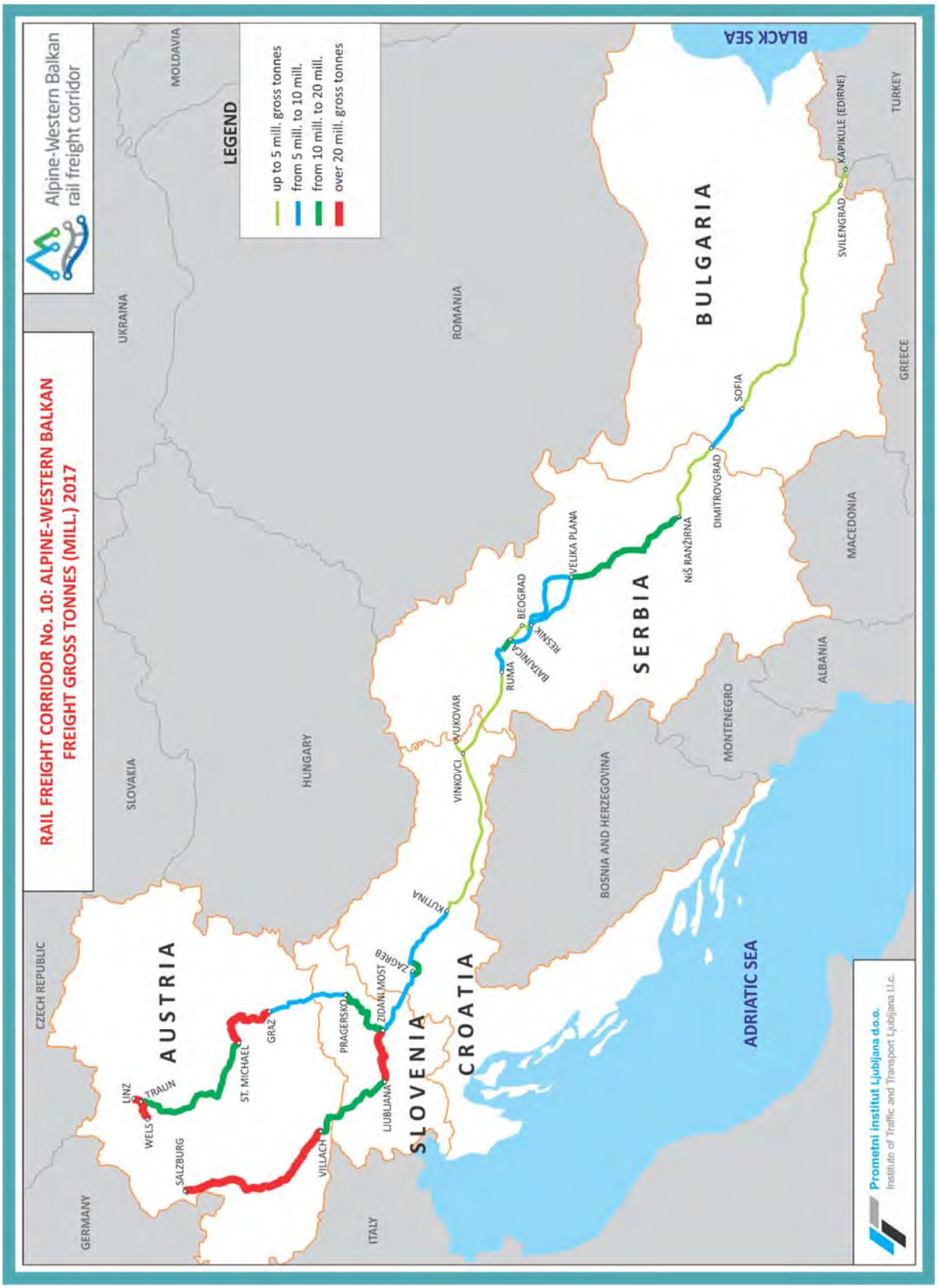
Figure 6-10: Volume of freight train km along the AWB RFC in 2017



Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC.

A total of 40 % of freight train km from the AWB RFC in 2017 was in Austria, 22 % in Serbia, 19 % in Slovenia, and 10 % or less in Croatia and Bulgaria.

Figure 6-11: Freight gross tonnes along the AWB RFC in 2017



6.4.3 Passenger volume

Passenger train kilometres refers to the number of train kilometres travelled by revenue earning passenger trains (international, regional, commuter). The following table and figure presents the volumes in 2016 and 2017.

Table 6-32: Passenger train kilometres along the AWB RFC in 2016 and 2017

State	AWB RFC: 1,000 pass. train km	
	2016	2017
Austria	11.630	12.069
Slovenia	5.999	5.840
Croatia	5.021	6.579
Serbia	3.739	4.030
Bulgaria	5.331	5.605
Total	**31.721**	**34.123**

Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC.

The volume of passenger train km on the AWB RFC increased by 7,6 % between 2016 and 2017.

The next table presents the share of passenger trail km on the AWB RFC compared to that on all the national railway networks.

Table 6-33: Share of passenger train km on the AWB RFC compared to all the national rail networks

State	AWB RFC share of pass. train km	
	2016	2017
Austria	10 %	11 %
Slovenia	58 %	57 %
Croatia	33 %	43 %
Serbia	34 %	24 %
Bulgaria	25 %	28 %

Source: EUROSTAT and Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC.

The share of passenger train km on the AWB RFC in Austria, compared to the all the national rail network, is about 10 %. In Slovenia the share is just under than 60 % in Croatia about 40 % in Serbia about 30 %, and in Bulgaria less than 30 %.

The following table presents the timetable for the direct international passenger train EN 415 from Austria to Beograd.

Table 6-34: Timetable of an international passenger train from Austria to Serbia

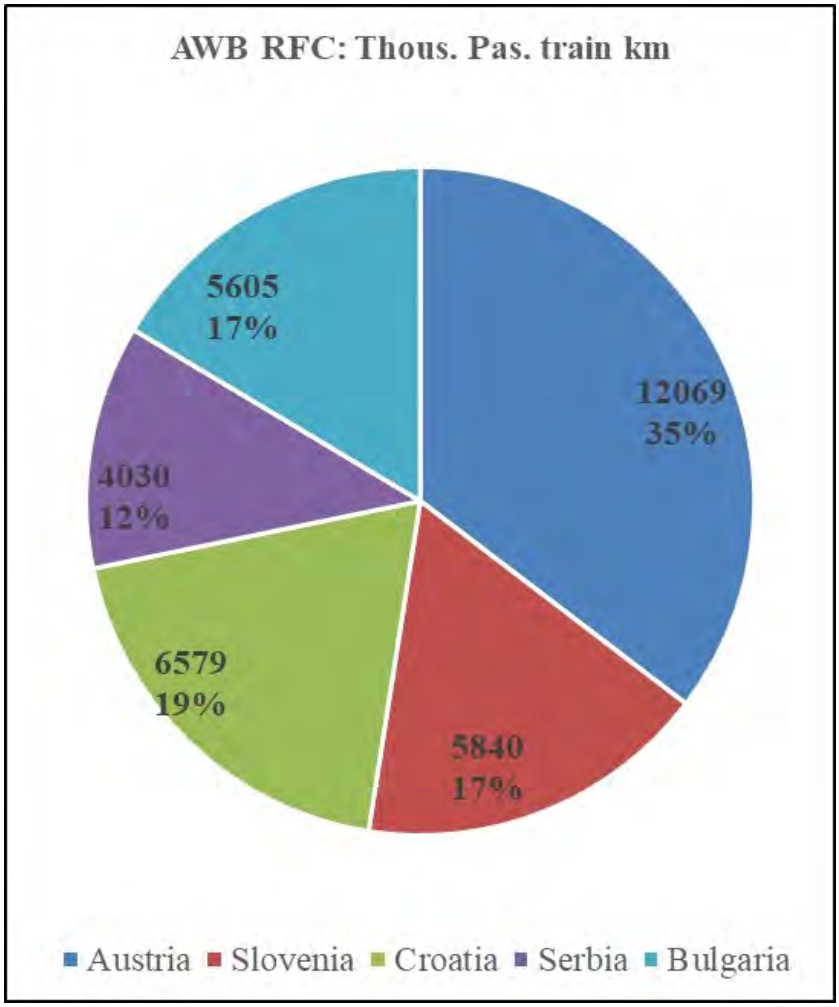
Station / stop	Arrival	Departure
Schwarzach-St.Veit (A)		04:23
Bad Gastein	04:55	05:01
Villach Hbf	06:05	06:25
Jesenice (SLO)	07:05	07:12
Ljubljana	08:11	08:25
Dobova	09:58	10:13
Zagreb Glavni kolodvor (HR)	10:43	11:03
Slavonski Brod	13:52	13:54
Tovarnik	14:56	15:11
Sid (SRB)	15:18	15:48
Beograd Centar	17:42	

Source: https://reiseauskunft.bahn.de/

The journey from Schwarzach-St. Veit in Austria to Beograd in Serbia takes 13 hours and 19 minutes. The average travel speed of the passenger train is 59 km/h

.

Figure 6-12: Passenger train kilometres along the AWB RFC in 2017

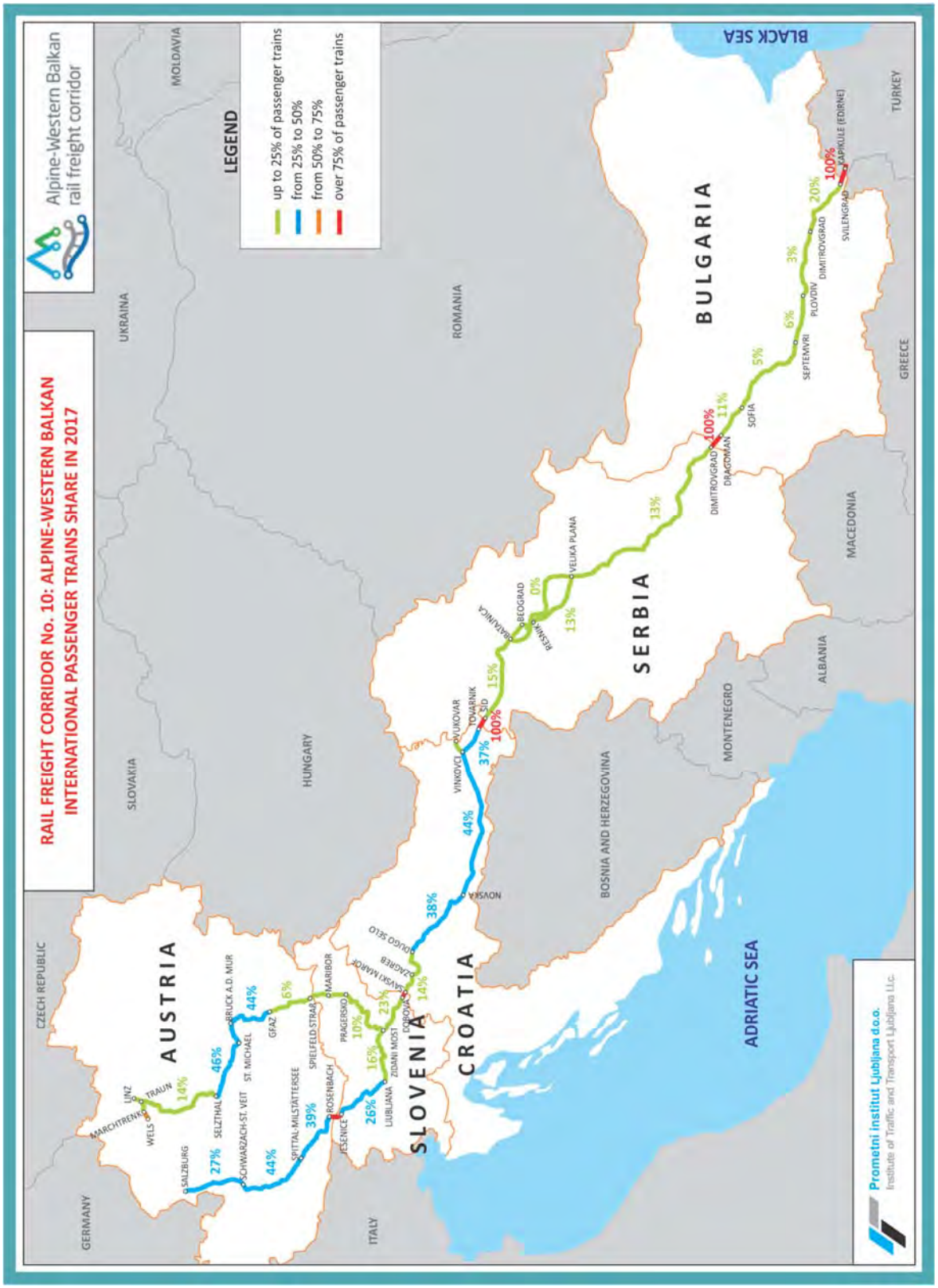


Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC.

A total of 35% of all passenger train km on the AWB RFC is accounted for by Austria. Slovenia, Croatia and Bulgaria have almost equal shares of just less than 20 %. Serbia has a share of 12 %.

The following figure presents the share accounted for by international passenger trains share along the AWB RFC in 2017 compared to all passenger trains. Only at cross border sections do international passenger trains account for 100 %. At other sections the share is under 50 %. The highest percentage taken by international passenger trains is seen for Austria and Croatia, at up to 46 %. Bulgaria has the lowest share of international passenger trains, and those on the section Sofia-Dimitrovgrad do not exceed 6 %.

Figure 6-13: International passenger trains share of passenger train km along the AWB RFC in 2017



6.4.4 Type of goods

Along the AWB RFC different types of goods are carried by different rail freight carriers. The most commonly carried types of goods are:

- containers
- vehicles
- coal
- iron, iron waste, iron ore
- cereals
- oil products, petrol, gasoline, diesel
- gas
- phosphates
- timber
- steel
- artificial fertiliser
- stone aggregate
- RO-LA trucks
- coke

6.4.5 Rail carriers

Rail freight carriers

Rail freight carriers in Austria:

- Rail Cargo Carrier (national carrier – ÖBB group)
- Adria Transport
- CargoServ
- ERS Railways
- LTE - Logistik und Transport GmbH
- Rail & Sea
- SETG- Salzburg Rail Transport Logistik
- Metrans
- CD Cargo
- GKB - Graz-Köflacher Bahn und Busbetrieb GmbH
- GCA - Grampetcargo Austria GmbH
- Ecco - Ecco Rail GmbH
- CargoServ - Voest Steelworks
- …

Rail freight carriers in Slovenia:

- SŽ-Tovorni promet (national carrier – SŽ group)
- Rail Cargo Carrier, družba za železniški tovorni promet, d.o.o.
- Adria Transport
- InRail S.p.A.
- Ten Rail d.o.o.

Rail freight carriers in Croatia:

- HŽ Cargo (national carrier)
- ENNA Transport
- Rail Cargo Carrier – Croatia
- Rail & Sea
- SŽ - Tovorni promet
- Transagent Rail
- Train Hungary Maganvasut Ipari
- CER Cargo

Rail freight carriers in Serbia:

- Srbija Kargo (national carrier)
- Despotija
- Kombinovani prevoz
- Neo Cargo Logistic
- Eurorail Logistics

Rail freight carriers in Bulgaria:

- BDZ Cargo (national carrier)
- Bulgarian railway company
- Bulmarket Rail Cargo
- SE Transport Construction and Rehabilitation
- Rail Cargo Carrier - Bulgaria
- GASTRADE. S.A.
- Mini Maritsa Iztok EAD
- DB Cargo
- Express Service
- Cargo Trans Vagon
- Port Rail
- TBD-Tovarni prevozi
- PIMK Rail PLS

- DMV Cargo Rail

Major passenger rail carriers

- Austria: OBB-Personenverkehr AG
- Slovenia: SŽ-Potniški promet
- Croatia: HŽ Putnički prijevoz
- Serbia: SrbijaVoz
- Bulgaria: BDZ Passengers – BDZ PP

6.5 RAIL CARRIER DEMANDS

Railway freight carriers and their clients have many demands to improve rail transport along the AWB RFC, and these need to be met in order to further raise the competitiveness of rail transport compared to the other modes (road, sea,…).

- **Travel time:** at the moment travel times via railway cannot be competitive to road transport, because of many obstacles on the rail. The travel times depend on the different authorities' procedures (customs procedures, inspections,…) and infrastructure conditions (speed restrictions…). The travel times must thus be reduced through different measures (investments or/and organisation).
- **Traction system:** the many traction systems along AWB RFC should be harmonised with the use of multisystem locomotives. Some railway sections are not electrified yet, but should be. On electrified lines electric traction is provided. This leads to more efficient train operations because of the better technical characteristics of electric locomotives, such as a lack of the gas exhausts seen with diesel locomotives.
- **Axle load category:** different track categories with various allowed axle loads along the AWB RFC have an influence on operating the rolling stock of the rail carriers. Because of insufficient axle load, freight wagons are not loaded optimally, and the locomotives used should also be suitable for the related infrastructure conditions. All lines should be for the category 22,5 t/axle.
- **Punctuality:** delays in freight transport are a huge problem, and can be over 100 minutes for a 100 km route. In is necessary to reduce delays in freight transport by using with different measures – the first measures without any investment should be organisational ones, particularly among the infrastructure managers and between the infrastructure managers and rail carriers.
- **Safety:** critical points in railway safety are the level crossings between rails and roads. Many rail-road crossings have automatic barriers, but some of the crossings sill have only Saint Andrews Cross systems. Because of this many collisions between road vehicles and trains occur, leading to injuries and even deaths.

- **Border crossing:** every border crossing takes times because of different border procedures: locomotive exchange, customs procedures, train inspection, brake test, etc. Freight trains thus spend a lot of time at borders. This time could be reduced to the minimum with organisational changes.
- **Speed restrictions:** such restrictions can be temporary or for a long time. Speed restrictions are usually introduced because of the railway infrastructure conditions, such as a lack of maintenance or maintenance works on the tracks, thus leading to delays. When the maintenance is foreseen in the timetable then the delays should be minimized.
- **Bottlenecks:** some railway lines are serious bottlenecks because of restricted capacity and the high volume of trains. Bottlenecks are usually located on single track railway lines, where freight trains have additional stops to wait for a free path. Their elimination can only be achieved with investment in a second track or additional railway stations.
- **Train path allocation:** railway infrastructure managers allocate train paths to carriers and other applicants in two ways:
    - orders for a new timetable period:
        - •through the regular procedure
        - •through a late procedure.
    - orders for ad hoc train paths:
        - •through the regular procedure
        - •through a shortened procedure

  There is now a lack of the One-Stop Shops (OSS), and path allocation should be centralised for the AWB RFC to simplify the procedures for carriers. OSS could solve some of the administrative barriers that now exist between carriers and infrastructure managers.
- **Intermodal terminals:** freight transport uses intermodal terminals to supply industrial and residential areas. In some terminals there is a lack of modern transhipment equipment (portal cranes, reach stackers…). The rail tracks at terminals are often too short for longer trains, and the access of the different rail carriers to private terminals (i.e. under private ownership) is sometimes disturbed.
- **Just-in-time delivery:** many clients that use the railway services require deliveries of cargo that are “just-in-time”. Additional storage of cargo incurs additional costs for clients. However, delays in railway freight transport can lead to dissatisfied clients. This can be overcome with better timetable planning and greater punctuality.
- **Railway infrastructure charges:** each AWB RFC member state has a different method for its railway infrastructure charges, which thus vary from state to state.
- **Train’s length:** in freight railway transport the length of a train is very important in order to ensure competitiveness with other modes and reduce the operational costs

per unit. Many freight trains (container trains, empty trains, car trains, mixed trains…) could be extended with additional wagons, but the usable track length at many railway stations is not long enough.

- **Information and communication technologies (ICT):** the efficiency of international rail freight transport could be increased with ICT, such as with better exchanges of information and the use of a path allocation system. The Path Coordination System (PCS) is an international path request coordination system for path applicants (railway undertakings, infrastructure managers and allocation bodies). This internet-based application optimises international path coordination by ensuring that path requests and path offers are harmonised by all involved parties.

6.6 INTERMODAL TERMINALS AND MARSHALLING YARDS

Intermodal terminals are the interface between the different transport modes – road, rail, and water – and are necessary to meet the needs of the big cities. Besides the pure transhipment of loading units from one transport mode to the other, intermodal terminals have to perform several basic functions such as transhipment, customs clearance, storage activities, etc. Such terminals are equipped with different forms of infrastructure (rail tracks, docks, storages, areas, parking spaces…) and superstructures (trains, wagons, cranes, trucks, fork lifts, ships…).

A marshalling yard is a railway freight train station, used to separate railway wagons onto one of several tracks. Larger yards tend to put the lead on an artificially built hill called a hump to use the force of gravity to propel the wagons through the ladder.

Table 6-35: Terminals and marshalling yards per AWB RFC member state

State	Number of intermodal terminals	Number of marshalling yards
Austria	8 (1 river port included)	4
Slovenia	3	1
Croatia	5 (2 river ports included)	1
Serbia	4 (2 river ports included)	2
Bulgaria	2	4
TOTAL	**22**	**12**

Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC

The following figure presents the locations of intermodal terminals with river ports and marshalling yards along the AWB RFC.

The table after the figure presents the list of intermodal terminals along with the basic attributes: railway hub, terminal name, type of mode (rail, road, river), area, storage capacity in TEU, number of tracks, track length in metres, gantry cranes and reach stackers.

Figure 6-14: Locations of terminals and marshalling yards

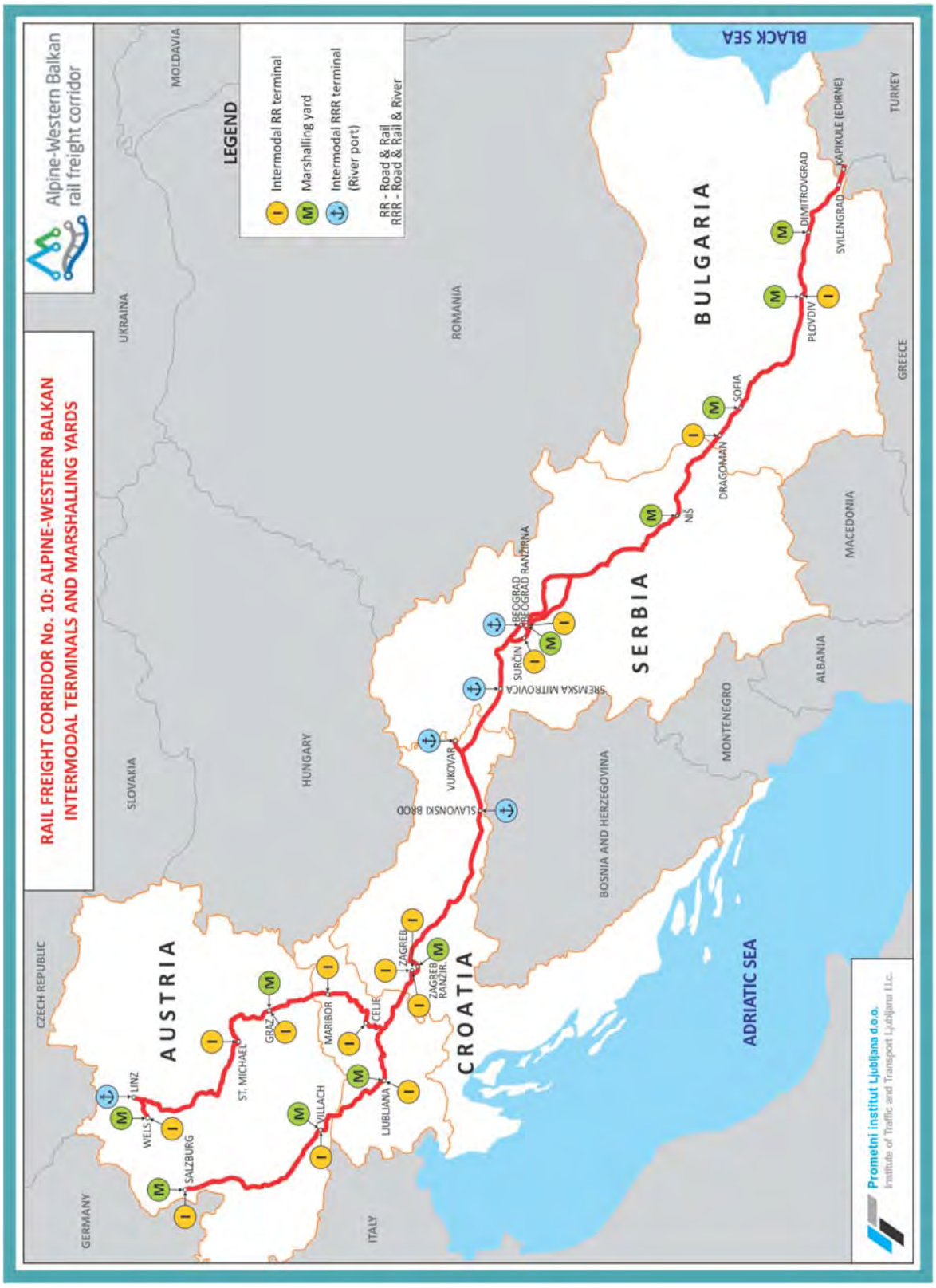


Table 6-36: List of intermodal terminals on the AWB RFC along with basic information

State	Railway Hub	Terminal Name	Rail	Road	River
Austria	Salzburg	Salzburg CTS	✓	✓	×
Austria	Salzburg	Salzburg Frachtenbahnhof - ROLA	✓	✓	×
Austria	Villach	Villach Süd CCT (Fürnitz)	✓	✓	×
Austria	Wels	Wels Vbf. CCT	✓	✓	×
Austria	Wels	Lambach	✓	✓	×
Austria	Linz	Linz Stadthafen CCT	✓	✓	✓
Austria	St.Michael	St.Michael	✓	✓	×
Austria	Graz	Werndorf	✓	✓	×
Slovenia	Maribor	Maribor Tezno	✓	✓	×
Slovenia	Celje	Celje tovorna	✓	✓	×
Slovenia	Ljubljana	Ljubljana Moste KT	✓	✓	×
Croatia	Zagreb	CT Vrapče	✓	✓	×
Croatia	Zagreb	Robni Terminali Zagreb - Jankomir	✓	✓	×
Croatia	Zagreb	Robni Terminali Zagreb - Žitnjak	✓	✓	×
Croatia	Slavonski Brod	Luka Slavonski Brod	✓	✓	✓
Croatia	Vukovar	Luka Vukovar	✓	✓	✓
Serbia	Sremska Mitrovica	Leget Sremska Mitrovica	✓	✓	✓
Serbia	Beograd	Surčin Nelt Dobanovci	✓	✓	×
Serbia	Beograd	Luka Beograd	✓	✓	✓
Serbia	Beograd	ŽIT Beograd	✓	✓	×
Bulgaria	Dragoman	RO-LA Dragoman	✓	✓	×
Bulgaria	Plovdiv	Todor Kableshkov - Zlatitrap RO-LA	✓	✓	×

Terminal Name	Area (m2)	Storage Capacity (TEU)	Number of tracks	Track length (m)	Gantry cranes	Reach stacker
Salzburg CTS	95000	3600	6	3000	2	15
Salzburg Frachtenbahnhof - ROLA	5000	/	2	800	/	/
Villach Süd CCT (Fürnitz)	70000	N/A	7	2700	1	3
Wels Vbf. CCT	120000	N/A	10	5160	2	4
Lambach	180000	3000	5	1625	/	3
Linz Stadthafen CCT	90000	8000	4	2060	2	5
St.Michael	15000	N/A	2	720	/	3
Werndorf	25000	3600	4	3500	2	N/A
Maribor Tezno	3500	50	2	570	/	2
Celje tovorna	6500	80	1	300	/	1
Ljubljana Moste KT	99250	1270	4	2000	1	2
CT Vrapče	25000	621+400	3	1712	/	2
Robni Terminali Zagreb - Jankomir	69000	N/A	N/A	N/A	N/A	N/A
Robni Terminali Zagreb - Žitnjak	97000	N/A	N/A	N/A	N/A	N/A
Luka Slavonski Brod	N/A	N/A	N/A	N/A	N/A	N/A
Luka Vukovar	12800	30	3	1942	1	N/A
Leget Sremska Mitrovica	45000	N/A	N/A	N/A	N/A	1
Surčin Nelt Dobanovci	105000	400	N/A	N/A	/	1
Luka Beograd	800000	N/A	N/A	12507	1	1
ŽIT Beograd	N/A	N/A	N/A	N/A	/	N/A
RO-LA Dragoman	N/A	/	2	cca 660	/	/
Todor Kableshkov - Zlatitrap RO-LA	77000	2000	1	468	/	2

Source: different sources (Railway infrastructure managers, terminal operators, WEB,…)

Table 6-37: List of marshalling yards on the AWB RFC

State	Railway Hub	Marshalling yard
Austria	Salzburg	Salzburg
Austria	Villach	Villach
Austria	Wels	Wels
Austria	Graz	Graz
Slovenia	Ljubljana	Ljubljana Zalog
Croatia	Zagreb	Zagreb ranžirni kolodvor
Serbia	Beograd	Beograd ranžirna
Serbia	Niš	Niš ranžirna
Bulgaria	Sofia	Volujak
Bulgaria	Sofia	Iskar
Bulgaria	Plovdiv	Plovdiv razpredelitelna
Bulgaria	Dimitrovgrad	Dimitrovgrad

Source: Railway infrastructure managers – ÖBB, SŽI, HŽI, IŽS, NRIC

An analysis of intermodal transport terminals within the Alpine-Western Balkan (AWB RFC) shows:

- many terminals on the AWB RFC are located on crossroads with the other European transport corridors (RFCs),
- the appropriate location of terminals within the AWB RFC railway network,
- intermodal transport terminals located along the AWB RFC are connected to the AWB RFC railway infrastructure,
- interactions with the potential to increase the transport (cargo) volume for the AWB RFC and intermodal terminals,
- sufficient capacity to handle TEU in the near future,
- possible and necessary expansion of intermodal terminals in the future,
- investments in cargo-handling equipment (new gantry cranes and reach stackers…)
- modernisation and automatization – new informative technology solutions should be provided in future,
- potential for cooperation between the AWB RFC and intermodal transport terminals.

