Silk Road Transport Corridors: Assessment of Trans-EAEU Freight Traffic Growth Potential

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SILK ROAD TRANSPORT CORRIDORS: ASSESSMENT OF TRANS-EAEU FREIGHT TRAFFIC GROWTH POTENTIAL

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This report, prepared with the participation of experts from the Institute of the Economy and Transport Development, presents the results of quantitative assessment of freight traffi growth prospects along the China–EAEU–EU axis. The report provides a description of general trends affecting development of freight transport subject to commodity structure and mode of transport. Special attention is paid to factors driving changes in freight traffi The authors present their view of the impact that freight rates have on the metrics of freight traffi being rechannelled to EAEU transport infrastructure and the operation of certain factors, such as regularity (rhythmicity) and timeframes of cargo deliveries. The fi part of the report offers an assessment of additional freight traffi which may be attracted to transport routes along the China–EAEU–EU axis, in the short and long term.

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APR — Asia-Pacific Region
BRI — Belt and Road Initiative
EAEU — Eurasian Economic Union
EDB — Eurasian Development Bank
EDB Centre for Integration Studies — Centre for Integration Studies of the Eurasian Development Bank
EU — European Union
FEACN — Foreign Economic Activity Commodity Nomenclature. Classification of goods used for customs operations in EAEU member states
FEU — Forty Foot Equivalent Unit, a conventional unit used to describe the cargo capacity of container carriers and container terminals
HS Code — Harmonised System Code
IMF — International Monetary Fund
KTZ — JSC National Company Kazakhstan Temir Zholy (National Railway Company of Kazakhstan)
OECD — Organisation for Economic Cooperation and Development
PRC — People's Republic of China
TEU — Twenty Foot Equivalent Unit, a conventional unit used to describe the cargo capacity of container carriers and container terminals
TLC — Transport and Logistics Centre
UNCTAD — United Nations Conference on Trade and Development
WTO — World Trade Organisation

Summary

- **Growth of transit container traffic through the EAEU will be contingent on development of trade between the PRC and the EU.** Currently about 98% of mutual EU–China deliveries are made by maritime transport, with aviation transport and railway transport accounting for 1.5–2% and 0.5–1%, respectively. Approximately 80% of EU–China cargoes are carried in containers, including about 90% of cargoes brought to the EU from China (imports) and 70–75% of car- goes carried from the EU to China (exports).
- **Practically all EAEU exports to the PRC are solid and liquid bulk cargoes, while most imports from China are delivered in containers.** Export freight traffic from EAEU member states to China has a low share of container cargoes (about 1.5–2%) due to the absolute domination in commodity structure of "un- containerisable" cargoes (Fuel, Mineral Raw Materials, Timber, Mineral Fertilisers, Agricultural Raw Materials). Over the last 10 years, the share of container cargoes in total EAEU imports from China has considerably increased (from 35% to 55%). The commodity structure of freight traffic from China, already dominated by con- tainerisable cargoes, stimulates continued containerisation.
- An analysis of the commodity structure of Eurasian freight transport in terms of customs value of goods per unit of mass, consumer properties of goods and technological characteristics of their prepacking, packaging, transport and logis- tics, has yielded a list of cargoes suitable for the switch from maritime transport to railway transport. Primarily those are: Consumer Goods, Engineering Products and certain Non-Ferrous Metals (e.g. Nickel Products).
- **It is anticipated that railway container traffic between the EU and China (transiting through the EAEU) will increase.** To attract additional freight traf- fic between the EU and the PRC, EAEU member states need to further expand their transport infrastructure and remove a number of barriers. There has been a consi- derable increase in railway container traffic from the EU to China, from 1,300 TEU in 2010 to more than 50,000 TEU in 2016. Between 2010–2016, transit container traffic from China to the EU increased from 5,600 TEU to almost 100,000 TEU. At the end of 2017, the volume of transit container traffic across the EAEU along the China–Europe–China route reached 262,000 TEU, exceeding the 2016 value by a factor of 1.8.
- **Increase of container traffi along the PRC–EAEU–EU axis was largely suppor- ted by railway transport subsidies provided by China.** Our analysis shows that the annual doubling of the number of container trains and volume of container cargoes along PRC–EAEU–EU routes in 2013–2016 was largely attributable to sub- sidisation of export railway freight traffi by Chinese authorities. With the Chinese transit container freight rate reduced almost to zero, cargo fl ws generated by Chi- nese exporters rapidly switched from sea routes to railway transport.

- According to our estimates, **total subsidies provided by Chinese authorities amounted to about $88 million** in 2016. This estimate assumes an average container transport subsidy of $2,500 per FEU, with the total number of subsi- dised containers originating from central PRC provinces standing at 35,000 FEU. An average subsidy per FEU has been merely 0.3–0.4% of the total value of con- tainer-shipped cargoes.
- **Preservation and expansion of transport subsidies by Chinese provinces, is the key driver of continued container traffi growth.** The growth of rail- way container traffi between China and the EU in 2011–2017 from 7,000 FEU to 131,000 FEU (or from 14,000 TEU to 262,000 TEU) has been achieved at a through railway freight rate of $4,800–6,000 per FEU (subsidised by about 40%) (Figure A). Subsidy-driven reduction of China–Europe railway contai- ner freight rates by 30–50%, has resulted in a 19-fold increase of container traffic.
- The current through freight rate (including subsidies) of $5,500 per FEU, may en- courage further growth of container traffic to 200–250,000 FEU in 2020 (a twofold increase over three years). After that, keeping the freight rate at $5,500 per FEU will no longer produce such a pronounced effect and container traffic growth rates will dramatically decrease (Figure B).
- Container traffic increase from 200–250,000 FEU in 2020 to 500,000 FEU by 2030, is possibly subject to further reduction of the through freight rate by $1,500 per FEU (from $5,500 per FEU to $4,000 per FEU) (Table A).
- **Inferior capacity of crossing points at the Belarus–Poland border, remains one of the key barriers to the growth of container traffic along the PRC– EAEU–EU axis.** This issue will be discussed at length in the next EDB Centre for Integration Studies' report, which will focus on the impact that non-tariff barriers have on transit potential and on development of transport corridors in EAEU mem- ber states.

Conclusion: We believe that explosive growth of container traffic until 2019–2020 is secured. After it plateaus, a lower freight rate will be required to secure further growth. It may be supported by investments (in physical infrastructure, transport and logistics centres, locomotives, border crossing infrastructure, electronic technologies, etc.) and/or by coordination of freight rate policies at the Greater Eurasian level.

Table A. Impact of Railway Container Freight Rates on Container Traffic

Source: authors' estimations

Period	Change in Container Freight Rate (per FEU)	Change in Freight Traffic, Thousand FEU
2011–2017	Reduction by 40% (from $9,000 to $5,500)	Growth from 7 to 131
2018–2020	Rate not changed (stays at $5,500)	1.5–2-fold growth (to 200–250)
2021–2030	Reduction by 30% (from $5,500 to $4,000)	2–2.5-fold growth (to 500)

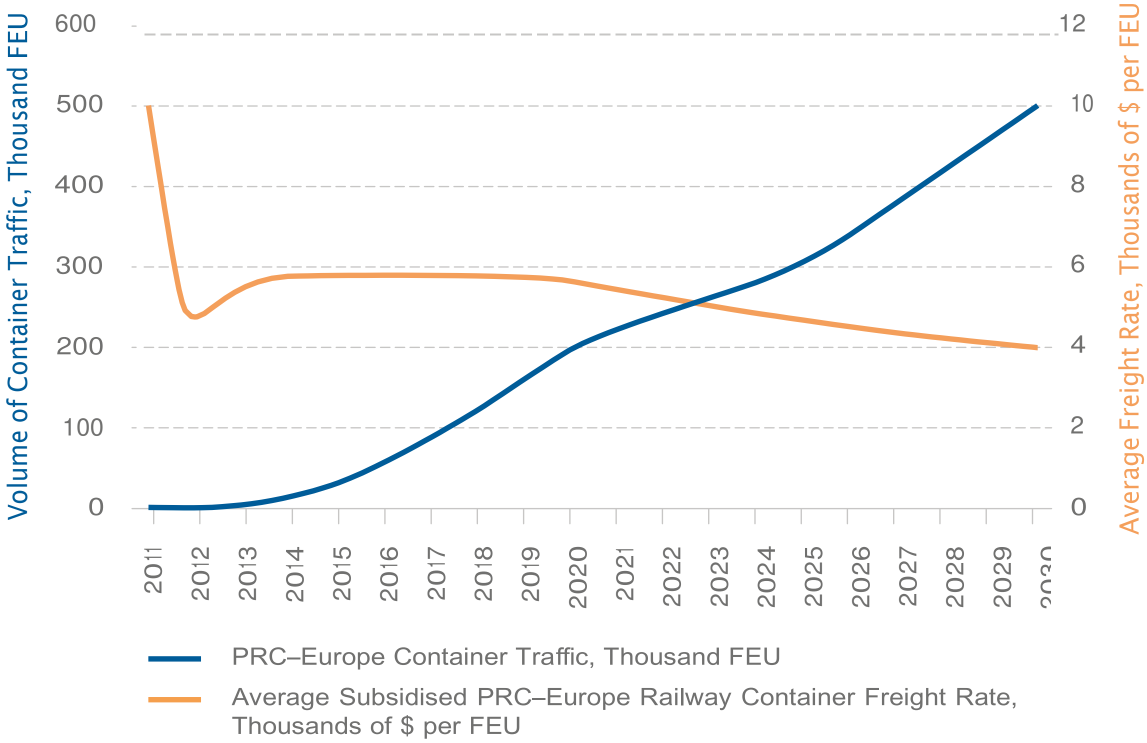


Figure A. Changes in Railway Container Freight Rates and Volume of Freight Traffic along PRC–Europe Routes (Estimated Freight Rate Elasticity of Demand). Scenario Envisaging Freight Rate Reduction to $4,000 per FEU by 2030

Source: in-house calculations

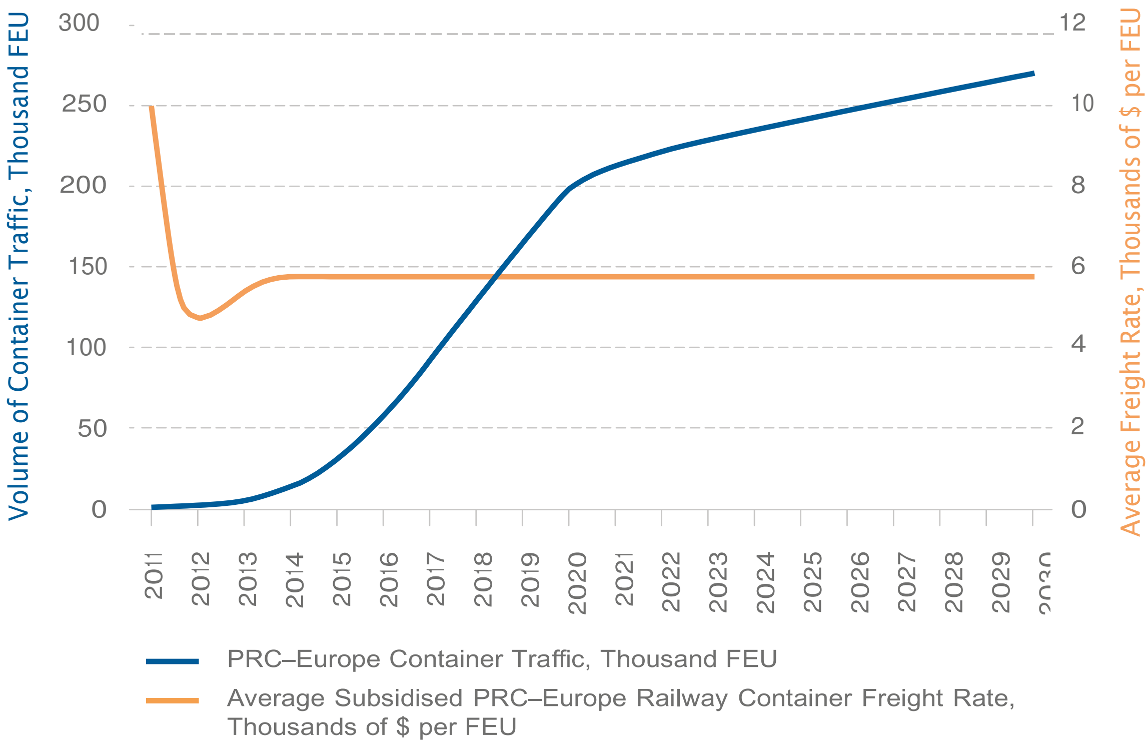


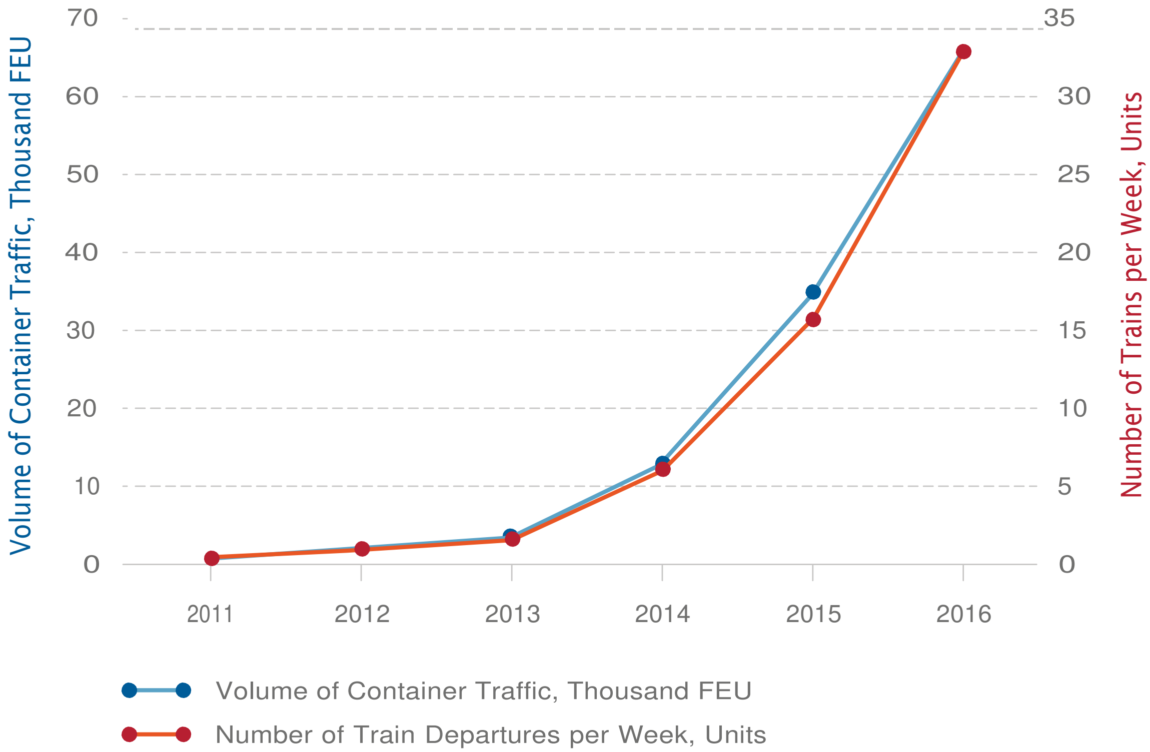
Figure B. Changes in Railway Container Freight Rates and Volume of Freight Traffic along PRC–Europe Routes (Estimated Freight Rate Elasticity of Demand). Scenario Envisaging Freight Rate Retention at $5,500 per FEU

Source: in-house calculations

- Railway container transport has certain advantages (compared to maritime trans- port) in the following areas: speed (timeframe), regularity (rhythmicity), reli- ability (guaranteed on-schedule delivery and cargo preservation) and the ability to deliver the cargo to any destination.
- **In the next two or three years, all regular trains from China that are "placed on track" will be fully loaded.** According to our estimates, **"convenience" elas- ticity of demand** ("convenience" including promptness, regularity and preci- sion of delivery) in railway container services between China and Europe, **stands at 98%**: in 2011–2016, the number of weekly train departures and the volume of container traffic have been growing virtually at the same rate (Figure C).
- Strict adherence to railway schedules (99.7% of all container trains running along China–Europe routes complete their journeys on schedule) and delivery times ap- proximately one-third of what is offered by maritime transport, guarantee a wide margin of "convenience".
- **According to our estimates, if current through freight rates are preserved (including Chinese subsidies), the China–Europe container traffic growth potential generated by the margin of "convenience" (promptness, regular- ity and precision of delivery) is far from exhausted.** By 2020, it may produce a manifold increase in the number of container trains and total volume of contai- ner traffic (to reach 200–250,000 FEU), with the number of train departures per week (regularity) going up by a factor of three (to about 100 per week) (Table B).

Figure C.
Changes in Container Trains' Frequency of Departure and Volume of Freight Traffic along PRC–Europe–PRC Routes, 2011–2016

Source: in-house calculations



	2011	2012	2013	2014	2015	2016	2020*
Volume of Container Traffic, Thousand FEU	7	14	10	22	40	74	200—250
Number of Train Departures per Week, Units	0.3	1	2	6	16	33	100

* As estimated by the authors.

Table B. Changes in Container Trains' Frequency of Departure and Volume of Freight Traffic along PRC–Europe–PRC Routes, 2011–2020

Source: China Railways Container Transport Co. Ltd (CRCT)

- **The existing potential of export traffic originating from Russia is all but exhausted. It is necessary to find new containerisable niche products that will enjoy demand in the capacious Chinese market, for example, Food Products (including Refrigerated Goods), Prepacked Chemical and Petrochemical Products or Engineering Products.**
- According to our calculations, the maximum additional container traffi that can be attracted to EAEU railway networks is estimated at 2.7 million FEU (5.4 million TEU), including West–East traffi of 325,000 FEU (550,000 TEU) and East–West traffi of 2,375,000 FEU (4,750,000 TEU) (Figure D):

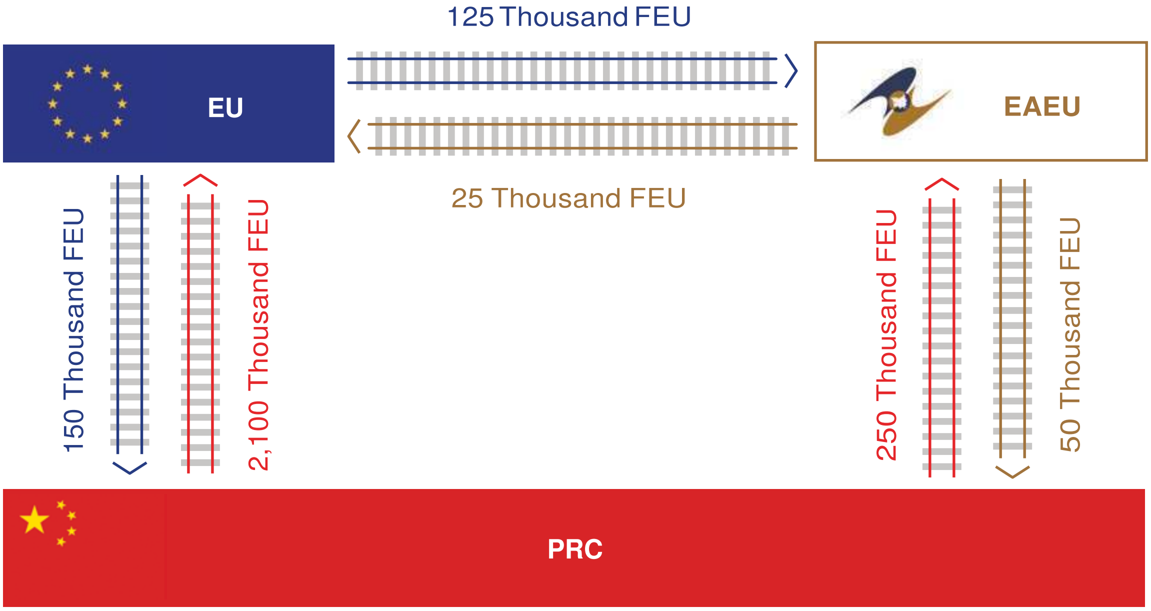
  EAEU → China—50,000 FEU (100,000 TEU)
  EU → China—150,000 FEU (300,000 TEU)
  EU → EAEU—125,000 FEU (250,000 TEU)
  China → EAEU—250,000 FEU (500,000 TEU) China
  → EU—2,100,000 FEU (4,200,000 TEU) EAEU
  → EU—25,000 FEU (50,000 TEU)

  However, the large imbalance between existing and additional West–East and East–West freight traffic may prevent EAEU railway networks from attracting all potential freight traffic along the China–EAEU–EU axis.
- **With balanced container loads (containers travelling both ways fully loaded with optimal cargoes; no empty containers), additional container traffi that may be attracted by EAEU railway networks is estimated at 500–550,000 FEU, while total freight traffi along the axis (including existing traffi may be as high as 650,000 FEU.**

  If the existing East–West/West–East container traffi imbalance (2:1) persists and West–East trains additionally take on any containerisable cargoes (subject to adequate development of transport and logistical infrastructure in EAEU member states and subject further to active cooperation of EAEU railway companies with their counterparts in China and the EU and with consignors/ consignees potentially interested in using railway transport), aggregate railway container traffi along the China–EAEU–EU axis could, in the long term, reach up to 1 million FEU per year.

