Freight Flows shift from road to railway transport for optimization of TEN-T corridor North Sea - Baltic Sea

Final report

Kaunas district municipality administration

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Executive Summary

Research on optimization of TEN-T North Sea – Baltic Corridor through modal shift from road to rail was prepared by Smart Continent LT UAB, according to the agreement No. S-172 with Kaunas District Municipality Administration. This research is part of the Baltic Sea Region NSB-Core Interreg project. The purpose of the study is to contribute to the development of the intermodal corridor North Sea – Baltic.

In the first part of the study the interaction between Kaunas Free Economic Zone and Kaunas Intermodal Terminal was analyzed. Examining this interaction from the legal side, it has been identified that EU transport policy has the greatest impact on interaction, with the target of 30% of freight by 2030 will be transported by rail, and by 2050 it is expected to reach even 50%. After analyzing Lithuanian strategic documents in the field of transport, it can be argued that at the national level, it is also aimed to develop intermodal transport. Strategic documents emphasize that in the freight sector, the concept of intermodal transport must be realized by expanding 3 types of transport nodes: sea and river ports and the next generation logistics centers called land ports. Nevertheless, analysis of Lithuanian legal acts showed that Lithuania does not have a legal basis that directly promotes the formation of intermodal transport; on the contrary, relatively cheaper roads than railway infrastructure charges are conducive to road transport carriers. Also, it is necessary to note that in Lithuania railway undertakings pay excise taxes on fuel, which is used to develop road infrastructure, while the railway infrastructure is supervised by carriers' profits. It also distorts competition between rail and road.

After that the main reasons for choosing a mode of transport were analyzed. The statistical economic data, the reasons for the formation of cargo flows, and detailed overview of cargo by different modes of transport (by country, nomenclature) were analyzed. It was also identified that the major investments of transport sector are planned for road transport infrastructure modernization: 49% for roads, 28% for railways, which again shows a contradiction with EU policy and the aim of promoting rail transport.

After analyzing primary and secondary sources and focus group discussion with logistics experts, the reasons for choosing the main mode of transport and the legal, technological and economic barriers of cargo shift to rail were determined - the main ones being the lack of service and the price.

After reviewing the activities of Kaunas FEZ and KIT and evaluating the results of the research from the previous sections, the current and expected technological interaction between these objects, and economic and legal points of contact were discussed. It combines an interoperability model with participants and their intended functions.

In the second part of the study, considering the results of the first part and additional identification of the general situation in the Lithuanian transport market, a model of cargo transportation shift from road to rail was prepared.

Basic concepts and abbreviations

CIM	Uniform Rules concerning the Contract of International Carriage of Goods by Rail
EK	European Commission
ES	European Union
KIT	Kaunas intermodal terminal
KT	Combined transport
LEZ	Free economic zone
LG	AB „Lietuvos geležinkeliai“
OECD	Organisation for Economic Co-operation and Development

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Introduction

Research “Freight Flows shift from road to railway transport for optimization of TEN-T corridor North Sea - Baltic Sea” was prepared by Smart Continent LT UAB, according to the 2018-02-23 agreement No. S-172, concluded with Kaunas District Municipality Administration. This research is a part of the Baltic sea region Interreg project NSB-Core. The purpose of the research – to contribute to the development of intermodal corridor of North Sea - Baltic Sea.

Research is conducted according to technical specifications stipulated in the contract and divided into two report chapters. Research in the first chapter include transfer of freight flows from road to railroad transport while increasing interaction between Kaunas Free Economic zone and Kaunas Public Logistic Center conceptual model. Carried out analysis of legal and transport policy documents and estimated possible implications for freight flows formation in the North – South direction. Conducted freight flows formation and nature, also reasons for choosing types of transport analysis. Presented the results of analysis of shippers and recipients of qualitative and quantitative freight flows, including the reasons for the choice, technological and economic barriers to rail transport. Methods used to conduct the research include interviews with cargo shippers and representatives of logistic companies. Analyzed interaction between Kaunas Public Logistic Center (Intermodal Terminal in Palemonas) and Kaunas Free Economic zone, assessed economic, technological and legal obstacles to interaction. In the second chapter, the interaction model of the Kaunas Public Logistics Center (Intermodal Terminal in Palemonas) and Kaunas Free Economic Zone is prepared, including co-operation schemes and economic model implications and necessary conditions for the model to function. Primary and secondary sources have been analyzed, and research has been done on the logistics model of operation in Lithuania in order to reach the maximum number of goods through Lithuania from South to North, by rail transport. Collected data on the transport activities of logistic objects (cargo shippers, recipients, logistics and transport companies, warehouses) located in Lithuania, the scope of their activities, ways of cargo transportation and warehousing. The case study of Lithuania includes the connection of Kaunas Intermodal Terminal (further – KIT) in Palemonas with the enterprises of Kaunas Free Economic Zone and assesses the requirements of the customer for logistics services and qualitative criteria. This case study is part of the BSR Interreg 2014 - 2020 “North Sea-Baltic Connector of Regions” Program (NCB CORE).