7 ANALYSIS OF AWB RFC RAILWAY INFRASTRUCTURE

7.1 TRANS-EUROPEAN TRANSPORT NETWORKS (TEN-T)

The Trans-European Transport Networks (TEN-T) are a planned set of road, rail, air and water transport networks in the European Union. The TEN-T networks are part of a wider system of Trans-European Networks (TENs), including a telecommunications network (eTEN) and a proposed energy network (TEN-E or Ten-Energy).

TEN-T envisages coordinated improvements to primary roads, railways, inland waterways, airports, seaports, inland ports and traffic management systems, providing integrated and intermodal long-distance, high-speed routes. The EU works to promote the networks by a combination of leadership, coordination, issuance of guidelines and funding.

For each individual structural subsystem several parameters have been analysed, including those which are essential for determining the conformity of the individual subsystems with the TEN-T requirements (Regulation No. 1315/2013, Regulation No. 1316/2013).

In accordance with the mentioned regulations, the most important demands are for the lines of the core network, which should be realised by the year 2030 and relate to the treated structural subsystems, i.e. the following:

- **deployment of the ERTMS (ETCS+GSM-R)**
- **electrification of the line tracks**
- **nominal track gauge 1435 mm**
- **at least 22.5 t axle load**
- **100 km/h line speed and**
- **possibility of running trains with a length of 740 m**

The TEN-T is extended to specific third countries, under the Serbia Commission delegated Regulations (EU) 2019/254 from 9 November 2018 & (EU) 2017/849 from 7 December 2016.

Figure 7-1: Core and comprehensive TEN-T network along the AWB RFC

7.2 SINGLE-DOUBLE TRACK LINES

A single-track railway line is a railway where trains traveling in both directions share the same track. A single track is usually found on lesser-used rail lines, often branch lines, where the level of traffic is low.

A double-track railway line usually involves running one track in each direction, compared to a single-track railway where trains in both directions share the same track. The capacity of double track lines is thus higher, compared to that of single track lines.

Every AWB RFC member state has some single-track line sections on the RFC route.

Single-track sections in Austria:

- Short sections between Schwarzach-St. Veit
- Section Villach-Rosenbach
- Sections Marchtrenk-Traun-Selzthal
- Short sections between Graz-Spielfeld-Strass-AT/SLO border

Single-track sections in Slovenia:

- Section Jesenice-Ljubljana
- Section AT/SLO border-Maribor

Single-track sections in Croatia:

- Section Dugo selo-Novska
- Section Vinkovci-Vukovar

Single-track sections in Serbia:

- Sections Batajnica-Resnik-Velika Plana
- Section Stalać-Đunis
- Section Niš- SRB/BG border

Single-track sections in Bulgaria:

- Section SRB/BG border-Sofia
- Section Plovdiv-BG/TR border

Figure 7-2: Single/double track lines

7.3 AXLE LOAD CATEGORY

The maximum axle load is related to the strength of the track, which is determined by the weight of rails, density of sleepers and fixtures, train speeds, amount of ballast, and strength of bridges. The axle load has many categories regarding the combination of mass per axle and mass per unit length, as presented in the following table.

Table 7-1: Axle load categories

Classification	Mass per axle				
	A	B	C	D	E
Mass per unit length	16,0 t	18,0 t	20,0 t	22,5 t	25,0 t
5.0 t/m	A	B1			
6.4 t/m		B2	C2	D2	
7.2 t/m			C3	D3	
8.0 t/m			C4	D4	E4
8.8 t/m					E5

Most of the AWB RFC route has an axle load category D – 22,5 t/axle. The axle load category C (20,0 t/axle) is available only in Slovenia and Croatia.

Axle load category C (20,0 t/axle) in Slovenia:

- Section AT/SLO border-Maribor (upgrading in progress)
- Section Celje-Zidani Most (upgrading in progress)

Axle load category C (20,0 t/axle) in Croatia:

- Section Vinkovci-Vukovar (after upgrading in period 2019-2021 will be E5 – 25,0t/axle and 8,8 t/m)

Figure 7-3: Axle load category

7.4 TRACTION SYSTEM

A system which causes the propulsion of a vehicle in which tractive or driving force is obtained from various devices, such as diesel engine drives, steam engine drives, electric motors, etc., is called a traction system.

It can also be defined as the railway vehicle that provides the necessary traction power to move the train, commonly referred to as the locomotive. This traction power can be diesel, steam or electric power.

The traction system can be classified as non-electric (diesel, steam) and electric traction systems. The two types of electric traction systems that exist are as follows:

- Direct Current (DC) electrification system with following voltage:
  - 300, 500, 600, 750, 1 200, 1 500 and 3 000 Volts
- Alternating Current (AC) electrification system with following voltage:
  - 15 000, 25 000 Volts

All traction systems are available on the AWB RFC route.

Austria – traction system 15 kV AC:

- Section Salzburg-AT/SLO border-Jesenice
- Section Wels/Linz-Spielfeld Strass

Slovenia – traction system 3 kV DC:

- Section Spielfeld Strass -AT/SLO border-Zidani Most
- Section Jesenice-Dobova

Croatia, Serbia, Bulgaria – traction system 25 kV AC:

- Section Dobova-SLO/HR border-Zagreb-HR/SRB border-Beograd-Niš
- Section SRB/BG border-Sofia-BG/TR border

Croatia, Serbia – diesel traction:

- Section Vinkovci-Vukovar (after upgrading in the period 2019 – 2021 it will be electrified with 25 kV AC)
- Section Niš-SRB/BG border (upgrading in progress)

Figure 7-4: Traction systems

7.5 ERTMS - COMMUNICATION DEVICES

Two types of communication devices (digital and analogue) are used along the AWB RFC:

- GSM-R and
- analogue radio system (ARS)

GSM-R, the Global System for Mobile Communications – Railway, or GSM-Railway, is an international wireless communications standard for railway communication and applications.

A sub-system of the European Rail Traffic Management System (ERTMS), it is used for communication between train and traffic management/control centres. The system is based on GSM and EIRENE – MORANE specifications, which guarantee performance at speeds up to 500 km/h, without any communication loss.

The analogue train radio system is an older system, used for operational communication between dispatchers in traffic management/control centres (TCC) and the drivers. The dispatch areas are divided by railway lines and the traffic control centres. The analogue radio systems are used for the following purposes: traffic management and control, shunting activities, communication among the railway executive staff during traffic operations, wagon inspection and inventory, as well as during maintenance works.

ERTMS communication devices between trains and traffic control centres.

Austria:

- GSM-R at all sections

Slovenia:

- Parallel GSM-R and analogue radio system at all sections

Croatia:

- Analogue radio system at all sections
- Without any system at section Vinkovci-Vukovar[7]

Serbia:

- Without any system at section Niš-SRB/BG border

Bulgaria:

- Without any system at section SRB/BG border-Sofia
- Parallel GSM-R and analogue radio system at section Sofia-Plovdiv

[7] According to the project documentation it is foreseen to be installed a digital telecommunication device and a telecommunications desk, which will be connected to the central traffic control centre. Communication devices will have interfaces for GSM-R.

- GSM-R at section Plovdiv-BG/TR border

Figure 7-5: ERTMS Communication devices

7.6 ERTMS - ETCS

The European Rail Traffic Management System (ERTMS) is the system of standards for management and interoperation of signalling for railways that has been adopted by the EU. It consists from:

- European Train Control System (ETCS, signalling) and
- GSM–R (communication)

The European Train Control System (ETCS) is the signalling and control component of the European Rail Traffic Management System (ERTMS). It is a replacement for legacy train protection systems and designed to replace the many incompatible safety systems. ETCS is implemented with standard trackside equipment and unified controlling equipment within the train cab. In its advanced form, all lineside information is passed wirelessly to the driver inside the cab, removing the need for the driver to watch out for lineside signals.

ETCS is specified at four numbered levels:

- Level 0: ETCS-compliant locomotives or rolling stock do not interact with lineside equipment, i.e. because they lack ETCS compliance.
- Level NTC (former STM): ETCS-compliant driving cars are equipped with additional Specific Transmission Modules (STM) for interaction with legacy signalling systems. Inside the cabs are standardised ETCS driver interfaces.
- Level 1: is installed on lineside and on board; spot transmission of data from track to train (and versa) via Eurobalises or Euroloops.
- Level 2: Eurobalises are only used for the exact train position detection. Continuous data transmission via GSM-R with the Radio Block Center (RBC) gives the required signalling information to the drivers display.
- Level 3: train location and train integrity supervision no longer rely on trackside equipment such as track circuits or axle counters.

Only ETCS L1 is deployed on the AWB RFC route in some parts of Slovenia, Croatia and Bulgaria.

Slovenia:

- Section Ljubljana-Zidani Most
- Section Pragersko-Zidani Most

Croatia:

- Section Novska-Okučani
- Section Vinkovci-Tovarnik HR/SRB border

Bulgaria:

- Section Septemvri-BG/TR border

Figure 7-6: ETCS System

7.7 LINE SPEEDS

In terms of the maximum line speed, the rail lines are categorised as high-speed rail lines and conventional lines. All railway lines on the AWB RFC route belong to the category of conventional lines. Line speeds are divided based on the different types of trains.

The lowest maximum line speeds for freight trains are in Serbia, where most of the lines can only have a speed of up to 50 km/h. The maximum line speed for freight trains on the AWB RFC is 120 km/h. Most of the lines with freight line speeds over 100 km/h are in Austria, Bulgaria, Croatia and Slovenia.

The lowest maximum line speeds for passenger trains are in Serbia, where most of the lines can only have a speed of up to 75 km/h. The maximum line speed for passenger trains on the AWB RFC is 160 km/h. Most of the lines with passenger line speeds over 126 km/h are in Austria, Bulgaria, Croatia and Slovenia.

After modernisation and upgrading of the railway line in Croatia, the section Vinkovci-Vukovar will have a line speed of 120 km/h.

The following two figures present the maximum line speeds for freight and passenger trains.

Figure 7-7: Maximum line speeds for freight trains

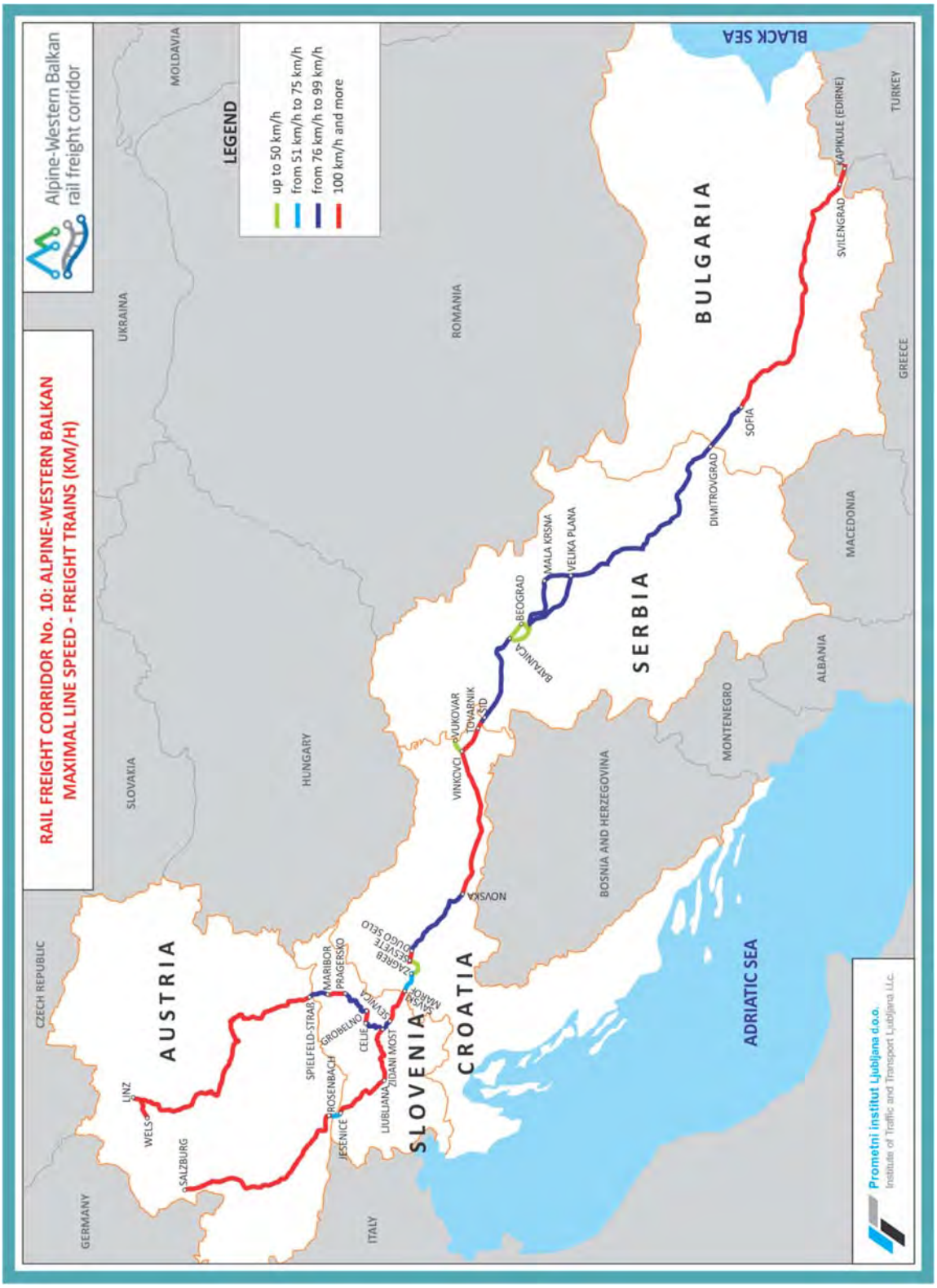
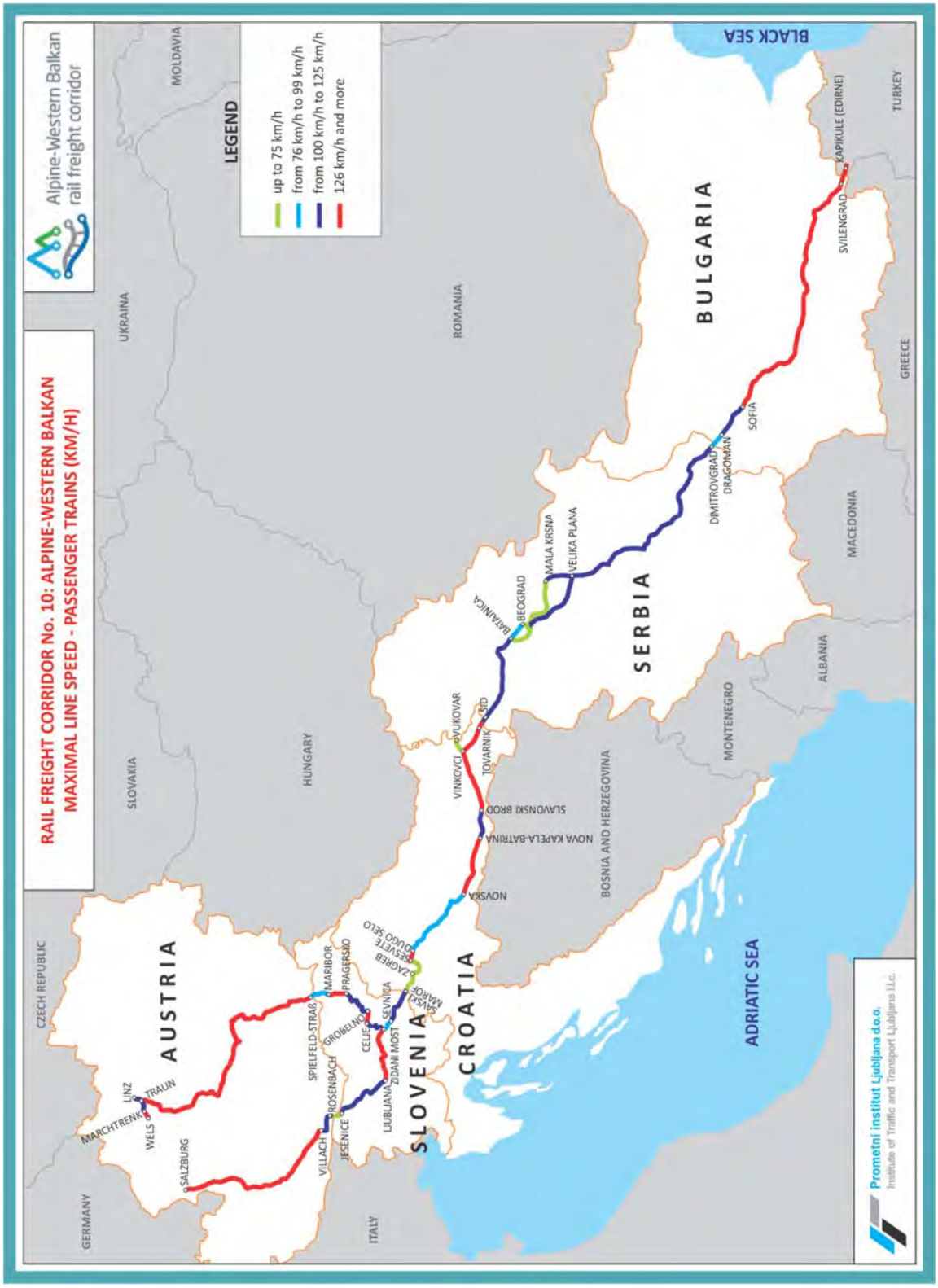


Figure 7-8: Maximum line speeds for passenger trains



7.8 LINE GRADIENT

The gradient or slope of a line is a number that can be expressed in ‰ (promile) that describes both the direction and the steepness of the line. It is calculated by finding the ratio of the vertical to the horizontal change between two points on a line. Line gradients limit the load that a locomotive can haul, including the weight of the locomotive itself.

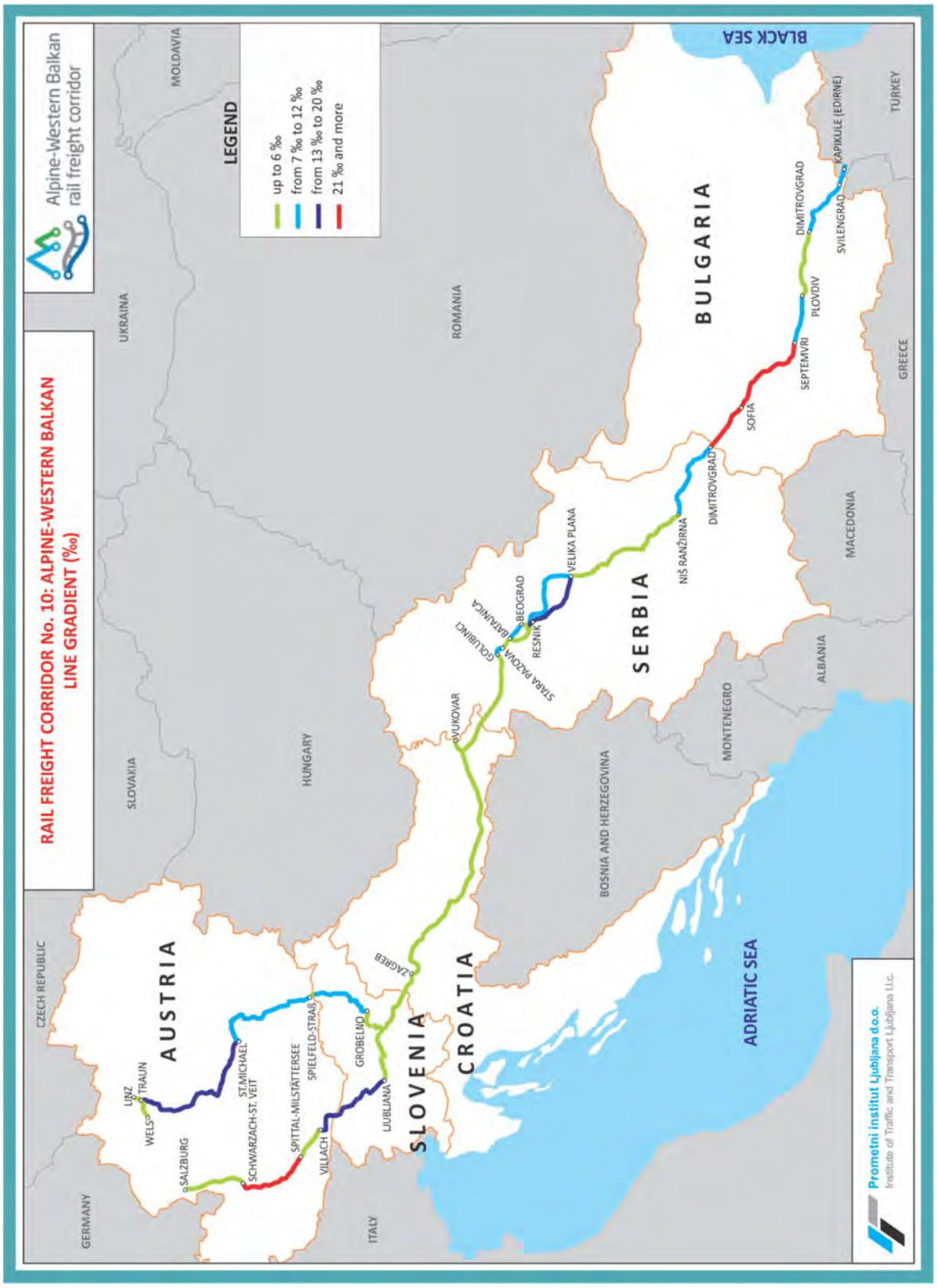
AWB RFC line sections with a gradient of more than 21 ‰:

- Austria: section Schwarzach-St. Veit-Spittal-Milstättersee (28 ‰)
- Bulgaria: section SRB/BG-Border-Septemvri (21-29 ‰)

AWB RFC line sections with a gradient between 13 to 20 ‰:

- Austria:
  - section Traun-St. Michael (17-20 ‰)
  - section Villach-A/SLO border (15-20 ‰)
- Slovenia:
  - section A/SLO border-Ljubljana (16-19 ‰)
- Serbia:
  - section Beograd Ranžirna-Velika Plana (13-15 ‰)

Figure 7-9: Line gradient



7.9 TRAIN LENGTH

The length of a train is measured in metres and includes wagons and locomotives, and depends on the usable lengths of the station tracks. The EU standard is to operate freight trains with a length of 740 meters.

AWB RFC line sections with a freight train length of more than 700 m:

Austria:

- section Salzburg-A/SLO border
- section Wels/Linz-A/SLO border

AWB RFC line sections with a freight train length of between 600 and 700 m:

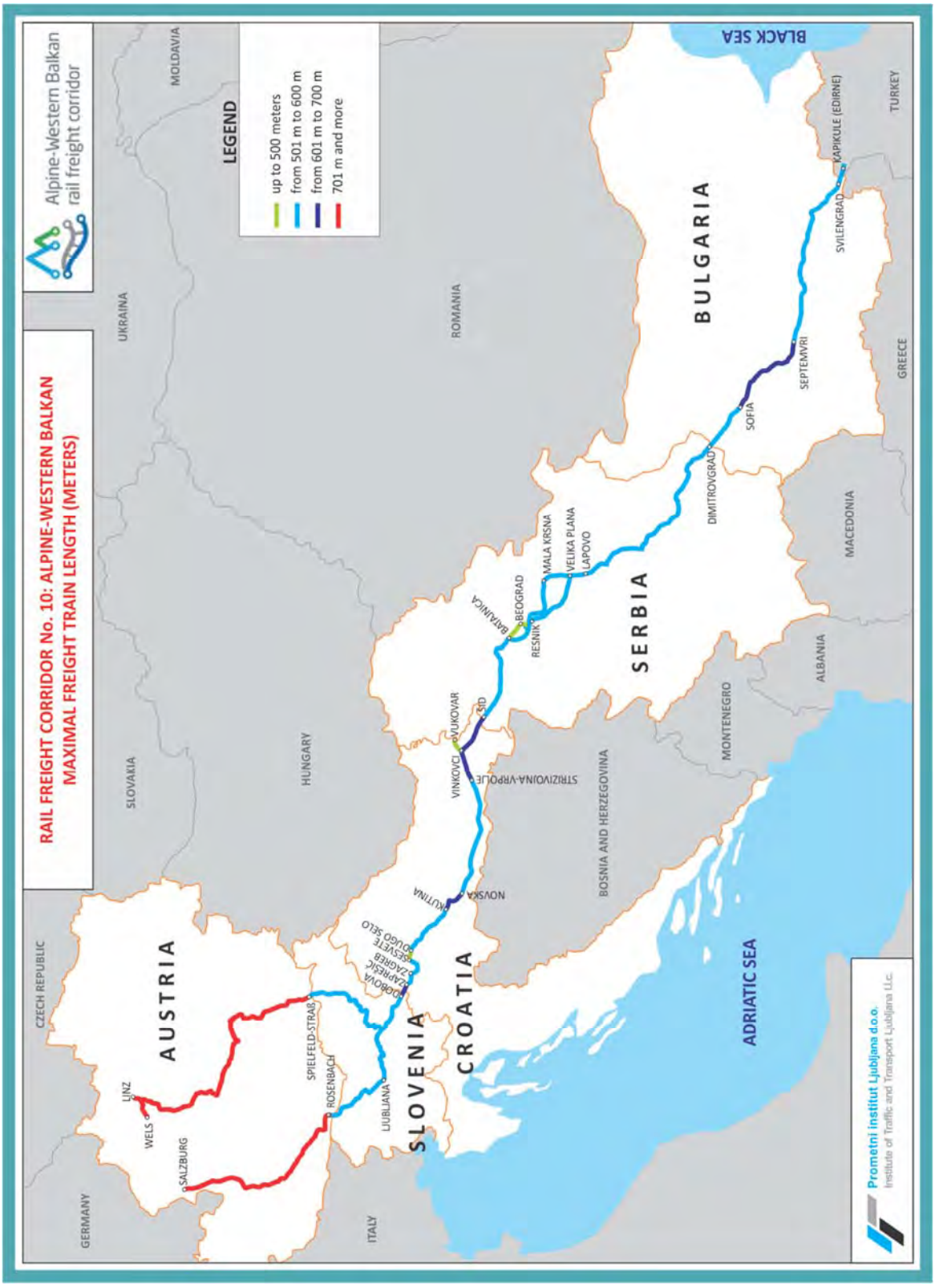
Croatia:

- section SLO/HR border-Zaprešić
- section Kutina Novska
- section Strizivojna Vrpolje-HR/SRB border

Bulgaria:

- section Sofia-Septemvri

Figure 7-10: Maximum freight train length



7.10 CAPACITY CONSUMPTION

The UIC 406 leaflet (2nd edition, June 2013) provides an international standard for evaluating capacity, to be used in developing common values for international corridors sharing different railway networks in different countries.