Figure D.
Maximum Container Traffic that Could Be Additionally Attracted by EAEU Railway Networks

Source: authors' estimations



Introduction

One of the key advantages of continental cooperation within the Eurasian space, is that it makes it possible to boost transport capacity and enhance related infrastruc- ture. Efforts in this area will produce a number of positive effects, the most important being a more extensive use of the transport capacity wielded by EAEU countries, lo- calisation of industrial production along trans-Eurasian transport corridors, growth of exports and stronger cohesion among intra-continental states and regions. The key players in this process are China, Russia, Kazakhstan, Belarus and EU member states.

The urgency of this matter rises sharply in the context of the interface between the EAEU and the Chinese BRI. For China, this initiative is closely linked with the development prospects of its western and northeastern provinces. China is inter- ested in using land routes to promote products manufactured in its western prov- inces (Xinjiang Uyghur Autonomous Region, Tibet Autonomous Region, Qinghai) and northeastern provinces (Nei Mongol, Heilongjiang). For China, it is strategically important to overcome imbalances in economic development of its inland regions and primarily, to bridge the gap between the lagging western provinces and the more advanced eastern provinces. To do that, the government of the PRC is implementing a set of measures designed to build up a new transport infrastructure that will pro- mote the growth of westbound cargo flows.

For EAEU member states, involvement with the Chinese BRI is equally relevant. Their key task is to resolve domestic problems related to transport and logistics in- frastructure, containerisation of the economy and optimisation of industry regula- tions, tax administration, etc. This will generate intensive growth of internal, inter- regional freight traffic, reinforce regional links and improve the logistical positions of landlocked regions, such as the Russian Urals and Siberia and all of Central Asia (Libman, 2016; Karaganov et al., 2015; Syroezhkin, 2016; Toops, 2016).

A number of EU countries with railway connections to Asia have already begun, albeit on a limited scale, to make use of the advantages offered by trans-Eurasian transport corridors. European transport and logistical companies and consumers of transport services have taken a cautious stance with respect to the new opportunities opened up by transcontinental transit and in some cases lack reliable information (including information about carriage terms and costs, cargo delivery times, etc.).

In the context of the BRI transport theme, this is primarily a “container story”. Most opportunities associated with transit traffic along BRI routes are related to the use of containers. Container transport remains virtually the only method of delivery of Eurasian transit cargoes. The use of containers guarantees preservation of cargo, standard dimensions, reduced packaging costs, accelerated cargo handling, unified shipping documents and facilitated forwarding. If the bulk of freight traffic along the China–EAEU–EU axis does switch to land routes, it will be using 20 and 40-foot containers (Vinokurov, 2017).

This gives rise to the need for a comprehensive academic and applied research program to review the potential and prospects of developing trans-Eurasian land transport corridors, related transport and logistics infrastructure as well as the bar- riers to robust trade and economic relations among the countries lying along the PRC–EAEU–EU axis (Figure 1).

Accordingly, the logic of this report deals sequentially with the critical issues de- scribed below. In Section 1, we look at the current state of trade and the commodity structure of it between EAEU member states and China and between China and the EU (in terms of value and volume) as well as changes to it. We offer a brief analysis of the commodity structure of freight traffic among the relevant countries/integration as- sociations and of the way it changes over time (with a special emphasis on container cargoes) and describe the general trends affecting development of trans-Eurasian freight traffic along the PRC–EAEU–EU axis. Section 1 also presents the method- ological approach that was used to select container cargoes switchable to railway transport and a brief description of the main factors that determine the distribution (attraction) of freight traffic by transport modes employed to deliver cargoes along the China–EAEU–EU axis.

Section 2 presents an expert evaluation of the impact of the cost factor on the met- rics of freight traffic to be switched to the EAEU transport infrastructure (assessment of freight rate elasticity of demand for container freight services).

In Section 3, we review cargo delivery regularity (rhythmicity) and timeframes with a breakdown by transport modes (routes) and assess the impact that those factors have on the metrics of freight traffi to be switched to the EAEU transport infrastructure (assessment of the “convenience” elasticity of demand in container freight services).

Our comprehensive analysis of freight traffic along the China–EAEU–EU axis and of the factors affecting that traffic, has yielded an estimate of additional cargo flows (with a breakdown by commodity groups and traffic volume) that may be attracted to transport routes traversing the EAEU.

All supplementary materials are presented in attachments to this report.

The information base of our research includes the following materials:

— official information published by statistical agencies of EAEU and EU member states and the PRC and by certain international organisations (WTO, UNCTAD, OECD, IMF, World Bank).

— statistical information provided by transport and logistical companies of EAEU member states (Russian Railways, KTZ, The Belarusian Railway), the EU and the PRC.

— data provided by research and analysis centres (organisations) from Russia (and other EAEU member states), European and Asian countries, as well as other (including international) research and analysis centres (organisations), informa- tion agencies and mass media.

— data and qualitative assessments provided by independent experts and re- search teams.

The main source of information and analysis related to maritime transport was the annual UNCTAD *Review of Maritime Transport*, which contains materials on development of global maritime transport, as well as information on current rates and changes in freight rates charged for maritime container freight services along key routes (North America–APR/China, Europe–APR/China, South America– APR/China, Australia–APR/China, Africa–APR/China, Middle East–APR/China, internal APR routes). In addition, recent data on maritime container freight rates were obtained from the Shanghai Shipping Exchange, which has been publishing relevant indices (Shanghai Containerised Freight Index) since 2009.

Figure 1.
The Main Trans-Eurasian Corridors

Source:
EDB

1. General Trends Affecting Development of Freight Traffic Along the PRC–EAEU–EU Axis

1.1. EAEU–PRC Freight Traffic

In 2016, mutual trade turnover between the EAEU and China (by volume) reached its highest level in 10 years at 130 million tons[1] per year. Still, its value parameters on the global scale remain quite modest (despite their 1.5-fold increase over the decade). The increase of EAEU–China turnover was almost completely attributable to a 75% growth of EAEU exports to China, which amounted to 117 million tons in 2016. EAEU imports from China are smaller, at a steady 15 million tons per year (Attachment 2, Table A2.1). Russia, the largest EAEU economy, strongly dominates the structure of EAEU foreign trade freight traffic (see Attachment 1).

Land freight traffic between the EAEU and the PRC is supported primarily by railway transport. According to Russian foreign trade statistics, at the end of 2016 the vol- ume of railway-carried Russian exports to China, amounted to about 24 million tons, a more than 30 million ton decrease relative to 2011–2013 (mostly due to reduction of Iron Ore supplies). About half of railway freight traffic from Russia to China (an average of 10–13 million tons per year) consists of Timber (Round Timber and Sawn Timber). Railways are also used to carry significant volumes of the following to Chi- na: Mineral Raw Materials and Chemical Raw Materials (such as Iron Ore or Sulphur among others, between 6–11 million tons per year), Mineral Fertilisers (about 2 mil- lion tons per year), Fuel (mostly Hard Coal, about 1.8 million tons per year) and Pulp and Paper Products (0.9 million tons per year).

According to Russian foreign trade statistics, only about 1% of railway-carried Rus- sian exports to China are delivered in containers (150–200,000 tons per year, net). Russian Railways statistics, which feature multimodal China-bound cargoes as part of railway-carried exports (railway/maritime or railway/road) including the weight of containers, claim a higher share of container cargoes at 2–4%.

An analysis of Russian Railways statistics on export railway container traffic from Russia to China, as expressed in TEU (records maintained since 2010), reveals that over the last seven years, such traffic has increased by a factor of 2.5, from 69,000 TEU in 2010 to 171,000 TEU in 2016. Only 10-20% of that container traffic (21,000 TEU in 2016) actually crosses the border with China, meaning that the bulk of China- bound railway container traffic is transhipped through seaports (multimodal deliv- eries). Virtually all railway container traffic crossing a land border with China goes through Zabaykalsk (80–100%, declining) and Grodekovo (its share went up to 18% in 2016) (Figures 2 and 3). The other border crossing points, including those at the border between China and Kazakhstan, currently post close to zero freight traffic.

[1] The term "ton" refers to metric tons (1,000 kg), unless otherwise specified.

As for the commodity structure of that freight traffi it consisted almost completely (93–99%) of “Other Cargoes” in 2015–2016 (according to the classifi of cargoes used in Russian Railways statistical reports). In 2016, however, “Other Cargoes” accounted for only half of total freight traffi with “Timber Cargoes” making up the balance.

In terms of short-term and mid-term expansion of export railway container traffic from Russia to China, the most high-potential position is FEACN Commodity Group 84 “Engineering Products” (classified by Russian Railways as “Other Cargoes”). At this time, the volume of exports, both in absolute and relative terms, is insignificant, but it may well increase as Russian and Chinese machine builders step up their produc- tion cooperation.

According to Russian foreign trade statistics, the volume of railway-carried Russian imports from China, stands at about 2 million tons per year. Approximately one quar- ter of railway freight traffic from China to Russia is represented by Engineering Prod- ucts (0.4–0.6 million tons per year), while Metal Products and Finished Construction Materials account for 15–20% each and Finished Chemical products, Fuel and Mineral and Chemical Raw Materials for 10% each. Statistical indicators provided by Russian Railways with respect to import railway freight traffic from China to Russia are ap- proximately twice as high, as they include multimodal traffic which involves railway transport and tare weight.

According to Russian Railways statistics, import railway container traffic from China to Russia has amounted to 200–250,000 TEU per year, over the last several years.

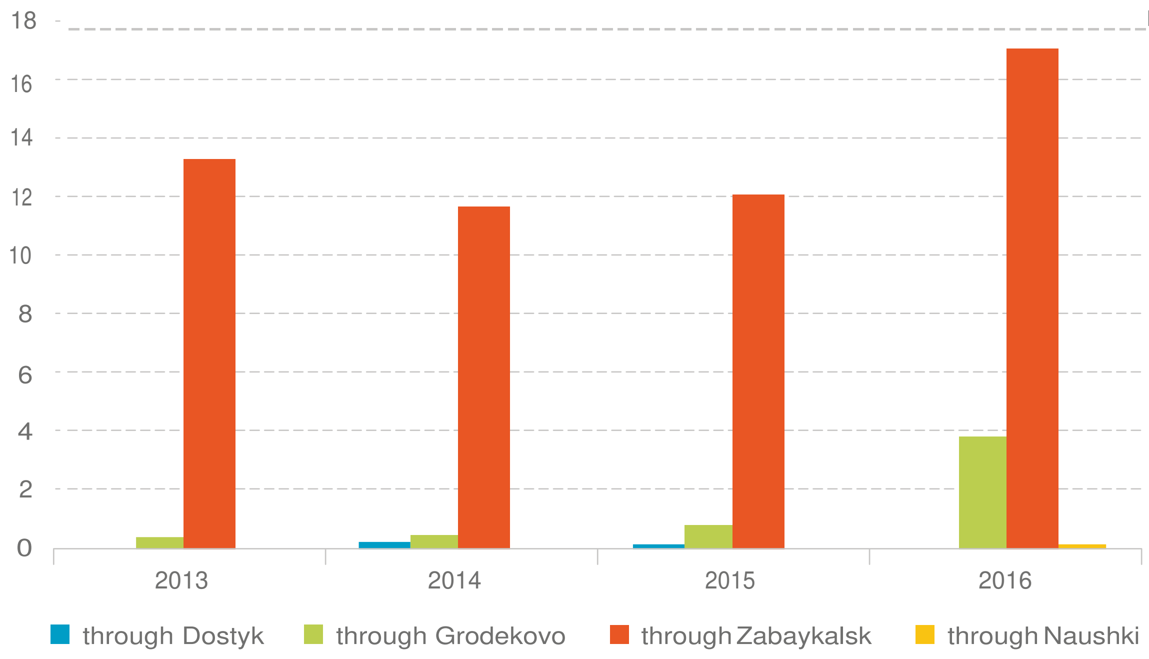
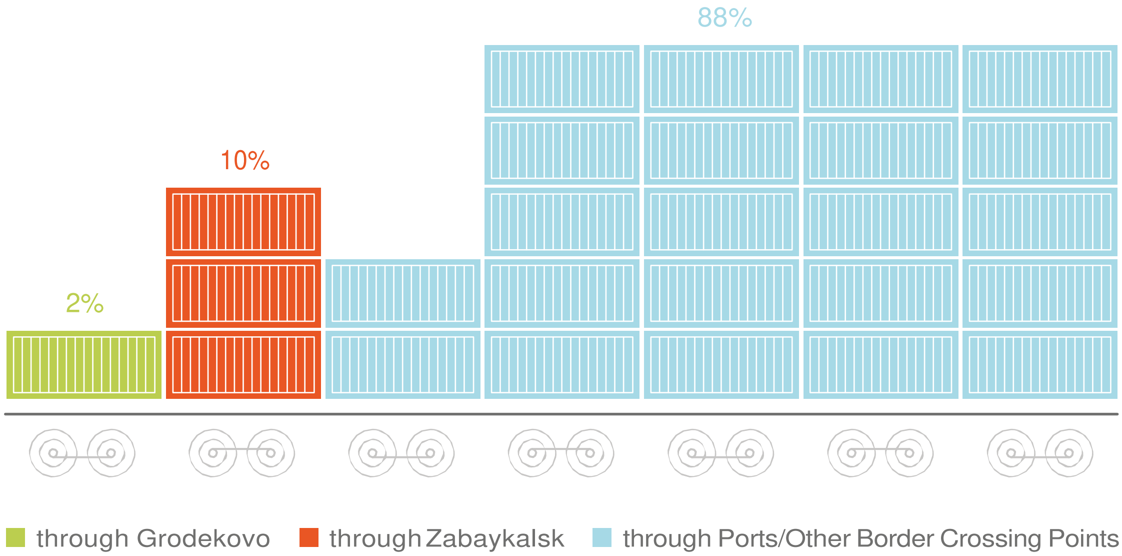


Figure 2.
Changes in Export Railway Container Traffic from Russia to China with a Breakdown by Border Crossing Points, 2013–2016, Thousand TEU

Source: Institute of the Economy and Transport Development based on Russian Railways statistics

Figure 3.
Structure of Export Railway Container Traffic from Russia to China with a Breakdown by Border Crossing Points in 2016

Source:
Institute of the Economy and Transport Development based on Russian Railways statistics



The bulk of railway container traffi originating from China is transhipped through seaports (multimodal deliveries). Only about 1/4 of total import container traffi (55,000 TEU in 2016) passes crossing points at the border with China. Almost all import railway container traffi from China (like China-bound traffi crosses the land border with China at Zabaykalsk (90–98%) and Dostyk (in 2016, its share went up to 9%) (Figures 4 and 5). Freight traffi through other border crossing points is currently minimal. In terms of commodity structure, "Other Cargoes" (according to the Russian Railways classifi account for 95% of total freight traffi with a small fraction (about 1,000 TEU per year) attributable to "Mineral and Construction Cargoes".

It is quite possible that the growing share of container cargoes in the structure of rail- way-carried imports from China to Russia (which, according to Russian Railways sta- tistics, has reached 60% over the last several years) will increase even further (by way of example, 100% of cargoes imported by Germany from China are delivered in con- tainers), especially with respect to "Other Cargoes", almost all of which can be con- tainerised. The relatively small import railway container traffic from China (which significantly decreased in 2015–2016) could exhibit manifold mid-term growth.

The volume of railway-carried Kazakhstani exports to China (as reported by KTZ) con- tinues to grow as transport capacity at the Kazakhstan–China border crossing points (Dostyk–Alashankou and Altynkol–Khorgos) increases. It is currently estimated at almost 4.7 million tons per year. The commodity structure of export freight traffi is dominated by Mineral Raw Materials (Ferrous and Non-Ferrous Metal Ores), Metal Products (Ferrochrome), Fuel (LNG) and Agricultural Raw Materials (Grain). The share of container cargoes (which consist mostly of Ferrous Alloys and Non-Ferrous Met- als) in Kazakhstani railway freight traffi to China is about 15%. Due to the advan- tageous geographical position of Kazakhstan (compared to competing countries),

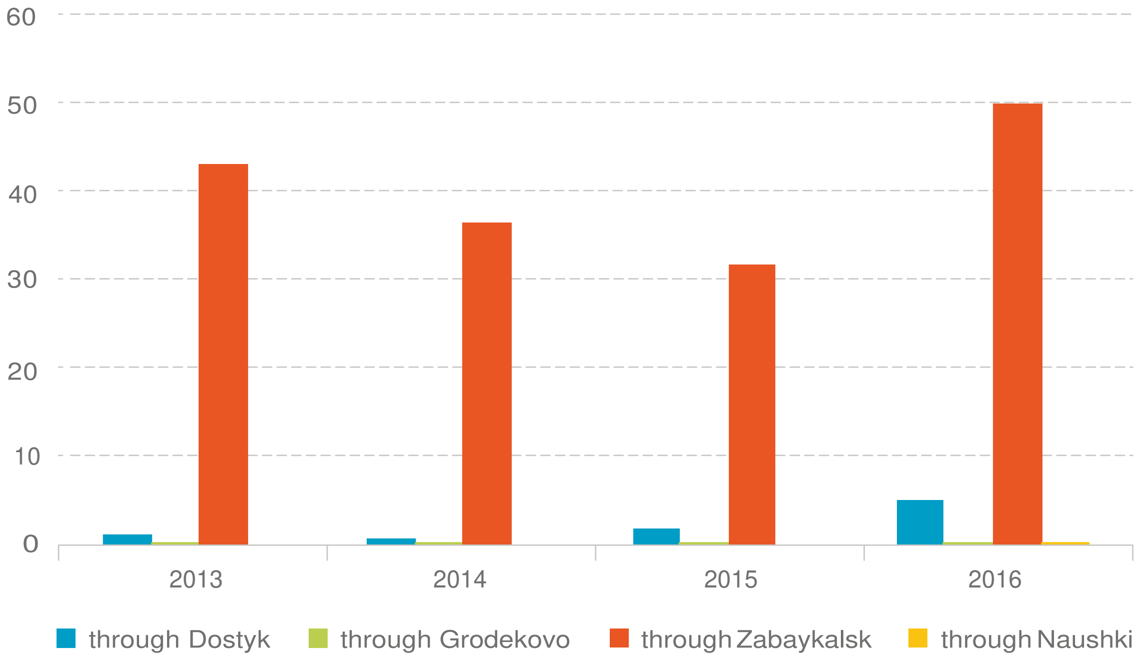


Figure 4. Changes in Import Railway Container Traffic from China to Russia with a Breakdown by Border Crossing Points, 2013–2016, Thousand TEU

Source: Institute of the Economy and Transport Development based on Russian Railways statistics

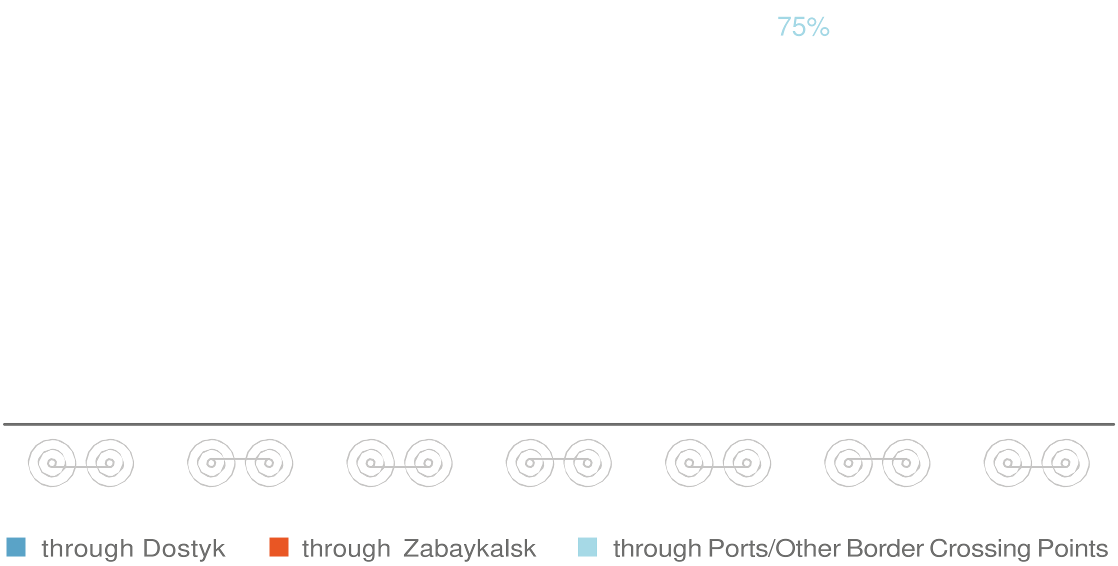


Figure 5. Structure of Import Railway Container Traffic from China to Russia with a Breakdown by Border Crossing Points in 2016

Source: Institute of the Economy and Transport Development based on Russian Railways statistics

which is eminently suitable for expansion of China-bound deliveries of Ferrous Al- loys (specifically, Ferrochrome), a product eagerly sought by Chinese metallurgical plants, combined with the increasing transport capacity of the railway connecting the two countries, this freight traffic can be expected to continue to grow, boost- ing the share of container cargoes in Kazakhstani railway-carried exports to China.