In order for capacity utilisation (consumption) values to best represent the corresponding infrastructure, the following conditions can be used as a guideline:

- The capacity consumption values reflect the infrastructure characteristics of the defined train path line sections.
- The line section with the highest capacity consumption value along the train path line section is the representative line section for the train path line section.
- Acceptable quality of service is represented by capacity consumption values of up to 100%.
- Capacity consumption values beyond 100 % represent a bottleneck, which means a lower quality of service, and should be subject to timetable or infrastructure improvement measures.
- Capacity consumption values below 100 % represent available capacity and thus the potential for additional train paths along the defined train path line section.

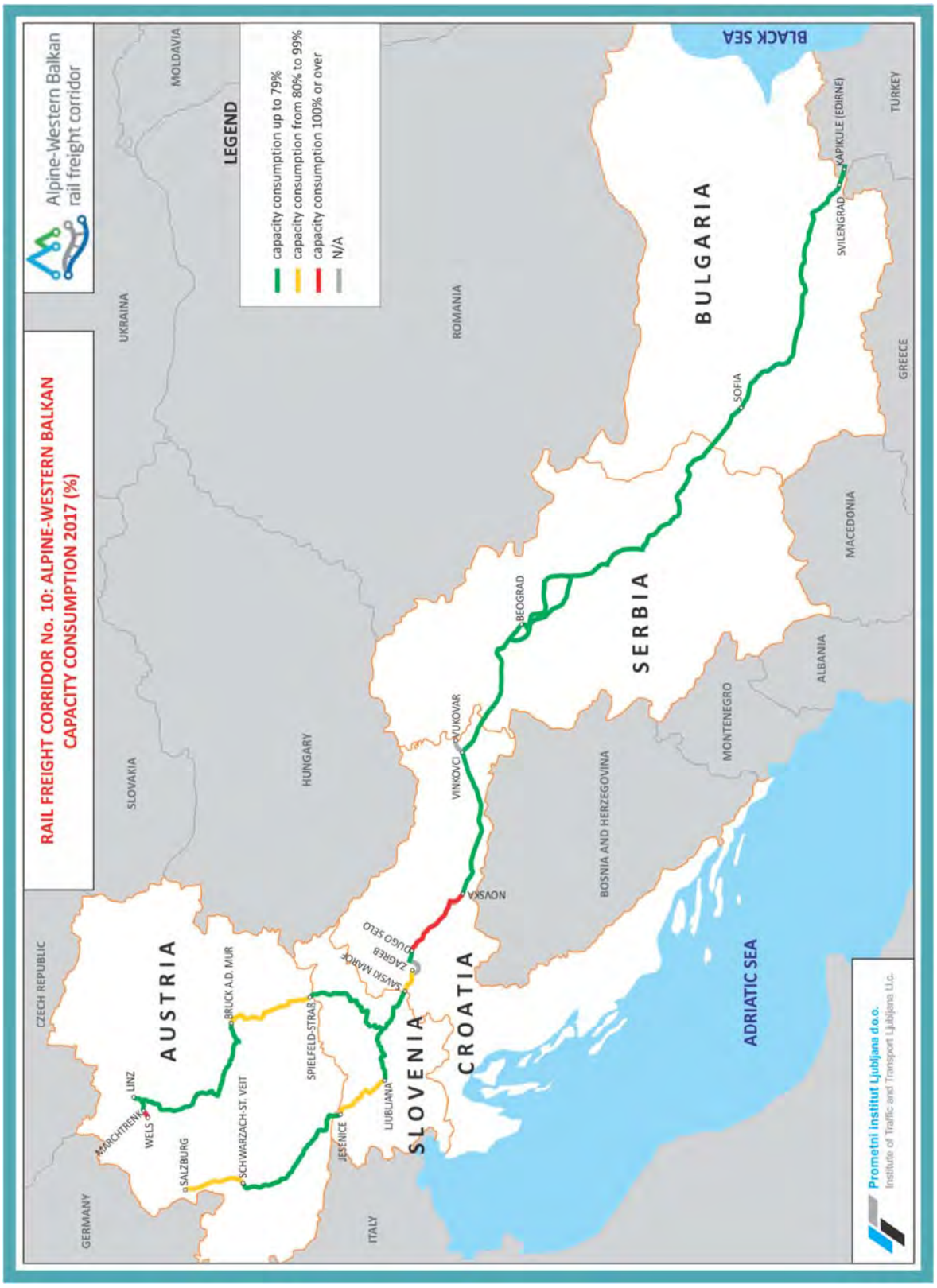
Capacity consumption exceeded 100 % on the following line sections:

- Austria: section Wels-Marchtrenk
- Croatia: section Dugo Selo-Novska

Capacity consumption between 80 % and 99 % was found on the following line sections:

- Austria:
  - section Salzburg-Schwarzach-St. Veit
  - section Bruck a.d. Mur
- Slovenia:
  - section Jesenice-Ljubljana
- Croatia:
  - section Savski Marof-Zagreb

Figure 7-11: Capacity consumption



8 DEVELOPMENT OF RAIL FREIGHT TRAFFIC AND MAJOR TRADE FLOWS ALONG THE AWB RFC

The AWB RFC route is the key rail axis in the Western Balkans region, both in terms of passengers and freight. A recent study by the International Bank for Reconstruction and Development[8], estimates that rail freight flows reach 12,000 to 14,000 tonnes per day in the most heavily used sections, in the Zagreb and Belgrade areas. This is equivalent to about 3 to 5 million tonnes of freight per year[9].

The significant potential of the AWB RFC is underlined by the fact that prior to the dissolution of Yugoslavia – which ended the functioning of the corridor as a seamless transport axis – the volume of transit goods transported along this route was more than double the current figures: In 1989, approximately 18 million gross tonnes were shipped by rail along the corridor[10]. One of the key reasons for the decrease in volume is a shift of transit traffic to routes further north.

In terms of markets, Alpine-Western Balkan AWB RFC will serve two geographically distinct submarkets:

- **Transport related to the regions served by the Alpine-Western Balkan RFC, including:**
  - **transport between the regions directly served by the corridor and**
  - **transport between the region served by the corridor and other parts of Europe;**
- **Long-distance transport transiting the AWB RFC along its entire length between Austria and Bulgaria (possibilities for transit between Germany and Turkey).**

In each of these markets there is significant potential to develop rail freight transport, either by shifting transport to rail from other modes (modal shift effect) or by developing overall transport volumes via the positive impact of transport improvements on regional economic development and trade (development and trade effect).

The key difference between these two markets is that the first is determined to a large extent by economic development of the region along the corridor, i.e. both modal shift and development/trade effects play a role here. For long-distance transport, the modal shift effect dominates.

[8] IBRD (2015). The Regional Balkans Infrastructure Study (REBIS) Update, Report No. 100619-ECA, The International Bank for Reconstruction and Development, Washington DC, September 2015
[9] The study does not specify whether the daily volumes refer to 365 days per year or to workdays only (around 300 days).
[10] Source: SŽ-Infrastruktura

8.1 REGIONS SERVED BY THE AWB RFC

Transport is a derived demand and as such closely related to the integration of a region in trade networks and its economic development. This section therefore briefly outlines data and forecasts for the region covered by the Alpine-Western Balkans RFC (a more detailed analysis is in subchapter 5.2, "Economic indicators").

Various empirical studies analyse the patterns and development of trade relations in the South-Eastern European and Balkans regions[11,12,13]. These show that historically there have been very close economic links among Slovenia, Croatia and Serbia. This is due to a common history in the same country, resulting in a high degree of integration in economic, administrative and cultural terms. Over time, the intensity of trade among these states decreased in the aftermath of the dissolution of Yugoslavia. However, the volume of trade in the region is still higher than to be expected based on geography and economic structure. This means that transport flows are still more intense than in comparable regions due to historic factors. The contrary is the case for trade and transport between Bulgaria and the states on the former territory of Yugoslavia. Here trade is considerably below its potential value.

In conclusion, historic and current trade data suggest that trade flows and goods traffic among Slovenia, Croatia and Serbia are at a comparatively high level. The establishment of the Alpine-Western Balkan RFC can help to increase the market share of rail in this significant market. At the same time, there is significant growth potential for freight transport to and from Bulgaria to the other countries along the corridor.

Regarding trade and transport between the states of the Alpine-Western Balkan corridor and the rest of Europe, it is important to note that the EU is the dominant trading partner of the Western Balkan states. Roughly, three quarters of the trade volume of these countries, both in terms of exports and imports, is directed to EU member states, in particular to the core of the EU[14]. The Alpine-Western Balkan RFC establishes support for these trade relations by creating the conditions for competitive rail transport services, particularly to the economic core of Central and Western Europe and to the North Sea ports in Germany, the Netherlands and Belgium.

Significant growth potential could result from a convergence of the Western Balkan region towards income and productivity levels in Central and Western Europe. The level of economic activity in the countries covered by the Alpine-Western Balkan RFC is generally well below the average of the 28 EU member states (see the table below). Convergence towards EU levels would imply above-average GDP growth rates over long time periods.

[11] Jelena Trivić and Łukasz Klimczak (2015), The determinants of intra-regional trade in the Western Balkans, Zb. rad. Ekon. fak. Rij., vol. 33, sv. 1, p. 37-66
[12] Vujčić, Šošić (2008). South East Europe and the Trade Potential of Croatia.
[13] Christie, Edward (2002). Potential Trade in Southeast Europe: a Gravity Model Approach. In *WIIW Working Papers*, No. 21, March 2002. Vienna Institute for International Economic Studies (WIIW)
[14] http://ec.europa.eu/trade/policy/countries-and-regions/regions/western-balkans/

Moreover, due to its close relation to economic activity, economic growth would be accompanied by significant growth in freight transport.

Indeed, economic growth in the Western Balkan states has significantly exceeded overall growth in the 28 EU member states in general and that of relevant higher-income countries such as Germany and Austria (see the table below). This pattern is expected to continue according to short-term economic forecasts.

Table 8-1: GDP per capita in the AWB RFC countries and growth rates

	2017 GDP		GDP growth (%) - prognosis	
	Euro per capita	Index EU=100	2019	2020
(1) AWB RFC countries				
Austria	41.900	128	2,0	1,7
Slovenia	19.600	85	3,4	2,8
Croatia	10.900	61	2,6	2,5
Serbia	4.800	37	3,5	4,0
Bulgaria	7.100	49	3,3	3,0
(2) EU 28 average, other relevant countries				
EU 28	29.000	100	2,1	1,8
Germany	38.400	124	1,8	1,6
Turkey	9.600	67	3,0	3,0

Source: International Monetary Fund, Eurostat.

Regarding the medium to longer term, a recent report by the European Bank for Reconstruction and Development estimates that despite challenges in the past there are positive signs for a convergence of the Western Balkans towards average EU levels in economic performance, which can intensify provided appropriate conditions are created. The study identifies stronger trade integration, both within the region and with the rest of the world, and an improvement in transport infrastructure and connectivity, as among the key potential growth drivers.

8.2 LONG-DISTANCE TRANSPORT TRANSITING THE AWB RFC

Regarding long-distance transport, the AWB RFC provides a natural link between Central Europe and Turkey (and beyond). It offers the shortest route from Central Europe to the Bulgarian/Turkish border and relatively favourable topographic characteristics, in particular for rail freight (with steep gradients limited to Alpine crossings in Austria and some short sections elsewhere).

8.2.1 Turkey-EU international trade

This subchapter provides a picture of the trade in goods between the EU and Turkey.

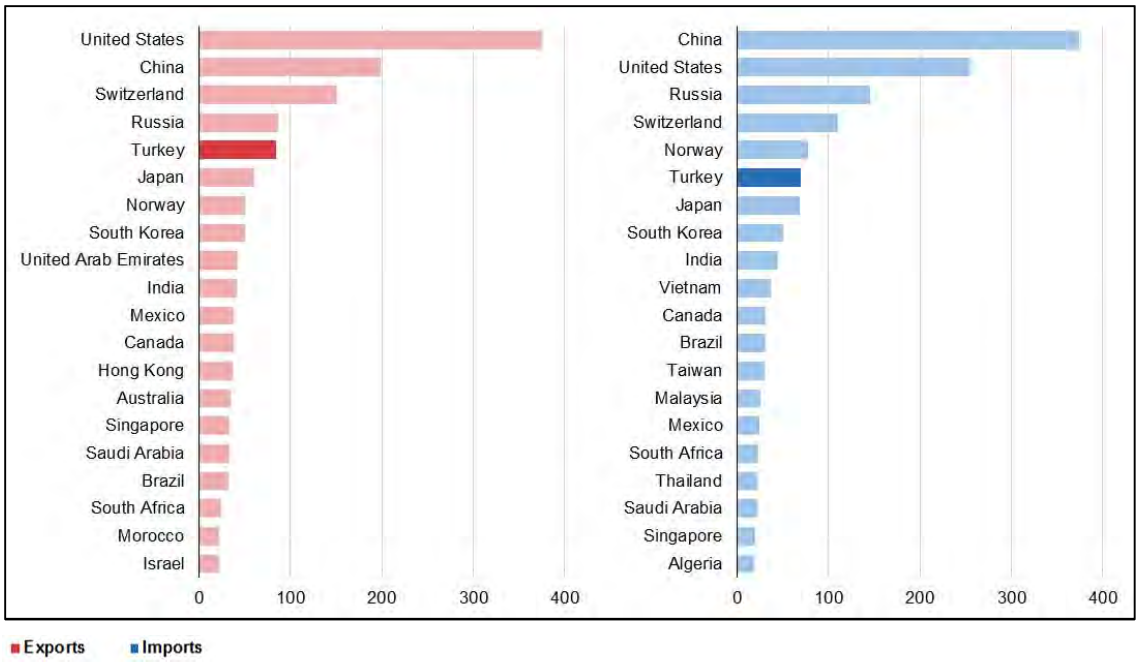
Overview:

- In 2016, Turkey was the 22nd largest exporter of goods in the world with a share of 1,2 % of world exports, and the 14th largest importer of goods with a share of 1,6 % of world imports.
- In 2017, among the EU's trading partners, Turkey was the fifth largest partner for exports of goods from the EU and the sixth largest partner for imports of goods to the EU.
- Manufactured goods make up 81 % of EU exports of goods to Turkey and 89 % of EU imports of goods from Turkey.
- In 2017, Germany was the EU's largest importer of goods (14 billion EUR) and exporter of goods (22 billion EUR) with Turkey.
- Germany also had the largest trade in goods surplus (8 billion EUR) with Turkey, while Slovenia had the largest deficit (1,5 billion EUR).

The following figure shows the top 20 import and export partners for trade of goods with the EU in 2017, with a focus on Turkey.

Figure 8-1: Top 20 import and export partners for trade of goods with the EU in 2017, with a focus on Turkey

(EUR billion)

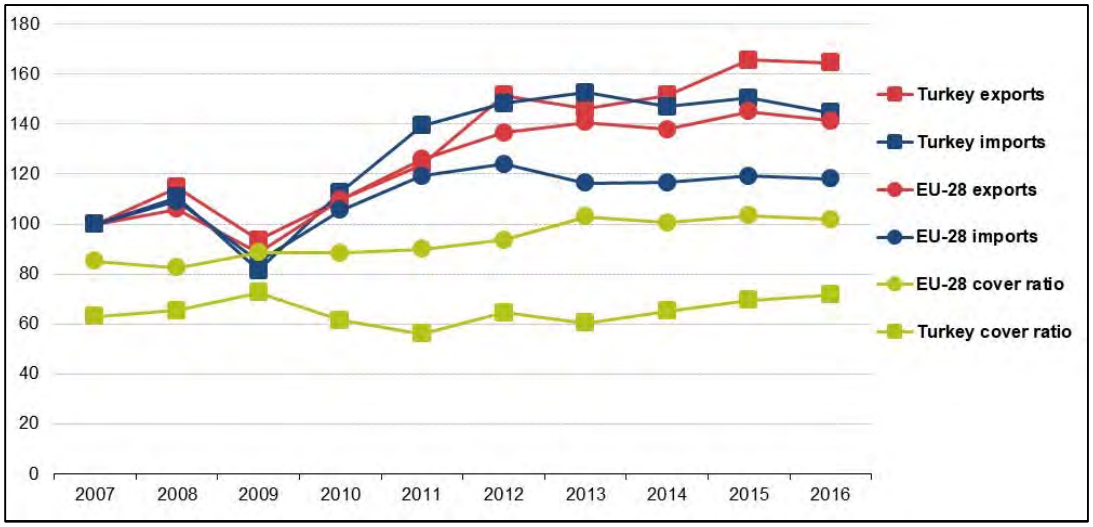


Source: Eurostat.

The figure shows Turkey was the 5th largest export partner (85 billion EUR) and 6th largest import partner (70 billion EUR) for the EU in 2017.

The next figure focuses on the evolution of trade in goods in the EU and Turkey over the period 2007 – 2016. From 2007 to 2012 imports and exports of goods for both economies developed in similar fashion, with a low point in 2009 followed by a recovery. Between 2012 and 2016 there were alternating years of growth and decline in both economies' imports and exports. Over the whole period 2007 – 2016, Turkish exports (+ 65 percentage points) grew 20 percentage points more than its imports (+ 45 percentage points) which helped to increase its cover ratio from 63 % to 72 %. Although the EU's exports (+ 41 percentage points) grew less than Turkish exports the EU's cover ratio went from 85 % in 2007 to 102 % in 2016 because its imports (+ 18 percentage points) increased far less than its exports.

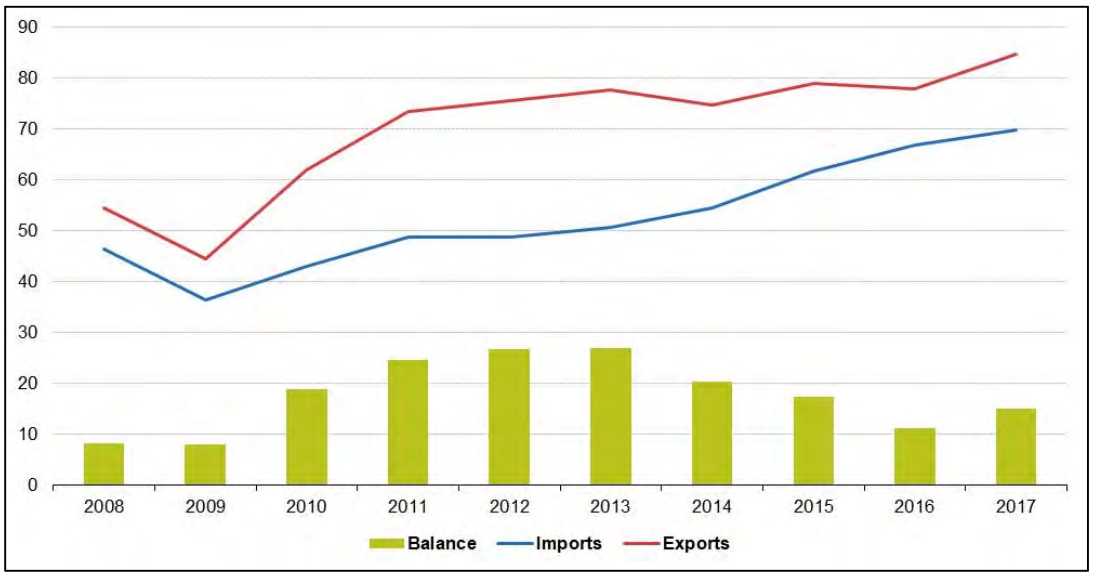
Figure 8-2: Evolution of trade in goods of the EU-28 and Turkey (2007 = 100) and cover ratio (%), 2007 – 2016



Note: While the trade balance provides information on the absolute value of trading positions, the cover ratio provides a relative measure that is based on the ratio (expressed in percentage terms) between the value of exports and the value of imports; if exports are higher than imports then the cover ratio will be above 100.
Source: Eurostat.

The EU recorded a trade in goods surplus with Turkey from 2008 to 2017 (see next figure). In this time span, trade in goods between the two economies hit a low in 2009, but subsequently recovered and continued to grow. From 2009 to 2013 exports grew more strongly than imports, resulting in a trade surplus peak of 27 billion EUR in 2013. After that, imports grew more strongly, causing the trade surplus to fall to 11 billion EUR in 2016 before recovering somewhat in 2017, when it stood at 15 billion EUR.

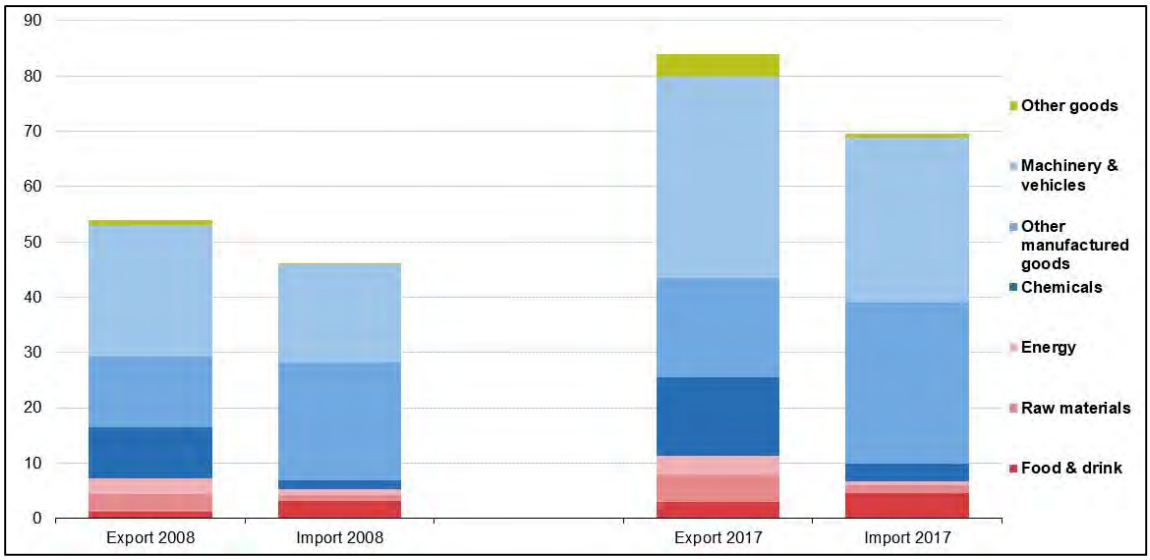
Figure 8-3: Imports, exports and balance for trade in goods between the EU and Turkey, 2008 – 2017 (in billion EUR)



Source: Eurostat.

When breaking down imports and exports by SITC groups (standard international trade classification), the main categories driving the exports from the EU to Turkey were 'Machinery and vehicles' (43 %), 'Other manufactured goods' (21 %) and 'Chemicals' (17 %) in 2017 (see next figure). Together these manufactured goods accounted for 81 % of exports from EU to Turkey in 2017. In imports the share of manufactured goods was 89 %, but here 'Machinery and vehicles' (43 %) and 'Other manufactured goods' (42 %) had almost equal shares. The share of 'Chemicals' (5 %) was much smaller than in exports.

Figure 8-4: EU-28 exports to and imports from Turkey by product group, 2008 and 2017 (in billion EUR)



Source: Eurostat.

Table 8-2: EU-28 exports to and imports from Turkey by product group, 2008 and 2017 (in billion EUR)

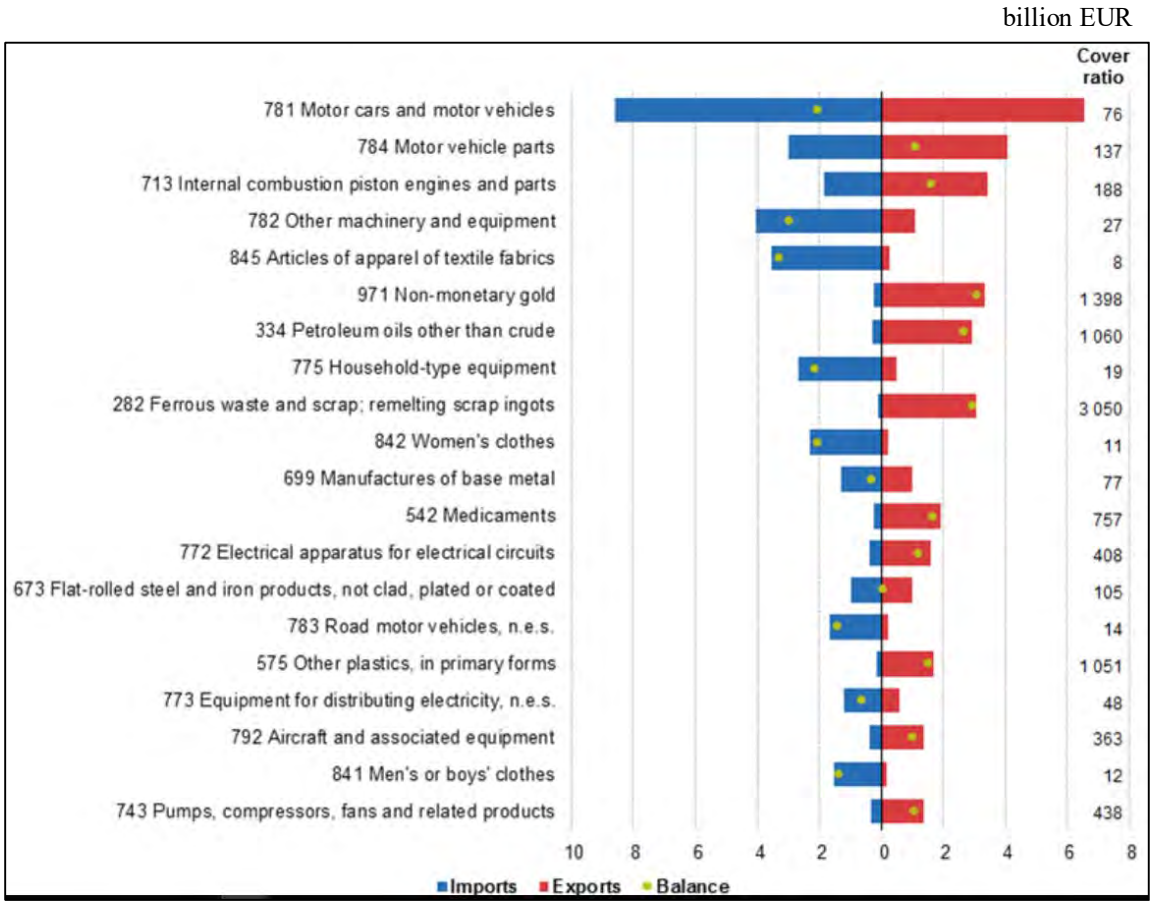
	Billion EUR		Billion EUR		Share by product group		Share by product group	
	Export 2008	Import 2008	Export 2017	Import 2017	Export 2008	Import 2008	Export 2017	Import 2017
Food & drink	1,2	3,2	2,9	4,6	2,2	6,8	3,5	6,6
Raw materials	3,3	1,0	5,1	1,5	6,1	2,2	6,0	2,1
Energy	2,7	1,1	3,3	0,6	4,9	2,4	3,9	0,9
Chemicals	9,2	1,6	14,2	3,2	17,0	3,5	16,8	4,7
Other manufactured goods	12,8	21,4	18,0	29,0	23,5	46,1	21,3	41,6
Machinery & vehicles	23,8	17,7	36,3	30,0	43,7	38,2	42,8	42,9
Other goods	0,9	0,2	4,1	0,6	1,6	0,4	4,8	0,8
Total	**54,5**	**46,3**	**84,7**	**69,7**	**100,0**	**100,0**	**100,0**	**100,0**

Source: Eurostat.

The following figure gives more details about the goods exchanged between the EU and Turkey, showing the top 20 traded goods, which accounted for almost half of total traded goods in 2017. Half of the products among the top 20 belong to the 'Machinery & vehicles' group, five to 'Other manufactured goods', two to 'Chemicals' and one each from 'Raw materials', 'Energy' and 'Other goods'.