The limited export capacity of Kazakhstani processing industries (Machine Engineering, Chemical Industry, etc.), the segment which generates the most contain- erised exports in developed countries, precludes any significant mid-term increase of related railway container traffic from Kazakhstan to China.

Over the last several years, Kazakhstani import railway freight traffic from China (like Kazakhstani imports in general) has decreased, falling below 1.5 million tons in 2016. This can be attributed to the decline of demand for imported products in Kazakh- stan, driven by a significant reduction of global prices for and export revenues from, the country's key export commodities. In terms of commodity structure, Engineering Products, Metal Products and Finished Chemical Products are currently the largest Kazakhstani railway-carried imports from China, while the share of Petroleum Prod- ucts is declining. Stabilisation in global energy and raw materials markets is likely to trigger recovery of imports to Kazakhstan of Engineering Products and Household Appliances, goods which are mostly delivered from China in railway containers.

An analysis of foreign trade and transport statistics published by the EU, the EAEU and Belarus shows that almost 100% of Belarusian exports to China are carried by mul- timodal (railway/maritime) transport through the Baltic States and Baltic Sea ports (1–2 million tons per year). The key export items are Mineral Fertilisers and Round Timber; accordingly, the share of container cargoes (represented mostly by Finished Chemical Products and Engineering Products) is insignificant (1–2%). The volume of Belarusian transit export cargoes carried to China by Russian and Kazakhstani rail- ways is still quite modest (according to Russian Railways statistics, about 2–8,000 tons per year), with supplies made up exclusively of "Other Cargoes", which are becoming increasingly containerised (more than 80% in 2016).

Belarusian imports from China are also carried by multimodal (railway/mari- time and road/maritime) transport through the Baltic States and Baltic Sea ports. According to Russian Railways statistics, Belarusian import railway freight traffic from China transiting through Russia and Kazakhstan considerably increased to ex- ceed 60,000 tons, or 10% of total Belarusian imports from the PRC in 2016. Structu- rally, it is dominated by containerised "Other Cargoes" (85%).

The volume of railway-carried Kyrgyzstani exports to China is currently insignificant (Coal, Precious Metals) and pending implementation of a project to establish direct railway service between the two countries, it is restricted by the limited transport ca- pacity of Kazakhstan's transit railway routes using the border crossing points Dostyk– Alashankou and Altynkol–Khorgos. Kyrgyzstani railway-carried imports from China are also insignificant at less than 100,000 tons per year. Key import items include Engineering Products, Metal Products and Finished Chemical Products.

According to Russian Railways statistics, railway transport (with transit through Russia/Kazakhstan) is currently not used to support export or import shipments between Armenia and China.

1.2. PRC–EU Freight Traffic

The more than twofold increase in the volume of export railway freight traffi from EU countries to China (from 190,000 tons in 2007 to almost 400,000 tons in 2016) is pri- marily attributable to a manifold growth of railway deliveries from Europe[2] to China (via Russia and Kazakhstan) of Passenger Motor Vehicles and Components as well as certain types of Engineering Products (engine parts, transmissions, pumps, etc.) (Attachment 1). The share of Engineering Products reached half of the total exports in 2016. Approximately 15–20% of European railway-carried exports to China are rep- resented by Metals and Metal Products (which posted a more than twofold growth, reaching almost 70,000 tons). Other notable export items include Finished Chemical Products (about 10%) and Forestry Products (Pulp and Paper and Timber, accounting for approximately 5–8% each) (Figure 6). An analysis of Russian Railways statistical data shows that virtually all railway-carried cargoes transported from the EU to China (transit using the Russian Railways railway network) are containerised.

In the commodity structure of railway-carried EU imports from China in recent years, Machinery, Equipment, Industrial Products account for about 55% and Metal Products for 10–15% (with the share declining). Mineral and Chemical Raw Materials, Finished Chemical Products, Finished Construction Materials, Clothing, Footwear and Textiles each account for 5–10%, while the shares of the remaining product groups are consid- erably less (Figure 7).

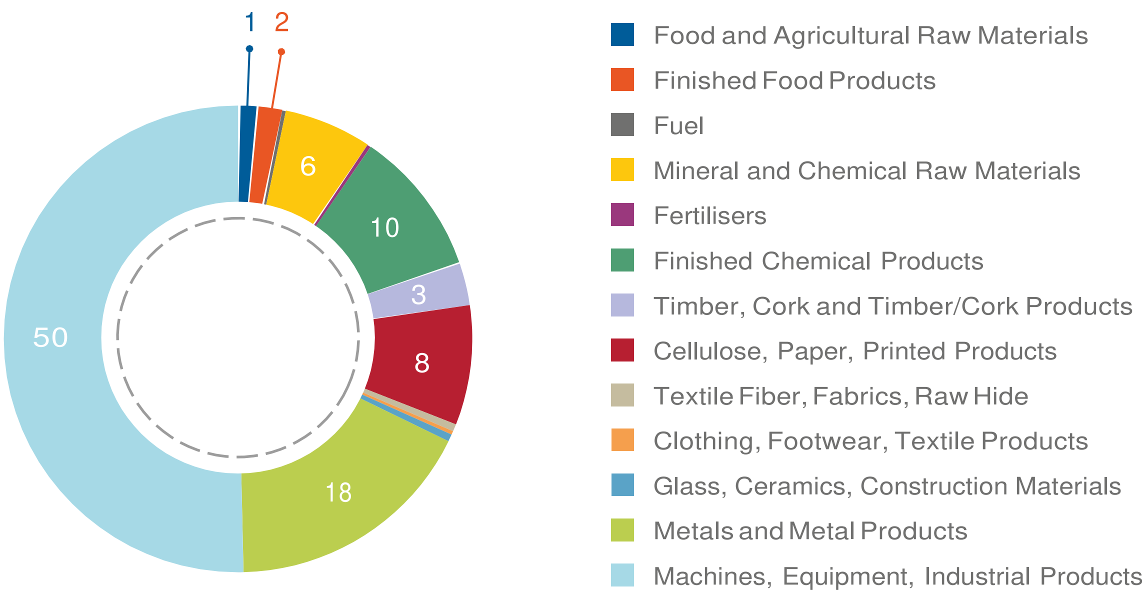


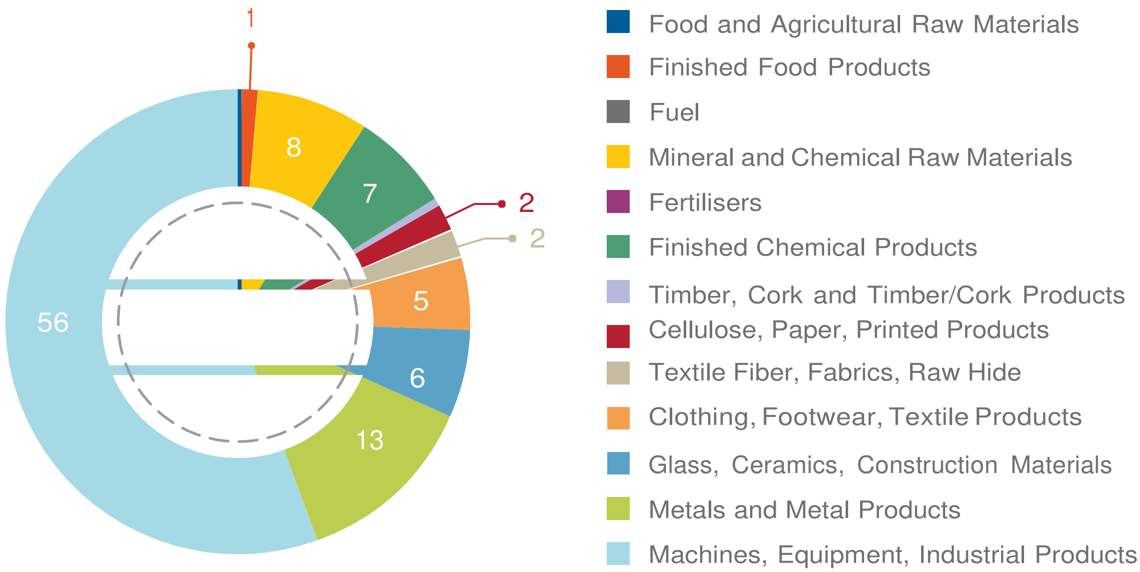
Figure 6. Commodity Structure of EU Railway-Carried Exports to China in 2016, %

Source: Eurostat

[2] In this report, the terms "European countries" and "Europe" refer to European Union member states.

Figure 7. Commodity Structure of EU Railway-Carried Imports from China in 2016, %

Source: Eurostat



The current high rate of containerisation of mutual trade and freight traffic between the EU and China (80%) is attributable primarily to maritime trade, as 98% of all car- goes are carried by ship.

Russian Railways statistics on transit railway container traffic from the EU to China (expressed in TEU) indicate an "explosive" growth from 1,300 TEU in 2010, to more than 50,000 TEU in 2016. While prior to 2014, virtually all transit railway container traffic from the EU to China went through Zabaykalsk (95–100%), the share of that crossing point decreased to 22% in 2016, with 2/3 of containers (about 34,000 TEU) transported through Dostyk and another 10% through Naushki (Figures 8 and 9). In terms of freight traffic structure, more than 95% of transit railway container car- goes transported from the EU to China are classified under "Other Cargoes".

Between 2010–2016, reverse transit container traffic (from China to the EU) in- creased from 5,600 TEU to almost 100,000 TEU and is now almost two times higher than export container traffic from the EU to China. Distribution of that freight traffic by border crossing points is similar to that registered for EU–China freight traffic: the share of border crossing point Dostyk has increased from 1% to 67%, the share of Zabaykalsk has decreased from 99% to 20% (with the absolute volume of container traffic through that crossing point up almost 3.5-fold) and there has been a rapid growth of freight traffic through Naushki (8% in 2016) and Altynkol (5%) (Figures 10 and 11). Virtually all freight traffic (99%) consists of "Other Cargoes".

The commodity structure of mutual trade between EU countries and China (dominat- ed by container cargoes and containerisable cargoes, including those capable of being switched from maritime transport to railway transport) creates good prospects for considerable growth of transit railway container traffic (EU–China) through the terri- tory of EAEU member states (Kazakhstan, Russia and Belarus)—using their transport networks and logistical infrastructure.

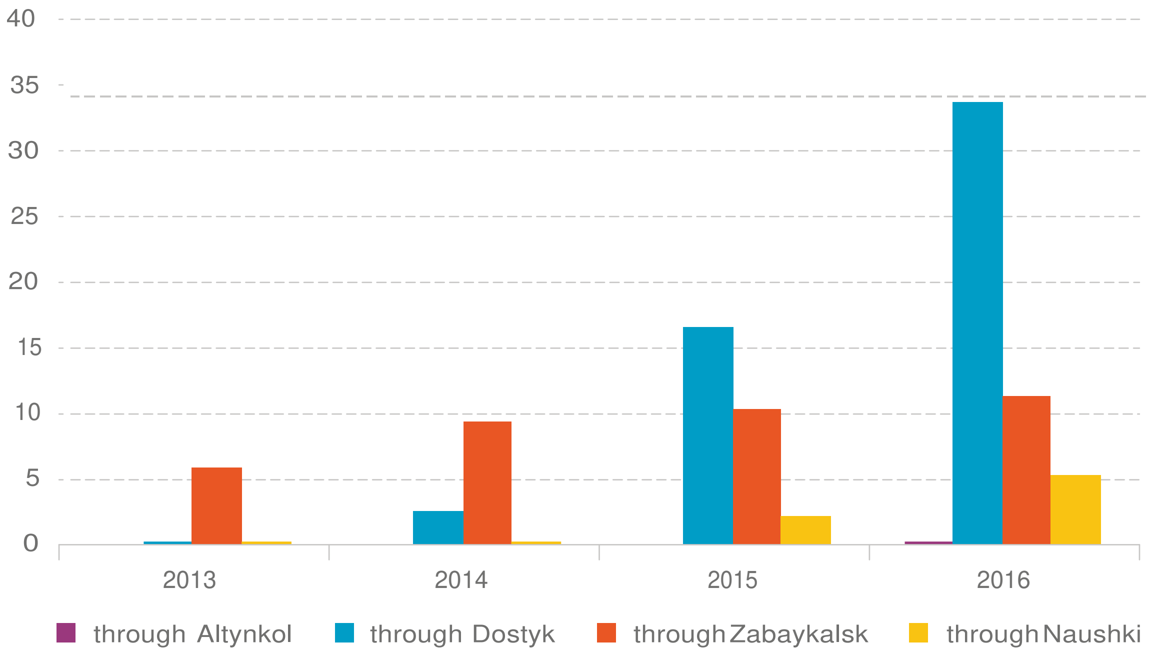


Figure 8.
Changes in Transit Railway Container Traffic from the EU to China with a Breakdown by Border Crossing Points, 2013–2016, by Volume, Thousand TEU

Source: Institute of the Economy and Transport Development based on Russian Railways statistics

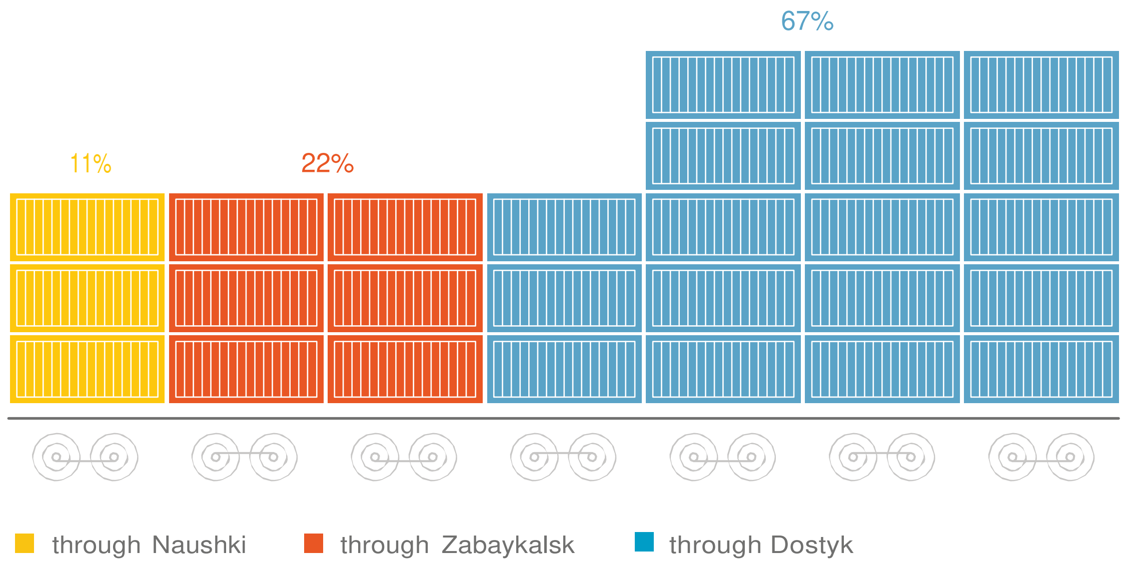


Figure 9.
Structure of Transit Railway Container Traffic from the EU to China with a Breakdown by Border Crossing Points in 2016

Source: Institute of the Economy and Transport Development based on Russian Railways statistics

Figure 10. Changes in Transit Railway Container Traffic from China to the EU with a Breakdown by Border Crossing Points, 2013–2016, by Volume, Thousand TEU

Source: Institute of the Economy and Transport Development based on Russian Railways statistics

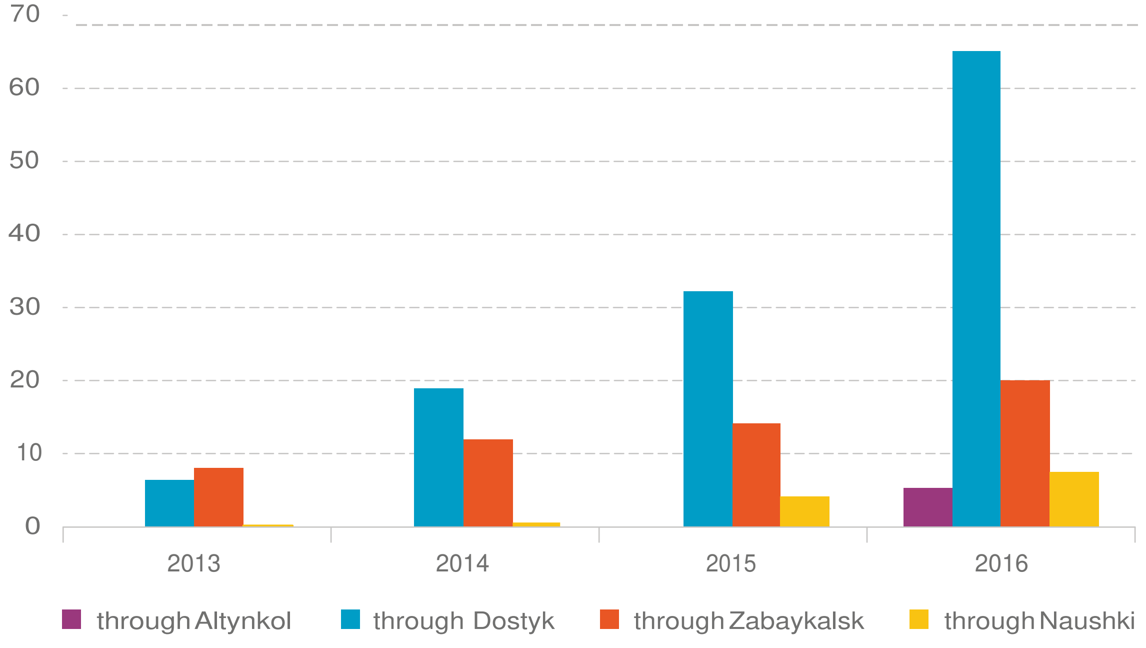
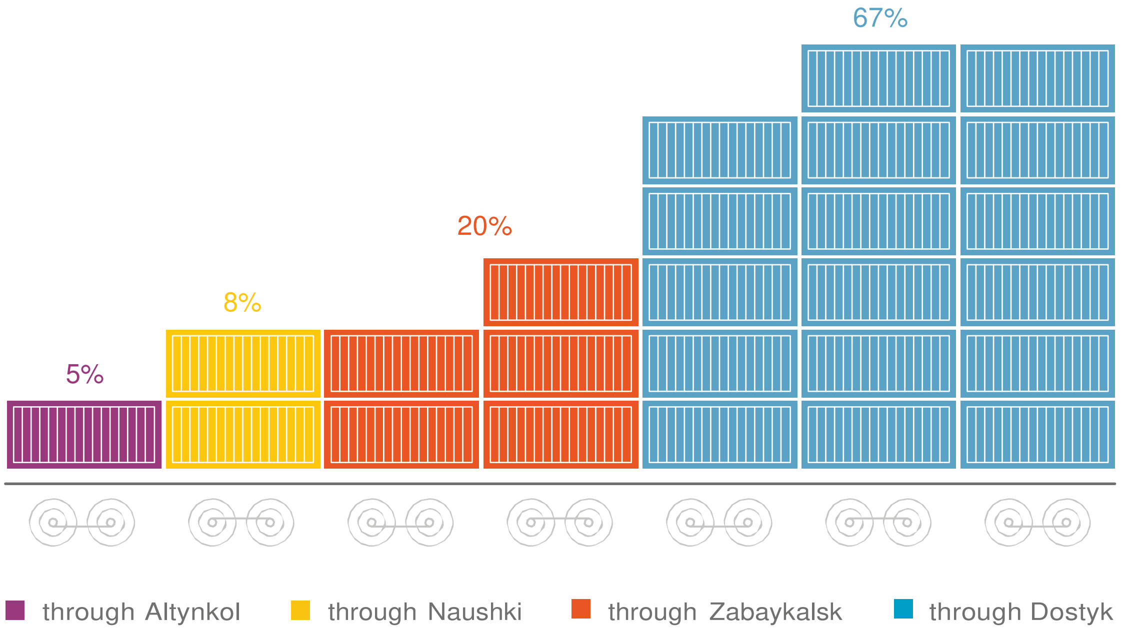


Figure 11. Structure of Transit Railway Container Traffic from China to the EU with a Breakdown by Border Crossing Points in 2016

Source: Institute of the Economy and Transport Development based on Russian Railways statistics



1.3. Methodological Approach to Selecting Container Cargoes Switchable to Railway Transport

The methodological approach developed in our research based on analysis of the commodity structure of foreign trade freight traffic, makes it possible to identify the potential volume and structure of cargoes that could be switched from maritime transport to railway transport.

Technically, most cargoes (with the exception of oversized, self-propelled and towed machines, such as those used for mining, road construction, railway machinery, bus- es and lorries) can be transported in containers. Moreover, such machines can be transported in containers in the form of knock-down kits. However, it is inexpedient to transport many inexpensive, high-tonnage cargoes in containers from the view- point of the economic viability of transport and logistic operations and, although there are "containerised" exceptions, most such cargoes are not, nor will they ever be, transported in containers (Table 1). Such commodity groups may include certain expensive low-tonnage cargoes that are *de facto* transported in containers (e.g. lubri- cant oils in retail packages classified under "Fuel"), but their share in the total volume of international freight traffic is negligible and can be left out of the equation.

FEACN Commodity Group	Cargo
10	Cereals
23 (excluding 2309)	Food Industry Waste (Excluding Animal Feed)
25	Non-Metallic Raw Materials, Cement
26	Ores
27	Fuel
28	Inorganic Chemical Raw Materials
29	Organic Chemical Raw Materials
31	Mineral Fertilisers
4403	Round Timber
for the Russian Federation and Emerging Countries—4401, 4402, 4403, 4406, 4407	Round Timber and Sawn Timber
68	Construction Stone
72 (excluding 7202)	Ferrous Metals (Excluding Ferrous Alloys)
7302, 7303, 7304, 7305, 7306	Rails and Pipes
8429, 8430	Mining and Road Construction Machines
8601, 8602, 8603, 8604, 8605, 8606	Locomotives and Railway Cars
8701, 8702, 8704, 8705	Tractors, Buses, Trucks and Special Motor Vehicles
88	Aviation Equipment
89	Vessels

Table 1.
Cargoes Not Suitable for Container Transport

Source:
in-house estimates based on Eurostat data and foreign trade analyses

In the future, containers may well be used to transport cargoes from certain commod- ity groups for which this mode of transport is currently not the first choice. Such situ- ations may emerge in the event of a significant rise in global prices for a considerable part of the products comprising such groups (e.g. for Alloy Steel Products classified under Group 72, Ferrous Metals). Moreover, for certain idiosyncratic reasons, inex- pensive "non-containerisable" high-tonnage cargoes are, in fact, being transported in containers along some transcontinental routes. Thus, almost 100% of Germany- bound Chinese cargoes (including Construction Stone, Ores, Non-Metallic Raw Ma- terials, Fuel and other similar goods) are transported in containers. This is large- ly attributable to the domination, both in Chinese and German ports, of container transhipment technologies that do not involve either loading or unloading of solid or liquid bulk cargoes.

Almost all international cargoes (with the exception of those classified under the 18 commodity groups listed above) are containerisable.

For a number of objective and subjective reasons, most freight traffic between Eu- ropean countries and the APR is currently by maritime transport, with most cargoes carried in both directions in containers. For some of these cargoes, particularly those with high unit value (value per unit of mass), one of the critical competitive factors is delivery time and it is technically impossible to reduce that time if maritime trans- port is used. Accordingly, for those cargoes it is reasonable to use the much faster railway delivery (through Russia and EAEU member states). A comprehensive analy- sis of the commodity structure of Eurasian freight traffic between critical country pairs, subject to unit values and physical volumes of international cargoes classified under 2-digit/4-digit HS/FEACN codes, has yielded a list of cargoes that are relevant (attractive) for the switch (reorientation) from maritime transport to railway trans- port (Table 2).

Based on customs value per unit of mass (estimated to be in excess of $10 per kg), consumer properties of the product (cargo) and technical aspects of its prepack- ing, packaging, transport and logistics, Engineering Products (with the exception of oversized machines not suitable for container transport) and Consumer Goods (Clothing, Footwear, etc.) are the leading product groups for which transit deliv- ery (through Russia and other EAEU member states) by railway is optimal. Other product groups that might be switched from maritime transport to railway trans- port include Pharmaceutical Products, Perfumery and Cosmetics, Toys and Sports Equipment and Works of Art. In addition, based on their value metrics and technical parameters related to carriage by railway transport (in containers), certain Non- Ferrous Metals (in particular, expensive Nickel Products) may also be effi transported in containers.

FEACN Commodity Group	Cargo
30	Pharmaceutical Products
33	Perfumery and Cosmetics
42	Leather
43	Fur
50	Silk
51	Wool
61	Knitted Goods
62	Clothing
64	Footwear
65	Headwear
75	Nickel
84 (excluding 8429, 8430)	Engineering Products
85	Electric Equipment and Radio Electronic Devices
90	Tools
91	Watches
95	Toys and Sports Equipment
97	Works of Art

Table 2. Containerisable Cargoes that Could be Switched to Railway Transport

Source: in-house estimates based on Eurostat data

1.4. Main Factors Shaping Distribution of Freight Traffic among Modes of Transport

There are three groups of factors which may affect distribution of freight traffic among various modes of transport.

Characteristics of Transported Cargoes

Physical state of the cargo (solid, liquid, gaseous), cargo properties (bulk, perishable, fl hazardous, etc.) and packaging dimensions. For example, liquid cargoes are generally not suitable for container transport (with the exception of tank con- tainers), but if prepacked they may become containerisable (motor lubricant oils, white spirit and similar products).

Cargo tonnage: high, medium and low-tonnage cargoes. This factor directly affects the choice of the mode of transport. The absence of high-tonnage cargoes in the trade between the EU and China (with the exception of Swedish Iron Ore, Scandina- vian Timber and French Grain) means that it is possible to almost completely con- tainerise mutual freight traffi

Cargo price: an integral, "synthetic" indicator which determines the economic vi- ability of a particular mode of transport (Table 3). In addition to the factors dis- cussed above, such as the type of cargo and related volume and physical properties (including physical state and packaging), the price of transported cargo directly af- fects selection of the mode of transport to be used along EAEU–China, EU–China and EAEU–EU routes. The price, being the integral (universal) indicator describing the product or cargo, determines to a certain extent, the very possibility of economi- cally viable and effi use of a certain type and mode of transport. Methodologi- cally, the link between the price of the transported cargo and selection of the mode of transport relies on the share of the transport component in the ultimate price of the cargo (as perceived by the consumer) vis-à-vis other inherent economic fac- tors (such as losses from cargo being delayed on the way, cost of maintaining storage facilities to secure a suffi stock of raw materials and fi products, etc.).

Geographical Position of Counterparties

The geographical position of the relevant regions is another important factor which affects selection of certain modes of transport for freight along the China–EAEU–EU axis. Large distances between countries and regions along that axis predetermine ex- tensive use of maritime, railway and aviation transport, limited use of road transport and minimal use of inland water transport.

- The maritime route through the Suez Canal is currently the main route for freight traffic between the EU and the PRC. In the future, the Northern Sea Route may put up some competition, but even with global warming, it may be regarded only as an auxiliary option. At the same time, development of continental railway sys- tems (primarily in EAEU member states and China) improvement and alignment of freight rate policies in stakeholder countries, development of transport and lo- gistical infrastructure (debottlenecking), active marketing in EU member states and China to attract industrial clients to EAEU transit transport networks, are all measures that can encourage a switch of an increasing share of freight traffic from maritime transport to railway transport.
- Freight traffi between EAEU member states and China is set to use maritime transport (in its multimodal railway/maritime version), railway transport and road transport (to service cross-border trade). In EAEU–China trade, multimod- al railway/maritime transport maintains a competitive edge vs. direct railway transport because in Russia, production and consumption potential is concen- trated in the European part of the country and in Kazakhstan in the north and northwest.
- The main modes of transport serving EAEU–EU freight traffic are railway trans- port, road transport and maritime transport (in its multimodal railway/maritime and road/maritime versions). Due to the relative geographic proximity of EU coun- tries, Belarus and the European part of Russia, the use of road transport to carry container cargoes between the EAEU and the EU remains economically viable.

Parameters of Various Modes of Transport

Another equally important group of factors affecting selection of a given mode of trans- port for various types of cargoes comprises economic, organisational and technological parameters of various modes of transport in the context of the shipping process: cost, weight, speed (timeframe), regularity (rhythmicity), reliability (guaranteed on-sched- ule delivery and cargo preservation) and ability to deliver the cargo to any destination (Table 3).

The following sections provide a comparative analysis of the impact that those factors have on the volume, commodity structure and value parameters of freight traffi and an assessment of the elasticity of demand for transport services subject to these fac- tors' operation.

Mode of Transport	Through Freight Rate	Delivery Time	Delivery Regularity	Delivery Precision
Maritime (Multimodal)	$2,500 per FEU			
Railway	$5,500 per FEU (including PRC subsidies)*			
	$9,000 per FEU (excluding PRC subsidies)*			

Table 3. Interrelation of Factors Affecting Selection of Maritime/Railway Transport to Carry Container Cargoes and Best Option for the Consignor Subject to Economic Conditions in 2016

Source: in-house estimates

Note: favourable factors are shown in green, less favourable in yellow and unfavourable in red.
* Subsidisation of railway freight traffic in the PRC will be discussed in Section 2.

2. Assessment of Freight Rate Elasticity of Demand for Container Freight Services: Impact of Cost on Freight Traffic

2.1. Maritime Container Freight Rates and Their Impact on Land Freight Traffic

A review of changes in maritime container freight rates used on Asia–Europe routes (Shanghai–Northern Europe and Shanghai-Mediterranean) shows their considerable volatility in 2009–2017 as part of a long-term downward trend. From 2009 to 2016, freight rates decreased almost twofold from $2,600 per FEU ($1,400 per TEU)[3] to less than $1,400 per FEU ($770 per TEU), to climb back up to $1,800 per FEU by the middle of 2017. The relevant indices moved in a haphazard fashion, posting annual increase/ decrease rates of 30–50% (Attachment 2, Table A2.3).

The volume of container traffic between the EU and China in 2009–2016 was gene- rally stable at 5–6.5 million FEU (10–30 million TEU) per year, displaying an overall growth trend (31% over eight years). During some years in that period, the volume of container traffic decreased, by 8% in 2012, by 2% in 2013 and by 4% in 2015.

The relationship between the volume of container traffic and maritime container freight rates is illustrated below (Figure 12):

- In 2010, as the SCFI[4] Shanghai–Northern Europe and the SCFI Shanghai–Mediterranean posted a year-on-year increase of 28% and 24% respectively, container traffic between the APR and the EU went up by 21%.
- In 2011, when the indices dropped by 51% and 44% respectively, container traffic continued to grow (+6%).
- In 2012, when the Shanghai Shipping Exchange indices recovered and increased by 54% and 37% respectively, container traffi between the APR and the EU went down by 8%.
- In 2013, container traffic continued to decline (–2%) against the backdrop of a new decrease in index values by 20% and 14%, respectively.
- In 2014, when the Shanghai Shipping Exchange indices posted insignificant growth (by 7% and 9%, respectively), container traffic increased by 13%.
- In 2015, a new collapse of freight quotes by 46% and 41%, respectively, provoked a decrease of container traffic by 4%.
- in 2016, when the Shanghai Shipping Exchange indices showed differentiated growth (+ 23% for the SCFI Shanghai–Northern Europe and +4% for the SCFI Shang- hai–Mediterranean), container traffi between the APR and the EU increased by 5%.

[3] Here and in the following sections, 1 FEU is assumed to be approximately equal to 2 TEU.

[4] Shanghai Containerised Freight Index.

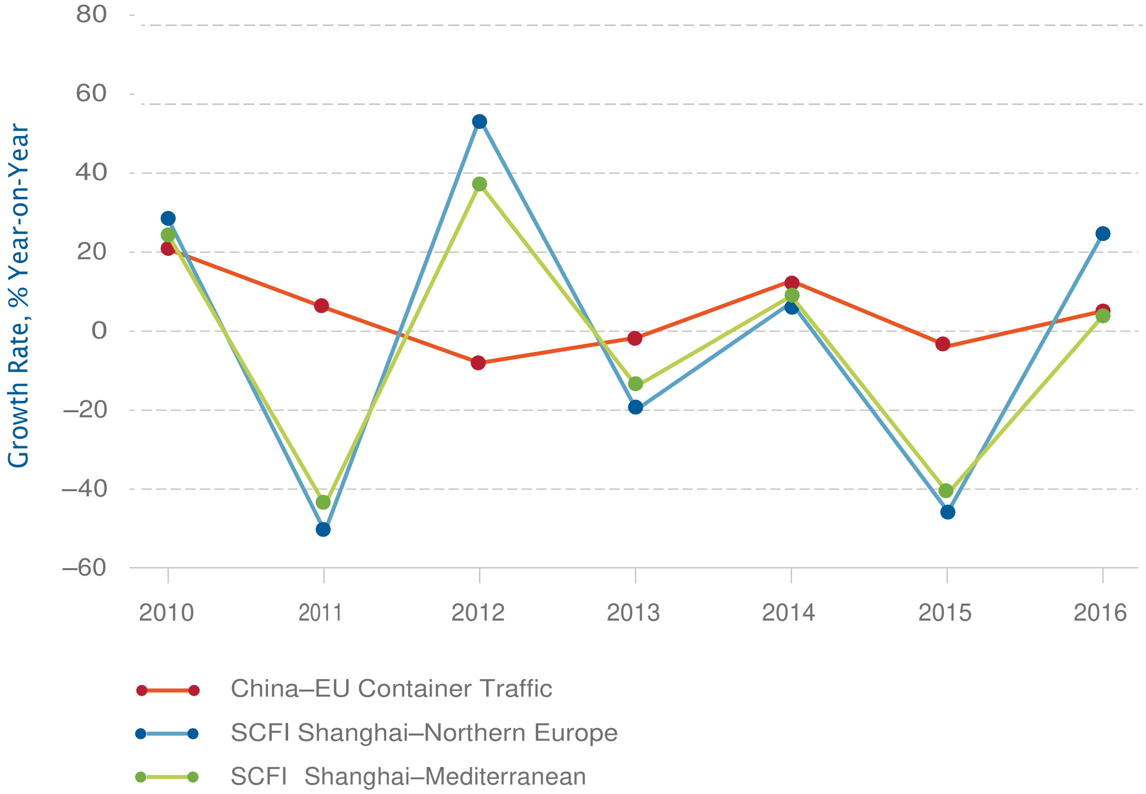


Figure 12.
Changes in Freight Indices and Volume of Container Traffic along APR–Europe Routes

Sources:
Eurostat, Shanghai Shipping Exchange

As we can see, changes in container traffi did not correlate with changes in maritime container freight rates. Reduction of freight rates did not spur container traffi while their growth and high level did not depress it. We may conclude that demand for maritime container freight services (regardless of the type of cargo) is inelastic vis-à-vis freight rates. The situation is as follows: shipping companies are frequently forced to reduce con- tainer freight rates to below cost to maintain their schedules. In the opinion of industry experts, over the last several years there has been an increase in excessive tonnage in the container freight segment of the maritime freight market, which led in August 2016, to the bankruptcy of Hanjin Shipping Co Ltd. (South Korea), one of the world's largest shipping companies.

On APR (China)–Europe routes, the situation is further exacerbated by the imbalance in container trade between the EU and China. The volume of container cargoes deliv- ered from China to the EU in recent years is approximately 80% higher than the volume moving in the reverse direction. According to Eurostat, over the last several years, the share of empty containers in freight traffi from the EU to China stands at about 35–40% (in 2007–2008, it exceeded 50%) vs. 1–3% in freight traffi from China to the EU. Return containers sent from EU countries to China are often fi with cargoes that are normally not containerised, such as Timber or Waste Paper.

It should be noted that, as a rule, seaports do not act as major “generators” of export and import freight traffic, or as starting and finishing points of their origin or destina- tion. Accordingly, to make a correct comparison of freight costs incurred when using different modes of transport to carry cargoes between China and Europe, it is neces- sary to take into consideration the freight rates charged for delivery of containers to and from ports by railway, road, or inland waterway, as well as the cost of tranship- ment of cargoes in ports. Those additional container freight costs constitute a sig- nificant part of the “through” cost of delivery of cargoes from China to the EU and from the EU to China. It would be reasonable to select Chongqing, one of the largest industrial cities in Central China (whose administration was the first to start subsi- dising freight rates), as the point of origin of container traffic in China and Duisburg, North Rhine–Westphalia, a major German industrial centre, as its point of destina- tion. China Railways Container Transport Co. Ltd (CRCT) has selected this direction to map the largest number of regular container train routes, setting an extremely busy schedule: 16–17 trains per week from Chongqing to Duisburg and 7 trains per week from Duisburg to Chongqing (Attachment 2, Table A2.6).

2.2. Railway Container Freight Rates and Their Impact on Freight Traffic

Currently all active railway routes that connect China with EU countries (according to the schedule published by CRCT) pass through EAEU member states.

There is no uniform through freight rate along their length. Each railway company operating the transcontinental route uses its own freight rates. Currently freight rate changes made by railway operators are not synchronised. In addition, one of the im- portant components of the through freight rate is the cost of maintenance of rolling stock (container cars) which may be owned by the consignor or the railway company, be used under lease, etc.

Therefore, no single railway company can change its freight rates so as to dramati- cally affect the aggregate ultimate amount of freight costs without going beyond its profitability range. Two possible options are agreed synchronous reduction of freight rates by all stakeholders, or provision by the State of preferences (within the frame- work of an international railway freight traffic promotion policy) enabling the na- tional carrier to drastically reduce its freight rates.

Railway container traffic between the PRC and Europe acquired a commercial and regular nature only in 2014. Prior to that, it was limited to one-off deliveries without any attempt to gain any direct economic effect or to fill up the return containers. Vibrant growth of the volume of railway container traffic between China and the EU started when the Chinese regional government subsidies began. Subsidy of railway container traffic by regional Chinese authorities is the main factor responsible for the growth of railway traffic between the PRC and Europe.

Subsidisation of Railway Container Traffic along the PRC–EAEU–EU Axis by Chinese Authorities

Analysis of the few available sources of information shows that Chinese authorities are currently using a decentralised system to subsidise railway container traffic. Sub- sidies are provided only by administrations of the relevant provinces and municipali- ties subordinated to the central government and only with respect to transcontinen- tal railway routes (port-bound traffic is not subsidised). The level of subsidisation can vary significantly from region to region. Furthermore, Chinese authorities do not subsidise container traffic from Europe to China. As a result, European consignors are less inclined to use railway containers to carry cargoes to China (HSBC, 2016).

Subsidisation of railway container traffic is restricted to provinces and cities of Cen- tral China (Chongqing, Sichuan, Hubei, Henan) for geographical reasons (great dis- tance to seaports and relatively smaller distance to Europe by land). These Chinese regions are currently experiencing the most dynamic growth and generating new in- ternational railway container traffic. The number of container trains is rapidly grow- ing and most routes start and finish here.

As noted by Brinza (2017), the average amount of subsidies varies from region to re- gion and lies within the range of $3,500–4,000 per FEU, while the standard freight rate charged for transporting a container from China to Europe is about $9,000; thus the subsidy lowers it to $5,000. A similar estimate is provided by Moss (2017): about $5,000 for transporting a container by railway from Chengdu to Hamburg. These fig- ures correlate with the systematised information presented by Besharati et al. (2017). Generally, regional subsidies vary from $1,500 to $7,000 per FEU (Table 4). In fact, the subsidies make it possible to reduce the freight rate for transporting cargoes on Chi- nese territory to zero.