Another interesting way to look at the data is to investigate the export/import ratio of traded goods, in order to better identify the direction taken by flows and specialisation between the two areas. For the top product, 'motor cars and vehicles', the cover ratio of 76 indicates that the value of EU exports is equal to 76 % of the value of imports. For the second product, 'motor vehicle parts', the ratio of 137 shows the reverse: exports are higher than imports. Both ratios are still relatively close to 100 indicating substantial trade flows in both directions. There are also products with very low ratios, such as 'articles of apparel of textile fabrics', 'women's clothes' and 'men's or boys' clothes' with ratios of 8, 11 and 12, respectively. Here the trade flow consists mostly of imports into the EU. Examples of very high ratios are found in 'ferrous waste and scrap' and 'non-monetary gold'.

Figure 8-5: Most traded goods with Turkey, top 20 products, 2017



Note: While the trade balance provides information on the absolute value of trading positions, the cover ratio provides a relative measure that is based on the ratio (expressed in percentage terms) between the value of exports and the value of imports; if exports are higher than imports then the cover ratio will be above 100.
Source: Eurostat.

The next figure shows EU member states' imports of goods from Turkey and the share of Turkey in national extra-EU imports. The following figure provides similar information but concerning EU member states' exports of goods to Turkey.

There were three (3) EU member states whose imports of goods from Turkey in 2017 were higher than 8 billion EUR: Germany (13,9 billion EUR), the UK (8,4 billion EUR) and Italy (8,3 billion EUR). More than one fifth of Bulgaria's extra-EU imports (21 %) came from Turkey. Slovenia (19 %) and Romania (16 %) also had high shares, while all other EU member states had shares below 6 %.

Figure 8-6: Imports of goods from Turkey by EU member states, 2017

	EUR million	% of Turkey in extra-EU imports
Germany	13.881	4,0
United Kingdom	8.382	3,1
Italy	8.301	5,2
France	6.448	3,9
Spain	5.951	4,7
Belgium	4.519	3,6
Netherlands	3.807	1,4
Romania	3.013	16,5
Poland	2.082	3,6
Bulgaria	1.860	20,8
Slovenia	1.841	18,8
Austria	1.570	4,4
Greece	1.433	5,9
Sweden	1.192	3,0
Czech Republic	1.032	3,3
Hungary	977	4,3
Denmark	885	3,6
Portugal	664	4,1
Ireland	381	1,4
Finland	354	2,0
Slovakia	335	2,3
Croatia	283	5,8
Lithuania	162	1,9
Malta	96	4,9
Latvia	94	2,9
Estonia	93	3,3
Cyprus	92	2,8
Luxembourg	17	0,5

Source: Eurostat.

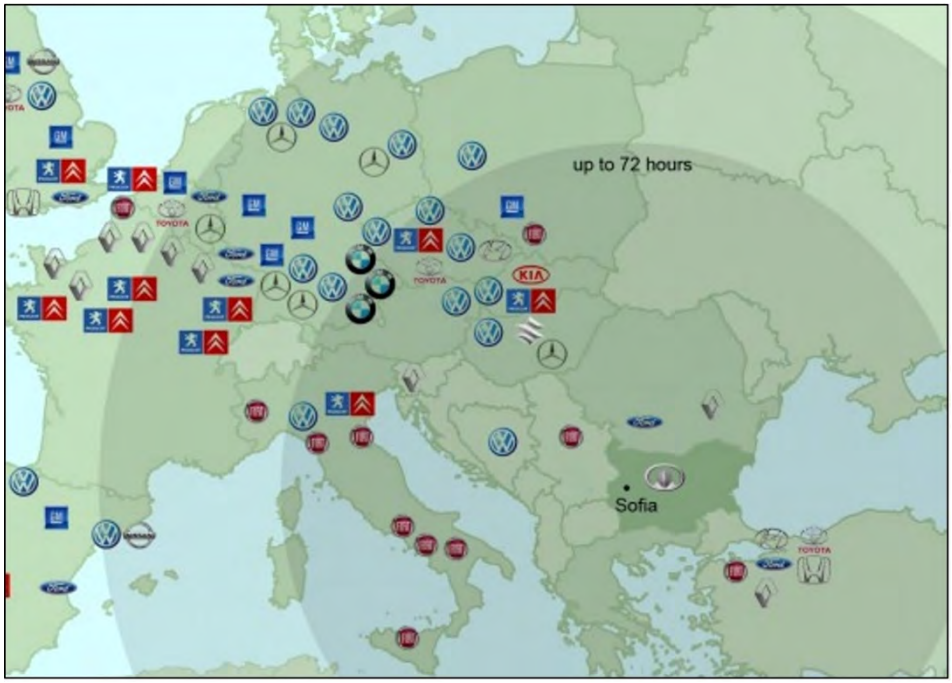
Figure 8-7: Exports of goods to Turkey by EU member states, 2017

	EUR million	% of Turkey in extra-EU exports
Germany	21.810	4,1
Italy	10.094	5,1
United Kingdom	8.446	4,1
France	6.746	3,5
Netherlands	6.542	4,6
Spain	5.730	6,0
Belgium	5.269	5,0
Poland	2.928	7,0
Romania	2.091	13,8
Bulgaria	2.059	23,1
Czech Republic	2.021	7,8
Greece	1.953	14,6
Hungary	1.698	8,9
Sweden	1.458	2,6
Austria	1.371	3,2
Denmark	760	2,2
Finland	756	3,1
Slovakia	710	6,6
Ireland	508	0,9
Lithuania	390	3,5
Portugal	389	2,7
Slovenia	324	3,9
Croatia	207	4,1
Latvia	175	4,3
Estonia	172	4,7
Luxembourg	114	5,2
Malta	14	1,4
Cyprus	3	0,2

Source: Eurostat.

Turkey has many automotive enterprises, that produced cars. Many EU and Asian enterprises have factories in Turkey. The next figure presents the automotive industry in Europe.

Figure 8-8: European automotive industry



Source: http://www.investbg.government.bg/en/sectors/facts-17.html, modified by Prometni Institut Ljubljana, d.o.o.

8.2.2 China-EU international trade

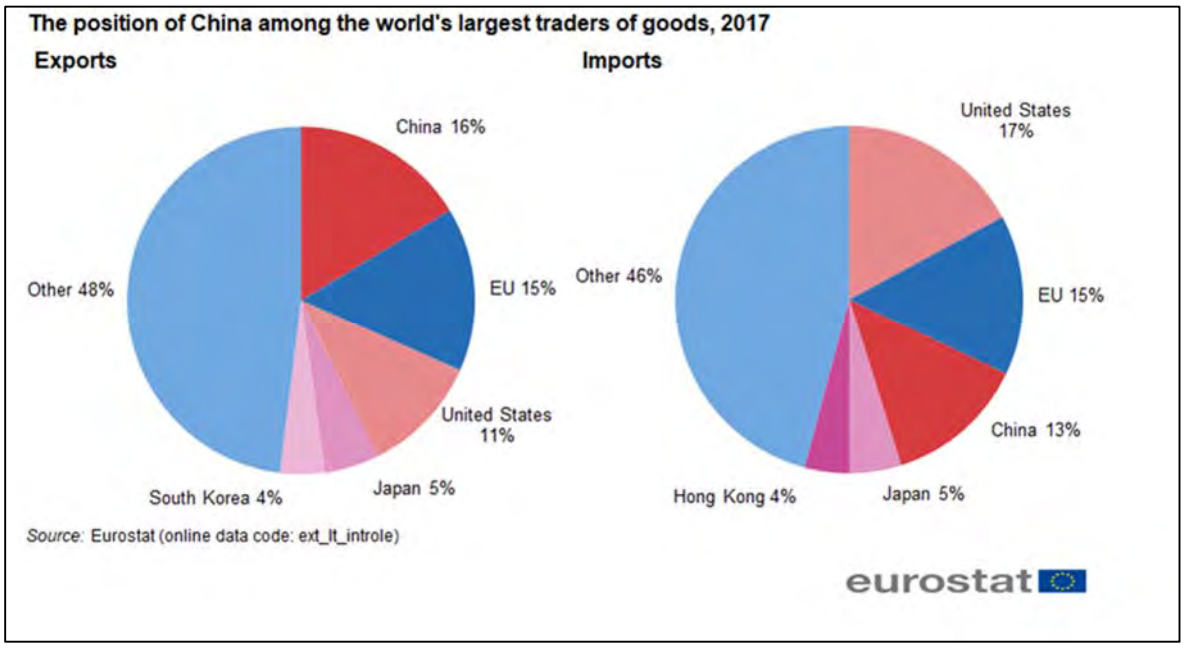
This subchapter provides a picture of the international trade in goods between the EU and China.

Overview:

- In 2017, China was the largest exporter and the 3rd largest importer in the world.
- In 2018, China (11 %) was the 2nd largest partner for EU exports of goods and the largest partner for EU imports of goods (20 %).
- Among the EU member states, the Netherlands was the largest importer of goods from China and Germany was the largest exporter of goods to China in 2018.

The next figure shows the world largest traders. China (2.004 billion EUR, 16 %) was the largest exporter in the world, followed by the EU (1.879 billion EUR, 15 %), the United States (1.368 billion EUR, 11 %), Japan (618 billion EUR, 5 %) and South Korea (508 billion EUR, 4 %). China (1.632 billion EUR, 13 %) was the third largest importer in the world, preceded by the United States (2.131 billion EUR, 17 %) and the EU (1.857 EUR billion, 15 %) and followed by Japan (594 billion EUR, 5 %) and Hong Kong (522 billion EUR, 4 %).

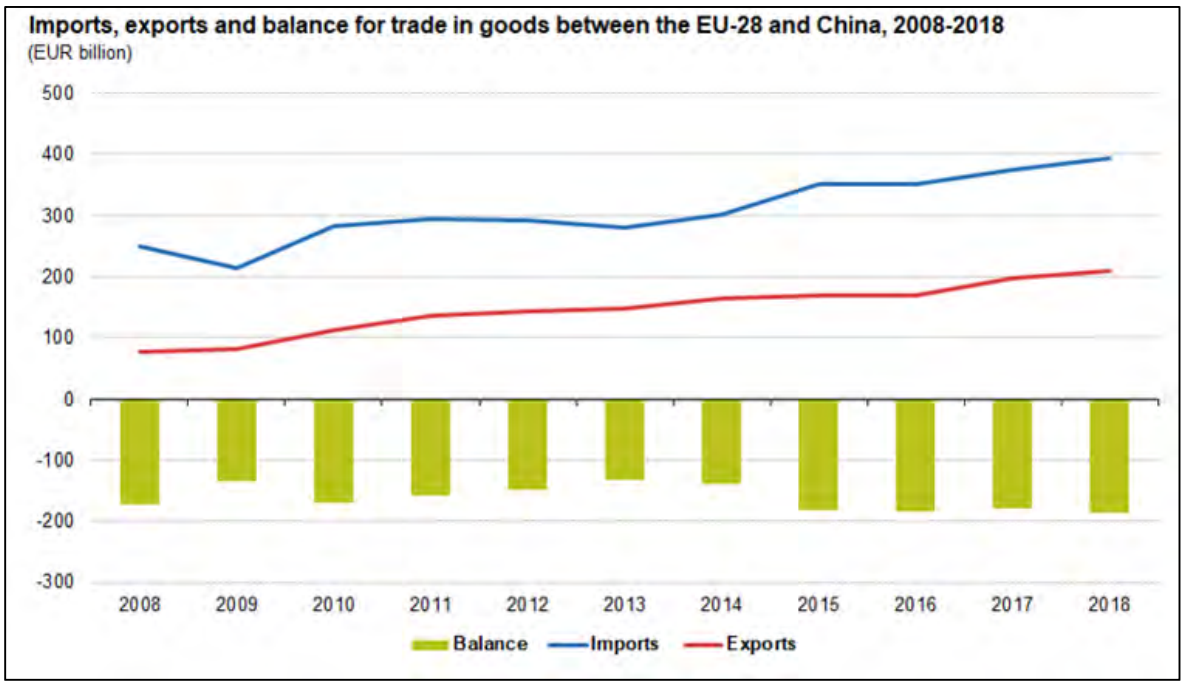
Figure 8-9: The position of China among the world's largest traders of goods, 2017 (%)



Source: Eurostat.

The next figure shows the exports, imports and trade balance between the EU and China. In 2008 the EU had a trade deficit with China of 171 billion EUR. There remained a deficit throughout the whole period, reaching 185 billion EUR in 2018. EU exports to China were highest in 2018 (210 billion EUR) and lowest in 2008 (78 billion EUR). EU imports from China were highest in 2018 (395 billion EUR) and lowest in 2009 (215 billion EUR).

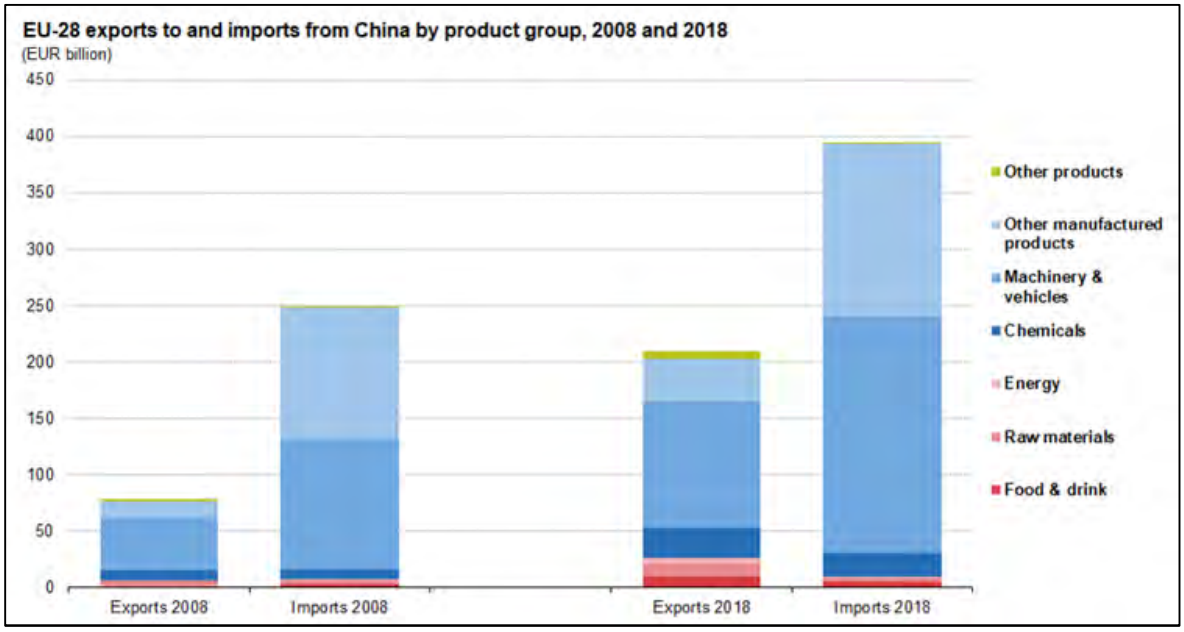
Figure 8-10: Imports, exports and balance for trade in goods between the EU-28 and China, 2008 – 2018 (in billion EUR)



Source: Eurostat.

The following figure shows the breakdown of EU trade with China by SITC groups. In 2018, EU exports of manufactured goods (84 %) had a higher share of total trade than primary goods (12 %). The most exported manufactured goods were 'Machinery & vehicles' (53 %), followed by 'Other manufactured products' (18 %) and 'Chemicals' (13 %). In 2018, EU imports of manufactured goods (97 %) also had a higher share than primary goods (2 %). The most imported manufactured goods were 'Machinery & vehicles' (53 %), followed by 'Other manufactured products' (39 %) and 'Chemicals' (5 %).

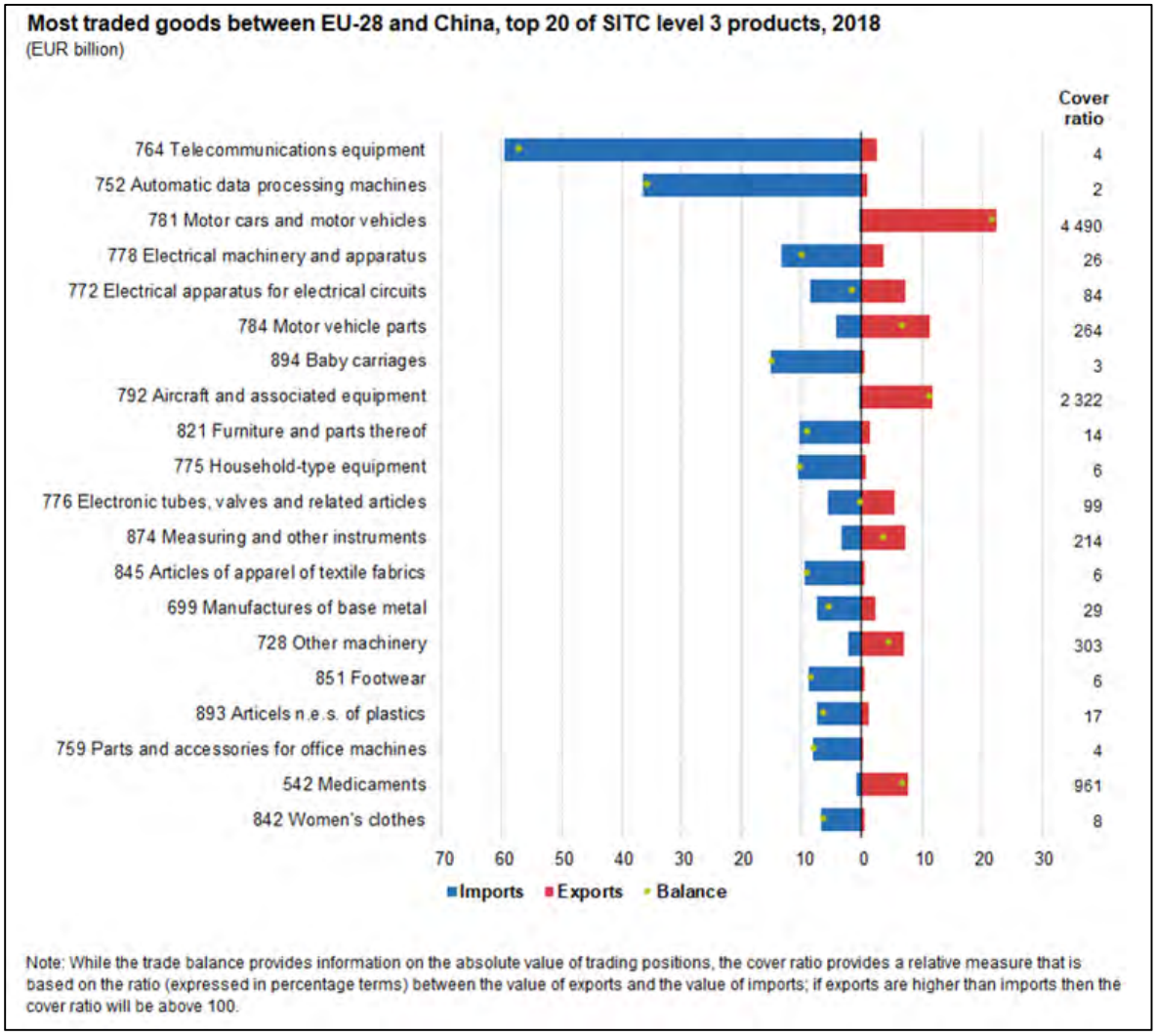
Figure 8-11: EU-28 exports to and imports from China by product group, 2008 and 2018 (in billion EUR)



Source: Eurostat.

Another interesting way to look at the data is to investigate the cover ratio (exports / imports) of traded goods, showing the direction of the trade flows between the two economies. These ratios can be found in the right-hand margin of the next figure. Twelve products have cover ratios below 50, indicating EU imports from China are at least twice as large as EU exports to China. Six products have ratios above 200, indicating EU exports to China are at least twice as large as EU imports from China. Two products have ratios between 50 and 200, showing more balanced trade.

Figure 8-12: Most traded goods between EU-28 and China, top 20 of SITI level 3 products, 2018 (in billion EUR)



Source: Eurostat.

9 POSSIBILITIES TO SHIFT CARGO FROM ROAD TO RAIL

Many railway technologies make it possible to shift the cargo from road transport to rail transport. The cargo volume could be transported in containers, swap bodies or heavy goods vehicles.

Intermodal freight transport involves the transportation of freight in an intermodal container or vehicle, using multiple modes of transportation (e.g., rail, ship, and truck), without any handling of the freight itself when changing modes.

Combined transport is a form of intermodal transport, which is the movement of goods in one and the same loading unit or road vehicle, using two or more modes of transport successively without handling the goods while changing modes. Combined transport is intermodal transport where the major part of the journey is by rail, inland waterway or sea, and any initial and/or final legs carried out by road are as short as possible

9.1 COMBINED TRANSPORT

European combined transport saw a year of robust growth in 2017: the total number of consignments transported by UIRR operator members increased by +5,5 %, whereas output when expressed in tonne-kilometres grew by +8,7 %. Cross-border services expanded by +8,83 %, while domestic services grew by +7,93 %. Within the cross-border relations, the extra-EU – transcontinental – services expanded by 38 %, while intra-European traffic saw +5 % growth[15].

Table 9-1: EU combined transport volume in the years 2016 and 2017

	Cross-border			Domestic			Total		
	2016	2017	2017/2016	2016	2017	2017/2016	2016	2017	2017/2016
Number of consignments	2,075,709	2,153,563	3.75%	949,151	1,037,008	9.26%	3,024,860	3,190,571	5.48%
containers	1,559,213	1,651,506	5.92%	860,373	954,711	10.96%	2,419,586	2,606,217	7.71%
(craneable) semi-trailers	391,389	372,826	-4.01%	79,146	73,453	-7.19%	470,535	446,279	-5.15%
complete trucks (RoLa)	125,107	129,231	3.30%	9,632	8,844	-8.18%	134,739	138,075	2.48%
Average distance	1,067	1,120	5.00%	491	492	0.20%	878	944	7.48%
Billion tkm	50.26	54.70	8.83%	8.70	9.39	7.93%	58,96	64.09	8.70%
Number of TEU	4,151,418	4,307,126	3.75%	1,898,301	2,074,015	9.26%	6,049,719	6,381,141	5.48%

Source: UIRR Report: European road-rail combined transport 2017-18.

The transport of complete trucks, or Ro-La (accompanied combined transport), once over 12 % of total combined transport traffic, has halved in its weight, while the proportion of consignments utilising a craneable semi-trailer increased to about 14 % by 2017. The

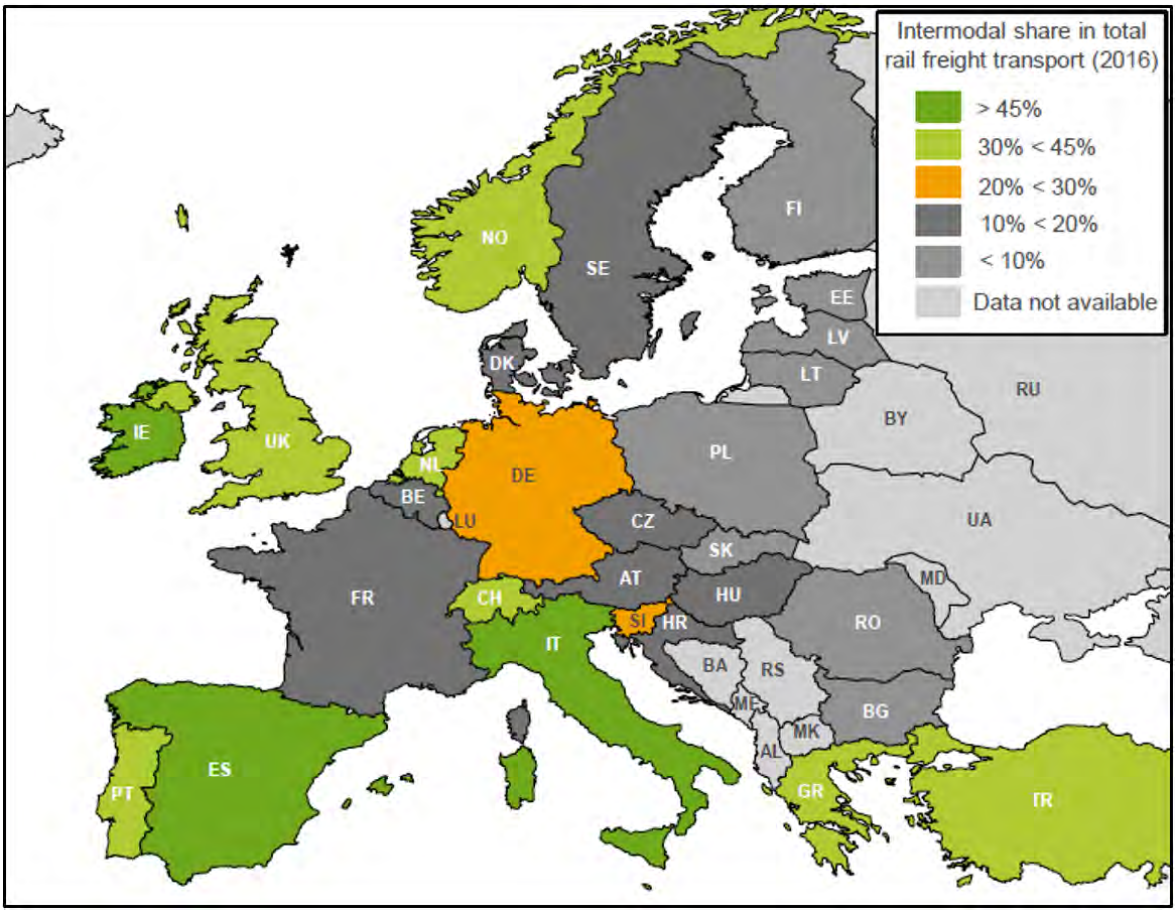
[15] Source: UIRR Report: European road-rail combined transport 2017 – 2018.

proportion of containers and swap bodies continues to grow, with about 82 % of all UIRR consignments.

The most important routes of unaccompanied combined transport are the ones connecting Northwest Europe with South Europe (transalpine corridors with more than 50 % of the total volume). Ro-La is focused on transalpine routes. Traffic is dynamically developing based on Western-Eastern relations, and even more within the Eastern countries and along the intercontinental routes towards China, Russia and Turkey[16].

The next figure shows the intermodal share of railway transport in Europe.

Figure 9-1: Intermodal share of rail freight transport in Europe



Source: Eurostat (2018), last database update by Eurostat: November 14, 2018, BSL Transportation analysis, modified by Prometni Institut Ljubljana, d.o.o.

[16] Source: UIRR Report: European road-rail combined transport 2017-18

The highest share of rail intermodal transport on the AWB RFC route is seen in Slovenia, with 20 – 30 % of all freight transport.

The next table presents domestic unaccompanied container transport by EU state in TEU units and tonnes.

Table 9-2: Development of domestic unaccompanied container transport per EU member state

Country	TEU			Tonnes		
	2015	2017	development (2015-2017)	2015	2017	development (2015-2017)
Austria	400.993	455.234	13,5 %	4.409.791	6.220.536	41,1 %
Bulgaria	32.834	5.224	-84,1 %	330.059	52.501	-84,1 %
Croatia	40.231	29.223	-27,4 %	269.633	287.332	6,6 %
Germany	3.334.870	4.141.373	24,2 %	35.629.640	41.377.684	16,1 %
Serbia	13.892	13.892	0,0 %	138.922	138.922	0,0 %
Slovenia	66.836	95.637	43,1 %	508.756	1.028.293	>100 %

Source: BSL transportation analysis, UIRR.

The highest increases were in Slovenia, Germany and Austria, while falls in container transport were seen in Bulgaria and Croatia.

The next table shows railway container transport (TEU) in EU member states and Turkey. The states along the AWB RFC are highlighted.