Table 4. EU-Bound Container Traffic Subsidies Provided by Regional Chinese Authorities, Effective Years and Average Subsidised Through Freight Rates

Source: in-house estimates

Subsidising Chinese Administration (Direction)	Route	Distance, km	Transit Time, days	Effective Year	Through Freight Rate, $ per FEU	Subsidy Amount, $ per FEU	Average Subsidised Freight Rate, $ per FEU
Chongqing–EU	Chongqing–Duisburg (Germany)	11,000	15–17	2011	8,000–9,000	3,500–4,000	4,750
Hubei–EU	Wuhan–Czech Republic, Poland	10,700	15–17	2014	12,000	4,000–5,000	7,500
Sichuan–EU	Chengdu–Łódź (Poland)	9,965	12–14	2013	8,500–10,290	3,000–3,500	6,150
Henan–EU	Zhengzhou–Hamburg (Germany)	10,245	16–18	2013	10,500	3,000–7,000	5,500
Jiangsu–EU	Suzhou–Warsaw (Poland)	11,200	12–15	2014	7,500	1,500	6,000
Zhejiang–EU	Yiwu–Mad rid (Spain)	13,052	21	2014	10,000	5,500	4,500

According to our estimates, total subsidies provided by Chinese authorities in 2016 amounted to about $88 million. This estimate assumes an average container transport subsidy of $2,500 per FEU, with the total number of subsidised containers originating from central PRC provinces standing at 35,000 FEU. Accordingly, an average subsidy per FEU has been merely 0.3–0.4% of the total value of container-shipped cargoes.

It is probable that China will discontinue or reduce subsidies for freight traffi af- ter 2020. This may happen due to the growing demand for container traffi from the PRC to the EU, as Chinese consignors enjoy additional advantages offered by railway routes (in comparison with sea routes): convenience (speed, frequency and regularity, door-to-door delivery, etc.) is expected to compensate for the freight rate disparity.

The subsidisation policy pursued by the authorities of a number of Chinese provinces certainly changes the economics of international railway container traffi fundamen- tally, distorting the ratio of actual transport costs and freight rates. It is not quite cor- rect to compare changes in the volume of railway container traffi along China–Europe routes with changes in the subsidised through freight rate charged for container deliv- ery. However, the actual reduction of the freight rate makes transporting a broad range of goods from China to Europe by railway containers a commercially viable proposi- tion, which encourages consignors to switch from sea routes to railways. Incidentally, the signifi increased frequency (regularity) of departure of container trains from China to Europe and back (which is an order of magnitude higher than for maritime transport) has already become a new “non-tariff” factor of attraction for consignors. It should also be noted that the continuously expanding geography of railway contai- ner routes gives this mode of transport a certain competitive edge in terms of door-to-door delivery compared to sea routes, which almost always imply the need to use multimodal transport and tranship the cargo before it can reach the end consumer.

Assessment of the Relationship between Demand for Container Traffic and Freight Rate

In theory, there should be an inverse relationship between the freight rate and the volume of freight traffic. Any reduction of costs should significantly increase the competitiveness of the land route and attract consignors.

But in reality, the relationship between the volume of container traffic and transport costs functions differently. This is largely attributable to the use of non-market pric- ing practices (subsidy of freight rates by Chinese authorities), the relatively short his- tory of commercial operation of land routes between China and Europe, the absence of reciprocal China-bound export flows from the EU and the EAEU and a number of other factors. Let us take an in-depth look at the situation with freight traffic along the PRC–EAEU–EU axis and container freight rates.

The annual doubling of the number of container trains and of the volume of contai- nerised cargoes along PRC–EAEU–EU routes in 2013–2016, was largely attributable to freight rate changes in the PRC and to the possibility of quickly switching freight traffic from sea routes to railway transport, with its considerable advantages:

- 2011: The administration of the City of Chongqing begins to offer local manufacturers engaged in export railway container traffic subsidies in the amount of $3,500–4,000 per FEU (40–50% of the Chongqing–Duisburg through freight rate). Container trains start to depart regularly from Chongqing for Duisburg with a frequency of 1–2 trains per month in 2011, up to 16–17 trains per week in 2018 (Attachment 2, Table A2.6).
- 2013: The administration of Sichuan Province (City of Chengdu) begins to sub- sidise export railway container freight rates to the tune of $3,000–3,500 per FEU (30–40% of the Chengdu–Łódź through freight rate). Container trains start to de- part regularly from Chengdu for Łódź with a continuously increasing frequency, reaching 21–22 trains per week in 2018 (Attachment 2, Table A2.6).

These two commonly used routes allow us to assess the threshold competitive level of the China–Europe through freight rate compared to the multimodal option (maritime– railway route between China and Europe).

Calculations based on the data presented in Table 4 show that the through freight rate for multimodal (railway–deep sea–railway) shipping of a 40-foot container along the Chongqing–Shenzhen–Hamburg–Duisburg route can be estimated at about $3,200:

- Chongqing–Shenzhen (railway, 1,500 km)—$900 ($0.60 per km);
- Shenzhen–Hamburg (deep sea, 18,500 km)—$1,500 ($0.05 per km);
- Hamburg–Duisburg (railway, 400 km)—$800 ($2 per km).

The cost of shipping a 40-foot container by container train along the Chongqing–Duisburg route can be estimated at $8,000–9,000 per FEU without subsidies, while the subsidised freight rate is about $4,800 ($4,000–5,500) per FEU.

Another example: The average through freight rate for multimodal (railway–deep sea–railway) shipping of a 40-foot container along the Chengdu–Shenzhen–Gdańsk– Łódź route is $2,900:

- Chengdu–Shenzhen (railway, 1,800 km)—$1,100 ($0.60 per km);
- Shenzhen–Gdańsk (deep sea, 19,100 km)—$1,500 ($0.05 per km);
- Gdańsk–Łódź (railway, 300 km)—$300 ($1 per km).

The cost of shipping a 40-foot container by container train along the Chengdu– Łódź route can be estimated at $8,500–10,200 per FEU without subsidies, while the subsidised freight rate is about $6,000 ($5,000–7,300) per FEU.

Therefore, the growth of railway container traffic between China and the EU in 2011–2017, from 7,000 FEU to 131,000 FEU (or from 14,000 TEU to 262,000 TEU) was achieved with a through railway freight rate of $4,800–6,000 per FEU (subsidised by about 40%) (Table 5). Subsidisation-driven reduction of China–Europe railway container freight rates by 30–50%, resulted in a 19-fold growth of contai- ner traffic. Accordingly, the average competitive railway freight rate for container traffic between China and the EU was:

“deep sea” (multimodal) + $2,500 per FEU ≈ $5,500 per FEU

Table 5. Changes in Railway Container Freight Rates and Volume of Freight Traffic along PRC–Europe Routes (Estimated Freight Rate Elasticity of Demand), 2011–2016

	2011	2012	2013	2014	2015	2016
PRC–Europe Container Traffic, Thousand FEU	7	14	10	22	40	74
Average Subsidised PRC–Europe Railway Container Freight Rate, $ per FEU	9,000	4,750	5,450	5,750	5,750	5,750

Source: CRCT

Data from Table 5 testify to the high elasticity of demand for railway container ship- ping of certain cargoes[5], depending on freight rate changes.

According to the plans published by the National Development and Reform Com- mission of the PRC, the number of regular container trains running along China– EU routes by 2020 should triple and reach 5,000 (Binhai New Area, 2017). This will cause container traffic to increase to 200–250,000 FEU (400–500,000 TEU). In as much as China does not intend to increase subsidisation of railway container traffic, the formula and the value of competitive China–EU railway container freight rate will not change much.

A sevenfold growth of railway container traffic between China and Europe (from 74,000 FEU in 2016 to 0.5 million FEU) can be achieved if the through freight rate is further reduced by 25–30%. This is possible only if all railway operators (KTZ, Rus- sian Railways, European railway operators) pursue a uniform freight rate policy and railway container freight rate subsidisation by China remains at its current level. Freight rate reduction will enable a switch to railway transport of certain types of car- goes which, although suitable for this mode of transport, are significantly less expen- sive than those transported at this time.

We suggest two possible scenarios for development of container traffic along the PRC–EAEU–EU axis.

Scenario 1—Further Freight Rate Reduction: Container traffic increases to 0.5 million FEU. In this scenario, dependence of demand for railway container freight services on the freight rate (along the PRC–Europe route) will be expressed as follows (Figure 13):

- A through freight rate of about $9,000 per FEU (“deep sea” [multimodal] + $6,500 per FEU)—container traffic of less than 1,000 FEU (no commercial container traffic until 2013).
- A through freight rate of about $5,500 per FEU (“deep sea” [multimodal] + $2,500 per FEU)—container traffic of 74,000 FEU in 2016.
- A through freight rate of about $5,500 per FEU[6] (“deep sea” [multimodal] + $2,500 per FEU)—container traffic of 200–250,000 FEU in 2020.

5 According to an analysis of Eurostat statistics, in structural terms, railway container traffic between China and the EU is currently dominated by expensive goods with an average price of more than $100 per kg (electronics, computers, luxury cars, etc.).

6 Provided that global oil prices (and, accordingly, heating oil and diesel fuel prices as the key factors determining the cost of sea freight) remain at their current level.

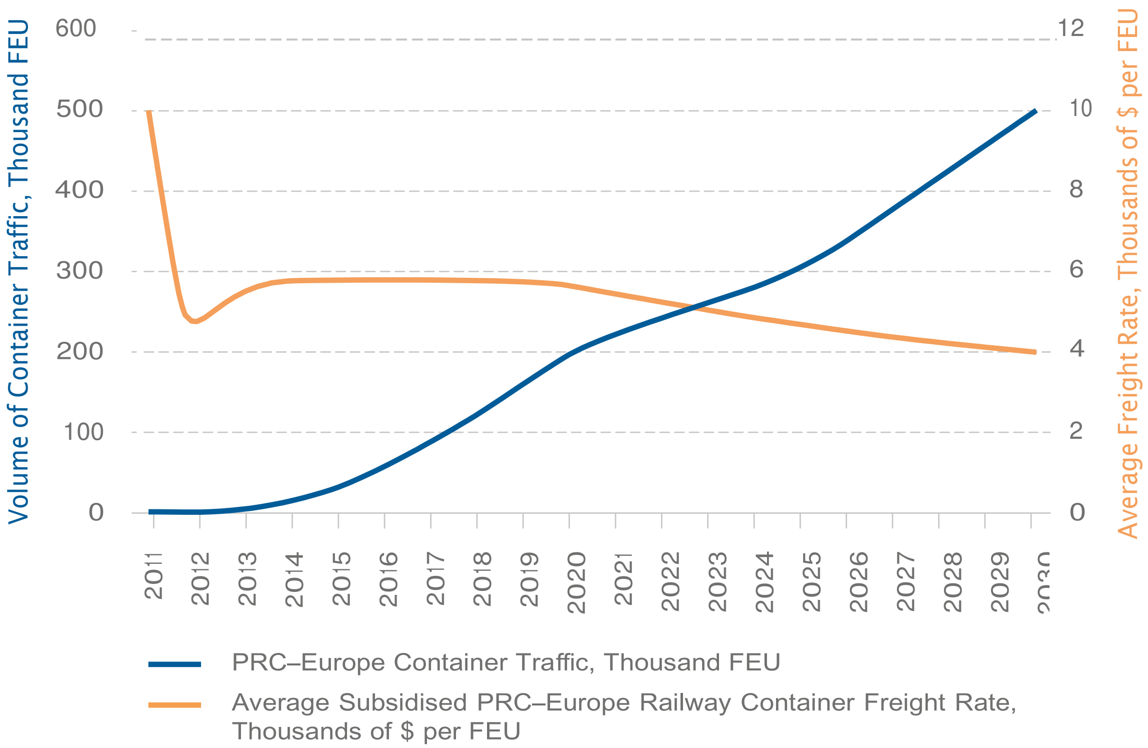


Figure 13. Scenario 1—Further Freight Rate Reduction. Changes in Railway Container Freight Rates and Volume of Freight Traffic along PRC–Europe Routes (Estimated Freight Rate Elasticity of Demand), 2011–2030

Source: in-house estimates

- through freight rate of about $4,000 per FEU[7] ("deep sea" [multimodal] + $1,000 per FEU)—container traffi of 500,000 FEU (1,000,000 TEU) in 2030 (Think Railways, 2016). The current through freight rate (including subsidies) of $5,500 per FEU has already made it possible to increase container traffic from virtually zero to 74,000 FEU in 2016 and may spur further growth of container traffic to 200–250,000 FEU in 2020. After that, keeping the freight rate at $5,500 per FEU will no longer produce such a pro- nounced effect and container traffic growth rates will dramatically slow down. This means that a container traffic increase from 200–250,000 FEU in 2020 to 0.5 mil- lion FEU by 2030 is possible, subject to further reduction of the through freight rate by $1,500 per FEU (from $5,500 per FEU to $4,000 per FEU).

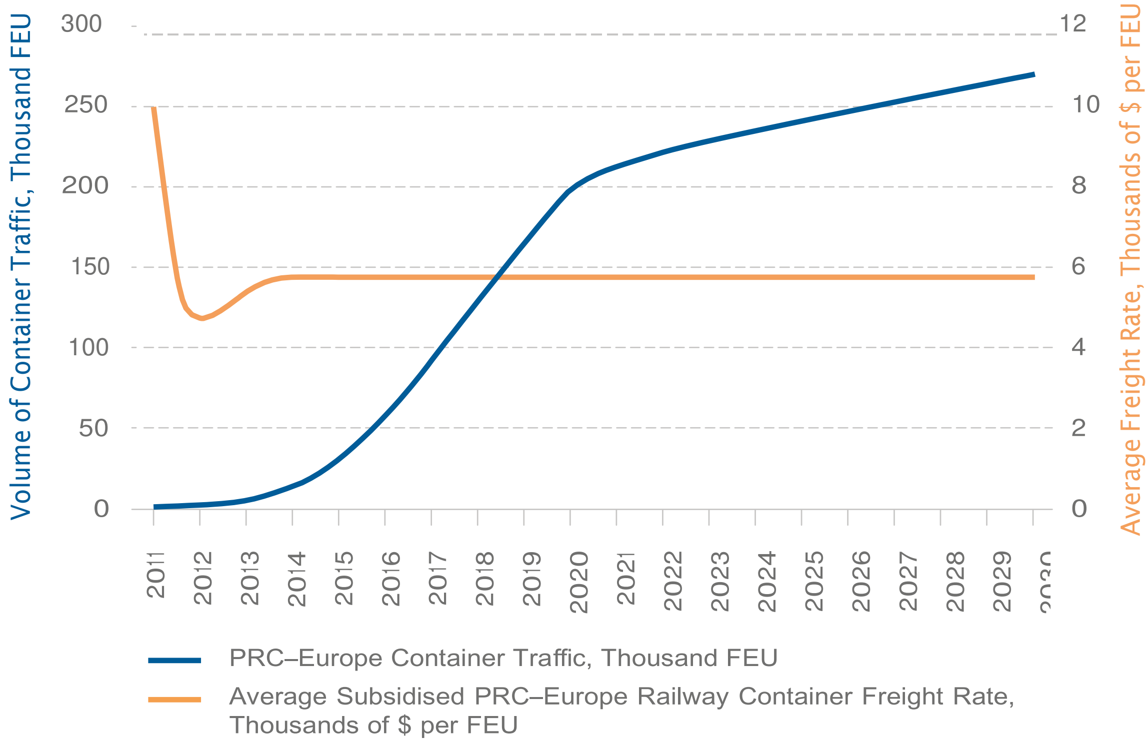
Scenario 2 can be described as "inertial": retention of the current through freight rate (including Chinese subsidies) at the current level of $5,500 per FEU after 2020. In this scenario, dependence of demand for railway container freight services on the freight rate (along the PRC–Europe route) will be expressed as follows (Figure 14):

- A through freight rate of about $9,000 per FEU ("deep sea" [multimodal] + $6,500 per FEU)—container traffic of less than 1,000 FEU (no commercial container traffic until 2013).

[7] Provided that global oil prices remain at their current level.

Figure 14. Scenario 2—No Freight Rate Change. Railway Container Freight Rates and Volume of Freight Traffic along PRC–Europe Routes (Estimated Freight Rate Elasticity of Demand), 2011–2030

Source: in-house estimates



- A through freight rate of about $5,500 per FEU ("deep sea" [multimodal] + $2,500 per FEU)—container traffic of 74,000 FEU in 2016.
- A through freight rate of about $5,500 per FEU[8] ("deep sea" [multimodal] + $2,500 per FEU)—container traffic of 200–250,000 FEU in 2020 and subsequent reduction of freight traffic growth rate.

An analysis of available data shows that each new reduction of the railway freight rate (closing the gap with the multimodal freight rate) enables transition to railway transport of additional switchable cargoes and accordingly, brings additional con- signors and generates additional freight volumes.

As noted above, there is a threshold through railway freight rate that enables the launch of an economically viable railway container freight service between China and Europe (about $0.60 per km, or an average of $6,000–7,000 for the entire route). Limited reduc- tion of the through freight rate, e.g. by $1,000 per FEU (from $9,000 per FEU to $8,000 per FEU) in 2011, would not have any impact on generation of container traffi

It should also be noted that there is currently no data on the actual correlation between freight rate changes and the volume of railway container freight traffi as massive de- partures of container trains from China to Europe only started in 2014 and the freight rates charged on subsidised routes (subsidy amounts) have not yet been adjusted.

[8] Provided that global oil prices (and, accordingly, heating oil and diesel fuel prices as the key factors determining the cost of sea freight) remain at their current level.

3. "Convenience" Elasticity of Demand for Container Freight Services: Impact of Speed and Regularity on Freight Traffic

The speed and regularity of freight traffi as well as shipping costs (freight rates) and cargo type, are some of the most important factors affecting the attractiveness of vari- ous modes of transport.

China's active stance in implementing the BRI is expressed, among other ways, by its effort to stimulate development of railway container traffi between the PRC and Eu- rope and by organising regular container train routes. According to CRCT, between 2011–2013 the number of container trains, despite fast growth, was measured in doz- ens. However, the volume of container traffi did not exceed 3,500 FEU per year and regular trains only ran from China to Europe. In 2014–2016, there was a sharp increase in the number of regular routes (21 in 2015, 52 in 2016), number of container trains and volume of container traffi (Table 6).

Table 6. Volume of Container Traffic Carried by Regular China–Europe Container Trains, 2011–2017

Source: CRCT

	2011		2012		2013		2014		2015		2016		2017	
	from China	to China	from China	to China	from China	to China	from China	to China	from China	to China	from China	to China	from China	to China
Container Trains, Units	17	0	42	0	80	0	280	28	550	265	1130	572	2,399	1,274
Container Traffic, FEU	702	0	1,837	0	3,480	0	11,902	1,133	23,566	10,885	48,700	4,197	106,000	52,965
Average Trainload, FEU	41		44	-	44	-	43	40	43	41	43	28	44	42

There remains a significant imbalance between railway container traffic from China to Europe and from Europe to China. According to CRCT, there were 44 regular routes from China to Europe by the end of 2017 and the total number of container trains was 2,400 (106,000 FEU), while the number of regular routes from Europe to China was only 17 and while the number of container trains was 1,300 (53,000 FEU). Germany is the main counterparty of China in Europe. About 60% of all container trains run- ning along China–Europe routes run between China and Germany.