Table 9-3: Railway container transport (TEU)

Year	2011	2012	2013	2014	2015	2016	2017
Austria	1.356.994	1.278.267	1.237.076	1.296.064	1.445.960	1.532.708	1.725.083
Bulgaria	51.387	53.272	63.725	35.419	37.807	46.527	35.580
Croatia	44.214	37.744	41.299	40.792	34.115	N/A	N/A
Czech	1.111.464	1.157.228	1.274.125	1.336.973	1.476.907	1.548.782	1.492.392
Germany	5.921.037	6.228.484	6.456.060	6.272.430	5.979.035	6.349.050	6.065.056
Greece	65.175	N/A	N/A	39.730	50.657	39.265	N/A
Hungary	52.752	386.746	519.480	448.166	651.093	736.798	458.169
Italy	563.196	752.433	767.503	789.217	710.969	730.452	811.785
Romania	125.372	91.465	61.474	54.995	99.737	95.561	102.468
Serbia	N/A	N/A	N/A	N/A	N/A	N/A	8.467
Slovakia	585.669	526.643	593.281	636.652	621.315	618.227	610.941
Slovenia	385.194	395.945	390.507	398.621	458.449	477.693	509.652
Turkey	659.004	707.989	814.981	891.605	713.504	789.761	N/A

Source: https://stats.oecd.org/

9.2 TRANSPORT BETWEEN TURKEY AND THE EU

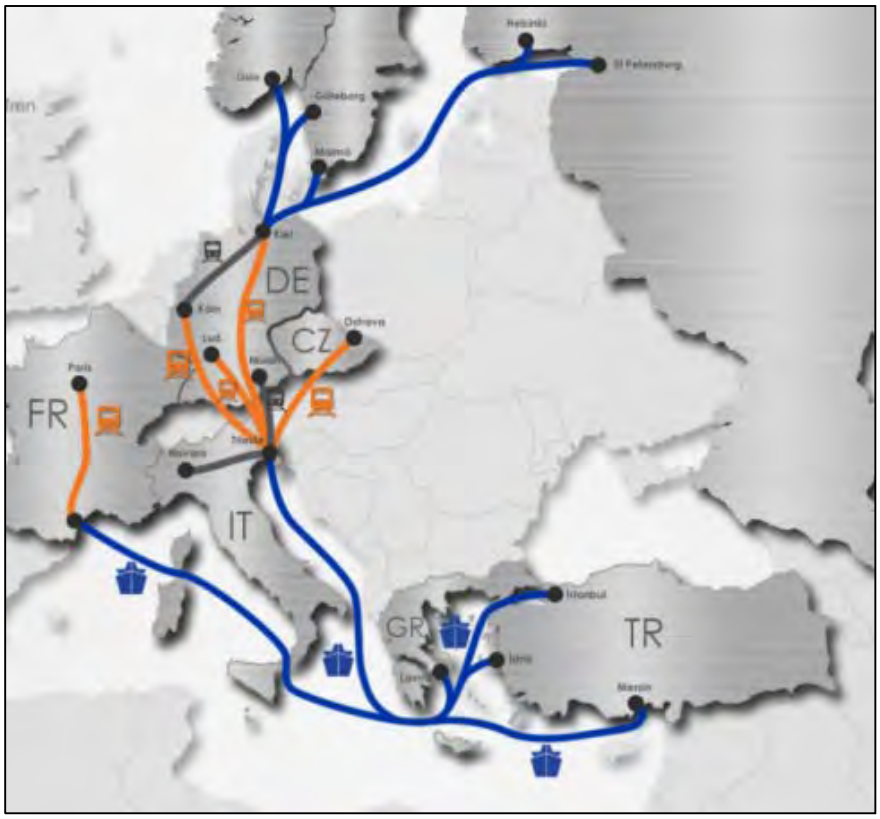
The most popular road transport routes from/to Turkey (import/export) for full truck loads are those in Germany, Poland, Hungary, Slovakia, Austria, the Czech Republic, Russia, Italy, the UK and Romania.

Turkey's biggest European intermodal rail freight operators are[17]:

- Ekol Logistics
- Rail Cargo Group
- UN Ro-Ro and
- Europe Intermodal (Kombiverkehr)

Ekol Logistics was amongst the first to introduce roll on-roll off services to Europe. Beginning with maritime routes, through the Aegean and Mediterranean, Ekol then moves loads onto their own dedicated block trains at Sète, France and Trieste, Italy. Ekol employs in excess of 120 containers for its rail fleet – allowing the brand to grow its intermodal, Europe-facing, freight volumes by 20 % in 2016.

Figure 9-2: Ekol Logistics



Source: https://railturkey.org/2017/05/10/turkey-europe-intermodal-lines/

[17] Source: http://www.transport-exhibitions.com/Market-Insights/Turkey-and-Eurasia/Turkey-Europe-rail-freight-intermodal

Rail Cargo Group (RCG) is unique in this list of intermodal rail operators in that it is the only one running rail services directly out of Turkey. In 2017 the company expanded its European services with the introduction of some new rail routes.

In 2018 Rail Cargo Group was the only operator still offering intermodal rail freight services between Europe and Turkey. It currently runs a return Sopron-Halkali service about six times each week on RFC 4 via Romania and Bulgaria, with all traction supplied in-house as far as to Kapikule at the Turkish border (with a transit time of 85 hours) – through the carrier services of RCG[18].

In December 2016, RCG was running a thrice-weekly service from Sopron in Hungary to Istanbul's Halkali station. It now also has a Poland-Budapest-Istanbul route. BILK terminal in Budapest, a central component of this new line, offers RCG a wide range of onward connections to other points in its network – including Germany's Ruhr Valley and the entirety of Romania.

RCG will also be teaming up with the Turkish state rail operator TCDD to achieve a greater share of railway cargo in the nation's transport and logistics mix. Privatisation is one of the key trend's shaping Turkish rail, so RCG might soon become one of Turkey's first, private rail operators.

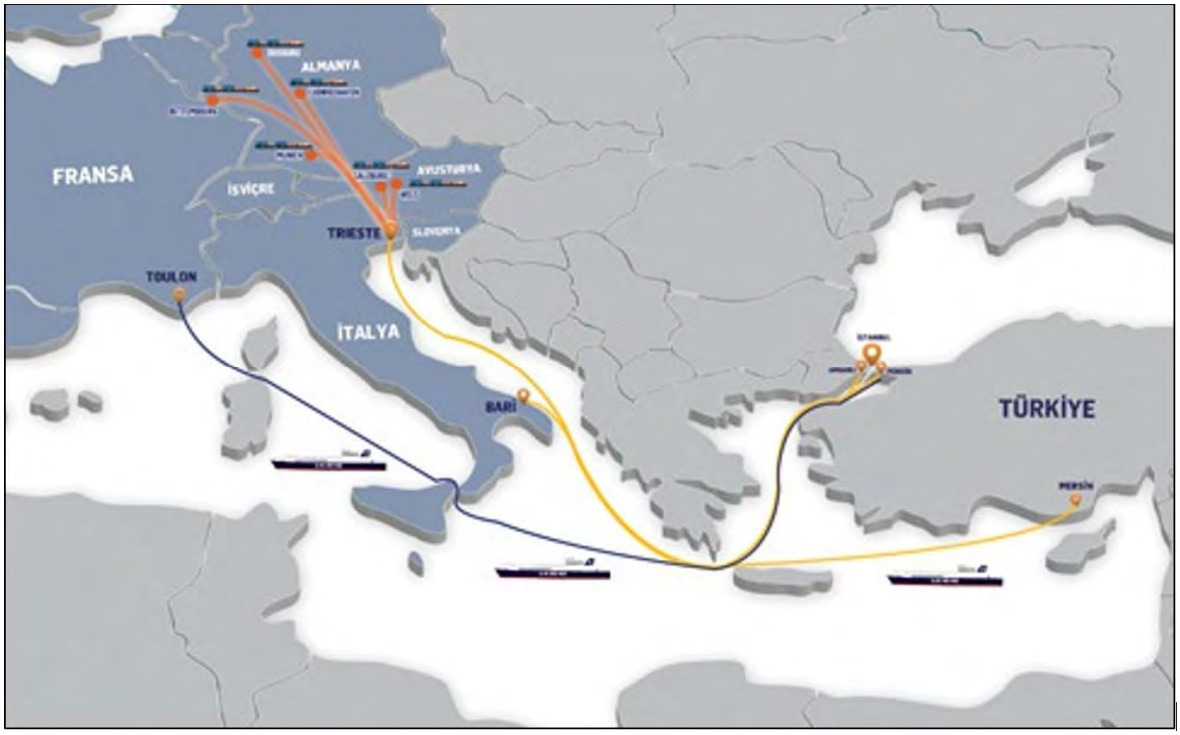
UN Ro-Ro are specialists in roll on-roll off services, UN Ro-Ro claims it has the "largest intermodal infrastructure between Europe and Turkey". It has been involved in intermodal transport, including operation of its own train fleet, since at least 1998.

Like Ekol Logistics, UN Ro-Ro's rail network begins proper in mainland Europe. It employs a number of lines, which gives it reach into Luxembourg, Germany, Austria, and Italy. At the ports of Trieste-Fernetti, port/dry port cargoes are loaded onto UN wagons for their journey across the continent.

In 2015 UN Ro-Ro operated with the 1.104 sailings between ports in Turkey and the Mediterranean (Italy), carrying 28.000 TEUs and using 2.139 freight trains.

[18] Source: http://www.oevz.com/en/news-en/rail-cargo-operator-adds-services-to-and-from-turkey/

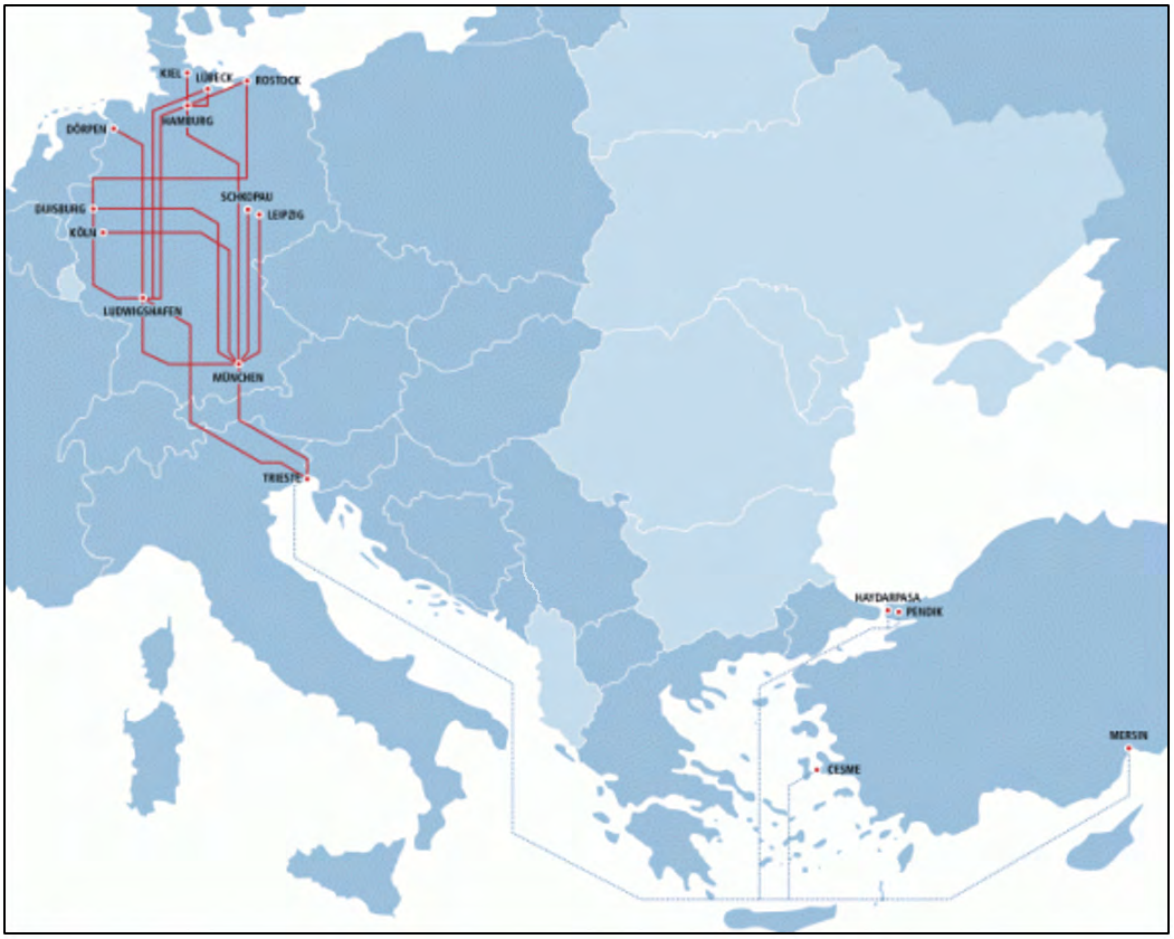
Figure 9-3: UN Ro-Ro



Source: https://railturkey.org/2017/05/10/turkey-europe-intermodal-lines/, modified by Prometni Institut Ljubljana, d.o.o.

Europe Intermodal (Kombiverkehr): Trieste is the only real port of call for intermodal transport from Turkey. Germany's Kombiverkehr, under its Europe Intermodal flag, runs the majority of its 30-train fleet from there. Kombiverkehr operates out of a number of Turkish terminals, including the ports of Ambarli, Haydarpasa, Pendik, Mersin, Alsancak, and Cesme. Mirroring Ekol and UN Ro-Ro, Kombiverkehr relies on maritime transport before switching to rail to carry its loads on European networks.

Figure 9-4: Europe Intermodal (Kombiverkehr)

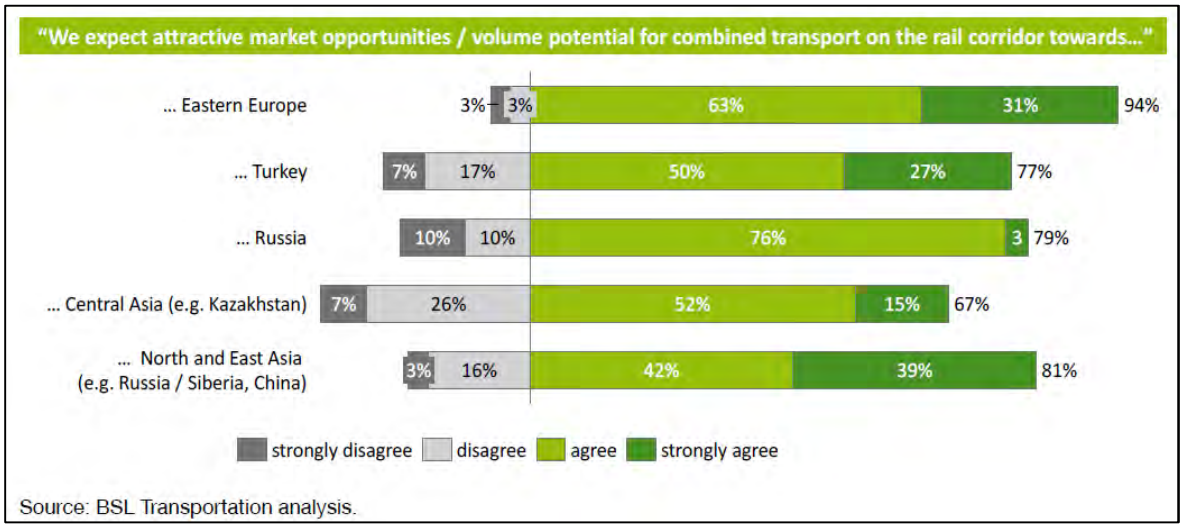


Source: https://railturkey.org/2017/05/10/turkey-europe-intermodal-lines/, modified by Prometni institut Ljubljana, d.o.o.

In view of the geographical focus of future combined transport (CT) development towards the East, the estimated prospects are very positive. The 2018 survey participants expect attractive market opportunities and volume potential for CT particularly on the corridor towards Eastern Europe and North and East Asia. But also the future expectations for CT activities to Turkey, Russia and Central Asia are optimistic, as shown in the next figure[19].

[19] Source: BSL Transportation analysis, UIRR.

Figure 9-5: Expected further geographical market potential for combined transport



9.3 HGV TRANSPORT BETWEEN TURKEY AND THE EU

A total of 45 % of Turkey's trade with the EU in 2013 was carried by road. This share, which has been relatively stable, is higher than road's share of Turkey's global trade (23 % by value of overall trade in 2013, down from 37 % in 2000). In tonnes, the road share is 22 % for imports and 12 % for exports. Turkey's trade with other regions has been growing much faster than its trade with the EU, in particular over the last five years. The balance of road freight trade varies across the EU member states. Germany, France and Italy export a higher volume of goods by road to Turkey than they import. Bulgaria, Romania and Poland import more by road from Turkey than they export[20].

Ro-Ro services have become established as an environmentally and economically efficient alternative to road for moving goods to and from Turkey. This type of service was originally developed by Turkish operators and ship owners to bypass the troubles in the Western Balkans in the 1990s. Nowadays these services are used to avoid transit through countries that impose limitations on Turkish hauliers, such as restrictions on the number of transit permits (e.g. Hungary, Slovenia, and Romania)[21].

The first ro-ro services ran between Turkey and Trieste in the North Adriatic sea but there are now also services between Turkey and Toulon in the south of France (from Toulon the trailer and semitrailers must be moved by French hauliers). These services are operated by Turkish ship owners and are almost entirely used by Turkish truck operators. For the Italian service, the trailer or semitrailer is stowed on the ferry in Turkey and the drivers and tractors

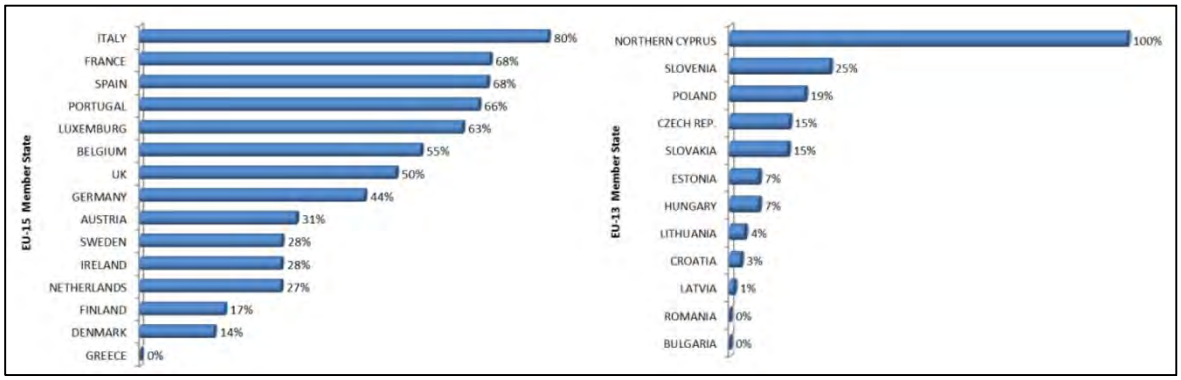
[20] Source: ICF International; Study on the economic impact of an agreement between the EU and the Republic of Turkey, October 2014

[21] Source: ICF International; Study on the economic impact of an agreement between the EU and the Republic of Turkey, October 2014

pick up the load in the port of Trieste. This system is now used by Turkish operators for more than 40 % of the trips between the EU and Turkey.

The following charts present the ro-ro share of road freighted trade between EU MS and Turkey. For important partners such as Germany, the UK and Belgium, ro-ro is part of a system of multimodal transport implying a ro-ro stretch heading in Trieste/Toulon combined with road transport for the intra-EU portion.

Figure 9-6: Ro-Ro's share of Turkey-EU trips by Turkish vehicles in 2013



Source: ICF International; Study on the economic impact of an agreement between the EU and the Republic of Turkey, October 2014, UND data

An estimate of the scale of road freight traffic taking account of both road-only and ro-ro movements has been made for this study and is shown in the next table. The number of trips is derived from data provided by the Turkish authorities. The tonnage estimates are based on an assumed load factor of 18 tonnes/vehicle. It suggests that road freighted imports from Turkey to the EU exceed exports in tonnage terms.

Table 9-4: Tonnage transported between EU and Turkey via road and ro-ro services

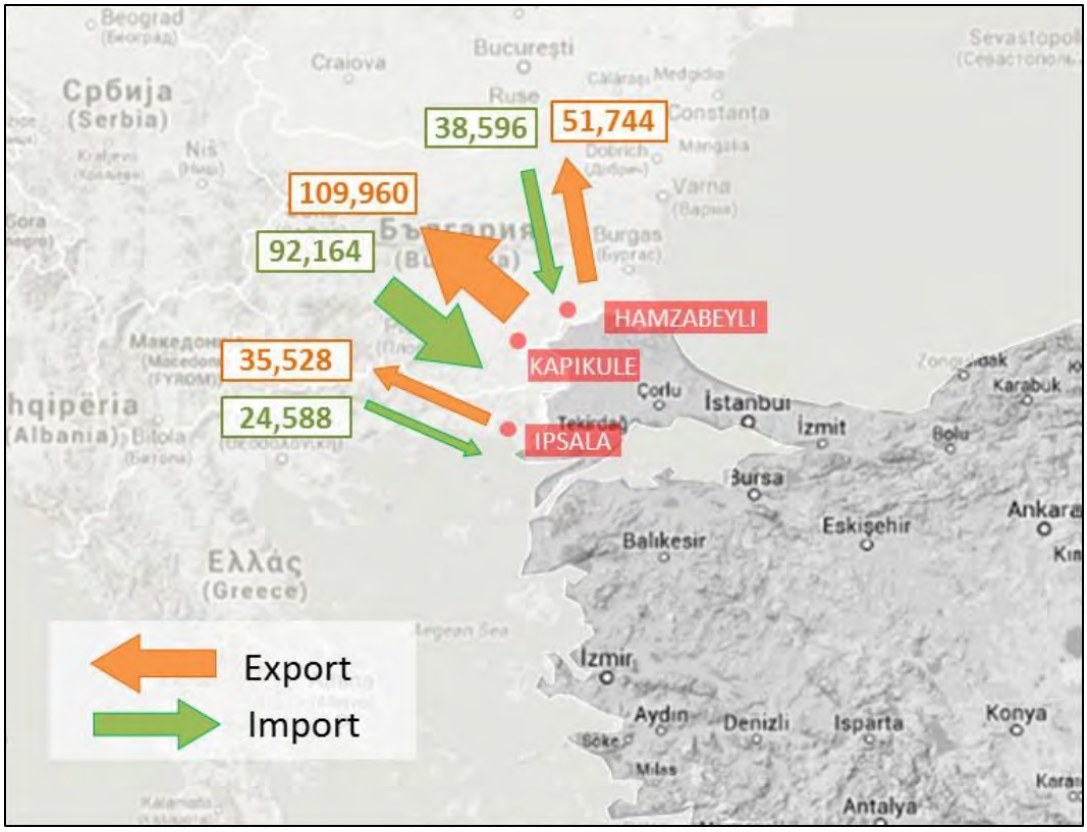
	Turkey - EU28 flows			**EU28 - Turkey flows**		
	Trips					
	Turkish Vehicles			**Turkish Vehicles**		
2010	296.691	126.297	**422.988**	248.751	96.553	**345.304**
2011	297.334	140.211	**437.545**	263.848	117.802	**381.650**
2012	297.648	138.023	**435.671**	267.325	110.726	**378.051**
2013	291.159	144.108	**435.267**	267.300	118.826	**386.126**
	Tonnes transported ('000) *					
	EU's IMPORTS from Turkey			**EU's EXPORTS to Turkey**		
	By Turkish		**Total**	**By Turkish**		**Total**
2010	5.340	2.273	**7.614**	4.478	1.738	**6.215**
2011	5.352	2.524	**7.876**	4.749	2.120	**6.870**
2012	5.358	2.484	**7.842**	4.812	1.993	**6.805**
2013	5.241	2.594	**7.835**	4.811	2.139	**6.950**

* 18 tonnes/truck has been assumed

Source: ICF International; Study on the economic impact of an agreement between the EU and the Republic of Turkey, October 2014, TRT analysis based on UND data

Turkey has three land border crossings with EU countries that are used by heavy goods vehicles-HGV (with Greece and Bulgaria). Data at border crossings were provided by Turkish institutions. The next figure shows the location and flows of Turkish vehicles recorded at the road border crossings towards the EU, in both Greece and Bulgaria.

Figure 9-7: HGV movements between the EU and Turkey at land borders (2013)



Source: ICF International; Study on the economic impact of an agreement between the EU and the Republic of Turkey, October 2014, Authors' analysis of UND data, modified by Prometni institut Ljubljana, d.o.o.

Data on border crossing waiting times at the Bulgarian border suggest typical wait times of around three hours. Trucks leaving Turkey to come into the EU tend to wait longer than those leaving the EU to enter Turkey. Waiting times spiked upwards during recent disputes between Turkey and Bulgaria due to roadside checks performed by Bulgarian and Turkish authorities[22].

The next table shows the volume of HGV on the route Turkey-EU-Turkey in 2013. The total for all three land border crossings represents of a share of 57 % of all HGV transported between EU and Turkey. Ro-ro ferries between Turkey and EU ports represent about 43 % of all transported trucks.

[22] Source: ICF International; Study on the economic impact of an agreement between the EU and the Republic of Turkey, October 2014

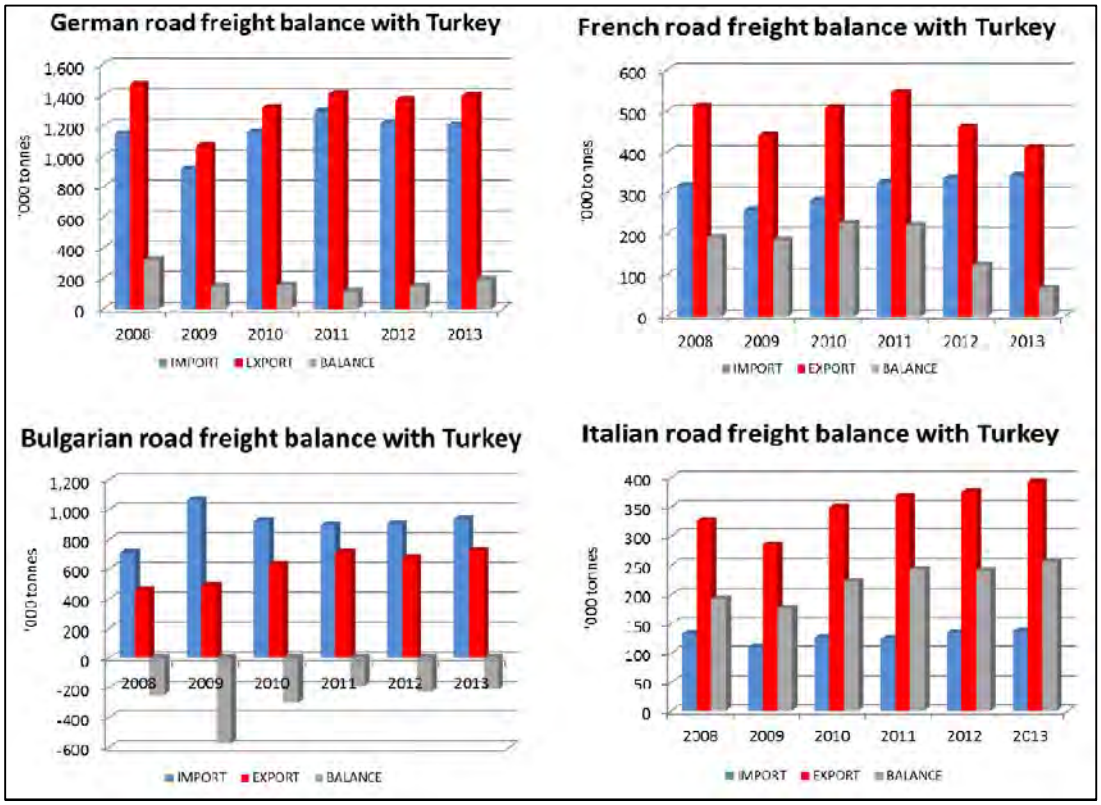
Table 9-5: Share of HGV on route Turkey-EU-Turkey in 2013

Border Gate	Turkey-EU	EU-Turkey	Total	Share (%)
İPSALA (LAND)	35.528	24.588	60.116	9,8
HAMZABEYLI (LAND)	51.744	38.596	90.340	14,7
KAPIKULE (LAND)	109.960	92.164	202.124	32,9
TEKİRDAĞ-TRIESTE (RO-RO)	1.087	300	1.387	0,2
AMBARLI-TRIESTE (RO-RO)	10.235	9.292	19.527	3,2
ÇEŞME-TRIESTE (RO-RO)	21.778	20.454	42.232	6,9
HAYDARPAŞA-TRIESTE (RO-RO)	28.066	28.271	56.337	9,2
PENDIK-TRIESTE (RO-RO)	50.794	57.918	108.712	17,7
MERSIN-TRIESTE (RO-RO)	15.718	17.431	33.149	5,4
Total	**324.910**	**289.014**	**613.924**	**100,0**

Source: ICF International; Study on the economic impact of an agreement between the EU and the Republic of Turkey, October 2014, Authors' analysis of UND data.

The next figure shows the volume of HGV between Turkey and four EU member states: Germany, France, Bulgaria and Italy. The strongest economic ties are between Germany and Turkey, followed by those with Bulgaria, Italy and France.

Figure 9-8: International road freight transport balance between Turkey and the main EU trading partners ('000 tonnes)



Source: ICF International; Study on the economic impact of an agreement between the EU and the Republic of Turkey, October 2014

Assumptions used for trip distribution between Turkey and EU for trucks (HGV)[23]

Trips to the UK:

- 90 % of traffic goes by road through Germany and Belgium
- 10 % of traffic goes through France after entering through Toulon

Trips by road to Benelux, Scandinavia, France, the UK:

- 75 % of traffic goes through Croatia, Slovenia, Austria
- 25 % of traffic goes through Hungary, Austria

Trips to Germany:

- 5 % of traffic goes through Romania, Poland and Slovakia
- 15 % of traffic goes through Romania, Hungary, Slovakia, and Czech Republic
- 26 % of traffic goes through Croatia, Slovenia, Austria
- 10 % of traffic goes through Romania, Hungary, Austria
- 44 % of traffic goes through the port of Trieste and Austria (UND data)

Trips to France:

- 38 % of traffic goes through the port of Trieste and crosses Italy
- 31 % of traffic goes by the direct ferry through Toulon
- 31 % goes by road through Austria, Germany

9.4 ACCOMPANIED RAIL TRANSPORT (RO-LA)

Accompanied combined transport is a branch of intermodal transport, which is the transport of goods only in the same loading unit or road vehicle. Combined transport is accompanied when the driver of a complete freight carrying road vehicle is accompanying that vehicle, while it is being transported using other mode of transport. In rail transportation, a rolling highway, or rolling road is a form of combined transport involving the conveying of road trucks by rail, referred to as Ro-La trains.

9.4.1 Ro-La service between Slovenia and Austria

On the east branch of the AWB RFC from Linz (A) to Zidani Most (SLO) accompanied railway transport (Ro-La) operates between the terminals Wels (AT) and Maribor (SLO). The operator is Adria Kombi. The Ro-La service has many advantages[24]:

[23] Source: ICF International; Study on the economic impact of an agreement between the EU and the Republic of Turkey, October 2014

[24] Source: www.adriakombi.si

- Restaurant/services on board
- No delays in train operation
- No road permits for Slovenia or Austria needed
- Road HGV transport during holidays and Sundays permitted
- Resting time for the drivers during the rail journey

Figure 9-9: Ro-La train at Maribor terminals (SLO)

Source: http://misko.jalbum.net/

Table 9-6: Ro-La timetable in 2019 from Maribor (SLO) to Wels (A)

		Operates	Check-In	Departure	Unloaded
Direction: Wels - Maribor					
1	41401	Mon. - Fri.	00:05	01:32	08:15
2	41403	Sat.	02:45	04:18	12:15
3	41405	Sat.	08:00	09:30	17:35
4	41407	Mon. - Sat.	16:30	18:19	00:30
5	41409	Sun.	19:30	21:41	05:15
Direction: Maribor - Wels					
1	41400	Mon.	02:15	03:53	11:20
2	41402	Tue. - Fri.	05:30	07:35	14:40
3	41404	Mon., Sat.	11:30	13:04	21:00
4	41406	Sat.	13:15	14:45	22:10
5	41408	Sun. - Fri.	20:30	21:51	04:30

Source: https://www.adriakombi.si/products/rolling-motorway/timetable

Price List in 2019 (VAT included)[25]:

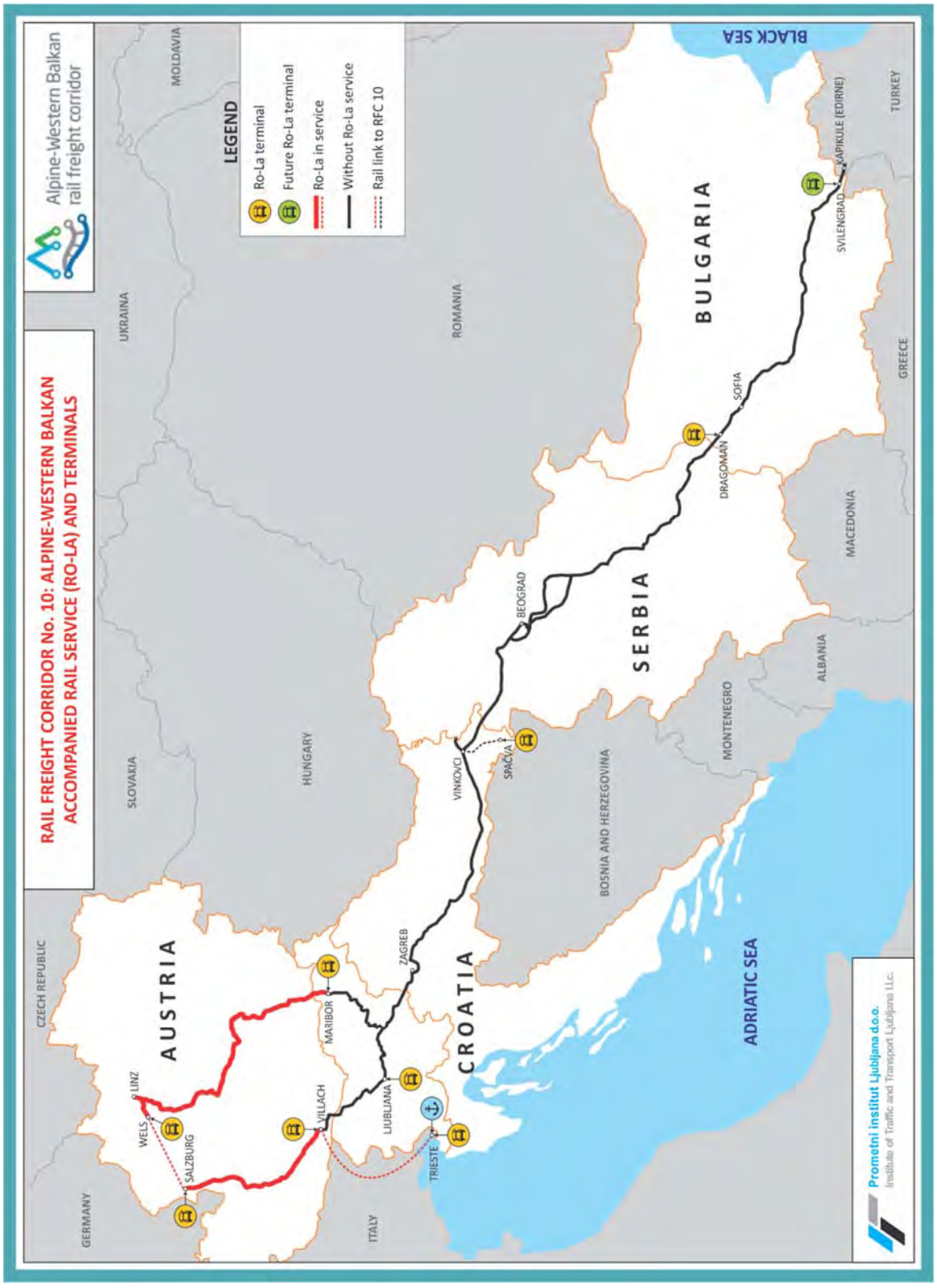
- One-way ticket - including max. 2 drivers = € 555,10
- Return ticket - including max. 2 drivers = € 1.037,00
- Discount for roundtrips - within 30 days = € 30,00 / trip
- Surcharge - ADR goods on board = € 18,30

Requirements for Ro-La service Maribor-Wels[26]:

- Maximum allowed angle height of the vehicle: 4m, maximum length: 18,75 m, maximum allowed width of the vehicle: 2,6 m.
- Maximum allowed total weight of the vehicle: 40 t, under certain conditions 44 t.
- All cargo considered prohibited or restricted may only be carried under certain conditions. (ADR).
- Goods subject to veterinary inspection cannot be dispatched in the direction from Maribor to Wels.
- Free transit between terminal Wels and German border (Suben); between terminal Maribor and Croatian border (Obrežje/Gruskovje).
- Free transit in 70 km radius from Wels terminal.
- Bonus road permits for Ro-La users.

[25] Source: www.adriakombi.si
[26] Source: www.adriakombi.si

Figure 9-10: Ro-La service and terminals along the AWB RFC



9.4.2 Other Ro-La terminals along the AWB RFC

Austria[27]

Austria has 3 Ro-La terminals along the corridor AWB RFC: Salzburg, Wels and Villach.

Salzburg is connected with Port of Trieste (Italy) by one pair of Ro-La trains per day. Wels has also connected with Port of Trieste (Italy) by two pairs of Ro-La trains per day.

Turkish logistics companies decided to use the Ro-La services between Salzburg and the port of Trieste. Port of Trieste has daily ferry connections with Ro-Ro ships from Turkey. Around 6,000 HGVs switch from road to rail again each year

In 2018, Rail Cargo Operator helped contribute to a cleaner environment by transporting 170,243 trucks by rail using Ro-La.

Slovenia

Slovenia has two Ro-La terminals, in Ljubljana and Maribor. The terminal in Maribor has daily connections with Wels in Austria, while that in Ljubljana only operates occasionally.

Croatia - Spačva[28]

Spačva is Ro-La terminal located in Croatia, near the highway (Zagreb-Beograd) exit for Spačva, positioned near the borders with Serbia and Bosnia. Spačva has two rail tracks with a usable length of up to 500 meters. The terminal is connected to the AWB RFC corridor via Vinkovci with a railway line that is 30-km long. The line is not electrified and diesel traction is needed.

The terminal was constructed in 2006, the first Ro-La train started to operate in 2008, running from Spačva to Wels in Austria. The main goal of this terminal was to shift the transit trucks (HGV) from Serbia, Turkey and Bosnia and Herzegovina to rail wagons.

Today, this Ro-La terminal has no train services or connections to any other Ro-La terminals in Europe. The Ro-La terminal at Spačva faces a number of obstacles, as follows:

- The location of terminal is not optimal (extended travel time by rail)
- Diesel shunting traction is needed between Vinkovci and Spačva
- Border waiting times for trucks (HGV) due to border crossing (HGV waits for border procedures and for trains in the terminal
- Many Ro-La services operate during the day (and thus not only one train)
- Administrative restrictions for the transit of trucks

[27] Source: https://www.railcargo.com/
[28] Source: Šimunić, M: Analiza mogućnosti uvođenja Ro – La prijevoza od Spačve do Welsa, završni rad, Zagreb, 2017

Bulgaria - Dragoman[29]

In 2010 Bulgaria launched the construction of its first Ro-La terminal, aiming to ease heavy truck traffic on a major motorway linking Europe with Turkey and the Middle East. The terminal has two rail tracks with a usable length of about 600 meters.

The terminal, which allows heavy trucks to be transported on railcars, has a capacity of 700 heavy trucks/day, mostly relying on Turkish transit traffic. The cost of Ro-La transportation is expected to be approximately 15 % lower than the cost of travelling by road, with prices of 300 to 360 EUR per heavy truck.

Today the Dragoman Ro-La Terminal is closed (non-operational).

The intermodal-container terminal Plovdiv has also possibilities to operate Ro-La trains.

Bulgaria has plans for the construction of Ro-La terminal in the Svilengrad area, near the border with Turkey.

9.5 PROMOTION/GOOD PRACTICE ON THE AWB RFC

In March 2009 railway infrastructure managers, railway carriers and railway operators along the AWB RFC showed an example of good practice – a pilot project – reducing the travel times of the combined freight trains between Slovenia (Ljubljana) and Turkey (Istanbul-Halkali). Slovenian, Croatian, Serbian, Bulgarian and Turkey railways have reduced the travel time of such trains using different railway procedures and without any investments in the railway infrastructure.[30]

A combined freight train called the "Bosphorus Europe Express" took over 60 hours travelling from Ljubljana to the container terminal Halkali in Istanbul. The train route was 1.577 kilometres long and went via five states (Slovenia, Croatia, Serbia, Bulgaria and Turkey). The average travel speed of the train was about 26 km/h. The rail operators were Adria Kombi (Slovenia) and Kombiverkehr (Germany).

This train operated as an intermodal freight train with high priority compared to other trains. It operated with two locomotives (electric and diesel) with different voltages and with very simplified procedures on the cross border sections. There was no need to change the locomotives at the border station or non-electrified railway section.

The combined freight train "Bosphorus Europe Express" operated only once – as a pilot project promotion in March 2009.

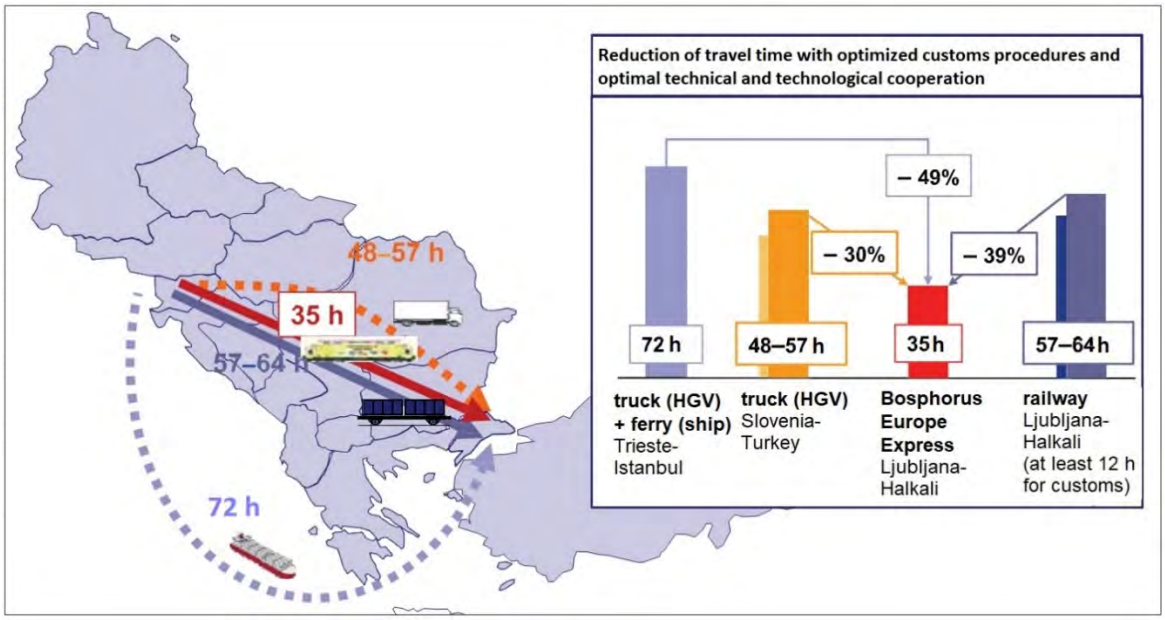
[29] Source: https://seenews.com/news/bulgaria-starts-building-maiden-31-mln-euro-rola-terminal-199782
[30] Source: *Nova proga*, Magazine of Slovenian railways, march 2009

Figure 9-11: Bosphorus Europe Express

Source: https://www.uic.org/com/uic-e-news/137

On the 16th of March 2009 the "Bosphorus Europe Express" reached the Halkali from Ljubljana in only 35 hours, at an average travel speed about 45 km/h. The train started in Ljubljana at 8:30 in the morning and reached Halkali the next day at 19:30. The travel time had been reduced by over 25 hours – or over 1 day. The train operated as an exceptional form of transport and took precedence over other freight trains on the route. At the same time, the train had two or three electric and diesel locomotives, and these did not need to change at the borders. Other procedures at the border stations were also reduced to the minimum.

Figure 9-12: Competitiveness of the "Bosphorus Europe Express" compared to other modes of transport



Source: Revija *Nova proga*, March 2009.

This pilot project showed the many advantages and competitiveness of railways compared to other modes of transport. For example: the ferry ship (Ro-Ro) for the Turkish trucks from Turkey to Trieste (Italy) takes 72 hours. The trucks on the road need between 48 to 57 hours to go from Turkey to Slovenia. Usually a train takes between 57 to 64 hours to go from Ljubljana to Halkali, but the "Bosphorus Europe Express" took it "only" 35 hours – and was thus the fastest method.

Figure 9-13: The "Bosphorus Europe Express" in March 2009

Source: Revija *Nova proga*, March 2009

9.6 GENERAL CONDITIONS TO SHIFT CARGO FROM ROAD TO RAIL

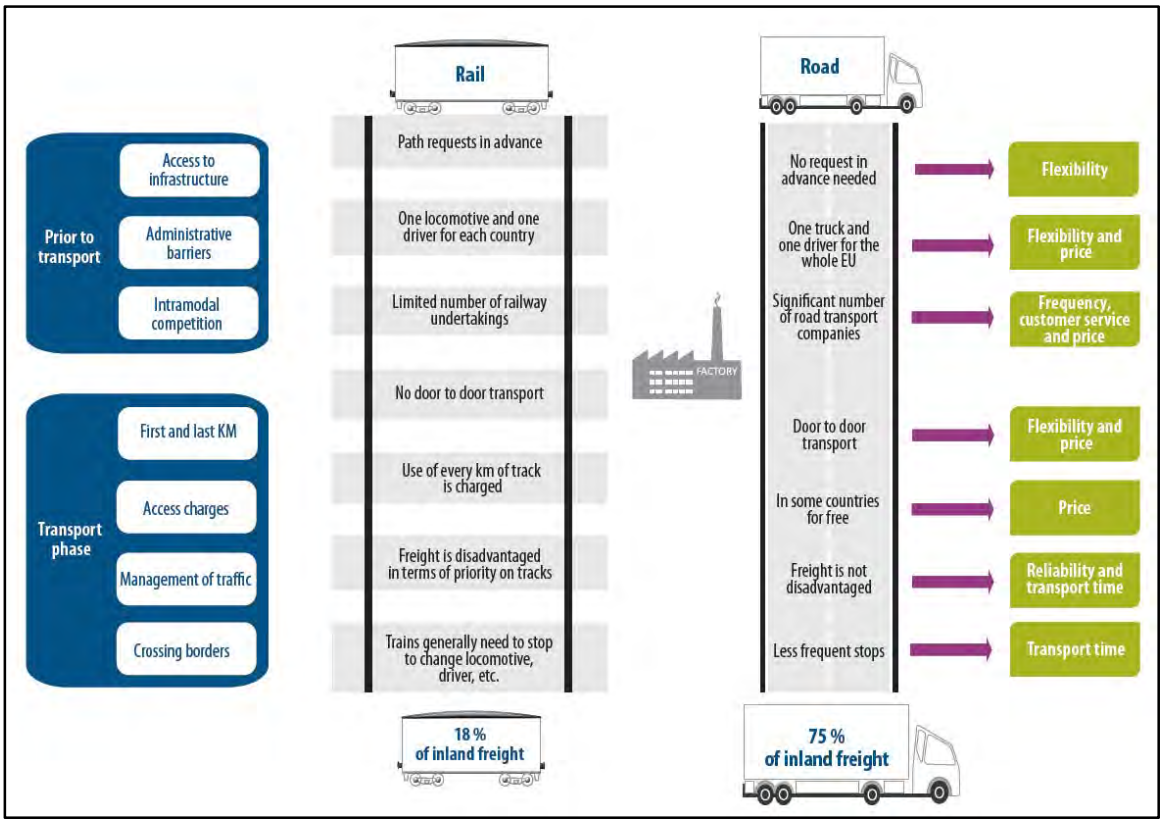
The promotion of more efficient and sustainable methods of transport, and in particular of rail freight, has been a key part of EU policy for the last 25 years. As early as 1992, the European Commission set shifting the balance between modes of transport as one of its main objectives. In 2001, the European Commission confirmed the importance of revitalising railways, setting the objective of maintaining the market share of the rail freight sector in Central and Eastern European member states at 35 % by 2010. Finally, in 2011, the Commission set a target of shifting as much as 30 % of road freight transported over distances greater than 300 km to other modes of transport, such as rail or waterborne transport, by 2030, and more than 50 % by 2050.[31]

Every day thousands of tonnes of goods are transported across the Europe to factories, warehouses or final customers. Rail freight (and combined rail–road transport) is in direct competition with road haulage: shippers regularly compare the two when deciding which mode of transport to use. They naturally choose the one which best suits their needs, mainly taking into account: reliability, price, customer service, frequency and transport time. Risk of loss and damage, flexibility and environmental impact are also taken into consideration. In other words, shippers choose methods of transport on the basis of business criteria, and not on the basis of EU policy priorities.[32]

Some products, such as raw materials, are by nature more suitable for transporting by rail. However, to be competitive with road transport for other types of good, the rail sector faces several challenges which have an impact on shippers' choice, such as timetable, access charges or punctuality.

[31] Source: Rail freight transport in the EU: still not on the right track, Special Report, European Court Of Auditors, 2016
[32] European Intermodal Association, Intermodal yearbook 2011 and 2012

Figure 9-14: Comparison of some of the challenges faced by rail freight transport compared to road



Source: European Court of Auditors

The main condition to shift cargo from road to rail is the available rail and road infrastructure. The cargo could be moved to rail at the usual railway stations, industrial areas with industrial sidings or in rail/road terminals. Different types of machinery are needed to load or unload the goods, such as reach stackers, cranes, elevators, fixed or mobile ramps, etc.

Very appropriate cargo for rail transport are block trains with homogenous types of wagons and goods. Block trains are loaded at the beginning before the run and unloaded at the end after the run has finished. During the run the block train needs no shunting's (marshalling yard) or any other operations because of the goods it carries. Intermodal transport (containers) are a very popular type of transport today, and in the future this will be the first choice when shifting from road to rail. Other types of goods, such as new vehicles (cars), cereals, steel, Ro-La trucks, are also suitable for moving from road to rail.

The poor performance of rail freight transport in terms of volume and modal share in the EU is not helped by the average commercial speed of freight trains. Simply put, freight trains run slowly and their speed has not significantly increased over the last decade. On some

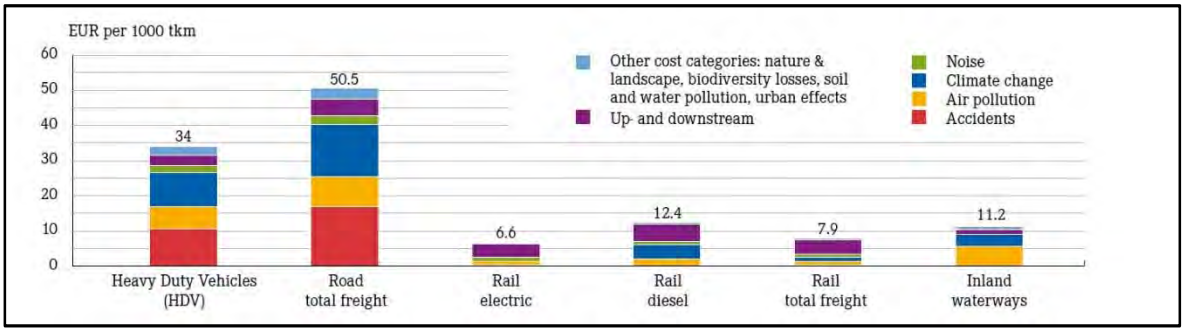
international routes freight trains run at an average speed of only around 18 km/h. In Central and Eastern EU member states the average speed is between 20 and 30 km/h.[33]

One of the key performance indicators in the competition between road and rail is the travel times between the origin and destination points. If railway transport could provide shorter travel times on a route compared to road transport, then it has the potential to encourage a shift in goods from road to rail. Travel times on the railway will be reduced with the aid of ongoing and future infrastructure and rolling stock projects.

In many different calculations, the real costs of freight traffic often remain hidden. This is because the external costs of road transport are usually ignored: these are the true costs incurred by transport, which are not supported and paid for by individual transport users but are borne by society as a whole. There are many external costs as a result of transport activity – the major ones include the impact on climate change, air pollution, accident costs, congestion, and noise, along with smaller but not insignificant issues such as ecosystem loss, soil and water pollution, and biodiversity loss.[34]

As shown in the figure below, the average external costs for road transport (using a heavy goods vehicle – HGV) are more than four times higher than rail for freight.

Figure 9-15: Average external costs for freight transport in EU member states



Source: CER & UIC, Greening transport: reduce external costs, April 2012

If the external costs would be included in the total transport price, paid by the end users, then railway transport could be much more competitive and cheaper. The EU and AWB RFC member states should support green rail freight transport, charging the negative external costs of transport.

An example of external costs has been calculated for transportation of 1.000 tonnes by road and rail between Istanbul and Munchen for a distance of 2.013 kilometres. The costs for trucks are 34 EUR/1.000 tkm, while those for rail are 6,6 EUR/1000 tkm (graph above).

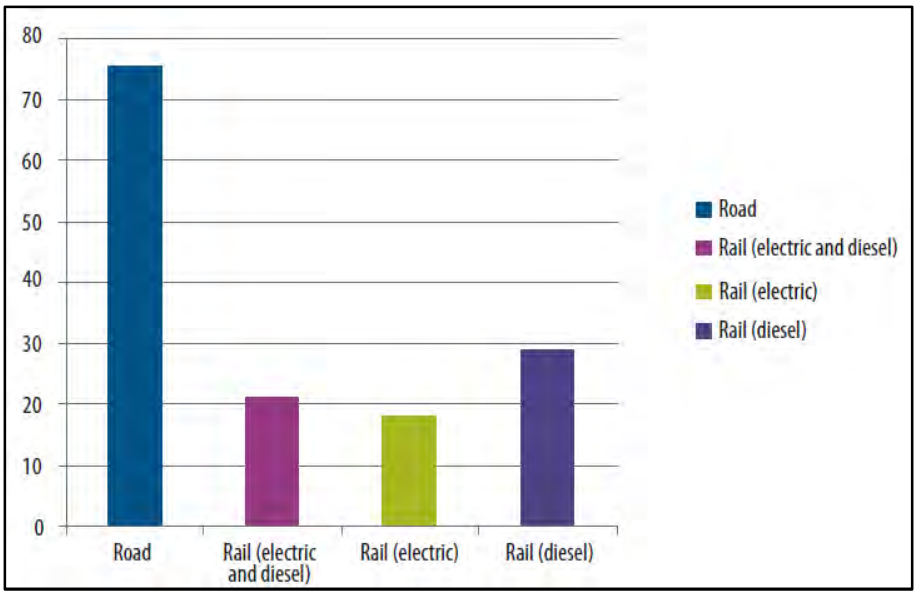
[33] Source: Rail freight transport in the EU: still not on the right track, Special Report, European Court Of Auditors, 2016
[34] Source: CER & UIC, Greening transport: reduce external costs, April 2012

- External costs for road transport: 68.442 EUR
- External costs for rail transport: 13.286 EUR

The external costs for transportation of 1.000 tones between Turkey and Germany by road are five times higher than the railway external costs. Railway transport is thus the most appropriate transport for long land distances.

Transport also has a negative impact on the environment and quality of life. It accounts for around one third of energy consumption and total CO_2 emissions in the EU. Promoting efficient and sustainable methods of transport, such as rail and inland waterways over roads, could also help lower Europe's dependence on imported oil and reduce pollution. According to the European Environment Agency, CO_2 emissions from rail transport are 3,5 times lower per tonne-kilometre than those from road transport.