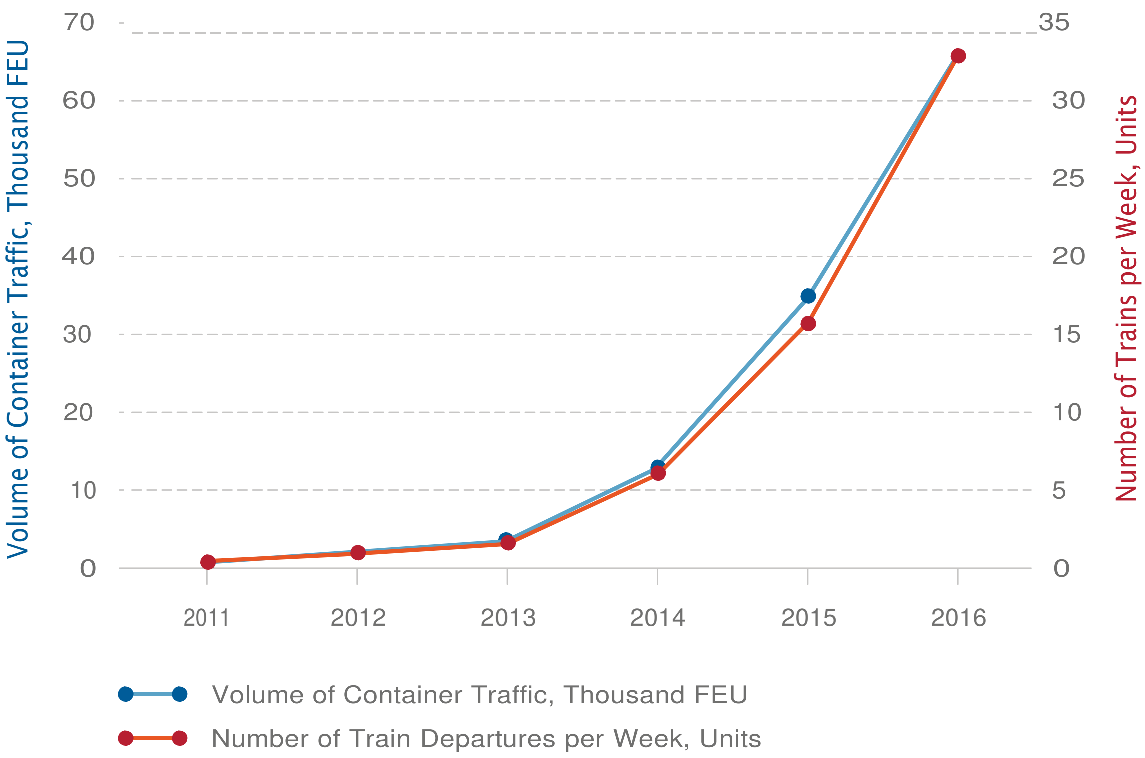
Most routes are used 2–4 times per week and in some cases the frequency of train runs is much higher. Routes linking the continental centres of Europe and Central China are classified as priority routes. For example, the Duisburg–Chongqing route is run by container trains (in both directions) 23–24 times per week, the Chengdu–Łódź/Nuremberg/Tilburg route 31–32 times per week. In other words, even today, owing to the efforts exerted by CRCT and other railway operators (KTZ, Russian Rail- ways and European railway operators, keeping a uniform schedule for transconti- nental container trains) to organise regular railway container routes, the frequen- cy of container cargo deliveries from China to Europe and from Europe to China is, considering door-to-door delivery, significantly higher than that offered by maritime transport. Besides, strict adherence to railway schedules (according to CRCT, 99.7% of all container trains running along China–Europe routes complete their journeys on schedule) and delivery times at approximately one-third of those offered by mari- time transport guarantee a wide margin of "convenience".

Therefore, "convenience" elasticity of demand with respect to railway container traf- fic between China and Europe is currently (in the present economic environment) almost 100%: in 2011–2016, the number of weekly train departures and the volume of container traffic have been growing virtually at the same rate, in the absence of any pronounced changes in freight rates (Figure 15).

With railway container freight rates along China–Europe routes remaining virtually unchanged throughout 2012–2016, container traffic is growing in parallel to the num- ber of departures of container trains, which deliver cargoes approximately twice as fast as maritime transport. When Chinese (and European) consignors get an opportunity

Figure 15. Changes in Container Trains' Frequency of Departure and Volume of Freight Traffic along PRC–Europe–PRC Routes, 2011–2016

Source: in-house calculations



to dispatch switchable cargoes by container trains along regular high-speed routes, they will use it. This is borne out by container trainloads remaining stable through- out 2012–2016 at about 42 FEU per train (which corresponds to the standard num- ber of platforms in a container train). On the other hand, there is the issue of filling containers returning from Europe to China. In 2016, container trainloads along those routes rapidly decreased to 28 FEU per train.

If current through freight rates are preserved (subject to Chinese subsidies), the China–Europe container traffic growth potential generated by the margin of "conve- nience" (promptness, regularity and door-to-door delivery) is far from exhausted and according to the program *Construction and Development Planning for the Sino-Europe Train (2016–2020)*, designed by the National Development and Reform Commission of the PRC, by 2016 it may produce a threefold increase in the number of container trains and total container traffic (to reach 200,000 FEU). The number of train depar- tures per week (regularity) should also go up by a factor of three (to about 100 per week, Table 7).

	2011	2012	2013	2014	2015	2016	2020*
Volume of Container Traffic, Thousand FEU	7	14	10	22	40	74	200–250
Number of Train Departures per Week, Units	0.3	1	2	6	16	33	100

* As estimated by the authors

Table 7. Changes in Container Trains' Frequency of Departure and Volume of Freight Traffic along PRC–Europe–PRC Routes, 2011–2020

Source: CRCT

Reduction of delivery times on existing and rapidly multiplying routes is still not critical (compared to sea delivery times) but it may assume a much more important role after 2020, primarily as a competitive advantage among various land routes.

Speed and Regularity of Sea Container Shipping

Maritime transport delivery speeds remain rather low (including those of modern container ships). Vessels travelling along the China–Europe route run at 20–25 knots, while average total travel time, including the Suez Canal passage and port calls, is 35–45 days[9]. Besides, there always remains the risk of delays for natural and other reasons (such as waiting for loading at the port of departure).

Regularity (rhythmicity) of maritime container traffic between the ports of the EU and China is rather high. For example, Maersk Line alone makes six runs per week. However, when using the sea route to carry containers between the EU and China, one has to take into account not only the actual travel time (4–6 weeks), but also the time required for consolidation of cargoes in ports (about 1 week).

[9] See, for example, Maersk Line routes at https://www.maerskline.com/routes/browse-routes.

4. Assessment of Potential Freight Traffic Growth Along the China–EAEU–EU Axis

4.1. Assessment of Additional Freight Traffic Served by Railway Routes between EAEU Member States and China

Freight Traffic from the EAEU to the PRC

The specialisation of EAEU member states in the international division of labour (supply to the global market of predominantly Fuel and Energy Products, Mineral and Chemical Raw Materials, Timber, Agricultural Raw Materials, Semi-Finished Prod- ucts, etc. In other words, cargoes whose carriage in containers is not economically or technologically viable or typical) determines the low share of container cargoes in the structure of their export freight traffic, including exports to China.

A comprehensive analysis of the structure of export freight traffic from EAEU mem- ber states to China shows that 96–97% of its total volume is represented by solid and liquid bulk cargoes. For example, at the end of 2016 the structure of EAEU exports to China (in volume terms) was dominated by Fuel (65% of total volume), Timber (15%), Mineral Raw Materials (9%) and Mineral Fertilisers (4–5%).

Only 3–4% of EAEU–China freight traffi was represented by containerisable cargoes and an even smaller fraction by cargoes that can in principle be transported by railway containers. The steady increase in the volume and share of container shipments in total freight traffi gives rise to optimistic forecasts regarding the prospects of container traf- fi growth, subject to development of the EAEU transport and logistical infrastructure.

The aggregate volume of container traffic from EAEU member states to China cur- rently stands at merely 2–2.5 million tons per year (approximately 75–100,000 FEU/ 150–200,000 TEU). This means that less than one half of the relatively small volume of containerisable cargoes mentioned above is actually delivered in containers and there is ample room for growth.

Most container traffic from Russia and other EAEU member states to China is mul- timodal traffic with the use of railway transport. In most cases, China-bound export cargoes (mostly originating from Russia) are delivered by railway containers to the ports of the Baltic Sea, Black Sea, Azov Sea, Barents Sea, or White Sea and transferred to ships. Only 10–20% of Russian export container traffic (11,000 FEU/21,000 TEU in 2016, according to Russian Railways) is transported directly to China by rail- way through border crossing points at Zabaykalsk (80–100%) and Grodekovo (18% in 2016). A small fraction of Kazakhstani container cargoes is now delivered directly to China by railway through border crossing points at Dostyk and Altynkol and Be- larusian container cargoes through Russian and Kazakhstani border crossing points.

The commodity structure of direct export railway container traffi from EAEU member states (mostly Russia) to China through land border crossing points is heavily domi- nated by one commodity group, “Other Cargoes”: Metal Products (including empty re- turn containers), Paper, Chemicals (Attachment 2, Table A2.4). In 2015–2016, there was a considerable increase in the commodity structure of Russian railway container ship- ments to China of exported “Timber Cargoes” (via Zabaykalsk), specifi Sawn Timber used to fi up empty return containers (a long-standing practice in Europe). The growth of container shipments exported through Grodekovo is also linked to the return to China of empty containers (classifi in Russian Railways statistics as Metalware) due to a sharp increase in 2016 of the volume of container traffi from China to Russia through land crossing points and consequently, of the number of empty return containers.

An analysis of the commodity structure of EAEU exports to China in the context of selecting commodities switchable to railway container shipments shows that the potential for such a switch is rather small in terms of volume. In recent years, the vol- ume of exports from EAEU member states to China of cargoes suitable for the switch to railway container shipments has been 20–30,000 tons (approximately 2–3,000 TEU/ 1–1,500 FEU) per year, sustaining a twofold decrease over the last 10 years. About 60–70% of that freight traffic is generated by Russia (1.5–2,000 TEU/1,000 FEU) and 20% by Kazakhstan (up to 1,000 TEU/500 FEU). That is predominantly additional freight traffic potentially switchable to railway routes for delivery of cargoes from Rus- sia and other EAEU member states to China. However, that “addition” is quite small, even relative to the existing volume of railway container traffic from EAEU member states to China through land crossing points and can raise that volume only by ap- proximately 15%.

The potential for increasing container traffic from EAEU member states to China is se- verely limited by the lack of suitable cargoes, either now or in the foreseeable future. Maximum additional China-bound freight traffic (50,000 FEU) can be achieved exclu- sively by developing new export product niches. At the same time, existing practical experience of expanding railway container shipments to China from EAEU member states and EU countries indicates that it is possible to enhance the commodity struc- ture of freight traffic with such cargoes as Timber, Metal Products (e.g. Ferrous Alloys), Metalware, Pulp and Paper Products, Food Products, Prepacked Petrochemical Prod- ucts, etc. In terms of short-term and mid-term expansion of railway-carried exports from Russia to China, the most high-potential FEACN position is Commodity Group 84, “Engineering Products” (classified by Russian Railways as “Other Cargoes”[10]). The volume of exports is currently insignificant both in absolute and relative terms, but it has a huge growth potential, especially as Russian and Chinese machine build- ers step up their production cooperation.

[10] According to UNCTAD statistics, in 2014–2016, the structure of Russian Engineering Products exports to China was unsurprisingly dominated by Equipment for Atomic Power Stations (1–1,500 tons per year), Airplane Engines (500 tons per year), Passenger Vehicles with engine cubic capacity of 1,500–3,000 cm^3 (up to 4,800 tons per year) and Lasers (200 tons per year). Russia is the global technological leader in manufacturing most of those products; the best prospects are associated with nuclear power (possible major supplies to China of fast-neutron reactors), airplane building (supplies of jet engines for civil aviation, composite materials and titanium blocks and parts for future Chinese airplanes) and laser equipment. However, the probability of a manifold increase in the volume of supplies is rather remote.

Freight Traffic from the PRC to the EAEU

The commodity structure of exports from China (which is now the "workshop of the world") is dominated by finished processed goods with prevalence of container or con- tainerisable cargoes. Trade between China and Germany shows that Chinese exports can be fully containerised. The share of container cargoes in the structure of EAEU imports from China has reached 55% (with the volume of such cargoes growing in absolute terms) and the commodity structure of freight traffic (which is dominated by containerisable commodity groups) stimulates its further containerisation, which may potentially approach 100%.

The commodity structure of direct Russian railway imports from China through crossing points at the border with China (28,000 FEU/55,000 TEU in 2016) is domi- nated by "Other Cargoes" (according to the Russian Railways classification) which consists, among other things, of "Industrial Consumer Goods" (20–30%) and "Metal- ware", as well as "Machines, Machine Tools, Engines" (20–25% each) (Attachment 2, Table A2.5).

The commodity structure of railway container traffic from China to other EAEU mem- ber states is not materially different from the commodity structure of freight traffic to Russia; the volume of that traffic is estimated at 7,500 FEU/15,000 TEU per year (with Kazakhstan being the leading counterparty). Therefore, total import container traffic from China to EAEU member states through land borders can be estimated at 35,000 FEU/70,000 TEU per year.

An analysis of the volume and commodity structure of EAEU imports from China shows a large potential for future growth of railway container traffic (Attachment 2, Table A2.7). According to our estimates, the volume of EAEU imports from China switchable to railway transport amounts to 4–5.5 million tons per year (which is, subject to average container load, equivalent to 250–300,000 FEU/500–600,000 TEU). In other words, about 10–15% of existing potential is currently being used and freight traffic could be increased by a factor of eight or nine.

The main commodity group comprising freight traffic from China to the EAEU switch- able to railway transport is "Machines, Equipment, Industrial Products" (75–80%); another 20% is represented by Consumer Goods (Clothing, Footwear, Textiles) and 1.5–2% by Finished Chemical Products. These cargoes make up most of the goods im- ported by Russia (and other EAEU member states) from China in railway containers. Cargoes classified under Engineering Products Components (including Motor Vehicle Components) could be switched to railway transport in the most economically and technologically efficient manner.

Chinese companies seeking to implement new production projects in Russia, Kazakh- stan and other EAEU member states (including, for example, automobile plants) are interested in organising supply logistics so as to assure timely, regular and volume- flexible deliveries at costs (freight rates) that will not have a material impact on the ultimate aggregate cost of production at localised enterprises. Such terms can be se- cured by railway container shipments from Chinese plants to their counterparties in EAEU member states, using subsidies offered by Chinese authorities to support railway freight traffic in certain provinces of the PRC.

One of the conditions for successful implementation of such a scenario for develop- ment of freight traffi between China and EAEU member states is modernisation of the EAEU transport and logistical infrastructure. This applies not only to de- bottlenecking of border crossing points (gauge change points, related logistical terminal infrastructure, border and customs corridors), but also to improvement of transport capacity of the EAEU railway infrastructure as a whole and creation of "distribution" transport and logistics centres (TLCs) at critical transport hubs (Vinokurov and Tsukarev, 2018).

The lack in EAEU member states of an adequate cargo base to load return contain- ers is a serious problem which considerably limits the potential for boosting rail- way container traffic from China and which is likely to defy solution in the foresee- able future. The share of cargoes switchable to railway transport in the total volume of goods exported by EAEU member states to China is insignificant. Only the total potential volume of all containerisable China-bound EAEU cargoes can match the volume of Chinese cargoes transported to EAEU member states.

4.2. Assessment of Additional Freight Traffic Served by Railway Routes between EU Countries and China

Freight Traffic from the PRC to the EU

Stimulation by Chinese authorities of railway freight traffi between China and Europe using BRI transport corridors (by subsidising carriage through Chinese territory), the main driver of the current fast growth, will if continued, improve the prospects of fur- ther expansion of that traffi Along with other factors, subsidy of international rail- way freight traffi through Chinese territory prompts, at least to some extent, a switch of transit cargo fl ws from the Trans-Siberian Railway to the route passing through Ka- zakhstan (through border crossing points at Dostyk and Altynkol), where the Chinese section is much longer.

The considerable volume of trade turnover between China and the EU (about 100 million tons per year), combined with complete dominance of container cargoes and contain- erisable cargoes in the structure of mutual deliveries, creates objective preconditions for diversifi of freight traffi by its partial switch from maritime to railway transport, which is faster, more accurate in terms of delivery times and more convenient for a sig- nifi part of Chinese and European consignors/consignees.

The volume of EU railway imports from China is growing even faster than European rail- way exports to China and in 2016 it approached 50,000 FEU/100,000 TEU (Attachment 2, Table A2.8). The commodity structure of transit railway container traffi from China to the EU (through crossing points at the border with China) and from the EU to China is dominated by "Other Cargoes" (99%). That commodity group is made up of Metal- ware (about 50%), Industrial Consumer Goods (approximately 30%) and Machines, Machine Tools, Engines (10%). The dynamic growth of railway freight traffi from China to the EU noted by the latest statistical reports and the considerable volume of such traffi refl t the huge export potential of China for a further increase of exports and the comparable demand for imported goods on the part of the European market. The rapid growth in 2014–2016 of freight traffi from China to Europe using the transit potential of EAEU member states galvanises EAEU policy in the area of development and promo- tion of its transport and logistical infrastructure.

The volume of goods (cargoes) imported by the EU from China that are switchable to railway container transport exceeds the volume of similar European exports by ap- proximately a factor of 5.5 and amounts to 20–22 million tons per year (Attachment 2, Table A2.9). Calculated in containers subject to historical container fi rates, potential new container traffi generated by the switch could reach 2–2.2 million FEU/4–4.5 mil- lion TEU per year. The commodity structure is almost exclusively made up of two groups: Engineering Products (70–75%) and Clothing, Footwear, Textiles (20–25%), with the shares of other commodity groups not exceeding 1–2%.

The long-term potential for boosting Chinese export railway traffic to the EU, practi- cally unlimited from a structural point of view (according to our estimates, it could increase more than 40-fold), may be inhibited by certain limitations related to gen- erating reciprocal container traffic from Europe. In 2016, the entire potential volume of EU exports to China switchable to railway transport (175,000 FEU/350,000 TEU) exceeded the actual railway freight traffic from China to the EU (almost 50,000 FEU/100,000 TEU) by a factor of 3.5.

Freight Traffic from the EU to the PRC

The rapid, manifold growth of railway freight traffic from the EU to China over the last several years, confirmed by foreign trade statistics published by Eurostat, China and Russian Railways, reflects the existing potential of the EU countries for further increase of exports and the demand for European products generated by the Chi- nese market. The build-up of transcontinental freight traffic using the EAEU transit potential, is also indicative of the grossly underutilised capacity of land routes and galvanises EAEU policy in the area of development and debottlenecking of transport and logistical systems.

The commodity structure of transit railway container traffi from the EU to Chi- na (through crossing points at the border with China) is completely dominated by “Other Cargoes” (96–99%, Attachment 2, Table A2.10). The group is made up of Motor Vehicles, Metalware and Machines, Machine Tools, Engines, with the shares of those components varying from year to year within a relatively wide range. In terms of prospects of increasing railway freight traffi from the EU to China, the most promising transit commodity groups include Motor Vehicles, Engineering Products and Chemical Products.

Over the last decade, the volume of EU exports to China switchable to railway container transport has increased by 70% to reach 3.8–4 million tons per year (approximately 170–180,000 FEU/350,000 TEU) (Attachment 2, Table A2.11).

Structurally, those exports are dominated by Engineering Products (broadly defined, including Industrial Equipment, Electric Equipment and Radio Electronic Devices, Motor Vehicles, Tools, etc.), accounting for about 95%. Finished Chemical Products account for another 2–3% and Clothing, Footwear, Textiles for about 2%, while the shares of the remaining commodity groups are insignificant. According to Eurostat, in 2016, Motor Vehicles accounted for more than 1/3 of EU railway exports to China by volume and for 2/3 in value terms.

In structural terms according to our estimates, EU export to China of cargoes switchable to railway transport could be increased approximately sevenfold—from 25,000 FEU/50,000 TEU to 175,000 FEU/350,000 TEU, with good prospects of further growth on the back of the relatively faster increase in the volume of delivery of more "expensive" commodities.

4.3. Assessment of Additional Freight Traffic Served by Railway Routes between EAEU Member States and the EU

Freight Traffic from the EAEU to the EU

The overwhelming domination of "non-containerisable" cargoes in the commodity structure of EAEU exports to the EU leaves container cargoes with a minuscule share of less than 1%. The rate of containerisation of railway-carried EAEU exports to the EU is approximately the same. According to Russian Railways and foreign trade sta- tistics, the share of railway-carried container cargoes in Russian exports to the EU stands at 1–2% of their total volume. Like Russian railway-carried exports to the EU, the share of container cargoes in railway-carried EU-bound shipments originat- ing from other EAEU member states is very small, which is consistent with the na- ture of the cargoes dispatched to Europe. Aggregate railway container traffic from EAEU member states to the EU through land border crossing points can be estimated at 20–25,000 FEU/40–50,000 TEU per year, with approximately one third of that volume represented by containerised Chemical Raw Materials going to Finnish ports (organic hydrocarbons, spirits, etc., which are not normally classifi as cargoes suitable for railway container transport).

The volume of EAEU exports to the EU switchable to railway container transport amounts to about 500,000 tons per year (approximately 25,000 FEU/50,000 TEU) (Attachment 2, Table A2.12). Structurally, the largest commodity groups are Metal Products (about 50%) and Engineering Products (35–45%), with Clothing, Footwear, Textiles accounting for another 4–5%. Almost all those cargoes could be converted into additional container traffic, which could then be attracted to transport routes along the China–EAEU–EU axis, doubling the volume of Europe-bound container traffic, subject to optimal use and further improvement of the EAEU transport and logistical infrastructure.