Figure 9-16: CO_2 emissions per tonne-kilometre in the EU in 2012



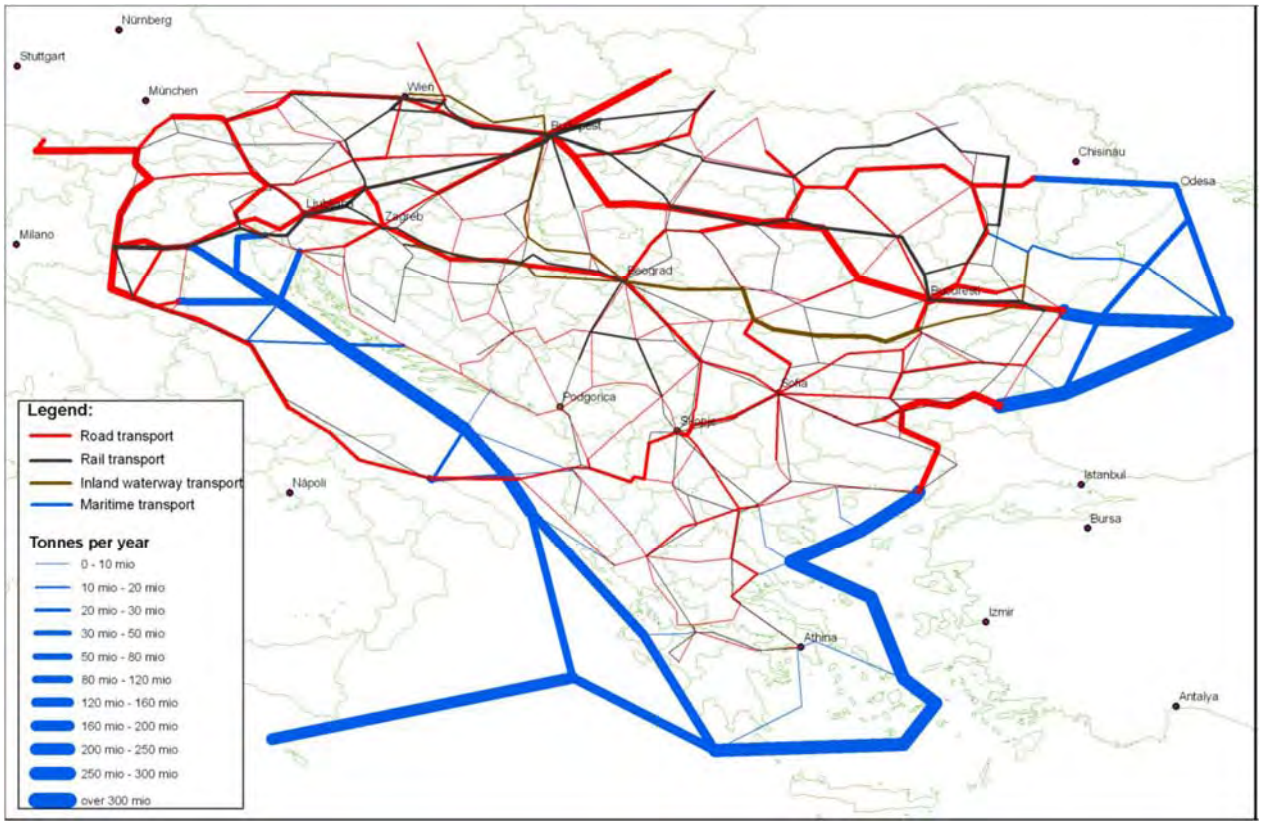
Source: European Court of Auditors based on European Environment Agency data.

The road links with many HGV, which could shift from road to rail, are presented in the next figure, and the focus should be on the following links:

- Turkey-Sofia
- Sofia-Beograd
- Beograd-Zagreb
- Zagreb-Ljubljana
- Ljubljana-Munchen/Wels

One freight train could carry between 80-90 TEU (20 feet containers), or about 30 trucks.

Figure 9-17: Yearly load (in tonnes) of the transport network along with the sustainable development of SEETAC, for the year 2020



Source: SEETAC – South East European Transport Axis Cooperation, OMEGA consult Ltd, 2012,

Figure 9-18: International freight road transport of foreign HGV, 2016

Territory driven upon:	Five main countries of registration of foreign lorries performing international transport										Cumulated share (%)
	First	Share (%)	Second	Share (%)	Third	Share (%)	Fourth	Share (%)	Fifth	Share (%)	
Bulgaria	Romania	52.3	Poland	19.9	Czech Republic	6.0	Germany	3.8	Greece	3.8	85.7
Croatia	Bulgaria	26.3	Greece	24.4	Romania	16.4	Poland	11.7	Slovenia	8.0	86.7
Austria	Poland	18.2	Hungary	16.8	Slovakia	14.2	Slovenia	12.2	Romania	8.3	69.7
Slovenia	Hungary	25.7	Croatia	20.4	Romania	14.5	Bulgaria	9.3	Greece	8.5	78.5

Note: Malta and Cyprus are not available.
Source: Eurostat computations

eurostat

Source: Eurostat

10 PROGNOSIS OF TRANSPORT PERFORMANCE DEVELOPMENT

The European Commission's Directorate-General for Energy (DG ENER) reference scenario published[35] in 2016 provides the most recent updated trend projections about the future of the transport sector in the EU. The report focuses on the EU energy, transport and greenhouse gas (GHG) emission projections, and on the cross-cutting interactions between different policies in these sectors. It starts from the assumption that the policies agreed at the both EU and EU member state levels by December 2014 have been implemented, and that the legally binding GHG and renewable energy systems (RES) targets for 2020 will be achieved. On this basis, volumes of both passenger and freight transport are expected to increase, although their growth is anticipated to slow down after 2030 (please see Figure 9, below).

Rail freight traffic is expected to account for the largest percentage increase in volumes transported (84 % between 2010 and 2050), which would result in its modal share increasing from 15 % to 18 %. Such an increase would be mainly driven by the scheduled completion of the TEN-T core and comprehensive networks, which is foreseen to experience the lowest increase in volumes, of only 39 % in the 2010 – 2050 timeframe, which means that its modal share would decrease slightly.

Road private transport is expected to keep its dominant position even if its modal share is expected to decrease (from 73 % in 2020 to 69 % in 2050). This reduction is anticipated as:

- car ownership rates are close to saturation in the EU member states;
- the price of fossil fuels is expected to increase in the long term;
- congestion in urban areas is growing; and
- the EU population is ageing.

Thanks to the gradual completion of the TEN-T network, the additional high speed rail (HSR) infrastructure and the upgrading of some existing lines, rail passenger transport is expected to grow by 76 % by 2050, compared to 2010, corresponding to an increase in modal share from 7,7 % to 9,7 %. Air transport is projected to register the highest growth of all transport modes, as the total number of passengers is projected to more than double by 2050 (i.e. increase by 125 %) compared to 2010. The overall growth in demand for passenger travel is expected to be more significant in the 2010 – 2030 period and in the EU-13 countries.

[35] Source: Research for TRAN Committee-Modal shift in European Transport: a way forward, Policy Department for Structural and Cohesion Policies, Directorate-General for Internal Policies PE 629.182 - November 2018.

Worldwide growth in international trade, including trade between EU countries and selected others, directly creates demand for transport services. Two scenarios for the projected growth of the transport performance have been designed for AWB RFC.

The first scenario is provisionally referred to as the “high growth rate” one. With this it is expected that the major transport infrastructure projects will be successfully completed. The forecasts of global financial institutions for higher growth between 2018 and 2023 have been taken into account as well.

The second scenario is based on a “stable growth rate” assumption, and represents the baseline scenario for transport, based on the GDP growth forecast in period 2018 – 2023.

Both scenarios comply with the European transport policy key recommendation that transport must develop at a lower growth rate compared to GDP, which is reasonable from an economic perspective.

The tendency for the predominance of road transport in terms of goods carried, both internationally and domestically, has been preserved. Railway transport has good prospects in terms of international traffic, predominantly transit traffic, while maritime and inland waterway transport remain at a relatively low capacity, mainly in the field of international transport. A decisive change in the redistribution among transport modes and reducing the share of road transport may only be achieved with the accelerated development of intermodal transport.

In freight, and in terms of the impact of external factors, intermodal transport, which combines the advantages of railway, waterborne and road transport, has the best chances for development. A higher growth rate of freight transport compared to passenger transport is foreseen in both scenarios. This is determined by assumptions for the successful implementation of infrastructure projects, which will contribute to the development of a modern transport network, competitive to transport systems in the developed European states, on the one hand, and expectations for the faster growth of industrial and agricultural production, which will increase transport demand – on the other.

Forecasting deals with the prediction of the future development of organisations, societies, economies, transport, the environment, etc. The aim is to get an idea of the future conditions which is based on rational ways of prediction. The forecasts thus obtained are of great importance for strategic management, risk management and planning.

The following tables show two forecast scenarios for the AWB RFC for period 2019 – 2030, separated by railway infrastructure managers. Transport forecast for passenger transport is available for train-kilometre units and passenger trains, and forecast for freight transport is available in gross tonnes kilometres and gross tonnes.

Table 10-1: Transport forecast AWB RFC – Scenario 1

RIM	Transport	Unit	2019	2020	2021	2024	2025	2027	2030
ÖBB-Infra	passenger	train-km (thous.)	12.575	12.836	13.102	13.820	13.992	14.343	14.702
		trains	23.861	24.356	24.861	26.224	26.551	27.215	27.898
	freight	gross tkm (mill.)	11.017	11.474	11.950	13.284	13.614	14.300	15.024
		gross tonnes (thous.)	20.906	21.772	22.675	25.207	25.834	27.135	28.508
SŽ-I	passenger	train-km (thous.)	6.139	6.295	6.455	6.889	6.994	7.209	7.430
		trains	20.854	21.383	21.925	23.402	23.758	24.486	25.239
	freight	gross tkm (mill.)	4.642	4.877	5.125	5.830	6.007	6.378	6.774
		gross tonnes (thous.)	15.767	16.567	17.407	19.802	20.405	21.665	23.011
HŽ-I	passenger	train-km (thous.)	6.816	6.937	7.061	7.394	7.473	7.634	7.799
		trains	19.042	19.382	19.728	20.658	20.879	21.328	21.788
	freight	gross tkm (mill.)	1.845	1.911	1.979	2.168	2.214	2.310	2.411
		gross tonnes (thous.)	5.154	5.338	5.528	6.057	6.187	6.455	6.735
IŽS	passenger	train-km (thous.)	4.325	4.480	4.640	5.086	5.195	5.421	5.658
		trains	7.197	7.455	7.722	8.464	8.646	9.022	9.416
	freight	gross tkm (mill.)	4.828	5.174	5.545	6.643	6.929	7.538	8.205
		gross tonnes (thous.)	8.035	8.611	9.228	11.055	11.531	12.544	13.655
NRIC	passenger	train-km (thous.)	5.877	6.017	6.161	6.552	6.646	6.838	7.036
		trains	15.823	16.201	16.589	17.641	17.894	18.411	18.944
	freight	gross tkm (mill.)	1.476	1.547	1.621	1.830	1.883	1.992	2.109
		gross tonnes (thous.)	3.974	4.165	4.364	4.928	5.070	5.365	5.679
Total AWB RFC	**passenger**	**train-km (thous.)**	**35.731**	**36.565**	**37.419**	**39.741**	**40.301**	**41.444**	**42.625**
		trains	**16.607**	**16.994**	**17.391**	**18.470**	**18.730**	**19.262**	**19.811**
	freight	**gross tkm (mill.)**	**23.808**	**24.983**	**26.219**	**29.755**	**30.648**	**32.519**	**34.523**
		gross tonnes (thous.)	**11.065**	**11.611**	**12.186**	**13.829**	**14.244**	**15.114**	**16.045**

Scenario 1 is an optimistic scenario with the average yearly growth of 3,67 % between the years 2019 – 2030 for freight transport. In passenger transport the average yearly growth is 1,72 %.

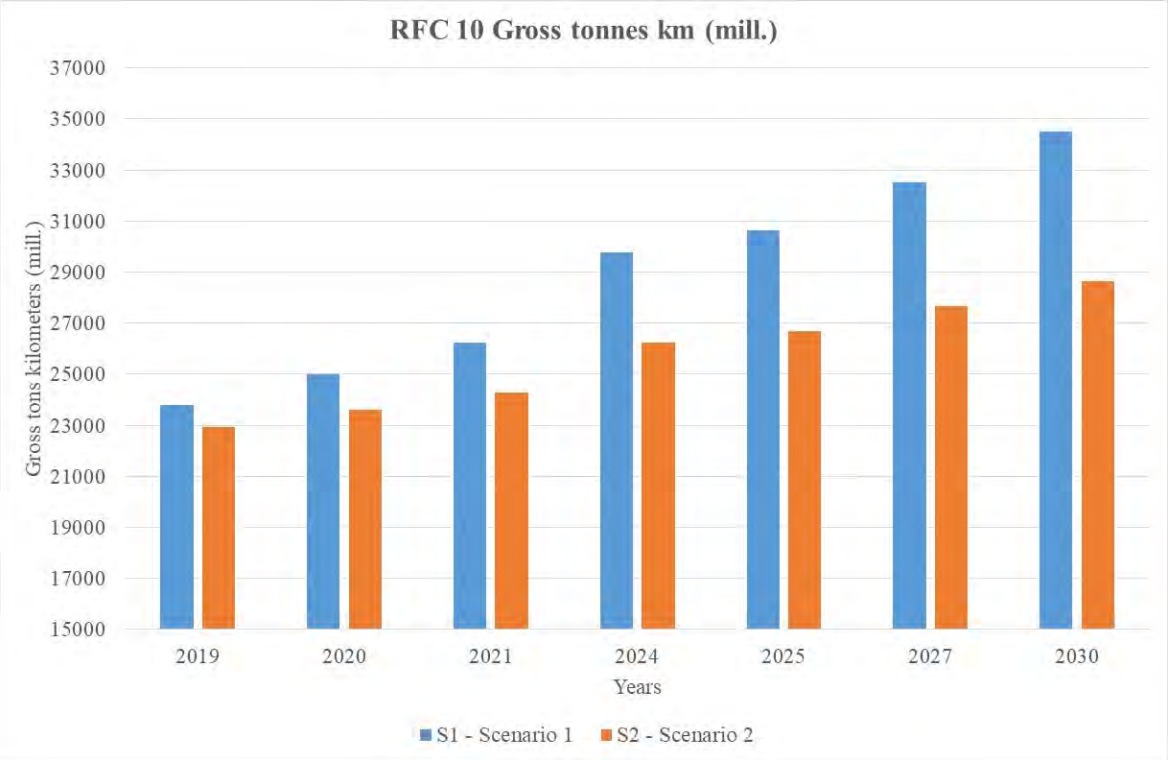
Table 10-2: Transport forecast AWB RFC – Scenario 2

RIM	Transport	Unit	2019	2020	2021	2024	2025	2027	2030
ÖBB-Infra	passenger	train-km (thous.)	12.371	12.525	12.681	13.095	13.193	13.391	13.592
		trains	23.475	23.767	24.063	24.849	25.035	25.410	25.791
	freight	gross tkm (mill.)	10.669	10.935	11.207	11.947	12.125	12.490	12.867
		gross tonnes (thous.)	20.245	20.749	21.265	22.670	23.008	23.700	24.415
SŽ-I	passenger	train-km (thous.)	6.019	6.110	6.203	6.452	6.510	6.630	6.752
		trains	20.443	20.754	21.070	21.914	22.114	22.520	22.934
	freight	gross tkm (mill.)	4.464	4.600	4.740	5.125	5.219	5.411	5.611
		gross tonnes (thous.)	15.165	15.626	16.101	17.408	17.726	18.379	19.058
HŽ-I	passenger	train-km (thous.)	6.720	6.792	6.865	7.058	7.103	7.195	7.288
		trains	18.776	18.977	19.180	19.719	19.846	20.102	20.361
	freight	gross tkm (mill.)	1.794	1.833	1.872	1.978	2.003	2.055	2.109
		gross tonnes (thous.)	5.013	5.120	5.230	5.526	5.597	5.742	5.891
IŽS	passenger	train-km (thous.)	4.206	4.296	4.388	4.638	4.698	4.820	4.946
		trains	6.999	7.149	7.303	7.719	7.819	8.022	8.231
	freight	gross tkm (mill.)	4.573	4.770	4.975	5.552	5.695	5.993	6.308
		gross tonnes (thous.)	7.611	7.938	8.279	9.240	9.478	9.974	10.498
NRIC	passenger	train-km (thous.)	5.767	5.850	5.934	6.158	6.211	6.318	6.428
		trains	15.529	15.752	15.977	16.581	16.723	17.012	17.307
	freight	gross tkm (mill.)	1.423	1.464	1.506	1.621	1.648	1.706	1.765
		gross tonnes (thous.)	3.831	3.941	4.054	4.363	4.439	4.593	4.753
Total AWB RFC	**passenger**	**train-km (thous.)**	**35.083**	**35.574**	**36.072**	**37.402**	**37.716**	**38.355**	**39.005**
		trains	**16.305**	**16.533**	**16.765**	**17.383**	**17.529**	**17.826**	**18.128**
	freight	**gross tkm (mill.)**	**22.924**	**23.601**	**24.299**	**26.223**	**26.691**	**27.655**	**28.659**
		gross tonnes (thous.)	**10.654**	**10.969**	**11.293**	**12.187**	**12.405**	**12.853**	**13.320**

Scenario 2 is a realistic scenario with the average yearly growth at 2,19 % between the years 2019 – 2030 for freight transport. In passenger transport, the average yearly growth is 1,03 %.

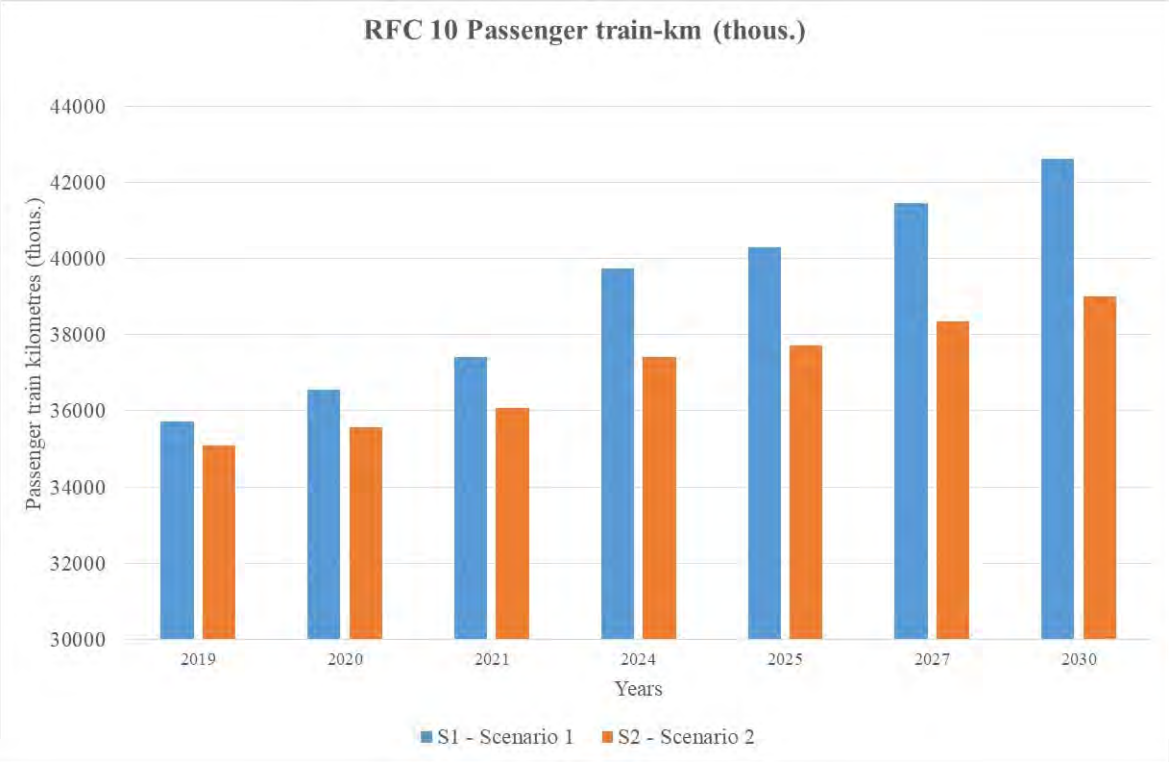
The following figures show the overall prognosis of the development of rail freight and passenger transport performances along the AWB RFC for all states together for both scenarios.

Figure 10-1: Transport forecast AWB RFC – Gross tonnes km (mill.)



Freight transport is presented via gross tonne kilometres. Scenario 1 is the optimistic scenario with the average yearly growth at 3,67 %. Scenario 2 is the realistic scenario with the average yearly growth at 2,19 %.

Figure 10-2: Transport forecast AWB RFC – Passenger train km



Passenger transport is presented via passenger-train kilometres. Scenario 1 is an optimistic scenario with the average yearly growth at 1,72 %. Scenario 2 is a realistic scenario with the average yearly growth at 1,03 %.

Transport forecast conclusions:

- a higher increase in rail freight transport performances on the lines included in the AWB RFC,
- a general increase in rail passenger transport performances (but lower than in freight transport),
- an increase in transport performances and resulting savings in negative social costs generated by transport,
- increased demands on capacity and technical parameters of lines included in the AWB RFC,
- requirements for modernisation, reconstruction and optimisation of the AWB RFC railway infrastructure and related rail, road, water and intermodal infrastructure,
- a requirement for a higher quality of communication and information technologies,
- pressure for greater reliability of the rail system,
- a requirement to meet the technical specifications for interoperability in rail passenger and freight transport,
- pressure for the harmonisation of charges between rail and road freight transport,
- development of transport performances below the pessimistic scenario in the event of a significant impact of defined forecast risks.

11 CONNECTIONS WITH OTHER RFCS AND RAIL NETWORKS

The AWB RFC has correlations with many other EU RFCs, with the parallel corridors and crossing corridors listed below.

The AWB RFC ends at Svilengrad on the BG/TR border, but the trains go further to Istanbul in Turkey. The line Kapikule-Halkali (Istanbul) is thus presented below, with the terminals and future plans.

11.1 OTHER RFCS

The AWB RFC is closely connected to five other EU RFCs, which it crosses or runs parallel to. The RFC with direct impact on the AWB RFC are:

- RFC 5: Baltic-Adriatic
- RFC 6: Mediterranean
- RFC 7: Orient/East-Med
- RFC 9: Czech-Slovak/Rhine-Danube (expected extension)
- RFC 11: Amber

A description of the correlations between the AWB RFC and other RFCs follows, given by AWB RFC state.

Austria:

- In Salzburg the crossing of the AWB RFC by RFC 9: Czech-Slovak/Rhine-Danube is foreseen (expected extension)
- On the line section Wels-Linz the AWB RFC goes parallel to RFC 9: Czech-Slovak/Rhine-Danube (expected extension)
- On the line section St. Michael-Bruck a. d. Mur-state border A/SLO the AWB RFC goes parallel to RFC 5: Baltic-Adriatic
- At Villach the AWB RFC is crossed by RFC 5: Baltic-Adriatic

Slovenia:

- On the line section at the state border A/SLO-Pragersko the AWB RFC goes parallel to: RFC 5: Baltic-Adriatic
- On the line section Pragersko-Zidani Most the AWB RFC goes parallel to RFC 5: Baltic-Adriatic, RFC 6: Mediterranean, and RFC 11: Amber
- On the line section Ljubljana-Zidani Most the AWB RFC goes parallel to RFC 5: Baltic-Adriatic, RFC 6: Mediterranean, and RFC 11: Amber
- On the line section Zidani Most-state border SLO/HR the AWB RFC goes parallel to RFC 6: Mediterranean

Croatia:

- On the line section state border SLO/HR-Zagreb the AWB RFC goes parallel to RFC 6: Mediterranean
- At Zagreb the AWB RFC crosses RFC 6: Mediterranean

Serbia:

- There are no correlations between the AWB RFC and any other RFCs
- The closest RFC is RFC 11: Amber, which starts/ends at the border HU/SRB in Kelebia (Hungary)

Bulgaria:

- At Sofia the AWB RFC crosses RFC 7: Orient/East-Med
- On the line section Sofia-Svilengrad the AWB RFC goes parallel to RFC 7: Orient/East-Med

The RFC 7: Orient/East-Med is the most competitive corridor with the AWB RFC.

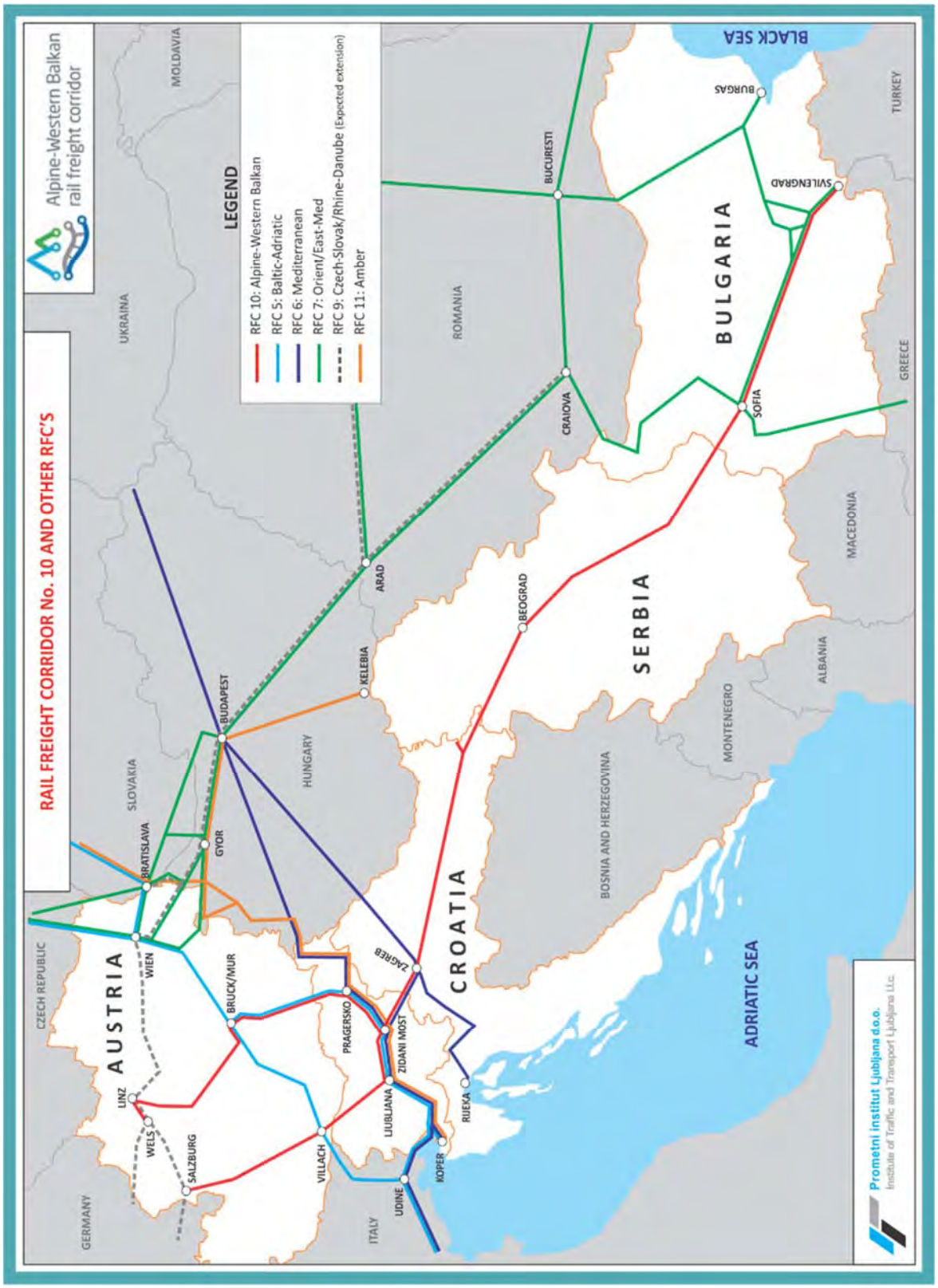
RFC Orient/East-Med[36] links the northern ports of Germany with the Eastern- and South-eastern parts of Europe via Central-Europe, running until the Greek port of Patras. The requirements deriving from the Regulation RFC OEM have called for the related EU member s to engage in international cooperation, namely: Germany, the Czech Republic, Austria, the Slovak Republic, Hungary, Romania, Bulgaria and Greece.

The current length of the corridor is approximately 8.700 km. However, the length of the corridor route sections are very different among the involved countries. Austria has the shortest one, with about 350 km, and Romania has the longest, about 2.200 km.

Comparing the RFC 7: Orient/East-Med and AWB RFC, the first is completely formed by EU member states, while the second also includes Serbia, which is not a EU member state.

[36] http://www.rfc7.eu/

Figure 11-1: Correlation between AWB RFC and other RFCs



11.2 TURKISH RAIL NETWORK

The rail network on the European part of Turkey consists of a railway line from the border BG/TR-Kapikule to Halkali in Istanbul. The railway line Kapikule-Halkali (Istanbul) is a single track line with a standard gauge 1.435 mm and electrified with 25 kV. The line is 278 km long.

Figure 11-2: Rail network in Turkey on the route Svilengrad-Istanbul

Source: http://www.bueker.net/trainspotting/map.php?file=maps/turkey/turkey.gif

Logistic terminals

A logistic terminal at Istanbul/Halkali was opened in 2013, with a capacity of 2 million tons/year and area of 220.000 m^2. The closest seaport is Ambarli (distance 10 km). In the last year about 0,5 million tonnes were carried by rail.