Freight Traffic from the EU to the EAEU

Container cargoes account for 20–25% of total EAEU imports from the Europe- an Union; in recent years, their volume has been declining and currently stands at 4.5–5 million tons per year. The volume of railway-carried containerised imports from the EU is declining even faster and currently amounts to about 0.5 million tons per year (25,000 FEU/50,000 TEU). Structurally, the share of Engineering Products in total railway container traffic from the EU to the EAEU is about 40%, the share of Mineral and Chemical Raw Materials (organic acids, spirits, etc.) is 25–30% and the share of Finished Chemical Products is 15–20%.

The main commodity group comprising freight traffic from the EU to the EAEU (totalling about 3 million tons, or 150,000 FEU/300,000 TEU) which is suitable for the switch to railway transport is "Machines, Equipment, Industrial Products" with 80–85% and another 10% is represented by Finished Chemical Products (Attachment 2, Table A2.13). These cargoes basically make up most of the goods imported by Russia and other EAEU member states from the EU in railway containers.

The capacity for switching EAEU-bound freight traffic originating from the EU to rail- way transport is currently used by 15–20%, and maximal utilisation of the opportuni- ties offered by the EAEU transport and logistical infrastructure could increase railway container traffic along that direction by a factor of 5–6.

In the long run, certain problems may be created by the imbalance in the EU–EAEU railway container traffic, with the share of switchable cargoes in EAEU exports to the EU being considerably less than in EU exports to the EAEU.

4.4. Aggregated Assessment of Additional Freight Traffic along the China–EAEU–EU Axis

Based on the results of comprehensive analysis of freight traffi along the China–EAEU– EU axis (with special emphasis on railway container traffi and application of the pro- posed methodological approach to selecting cargoes switchable to railway transport, we present the following aggregated assessment of potential additional freight traffi

West–East, railway container traffic, current status:

- EAEU → China—10–12,000 FEU (20–25,000 TEU);
- EU → China—25,000 FEU (50,000 TEU);
- EU → EAEU—25,000 FEU (50,000 TEU).

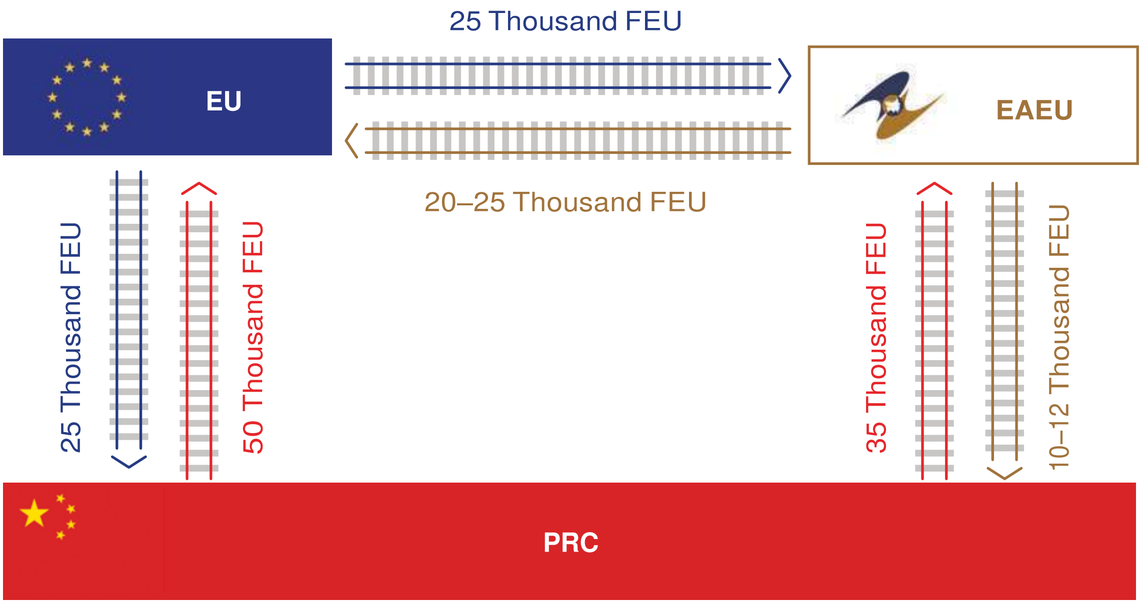
East–West, railway container traffic, current status:

- China → EAEU—35,000 FEU (70,000 TEU);
- China → EU—50,000 FEU (100,000 TEU);
- EAEU → EU—20–25,000 FEU (40–50,000 TEU).

Therefore, the aggregate volume of railway container traffi along the China– EAEU–EU axis is currently estimated at 170,000 FEU/330–345,000 TEU (West–East: 60,000 FEU; East–West: 110,000 FEU) (Figure 16).

Figure 16.
Actual Volume of Container Traffic along the PRC-EAEU–EU Axis Served by Railway Transport in 2016

Source: authors' estimations



West–East, maximum additional container traffi that could be attracted to EAEU railway networks:

- EAEU → China—50,000 FEU (100,000 TEU);
- EU → China—150,000 FEU (300,000 TEU);
- EU → EAEU—125,000 FEU (250,000 TEU).

East–West, maximum additional container traffic that could be attracted to EAEU railway networks:

- China → EAEU—250,000 FEU (500,000 TEU);
- China → EU—2,100,000 FEU (4,200,000 TEU);
- EAEU → EU—25,000 FEU (50,000 TEU).

Therefore, according to our calculations the maximum additional container traffic that could be attracted to EAEU railway networks is estimated at 2.7 million FEU (5.4 million TEU), including West–East traffic of 325,000 FEU (650,000 TEU) and East–West traffic of 2,375,000 FEU (4,750,000 TEU) (Figure 17).

However, the large imbalance between existing and additional West–East and East– West freight traffic may prevent EAEU railway networks from attracting all potential freight traffic along the China–EAEU–EU axis.

With balanced container loads (containers travelling both ways fully loaded with opti- mal cargoes, no empty containers), additional container traffic that could be attracted by EAEU railway networks can be estimated at 1–1.1 million TEU, while total freight traffic along the axis (including existing traffic) could be as high as 1.3 million TEU.

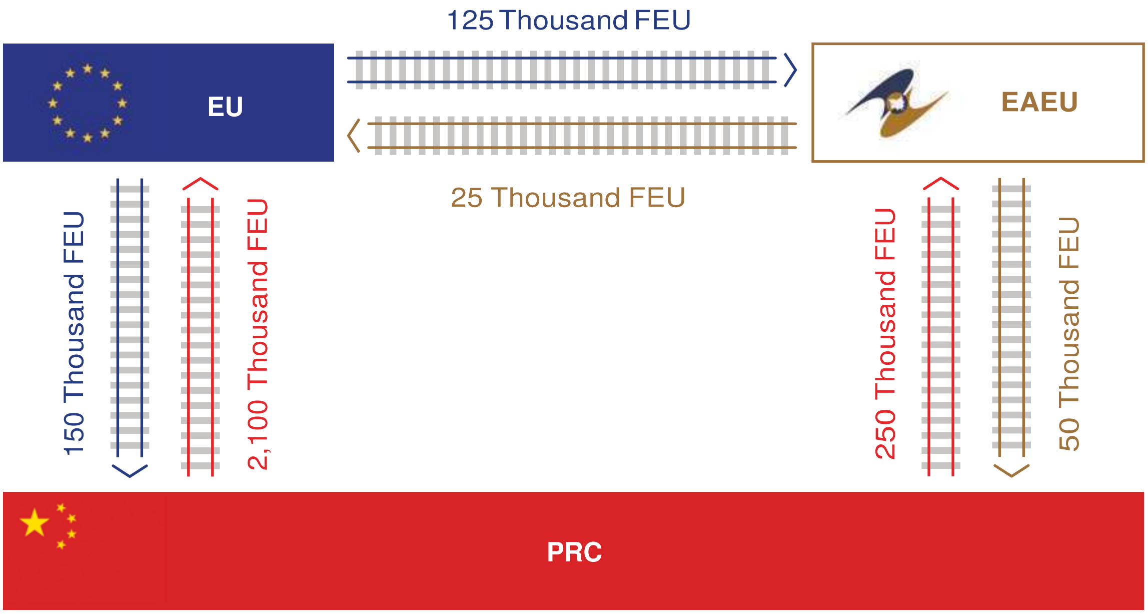


Figure 17. Maximum Container Traffic that Could Be Additionally Attracted by EAEU Railway Networks

Source: authors' estimations

If the existing East–West/West–East container traffic imbalance (2:1) persists and West–East trains additionally take on any containerisable cargoes (subject to ade- quate development of transport and logistical infrastructure in EAEU member states and subject further to active cooperation of EAEU railway companies with their coun- terparts in China and the EU and with consignors/consignees potentially interested in using railway transport), in the long term, aggregate railway container traffic along the China–EAEU–EU axis could reach 2 million TEU per year.

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Place of the EU, China and the EAEU in Global Economy and Trade

The EU has the world's second-largest GDP (after the USA) with a 22–25% share of glob- al GDP. At the end of 2016, China's share of global GDP reached almost 15% (a more than twofold growth over the last decade), while the share of the EAEU was 2–3%.

In terms of foreign trade, the EU is the world's largest exporter and importer region in value terms. Its total exports and imports in 2016 (including mutual intra-European deliveries) amounted to $5.4 billion and $5.3 billion, respectively, accounting for ap- proximately one third of total global trade. China is the world's largest exporter coun- try ($2.1 trillion, or 13% of global exports) and the world's second largest importer country (after the USA) ($1.7 trillion, or 10% of global imports). In volume terms, EU imports (3.5 billion tons in 2016) come second only to the Asia–Pacific Region, while China (more than 2.4 billion tons) is the undisputed APR leader, staying far ahead of all other countries in the world with 19% of total global imports in volume terms. The volume of EU and Chinese exports (2.4 billion tons and about 0.7 billion tons in 2016, respectively) makes them the world's most important suppliers (along- side Russia, Australia and the USA).

Over the last decade, the total volume of EAEU exports has increased by 16% (to 1.2 bil- lion tons in 2016) and accounts for 9–10% of total global trade by volume, while the share of the EAEU in global imports is about 2%.

EAEU and PRC Foreign Trade

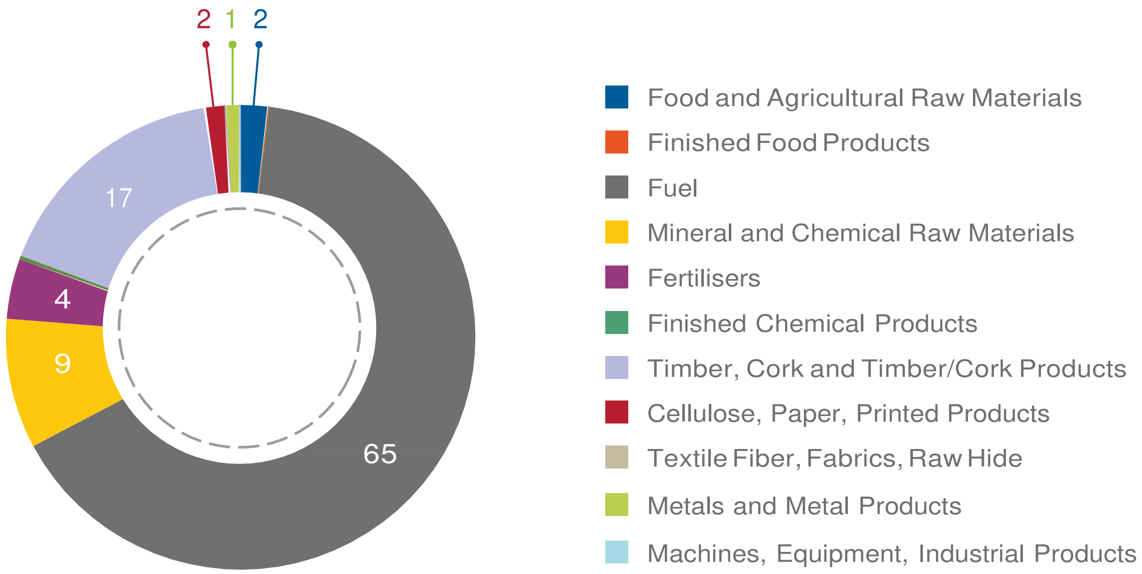
The "Fuel" commodity group dominates the structure of EAEU exports to China (by volume). Over the last decade, its share has doubled to reach 65% in 2016 (Figure A1.1). Goods from the "Fuel" group exported to China are represented mostly by Crude Oil (2016: 47.6 million tons from Russia, 3.2 million tons from Kazakhstan) and Coal (16 million tons from Russia). The volumes of exports of Petroleum Prod- ucts, Natural Gas and other Fuel products are significantly smaller.

In recent years, Timber (Round Timber and Sawn Timber) supplied to the Chinese market from Russia (almost 20 million tons in 2016) has accounted for about 15% of total EAEU exports to China. The share of Mineral Raw Materials in the structure of 2016 exports decreased to 9% (from 20% or more in previous years). This can be attributed to a reduction of supplies to China of Iron Ore from Kazakhstan and Rus- sia (the profi y of such supplies declined due to a global price slump). Mineral Fertilisers also account for a sizeable share of exports to China (4–5%, countries of origin: Russia and Belarus). The shares of remaining commodities are much less signifi

The commodity structure of EAEU imports from China is much more diversified. The commodity group "Machinery, Equipment and Industrial Products" accounts for the bulk (25–30%) of total supplies; "Metal Products" for about 15%; "Finished

Figure A1.1. Commodity Structure of EAEU Exports to China in 2016, %

Source: UNCTAD



Chemical Products", "Finished Construction Materials" and "Food and Agricultural Raw Materials" for approximately 10% each; "Mineral and Chemical Raw Materi- als" with "Clothing, Footwear, Textiles" accounting for 6–8% each (Figure A1.2). The shares of other commodity groups are insignificant.

Russia, as the largest EAEU economy, strongly dominates the structure of EAEU fo- reign trade freight traffi It accounts for about 3/4 of imports from the PRC and now more than 90% of exports to the PRC (previously, 75–80%). Kazakhstan remains Chi- na's second-largest trade partner in the EAEU. Belarus accounts for approximate- ly 2% of import and export freight traffi between the EAEU and China. The share of Kyrgyzstan in EAEU imports from China is about 5%, that of Armenia—1%; both countries' shares in total EAEU exports to China are insignifi (approximately 0.1% each).

The commodity structure of export freight traffic from EAEU member states to China is characterised by a low percentage of containerised cargoes (1.5–2%, or 2–2.5 mil- lion tons per year) due to the absolute domination in commodity structure of "un- containerisable" cargoes (Fuel, Mineral Raw Materials, Timber, Mineral Fertilisers, Agricultural Raw Materials). Over the last decade, the share of container cargoes in EAEU imports from China has considerably increased from 35% to 55%, with physi- cal volume of container supplies going up from less than 6 million tons to 7–9 million tons per year. The commodity structure of import freight traffic, already dominated by containerisable cargoes, is stimulating its continued containerisation.

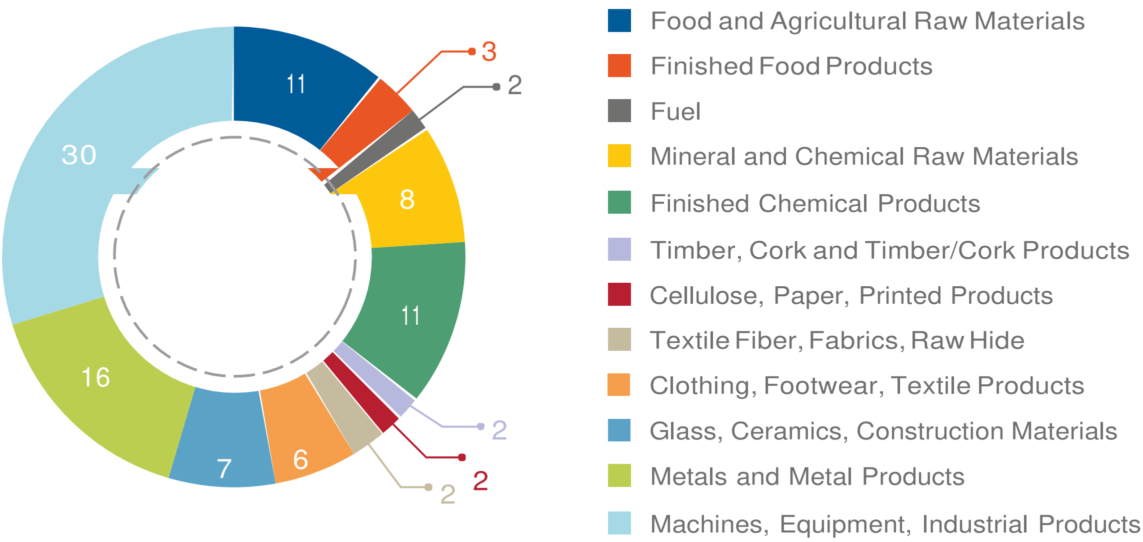


Figure A1.2. Commodity Structure of EAEU Imports from China in 2016, %

Source: UNCTAD

PRC and EU Foreign Trade

Despite the impressive value of mutual trade turnover between the EU and China ($560–600 billion in recent years), physical volumes are relatively modest (about 90–100 million tons per year) (Attachment 2, Table A2.2). Over 2011–2016, EU imports from China have exceeded EU exports to China by a factor of approximately two in va- lue terms and by 25–40% in volume. However, the mutual trade imbalance is gradually decreasing, especially by volume. While in value terms EU imports from China over the last decade have increased by approximately 20% and EU exports to China by 90%, in terms of volume, EU imports from China have not changed or have even slightly de- creased (from 65–75 million tons to 55–60 million tons) and EU exports to China have more than doubled (to almost 50 million tons). This has an indirect positive impact on development of their mutual container trade, reducing the considerable number of empty return containers travelling to China from EU countries.

In terms of the geographical structure of EU–China trade, China's largest trade part- ners in Europe (by volume) are Germany, the United Kingdom and the Netherlands, with Belgium, France, Italy, Spain and Poland also holding signifi positions.

Comprehensive analysis of available statistical data on the structure of trade between EU countries and China, with a breakdown by modes of transport, has shown that about 98% of mutual EU–China deliveries are made by maritime transport, with aviation transport and railway transport accounting for 1.5–2% and 0.5–1%, respectively.

ATTACHMENT 2

Table A2.1. Changes in Mutual Trade between the EAEU and China in Value and Volume Terms, 2007–2016

Source: UNCTAD

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Trade Turnover between the EAEU and China in Value Terms, $ Billion	51	71	51	76	108	116	117	109	79	78
EAEU Imports from China	29	42	28	46	57	63	66	61	44	46
EAEU Exports to China	21	29	23	30	52	53	51	48	35	33
Trade Turnover between the EAEU and China by Volume, Million Tons	81	75	86	90	118	130	130	127	117	130
EAEU Imports from China	14	18	9	13	16	17	18	17	12	12
EAEU Exports to China	67	58	77	77	102	113	112	110	105	117

Table A2.2. Changes in Mutual Trade between the EU and China in Value and Volume Terms, 2007–2016

Source: Eurostat

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Trade Turnover between the EU and China in Value Terms, $ Billion	419	482	415	527	601	561	569	620	578	570
EU Imports from China	321	366	300	376	411	375	372	401	389	381
EU Exports to China	98	115	115	150	190	185	197	219	189	188
Trade Turnover between the EU and China by Volume, Million Tons	100	93	78	86	95	88	94	100	105	109
EU Imports from China	77	67	45	54	57	49	53	59	59	60
EU Exports to China	23	26	33	33	38	39	40	41	45	49

Table A2.3. Comparative Changes in Freight Indices and Volume of Container Traffic along PRC–Europe Routes, 2009–2017

* Shanghai Containerised Freight Index

Sources: Eurostat, UNCTAD (2016), Shanghai Shipping Exchange

Indicator	2009	2010	2011	2012	2013	2014	2015	2016	2017
SCFI* Shanghai–Northern Europe, $ per FEU	2,581	3,310	1,630	2,503	2,005	2,148	1,164	1,264	1,423
Increase y-o-y, %		28	–51	54	–20	7	–46	9	13
SCFI Shanghai–Mediterranean, $ per FEU	2,584	3,217	1,800	2,472	2,129	2,318	1,367	1,251	1,351
Increase y-o-y, %		24	–44	37	–14	9	–41	–9	8
Container Traffic, China–EU, Million FEU	4.9	5.9	6.2	5.7	5.6	6.3	6.1	6.4	...
Increase y-o-y, %	–13	21	6	–8	–2	13	–4	5	...

Main Commodity Groups	2010	2011	2012	2013	2014	2015	2016
Export Freight Traffic from Russia to China through Crossing Points at the Border with China, Total	7.3	11.2	8.5	6.9	6.2	6.5	10.6
including							
Timber Cargoes	0.0	0.7	0.6	0.1	0.3	2.2	5.3
Other Cargoes	7.3	10.5	7.9	6.8	5.9	4.2	5.2
of which:							
Paper	1.8	2.3	2.7	2.5	1.7	1.2	1.3
Metalware	2.7	5.0	1.4	0.8	1.2	0.9	2.6
Chemicals and Sodium Carbonate	2.7	3.1	3.6	3.4	2.8	2.0	1.0

Table A2.4. Commodity Structure of Export Railway Container Traffic from Russia to China through Crossing Points at the Border with China, 2010–2016, by Volume, Thousand FEU

Source: Institute of the Economy and Transport Development based on Russian Railways statistics

Main Commodity Groups	2010	2011	2012	2013	2014	2015	2016
Import Freight Traffic from China to Russia through Crossing Points at the Border with China, Total	22.1	27.2	25.0	22.0	18.6	16.7	27.7
including							
Other Cargoes (Mineral Construction Cargoes, Ferrous Metals)	1.4	1.3	0.8	0.8	0.8	0.7	1.3
Remaining Cargoes							
of which:							
Motor Vehicles	3.0	6.8	6.0	3.8	1.5	1.1	0.9
Machines, Machine Tools, Engines	3.5	5.1	6.0	5.8	5.4	3.2	4.8
Metalware	4.1	4.7	4.4	4.6	4.7	4.1	5.7
Industrial Consumer Goods	6.7	5.6	4.6	4.1	3.6	4.8	9.4
Chemicals and Sodium Carbonate	1.8	1.8	1.5	1.4	1.4	2.0	4.3

Table A2.5. Commodity Structure of Import Railway Container Traffic from China to Russia through Crossing Points at the Border with China, 2010–2016, by Volume, Thousand FEU

Source: Institute of the Economy and Transport Development based on Russian Railways statistics

Table A2.6. Weekly China–Europe Container Trains Schedule (since January 2018)

Source: China Railways Container Transport Co. Ltd. (CRCT): http://www.crct.com/index.php?m=content&c=index&a=lists&catid=22

No.	Route Index	Regularity (Frequency)	Point of Departure	Time of Departure	Transit Time, days	Route	Border Crossing Point	Country of Destination	Transit Countries
1	X8001	1 per week	Zhengzhou North	13:52	~ 15 days	Zhengzhou–Hamburg	Alashankou	Germany	Kazakhstan, Russia, Belarus, Poland, Germany
2	X8003	1 per week	Zhengzhou North	8:04					
3	X8005	1 per week	Zhengzhou North	1:59					
4	X8069	1 per week	Zhengzhou North	4:00			Khorgos		
5	X8202/3	2 per week	Yutian	18:40	~ 15 days	Zhengzhou (Wuhan)–Hamburg	Erenhot	Germany	Mongolia, Russia, Belarus, Poland, Germany
6	X8014/3	1 per week	Chongqing	10:57	~ 15 days	Chongqing–Duisburg	Alashankou/Khorgos	Germany	Kazakhstan, Russia, Belarus, Poland, Germany
7	X8020/19	2 per week	Chongqing	12:49			Alashankou		
8	X8076/5	every other day	Chongqing	10:30			Khorgos		
9	X8084/3	daily	Chongqing	7:01			Alashankou		
10	X8434	3 per week	Chongqing	18:58			Erenhot		Mongolia, Russia, Belarus, Poland, Germany
11	X8412/1	2 per week	Chongqing	17:34	~ 10 days	Chongqing–Cherkessk	Manchuria	Russia	Russia
12	X8016/5	1 per week	Chengdu North	23:15	~ 12–15 days	Chengdu–Łodź/ Nuremberg/Tilburg	Alashankou	Poland/Germany/ Netherlands	Kazakhstan, Russia, Belarus, Poland, Germany, Netherlands
13	X8056/5	1 per week	Chengdu North	14:40					
14	X8086/5	daily	Chengdu North	22:40					
15	X8090/89	daily	Chengdu North	12:26					
16	X8078/7	every other day	Chengdu North	7:52			Khorgos		
17	X8062/1	1 per week	Chengdu North	11:41					
18	X8064/3	1 per week	Chengdu North	11:31					
19	X8406/5	2 per week	Jiashan	11:34	~ 12–15 days	Wuhan–Minsk/Hamburg	Manchuria	Belarus/Russia/Germany	Russia, Belarus, Poland, Germany
20	X8017/8/7	2 per week	Jiashan	5:38	~ 15 days	Wuhan–Pardubice/Łódź/ Hamburg/Duisburg	Alashankou	Czech Republic/Poland/ Germany	Kazakhstan, Russia, Belarus, Poland, Czech Republic, Germany
21	X8011/2/1	1 per week	Jiashan	22:29			Alashankou		
22	X8035/6/5	1 per week	Jiashan	13:40			Alashankou/Khorgos		
23	X8024	1 per week	Hefei East	18:10	~ 18 days	Yiwu–Madrid	Alashankou	Spain	Kazakhstan, Russia, Belarus, Poland, Germany, France, Spain
24	X8074/3	1 per week	Kiaosi/Yiwu	20:44	~ 12 days	Yiwu–Minsk	Manchuria	Belarus	Russia, Belarus
25	X8088/7	1 per week	Kiaosi/Yiwu	12:23	~ 18 days	Yiwu–Istanbul	Khorgos	Turkey	Kazakhstan, Azerbaijan, Armenia, Georgia, Turkey
26	X8066/5	1 per week	Hefei East	17:45	~ 15 days	Hefei–Hamburg	Alashankou	Germany	Kazakhstan, Russia, Belarus, Poland, Germany
27	X8402/1	3 per week	Suzhou West	2:00	~ 12 days	Suzhou–Warsaw	Manchuria	Poland	Russia, Belarus, Poland
28	X8410/09	1 per week	Suzhou West	2:40	~ 12 days	Suzhou–Warsaw	Erenhot	Poland	Mongolia, Russia, Belarus, Poland
29	X8082/1	1 per week	Yuntai	11:36	~ 18 days	Lianyungang–Istanbul	Alashankou	Turkey	Kazakhstan, Azerbaijan, Armenia, Georgia, Turkey
30	X8057	every other day	Shenyang East	3:35	~ 13 days	Shenyang–Hamburg	Manchuria	Germany	Russia, Belarus, Poland, Germany
31	X8027	2 per week	Changchun North	11:18	~ 13 days	Changchun–Schwarzheide (Dresden)	Manchuria	Germany	Russia, Belarus, Poland, Germany

No.	Route Index	Regularity (Frequency)	Point of Departure	Time of Departure	Transit Time, days	Route	Border Crossing Point	Country of Destination	Transit Countries
32	X8209/10	1 per week	Shenyang East	23:12	~ 12 days	Shenyang–Moscow	Erenhot	Russia	Mongolia, Russia
33	X8059/60/59	daily	Shenyang	9:30	~ 13 days	Shenyang–Hamburg	Manchuria	Germany	Russia, Belarus, Poland, Germany
34	X8428/7	2 per month	Changsha	11:30	~ 15 days	Changsha–Hamburg	Alashankou	Germany	(Kazakhstan/Mongolia), Russia, Belarus, Poland, Germany
35	X8422/1	2 per month	Guizhou	21:20			Erenhot		
36	X8426/5	3 per week	Shilong	6:30	~ 12 days	Guangzhou–Moscow	Manchuria	Russia	Russia
37	X8302/1	2 per week	Tianjin	17:40	~ 11 days	Tianjin–Moscow	Manchuria	Russia	Russia
38	X8303	1 per week	Chifeng	22:38	~ 10 days	Chifeng–Chelyabinsk/ Kleshchikha	Manchuria	Russia	Russia
39	X8098/7	1 per week	Xiamen (Fujian)	9:55	~ 16 days	Xiamen–Hamburg	Alashankou	Germany	Kazakhstan, Russia, Belarus, Poland, Germany
40	X8208/7	1 per week	Xiamen (Fujian)	11:20	~ 13 days	Xiamen–Moscow	Erenhot	Russia	Mongolia, Russia
41	X8072/1	1 per week	Xuzhou North	23:35	~ 5 days	Nantong–Mazar–i–Sharif	Khorgos	Afghanistan	Kazakhstan, Afghanistan
42	X8031	3 per week	Harbin South	10:36	~ 10–15 days	Harbin–Moscow, Warsaw, Hamburg	Manchuria	Russia/Poland/ Germany	Russia, Belarus, Poland, Germany
43	X8205	1 per week	Jining (Nei Mongol)	21:58	~ 5 days	Jining–Moscow	Erenhot	Russia	Mongolia, Russia
44	X8492/1	1 per week	Jiaozhou (Shandong)	2:16	~ 5 days	Jiaozhou–Hanoi	Pingxiang/Dong Dang	Vietnam	Vietnam
45	X8002	1 per week	Alashankou	20:24	~ 18 days	Hamburg–Zhengzhou	Alashankou	Germany	Kazakhstan, Russia, Belarus, Poland, Germany
46	X8008	1 per week	Alashankou	21:58					
47	X8040/39	4 per week	Alashankou	20:24	~ 18 days	Duisburg–Chongqing	Alashankou	Germany	Kazakhstan, Russia, Belarus, Poland, Germany
48	X8050/49	1 per week	Alashankou	9:30			Khorgos		
49	X8306/5	2 per week	Erenhot	15:49			Erenhot		
50	X8042	2 per week	Alashankou	20:24	~ 18 days	Łódź/Nuremberg/ Tilburg–Chengdu	Alashankou	Poland, Germany, Netherlands	Kazakhstan, Russia, Belarus, Poland, Germany, Netherlands
51	X8092/1	daily	Alashankou	5:16			Alashankou		
52	X8308/7	1 per week	Khorgos	9:30			Khorgos		
53	X8054/3	1 per week	Alashankou	21:58	~ 20 days	Madrid–Yiwu	Alashankou	Spain	Kazakhstan, Russia, Belarus, Poland, Germany, France, Spain
54	X8044/3	2 per week	Alashankou	21:58	~ 18 days	Hamburg–Wuhan	Alashankou	Germany	Kazakhstan, Russia, Belarus, Poland, Germany
55	X8408/7	1 per week	Manchuria	22:53	~ 15 days	Brest–Suzhou	Manchuria	Belarus	Russia, Belarus
56	X8058	1 per week	Manchuria	23:50	~ 15 days	Brest–Shenyang	Manchuria	Belarus	Russia, Belarus
57	X8030/29	2 per week	Manchuria	22:02	~ 15 days	Tomsk–Wuhan	Manchuria	Russia	Russia
58	X8204/1	1 per week	Erenhot	15:49	~ 18 days	Hamburg–Zhengzhou	Erenhot	Germany	Mongolia, Russia, Belarus, Poland, Germany
59	X8028	2 per week	Manchuria	0:34	~ 15–18 days	Schwarzheide–Changchun (Tomsk–Harbin)	Manchuria	Germany, Russia	Russia, Belarus, Poland, Germany
60	X8034/3	2 per week	Manchuria	22:02	~ 16 days	Tomsk–Chongqing	Manchuria	Russia	Russia
61	X8206	1 per week	Erenhot	17:49	~ 10 days	Vorsino–Jining	Erenhot	Russia	Russia, Mongolia

Table A2.7. Changes in, Commodity and Geographical Structure of, Import by EAEU Member States from China of Cargoes Switchable to Railway Container Transport, 2007–2016, Thousand Tons/ Thousand FEU

Source: UNCTAD

Commodity Groups and Countries	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finished Food Products	20	20	22	28	29	22	17	11	14	15
Finished Chemical Products	31	48	51	60	66	75	74	76	66	72
Cellulose, Paper, Printed Products	10	21	16	20	22	20	20	24	14	11
Textile Fibre, Fabrics, Raw Hide	0	0	1	1	0	0	2	1	0	0
Clothing, Footwear, Textile Products	454	682	534	870	989	1105	1163	1005	642	669
Metals and Metal Products	28	42	22	58	46	32	52	49	55	43
Machines, Equipment, Industrial Products	2,528	3,199	1,911	3,022	3,711	4,252	4,185	3,801	2,84	3,156
TOTAL, Thousand Tons	**3,072**	**4,012**	**2,557**	**4,059**	**4,863**	**5,505**	**5,513**	**4,967**	**3,575**	**3,966**
Russia	2,556	3,358	2,053	3,284	3,950	4,256	4,311	4,004	2,790	3,069
Kazakhstan	296	374	330	467	502	824	796	713	489	426
Belarus	66	95	63	102	138	137	157	68	141	225
Armenia	13	25	20	29	29	29	28	28	20	30
Kyrgyzstan	140	160	92	177	245	260	221	154	135	215
TOTAL, Thousand FEU	**192**	**251**	**160**	**254**	**304**	**344**	**345**	**310**	**223**	**248**
Russia	160	210	128	205	247	266	269	250	174	192
Kazakhstan	19	23	21	29	31	52	50	45	31	27
Belarus	4	6	4	6	9	9	10	4	9	14
Armenia	1	2	1	2	2	2	2	2	1	2
Kyrgyzstan	9	10	6	11	15	16	14	10	8	13

Main Commodity Groups	2010	2011	2012	2013	2014	2015	2016
Transit Freight Traffic from China to the EU through Crossing Points at the Border with China, Total	2.8	3.7	5.8	7.2	15.7	25.2	48.7
including							
Ferrous Metals	0.0	0.0	0.2	0.2	0.1	0.1	0.2
Other Cargoes	2.4	3.5	5.6	7.0	15.6	24.9	48.3
of which:							
Motor Vehicles	0.0	0.0	0.0	0.1	0.1	0.2	1.1
Machines, Machine Tools, Engines	0.0	0.1	0.3	1.0	1.5	2.7	4.9
Metalware	1.7	2.2	4.4	3.5	8.7	13.5	23.0
Chemicals and Sodium Carbonate	0.4	0.4	0.2	0.3	0.2	0.6	1.2
Industrial Consumer Goods	0.3	0.8	0.6	1.3	4.4	6.8	16.2

Table A2.8. Commodity Structure of Transit Railway Container Traffic from China to the EU through Crossing Points at the Border with China, 2010–2016, by Volume, Thousand FEU

Source: UNCTAD

Commodity Groups	2									
Finished Food Products	26	34	44	54	70	53	40	45	26	34
Finished Chemical Products										
Cellulose, Paper, Printed Products	230	256	247	272	289	278	260	265	247	235
Textile Fibre, Fabrics, Raw Hide	9	9	5	6	7	6	6	6	5	5
Clothing, Footwear, Textile Products	4,848	5,117	4,743	5,212	5,187	4,450	4,587	4,985	4,574	4,687
Metals and Metal Products	359	356	235	354	340	299	321	354	323	349
Machines, Equipment, Industrial Products	13,876	14,159	11,226	14,273	14,999	14,141	15,203	17,342	16,144	15,907
TOTAL, Thousand Tons	**19,529**	**20,113**	**16,652**	**20,352**	**21,076**	**19,416**	**20,626**	**23,214**	**21,538**	**21,451**
TOTAL, Thousand FEU	**1,953**	**2,011**	**1,665**	**2,035**	**2,108**	**1,942**	**2,063**	**2,321**	**2,154**	**2,145**

Table A2.9. Changes in and Commodity Structure of, Import by EU Countries from China of Cargoes Switchable to Railway Container Transport, 2007–2016, Thousand Tons

Source: UNCTAD

Table A2.10. Commodity Structure of Transit Railway Container Traffic from the EU to China through Crossing Points at the Border with China, 2010–2016, by Volume, Thousand FEU

Source: Institute of the Economy and Transport Development based on Russian Railways statistics

Main Commodity Groups	2010	2011	2012	2013	2014	2015	2016
Transit Freight Traffic from the EU to China through Crossing Points at the Border with China, Total	0.6	3.1	8.6	3.0	6.0	14.5	25.2
including							
Ferrous Metals	0.0	0.0	0.0	0.0	0.2	0.3	0.8
Other Cargoes	0.6	3.0	8.6	3.0	5.8	14.2	24.1
of which:							
Motor Vehicles	0.1	1.6	6.4	1.7	2.9	3.0	4.5
Paper	0.0	0.0	0.0	0.0	0.3	0.5	1.1
Machines, Machine Tools, Engines	0.2	1.0	0.9	0.9	1.0	2.4	3.0
Metalware	0.2	0.2	0.1	0.1	0.7	5.9	10.3
Chemicals and Sodium Carbonate	0.1	0.1	0.3	0.2	0.5	1.1	1.6
Industrial Consumer Goods	0.0	0.0	0.1	0.0	0.1	0.3	0.8

Table A2.11. Changes in and Commodity Structure of, Export by EU Countries to China of Cargoes Switchable to Railway Container Transport, 2007–2016, Thousand Tons

Source: UNCTAD

Commodity Groups	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finished Food Products	5	7	8	5	10	10	9	8	6	8
Finished Chemical Products	42	59	44	68	80	82	86	88	96	106
Cellulose, Paper, Printed Products	4	7	6	5	7	6	7	6	7	7
Textile Fibre, Fabrics, Raw Hide	0	0	0	0	0	0	0	0	0	0
Clothing, Footwear, Textile Products	37	44	85	53	67	68	64	67	71	75
Metals and Metal Products	37	26	28	26	22	22	15	12	16	32
Machines, Equipment, Industrial Products	2,113	2,182	2,199	3,120	3,636	3,544	3,784	4,067	3,53	3,592
TOTAL, Thousand Tons	**2,237**	**2,325**	**2,370**	**3,278**	**3,821**	**3,734**	**3,965**	**4,248**	**3,749**	**3,820**
TOTAL, Thousand FEU	**102**	**106**	**108**	**149**	**174**	**170**	**180**	**193**	**170**	**174**

Commodity Groups and Countries	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finished Food Products	9	10	7	3	3	4	3	6	4	4
Finished Chemical Products	9	10	8	7	9	11	11	11	12	13
Cellulose, Paper, Printed Products	7	6	5	4	4	4	3	3	2	3
Textile Fibre, Fabrics, Raw Hide	0	0	0	0	0	0	0	0	0	0
Clothing, Footwear, Textile Products	25	24	18	18	18	16	16	17	17	19
Metals and Metal Products	220	238	213	213	166	264	277	281	259	197
Machines, Equipment, Industrial Products	234	229	155	159	164	149	150	161	196	252
TOTAL, Thousand Tons	**503**	**516**	**407**	**405**	**364**	**449**	**459**	**478**	**490**	**488**
including										
Russia	423	438	347	344	299	381	402	415	425	412
Kazakhstan	18	18	10	7	9	14	9	6	11	14
Belarus	60	56	47	52	53	50	45	51	50	59
Armenia	2	2	1	1	2	3	3	4	2	2
Kyrgyzstan	1	3	3	1	1	2	1	3	2	1
TOTAL, Thousand FEU	**25**	**26**	**20**	**20**	**18**	**22**	**23**	**24**	**24**	**24**

Table A2.12. Changes in, Commodity and Geographical Structure of, Export by EAEU Member States to the EU of Cargoes Switchable to Railway Container Transport, 2007–2016, Thousand Tons/ Thousand FEU

Source: UNCTAD

Commodity Groups and Countries	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finished Food Products	64	51	40	39	36	33	35	43	29	34
Finished Chemical Products	402	407	354	392	397	417	422	417	355	362
Cellulose, Paper, Printed Products	185	199	136	141	150	138	129	114	64	53
Textile Fibre, Fabrics, Raw Hide	0	0	0	0	0	0	0	0	0	0
Clothing, Footwear, Textile Products	154	170	124	144	145	148	140	142	98	122
Metals and Metal Products	4	3	2	2	8	16	14	3	3	2
Machines, Equipment, Industrial Products	4,196	4,452	2,409	3,050	4,097	4,828	4,594	3,952	2,420	2,554
TOTAL, Thousand Tons	**5,005**	**5,282**	**3,066**	**3,769**	**4,832**	**5,581**	**5,334**	**4,672**	**2,968**	**3,126**
including										
Russia	4,203	4,597	2,477	3,284	4,321	4,934	4,622	3,921	2,519	2,731
Kazakhstan	518	298	247	157	150	205	265	239	195	146
Belarus	254	357	318	277	303	364	371	419	212	221
Armenia	20	20	15	16	17	18	18	18	23	15
Kyrgyzstan	10	11	10	35	41	61	58	74	18	14
TOTAL, Thousand FEU	**250**	**264**	**153**	**188**	**242**	**279**	**267**	**234**	**148**	**156**

Table A2.13. Changes in, Commodity and Geographical Structure of, Import by EAEU Member States from the EU of Cargoes Switchable to Railway Container Transport, 2007–2016, Thousand Tons/ Thousand FEU

Source: UNCTAD