The logistic terminal at Istanbul/Avrupa Yakası is in a phase of ongoing project studies and tender processes, and will be finished in the near future.

Figure 11-3: Logistics terminals in North-Western Turkey

Source: Turkish State Railways - TCDD Annual report for 2017

Future plans for the route Svilengrad-Istanbul/Halkalı-Kapıkule (230 km)[37]

Turkey has announced plans for building a new high speed railway line from Halkalı, Istanbul all the way to Kapıkule, Edirne-Turkey's border crossing with Bulgaria. The Halkalı-Kapıkule High-Speed Train Project will connect Turkey's high-speed train network with Europe's, and will connect the Iron Silk Road route's Turkish part with Europe. The old line will be used for freight transport.

The Halkalı-Kapıkule Rapid Railway Project consists of two sections. Some of the financing of the Çerkezköy-Kapıkule section, to a length of 150 km within the project, is planned to be carried out by the Instrument for Pre-Accession Assistance (IPA) of the EU. The project charter was realised in 2017 in order to make the construction tender within the scope of the IPA.

Project design works for the section Halkalı (Ispartakule)-Çerkezköy (80 km) were maintained within the scope of the contract signed in 2016. Project design works for the new high-speed line are in the final stage.

[37] Source: Turkish State Railways - TCDD Annual report for 2017 and https://www.dailysabah.com/business/2018/07/18/new-high-speed-halkali-kapikule-railway-line-to-be-built-in-northwest-turkey

The Halkalı-Kapıkule line was chosen as the priority project to use EU funds. It was proposed to rebuild it as a 200 kph high-speed railway line. The EU deemed it appropriate to carry out this project in two stages, with the Çerkezköy section to be built by Turkish State Railways (TCDD), and the Çerkezköy-Kapıkule section be covered by EU funds. According to the plans the construction works will start in 2019.

With the construction of the Halkalı-Kapıkule rapid railway line, the continuation of the Marmaray Project, a new railway route for faster passenger and freight transport between Turkey and the Balkan countries in will be completed. It is aimed to transport two million passengers and five million tonnes of freight per year with the completion of the project.

Figure 11-4: New railway line between the BG/TR border and Istanbul

Source: Turkish State Railways - TCDD Annual report for 2017

12 FUTURE INVESTMENTS ON AWB RFC

Every member state of the AWB RFC has plans to upgrade the existing railway sections of the corridor, with some of the plans already in progress.

12.1 AUSTRIA

The Tauern Line

The Tauern Line from Salzburg to Villach is one of the most important transalpine connections in Austria, and thus a primary corridor for crossing the Alps. At the heart of this line is the approximately 81 km long Tauern railway from Schwarzach-St. Veit to Spittal/Drau.

In order to increase speeds from 70 km/h to 100 – 110 km/h and route capacity for cargo traffic, a far-reaching upgrade of the previously single-tracked line to two tracks is required. Because of the massive investments that have taken place since 1970, a good portion of the route has already been upgraded to two tracks.

The Pyhrn Line (Upgrade Linz-Selzthal)

This line has been upgrading from one to two tracks in stages since 1993. At present, though, less than half of the almost 100 km long line has been upgraded to two tracks, along with modernising the railway stations and stops. Numerous railway stations have thus already been modernised and being given a whole new look, with others to follow. The Pyhrn Line therefore remains fit for purpose and is also creating a greater volume of regional and supra-regional railway traffic.

Table 12-1: AWB RFC planned investments in Austria

Section/Station	Description	Period	EUR (mill)
Linz-Wels	Four-track expansion; the project includes the construction of two lines that will complement the two existing lines	N/A	430
Bruck an der Mur-Graz	Upgrade of existing double track line Bruck an der Mur - Graz, increase of capacity until traffic starts on the new Koralm line, modernisation of railway stations	2015-2030	219
Graz-Klagenfurt	Construction of new line between Graz and Klagenfurt with a maximum speed 230km/h and max slope 10‰	2023	5.367
Graz-Werndorf	Upgrade between the Station Graz and the Station Werndorf, increase of capacity (partly construction of third and fourth track)	2016-2023	112
Werndorf-Border AT/SL	Upgrade of existing single/double track line, maximum speed up to 160km/h, construction of second track	Not fixed	570
Bruck an der Mur-Border AT/SL	Upgrade to ERTMS level 2	Not fixed	190

Source: OeBB infrastrktur

12.2 SLOVENIA

The Slovenian Ministry for Infrastructure is involved in many projects to upgrade the existing railway infrastructure on the route of the AWB RFC. The most important projects are upgrading of the line between Zidani Most-Šentilj-SI/AT border, that includes upgrading of the axle load category from 20 to 22,5 t/axle. In the following years ETCS Level 1 implementation will be assured on the sections Pragersko-Maribor-Šentilj and Dobova-Zidani Most.

Table 12-2: AWB RFC planned investments in Slovenia

Section/Station	Description	Period	EUR (mill)
Jesenice-border-Rosenbach (AT)	Security-technical upgrading of the railway tunnel Karavanke	2020-2021	115 SI-50
Kranj-Jesenice	Upgrade of line, stations and stop points	N/A	N/A
Maribor-Šentilj, Stations Maribor, Mb. Tezno, Pesnica, Šentilj	Upgrade of axle load category, track extensions, increase speed and capacity, new signal-safety devices, improve electric supply, new platforms and accesses	2018-2022	254
Pragersko	Upgrade of axle load category, track extensions, increase speed and capacity, new signal-safety devices, improve electric supply, new platforms and accesses	2019-2020	89
Zidani Most-Celje Rimske Toplice, Laško-Celje	Upgrade of axle load category, track extensions, increase speed and capacity, new signal-safety devices, improve electric supply, new platforms and accesses	2016-2020	282
Zidani Most-Šentilj (All stations on the section)	Upgrading signal safety devices, remote traffic control	N/A	N/A
Pragersko-Maribor-Šentilj; Dobova-Zidani Most	ETCS Level 1 implementation	2017-2023	19

Source: http://www.krajsamorazdalje.si/

12.3 CROATIA

Croatia signed an agreement with Serbia on the modernisation of the 300 km long Zagreb-Beograd railway section[38]. Croatia has already completed several sections on its side of the border, and is preparing to seek financing for the completion of the Dugo Selo-Novska and Okucani-Vinkovci sections. Also important is an upgrading of the line (axle load category and electrification) Vinkovci-Vukovar that connect sthe river port Vukovar.

Table 12-3: AWB RFC planned investments in Croatia

Section/Station	Description	Period	EUR (mill)
Zagreb Gk-Savski Marof	Reconstruction, renewal of tracks, bottleneck relief, reconstruction of the station according to the interoperability requirements Public procurement in preparation	2019-2021	63
Vinkovci-Vukovar	Upgrade and electrification of line and stations, new signal safety devices*	2019-2021	90
Dugo Selo-Novska	Preparation of the design and documentation for the reconstruction and modernisation and second track – phases 1, 2, 3	After 2022	550
Okučani-Vinkovci	Reconstruction of the existing track by building a second one, reconstruction of the stations according to the interoperability requirements Preparation of design documentation for the reconstruction	After 2022	11 (documentation only)
Zagreb Zapadni kolodvor-Zagreb Klara-Zagreb ranžirni-Zagreb Resnik-Sesvete-Dugo Selo	Reconstruction of the existing railway sections. Reconstruction of the stations according to the interoperability requirements	Ongoing projects 2018-2019	N/A

*EU allows exceptions regarding the usable track length
Source: HŽ-Infrastruktura, http://www.hzinfra.hr

[38]https://seenews.com/news/croatia-intensifying-investment-in-rail-infrastructure-transport-min-615430#sthash.YqT3OkRb.dpuf

12.4 SERBIA

Projects on the AWB RFC in Serbia are expected to start in the near future on about 300 km of railway lines to the total estimated value of 1,7 billion euros. The implementation schedule of the planned projects will be in accordance with the available funds

Table 12-4: AWB RFC planned investments in Serbia

Section/Station	Description	Period	EUR (mill)
Border-Šid-Golubinci (81 km)	Reconstruction and modernization, new signal safety and telecommunication devices - ERTMS	N/A	250
Stara Pazova-Beograd Centar (34,5 km)	Modernisation of the line (towards the Hungarian border) and station building in Beograd Centar	N/A	307,4
Beograd (Batajnica)	New intermodal terminal	N/A	N/A
Ostružnica-Beograd Ranž. (20 km)	Second track on the bypass line Beograd Ranžirna-Ostružnica-Surčin-Batajnica	N/A	52
Beograd Ranžirna	Station reconstruction with a container terminal	N/A	N/A
Jajinci-Mala Krsna (59 km)	Line reconstruction	N/A	N/A
Resnik-Velika Plana (84 km)	Reconstruction and modernisation of the Resnik-Klenje-Mali Požarevac-Velika Plana railway line	N/A	340
Velika Plana-Niš (111 km)	Reconstruction and modernisation of the existing double track line for a speed of 160 km/h	N/A	562,5
Stalać-Đunis (17,5 km)	Reconstruction and modernisation, construction of the second track on section Stalać-Đunis	N/A	157
Niš-Dimitrovgrad (96 km)	Reconstruction and modernisation with electrification: • Construction of Niš bypass (22 km) • Reconstruction and modernisation of railway section Sicevo-Dimitrovgrad (80 km) • Niš-Dimitrovgrad Railway line electrification (86 km)	N/A	N/A

Source: Infrastruktura željeznica Srbije, Ministry of Construction, Transport and Infrastructure of Serbia

12.5 BULGARIA

Bulgaria plans to upgrade some of the AWB RFC railway sections and railway nodes, financed also by funds from the Connecting Europe Facility (CEF). The process of upgrading and modernisation is in progress on the sections Voluyak Dragoman-SRB border, Sofia-Elin Pelin, Kostenets-Septemvri and railway nodes Sofia (Sofia-Voluyak) and Plovdiv.

Table 12-5: AWB RFC plan investments in Bulgaria

Section/Station	Description	Period	EUR (mill)
Voluyak Dragoman-Serbian border	Modernisation of the 49.5 km Voluyak Dragoman-Serbian border line, identified by the EU Council as a priority cross-border section	N/A	132
Sofia Railway Junction: Sofia-Voluyak	Development of Sofia Railway Junction: Sofia-Voluyak Railway Section	ongoing -2020	104
Sofia-Elin Pelin	Modernisation of the railway section Sofia-Elin Pelin	ongoing -2020	68
Elin Pelin-Kostenets*	Modernisation of the railway section Elin Pelin-Kostenets	ongoing -2020	524
Kostenets-Septemvri	Modernisation of the railway section Kostenets-Septemvri	ongoing -2020	178
Plovdiv	Development of Plovdiv railway node	ongoing -2020	103

*Modernised under the Operational Programme "Transport and transport infrastructure" 2014-2020.
Source: Connecting Europe Facility (CEF) – Transport grants 2014-2018

13 FURTHER RECOMMENDATIONS FOR THE AWB RFC

13.1 INFRASTRUCTURE SEGMENT

Many railway infrastructure projects currently in progress will upgrade railway links on the AWB RFC, such as eliminating diesel traction on certain rail lines (Vinkvoci-Vukovar and Niš-border SRB/BG) and upgrading the axle load category on some sections (border A/SLO-Maribor-Zidani Most and Vinkovci-Vukovar). Other projecta in progress will upgrade the ERTMS, achieve a freight train (FT) length of 740 m and speed of 100 km/h, but only on some of the AWB RFC.

The following table presents details for TEN-T core railway network with regard to its current state in 2018, infrastructure projects to be finished in the near future and potential additional projects to meet the infrastructure needs of the TEN-T.

Table 13-1: TEN-T (core network) and railway infrastructure needs with regard to the AWB RFC

Description	Current state in 2018	Infrastructure projects in progress in AWB RFC	Additional infra. projects on AWB RFC
Track gauge 1435 mm	✓	✓	No
Line electrification	× (partial)	✓	No
ERTMS (ETCS+GSM-R)	× (partial)	× (partial)	Yes
Line load 22.5 t/axle	× (partial)	✓	No
FT length 740 m	× (partial)	× (partial)	Yes
FT speed 100 km/h	× (partial)	× (partial)	Yes

FT-freight train

Additional infrastructure projects in the near future must go ahead with further ERTMS implementation, regarding communication between the engine driver and traffic management (GSM-R), and line equipment with ETCS levels to assure interoperability. Operability for FT with a length of 740 m should be implemented via station track extensions at selected railway stations to ensure that trains that are 740 m long can operate. The last measure is the most expensive, and this is upgrading of the lines to enable speeds of 100 km/h for freight trains.

Regarding the railway infrastructure on the AWB RFC there are many opportunities and possibilities to make the corridor more competitive, as follows:

- Possibility of using of European, private (from other states) and national funding sources for railway investments.
- Focusing financial resources to remove critical bottlenecks along the AWB RFC.

- Improving the future planning of infrastructure works among different states along the AWB RFC to reduce and minimise negatives impacts on traffic operations.
- Upgrading of the railway infrastructure of the AWB RFC to meet the higher TEN-T standards.
- Ensure proper and effective maintenance of railway infrastructure along the AWB RFC.
- AWB RFC member states should coordinate investment plans regarding the transport infrastructure along the corridor.

Special attention must be given to eliminate bottlenecks on the single track railway lines with capacity consumption over 100 %. The critical sections are in Croatia on the section Dugo Selo-Novska and in Austria between Wels and Linz. Single track railway lines with capacity consumption between 80-100 % also deserve attention today and in the future. These sections are: Salzburg-Schwarzach St. Veit and Bruck/Mur-Spielfeld Strass in Austria and Ljubljana-Jesenice in Slovenia.

It should be mentioned that Sofia, as the capital of Bulgaria with a population of over 1,5 million, has no operational intermodal rail/road terminal at the moment, because the Yana intermodal terminal (located near Sofia, 35 km away) is closed.

13.2 ORGANISATIONAL SEGMENT

Border crossing simplification: trains lose a lot of time during border crossings, and thus to enhance the competitiveness of the AWB RFC the waiting time must be reduced to the minimum with organisational changes. The pilot case of the intermodal train that ran from Ljubljana to Istanbul in 2009 demonstrates that this could be possible.

Railway infrastructure managers and railway carriers should raise the level of transport service to reduce delays in freight transport and provide more reliability and shorter travel times.

Harmonisation of operational rules and charges. Rules and charges should be implemented at the same level in all AWB RFC member states, and simplified to ensure a more competitive corridor.

Promoting national railway networks for use as local and regional freight terminals that can provide high-quality and competitive intermodal transport services.

The external costs of freight transport should be included in the total transport price and paid by the end users. In this way railway transport could be much more competitive and cheaper. The EU and AWB RFC member states should support a green rail freight transport, by including the negative external costs of transport in the price paid by end users.

Ensure proper and effective traffic management rules and stable and reliable coordination processes for temporary capacity restrictions (bottlenecks) along the corridor.

Continuously improve the quality of market surveys and overall communication between the RFC bodies (as defined by the RFC-Regulation) in order to enable better problem solving.

Railway infrastructure managers of the AWB RFC should actively cooperate with other parallel and crossing RFC to establish permanent cooperation.

Railway infrastructure managers and railway carriers should communicate all the time in order to carry out effective provision of information to all rail users.

The AWB RFC must be promoted as the shortest possible connection between Turkey and Central Europe (Germany). Promotion of intermodal transport on the route could help to shift the cargo from road to the rail.

One other challenge is that Serbia is not yet a member of the EU. If it joined then this would remove many obstacles at border crossings, as the whole of the AWB RFC would be covered by EU member states.

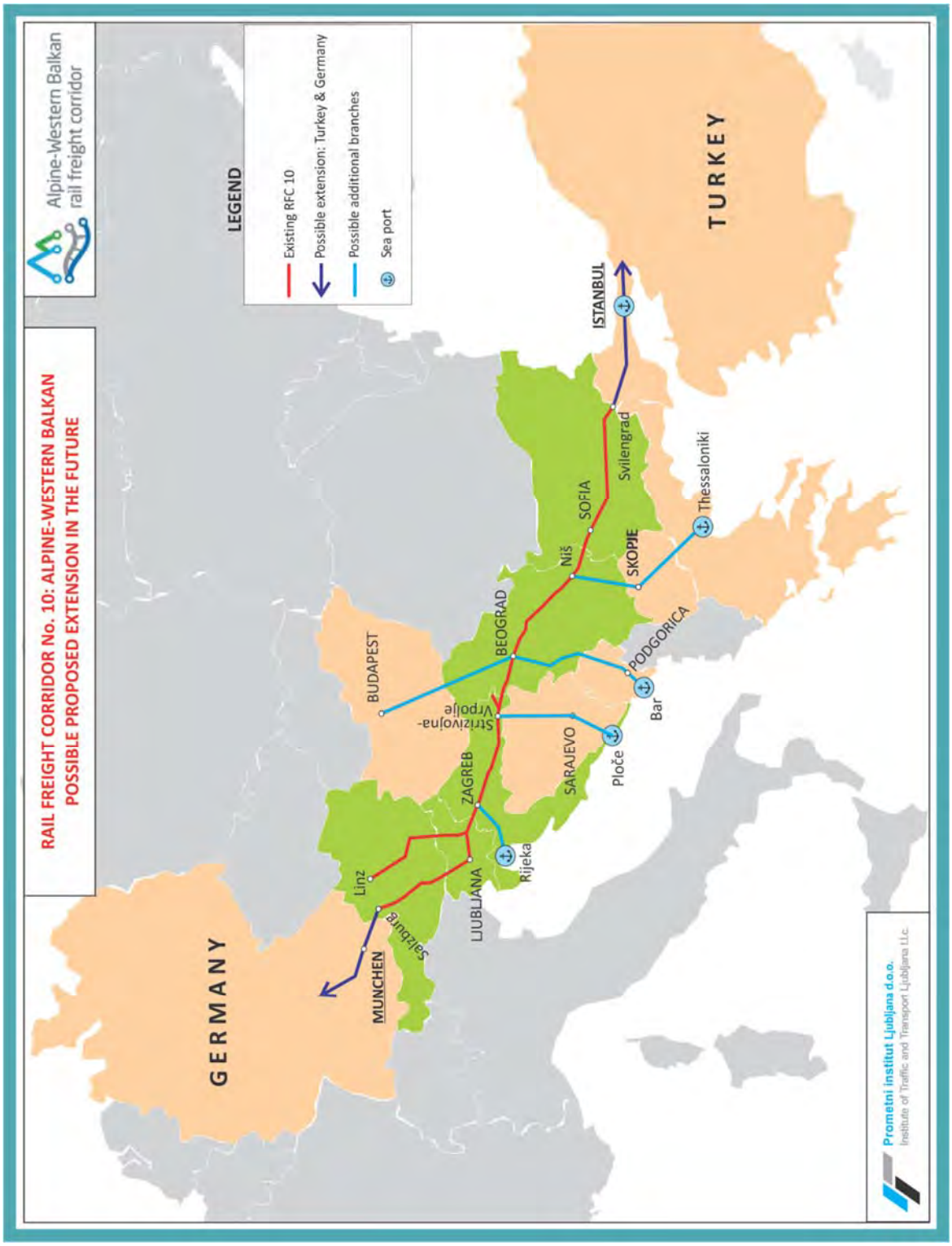
Along the AWB RFC thjere are many possibilities to shift cargo transport from road to rail, and the right measures should be taken by rail carriers, rail operators and road users to achieve this. The best practice is the use of Ro-Ro ferries between Turkey and Italy and Ro-La trains between Slovenia, Italy and Austria.

Future possible proposed extensions of the AWB RFC could go in different directions. A primary extension could be towards Germany (Munchen) and Turkey (Istanbul). A secondary extension with other additional branches could also be possible in the following four directions:

- from Zagreb via Karlovac to Rijeka (port) in Croatia (the AWB RFC would be parallel to RFC 6: Mediterranean on the route Zagreb-Rijeka)
- from Strizivojna-Vrpolje in Croatia via Sarajevo to Ploče (port) in Bosnia and Herzegovina;
- from Beograd in Serbia to Budapest in Hungary (the AWB RFC would be parallel to RFC 11:Amber on the route Kelebia-Budapest);
- from Beograd in Serbia via Podgorica and Bar (port) in Montenegro;
- from Niš in Serbia via Skopje in North Macedonia to Thessaloniki (port) in Greece.

Possible extensions could also be made to the neighbouring states of Germany, Turkey, Hungary, Bosnia and Herzegovina, Montenegro, North Macedonia and Greece.

Figure 13-1: Possible proposed extensions of the AWB RFC in the future



Two capitals, Ljubljana (Slovenia) and Zagreb (Croatia), are connected with the AWB RFC via Zidani Most and Dobova. There are exists a parallel railway line Ljubljana-Grosuplje-Trebnje-Novo mesto-Metlika-state border-Karlovac-Zagreb. This single track railway line has a length of 206,5 km and is mostl not electrified (only electrified on the section Karlovac-Zagreb).

In May 2018, a cooperation agreement on revitalisation of the cross-border railway infrastructure Ljubljana-Grosuplje-Trebnje-Novo mesto-Metlika-Karlovac-Zagreb was signed by the mayors of municipalities along the railway line. The objective of the revitalization of the railway line is to specify and develop innovative and technologically advanced services on the cross-border regional rail network. The purpose of the project is to increase the growth in demand for transport and the users' expectations based on the quality of service.[39]

The line has potential for both freight and passenger transport. It connects many industrial areas in Slovenia (Novo mesto, Trebnje…) and Croatia (Karlovac…).

The line Ljubljana-Novo mesto-Karlovac-Zagreb could be a bypass line in the case of total closure of the line Ljubljana-Zidani Most-Zagreb. After modernisation, the line has potential to be a diversionary route of the AWB RFC.

Figure 13-2: Proposal for future diversionary route of the AWB RFC

[39] Cooperation Agreement on revitalisation of cross-border railway infrastructure Ljubljana-Grosuplje-Trebnje-Novo mesto-Metlika-Karlovac-Zagreb, Otočec, 23rd May 2018

EThe U South East ACROSEE project is focused on reducing cutting stops at border crossings points (BCP), with some proposed measures[40] to reduce the time needed here.

Many BCPs consider that their facilities should be maintained and upgraded or that they need new equipment to replace outdated equipment or that in poor condition. The level of the facilities at BCPs affects not only their performance in organisational and operational terms, but also the wellbeing of the staff and users. A specific measure proposes that BCPs should be properly manned with an adequate number of staff, who will be properly trained in using new technologies and able to communicate with foreigners.

It is proposed that BCPs should synchronise their working hours. Of course, the optimum solution is that BCPs provide services 24/7, but for this to happen they should be manned with more staff, which consequently adds more operational costs and burden to the states' budgets.

A constant connection with the National Customs Authority is required, as well as constant exchanges of information between neighbouring BCPs.

Communication technologies provide the ability to exchange information rapidly and in a more secure way. BCPs must be informed about the arrival times of trains, their composition, weight, points of origin and destination, etc. "E-documentation" is considered (when fully applied) to significantly reduce the average time needed for trains to cross a BCP.

It is important for the BCPs' authorities to realize that the BCPs perform not only as gates to/from their countries, but also as points of financial transactions, providing valuable economic resources to their national economies.

[40] Source: ACROSSEE, CUTTING STOPS AT BORDER CROSSINGS, WP5 - "CROSS BORDER ANALYSIS", CEI, December 2014

14 CONCLUSION

Current global and European economic developments have an impact on increasing the demand for transport services, and this is due to the higher consumption of the EU population and the higher production of manufacturing enterprises. The demand is also directly influenced by the need to transport the final and intermediate products from Asia to Europe and vice versa. This demand then creates an offer that results in a larger market for transport services. There are many offers from several modes of transport in this market, where each mode of transport has its advantages and disadvantages for the transport process, customers, society the environment.

Rail freight is considered to be the most environmentally friendly mode of transport of goods, with an important role in the freight transport market. It contributes to the development of human society and combines economic and social progress while respecting the environment.

None of the measures taken so far to improve rail freight have`t dealt with common organisation, regulation and optimisation of the network in order to eliminate the shortcomings in continuity and reliability in international rail freight transport. Strengthening the cooperation among infrastructure managers should be primarily focused on the allocation of train paths for freight trains for the purpose of mutual coordination and acceleration of international rail freight transport. The result of coordination with regard to border waiting times is their reduction and the optimal use of the available network for sustainable development of rail transport.

The AWB RFC has got high potential to increase its competitiveness due to its location, tradition and good infrastructure connectivity between Central Europe and South-East Europe and Turkey and thus it can increase transport performances as well as its share of total transport volume within the related countries.

The significant potential of the AWB RFC is underlined by the fact that prior to the dissolution of Yugoslavia – which ended the functioning of the corridor as a seamless transport axis – the volume of transit goods transported along this route was about double the current figures: In 1989, approximately 18 million gross tonnes were shipped by rail along the corridor. One of the key reasons for the decrease in volumes has ben a shift of transit traffic to routes further north.

In terms of markets, the AWB RFC will serve two geographically distinct submarkets:

- Transport related to the regions served by the AWB RFC, including:
  - transport between the regions directly served by the corridor and
  - transport between the regions served by the corridor and other parts of Europe;
- Long-distance transport transiting AWB RFC along its entire length.

In each of these markets there is significant potential to develop rail freight transport, either by shifting transport to rail from other modes (**modal shift effect**) or by developing overall transport volumes via the positive impact of transport improvements on regional economic development and trade (**development and trade effect**).

Historic and current trade data suggest that trade flows and goods traffic between Slovenia, Croatia and Serbia are at a comparatively high level. The establishment of the AWB RFC can help to increase the market share of rail in this significant market. At the same time, there is significant growth potential for freight transport to and from Bulgaria to the other countries along the corridor.

Regarding trade and transport between the states of the AWB RFC and the rest of Europe, it is important to note that the EU is the dominant trading partner of the Western Balkan states. Roughly three quarters of the trade volume of these countries, both in terms of exports and imports, is directed to EU countries, in particular to the core of the EU[41].

Significant growth potential could result from a convergence of the Western Balkan region towards the income and productivity levels seen in Central and Western Europe. The level of economic activity in the countries involved in the AWB RFC is generally well below the average of the 28 EU Member States. Convergence towards EU levels would imply above-average GDP growth rates over the long term. Due to its close relation to economic activity, economic growth would be accompanied by significant growth of freight transport.

The AWB RFC represents the shortest route between Central Europe and Turkey. As shown in subchapter 5.3, "Review of AWB RFC State Markets", the economic cooperation (trade, goods exchange) between Germany and Turkey is at a high level (Germany is the most important economic partner for Turkey). The AWB RFC route between Munchen and Istanbul is about 350 km shorter than the parallel competitive route via RFC 7 (Bulgaria-Romania-Hungary-Austria).

The railway users demands should be take into consideration to improve services and infrastructure along the AWB RFC. The most important demands are: reduction of travel times, elimination of diesel traction, upgrading the axle load category, improving punctuality and safety, speeding up border crossing procedures, eliminating speed restrictions and bottlenecks, and extension of freight trains.

Many infrastructure projects are in progress with an aim to upgrade the existing railway infrastructure. The focus on future upgrading projects should be on implementation of the ERTMS, extension of station tracks to 740 meters and upgrading of the line speeds. The maintenance of the railway lines and stations should also be sped up.

Another important part of railway transport is the rolling stock – and here the locomotives and wagons are outdated and should gradually be modernised. Locomotives that do not

[41] http://ec.europa.eu/trade/policy/countries-and-regions/regions/western-balkans/

enable interoperability must be changed at the border crossings – thus lengthening the travel time. Modernisation of the rolling stock has to be done by the railway carriers.

As already mentioned in this study, the average external costs for road transport are more than four times higher than rail for freight. In this direction the EU and AWB RFC member states should support green rail freight transport and propose that the negative external costs of transport be paid by the end users.

A good pilot project from 2009 using an intermodal train running from Ljubljana to Istanbul showed that the travel time could be greatly reduced without any investments in the railway infrastructure. The use of good communications and technological procedures alone could thus reduce the travel time and improve the competitiveness of railway transport.

The optimisation of cross-border procedures to reduce travel times must include the railway sector (represented by infrastructure managers, rail carriers….) and public sector (represented by customs, police, etc….). Only common work on this issue could have positive impacts on railway transport.

The cargo potential seen in the countries around the AWB RFC could be the basis for the further extension of the AWB RFC route to other countries, such as Turkey, Germany, Hungary, Bosnia and Hercegovina, North Macedonia and Greece.