1 Conceptual model of freight traffic transfer from road to railways by increasing interoperability between Kaunas Free Economic Zone and Kaunas Public Logistics Center

The chapter discusses the main legal, economic and technological aspects that affect transport interactions between Kaunas Free Economic Zone and Kaunas Public Logistics Center. Depending on the analysis, the suggested interoperability model is presented. The proposed model is based on legal, economic and technological aspects.

1.1 Analysis of legal and transport policy documents and assessment of their possible implications for the development of North-South freight flows

The subsection overviews the main trends related to the legal regulation of transport policy in the European Union and in Lithuania. Attention is paid to the European Union's freight transport policies and their reflection in the National legislation and strategic planning documents.

1.1.1 Analysis of European Union legal and transport policy development documents

In all the countries of the European Union, the development of intermodal transport is based on the main EU directives that regulate and promote intermodal transport. The table below contains directives and regulations that are relevant to road and rail transport and intermodal transport.

Table 1 European Union directives and regulations

No.	Directives, regulations	Description
1	Directive 92/106 / EEC on common rules for the carriage of goods between Member States.	An EU measure to reduce the negative environmental impacts of transport of goods (such as CO 2 and other pollutants) and society (e.g. congestion, accidents, noise, etc.) in support of the transition from long-distance road transport to long-distance rail, inland waterways and maritime transport, as the latter have fewer negative externalities. The directive seeks to promote combined transport operations by removing authorization procedures and quantitative restrictions for combined transport operations. It is also emphasized that road transport carriers carrying the goods in the initial and final phase of the combined

No.	Directives, regulations	Description
		transport (further - CT) chain must be fully or at least partially exempted from road charges. In addition, financial support must be granted to carriers whose routes are carried out on combined transport. The state must reimburse or reduce the fees for rail travel, which are partly or wholly outside the country in which the vehicle is registered.
2	Directive 96/53 / EC fixes the maximum permissible dimensions for certain road vehicles nationally and internationally and the maximum authorized mass in international traffic.	The Directive sets national and international maximum dimensions for certain vehicles but allows national vehicles or vehicle combinations for national transport within their territory that do not comply with the requirements of the Directive. In addition, vehicles or vehicle combinations that exceed the maximum dimensions may only be permitted on the basis of special permits.
3	Regulation (EU) No 913/2010 of the European Parliament and of the Council on a competitive European rail network for freight.	The regulation establishes rules for the establishment and organization of international rail corridors for the competitive transport of goods with a view to developing a European rail network for competitive freight. It lays down the rules for the selection, organization, management and indicative planning of freight corridors in these corridors. This regulation also applies to the management and use of railway infrastructure in the freight corridors.

Source: Eur-lex

The table below provides key strategic documents for transport, which regulate and promote the development of intermodal transport.

Table 2 Key EU Transport Strategy Papers

Document title	Description
White Paper. A Single European Transport Area Development Plan. The development of a competitive, resource-efficient transport system.	The goals of the “White Paper” include promoting mobility, reducing emissions (about 60%), developing an efficient multivariate inter-city communication and transport network, creating a level playing field for long distance and freight transport between the continents at world level, promoting clean transport, establishing a common vehicle type approval and a common certificate of safety for railway undertakings and, to this end, increasing the role of the European Railway Agency, developing an integrated freight corridor management system, including rail charges , to ensure a real opportunity to use the railway infrastructure on an equal footing (among other things, rail-related services), in particular by structuring the distinction between infrastructure management and provision of services, etc. Also, it is planned that by 2030, 30% of the cargo must be transported by rail, and by 2050, even 50%. Use road transport only for "first mile" and "last mile" and it should not exceed 300 kilometers on each route for cargo transportation. The White Paper calls for

Document title	Description
	the introduction of transport-related information and communication technologies to ensure better and more integrated traffic management as well as streamlining administrative procedures for improving freight logistics, the ability to locate and track cargo, optimizing schedules and traffic flows.
„Europa 2020“ strategy	The goals of the strategy include developing transport infrastructure, traffic management and logistics. It is also foreseen that EU Member States must create advanced, innovative, interconnected transport infrastructure and provide for the implementation of EU infrastructure projects.
„Rail Baltica“ project	The main idea of the “Rail Baltica” project is to develop a high-quality railway line for passenger and cargo transportation between the Nordic countries, the Baltic States and Poland, as well as between the Baltic States and other EU countries through Warsaw. Making better quality, which means higher maximum speed, railway lines will improve the land transport connections between the Baltic States, the Nordic countries and Poland. Modernized railway connections will not have a negative impact on the environment, will help to reduce traffic congestion on the European road network, improve transportation with the Baltic States and possibly improve conditions for rapid regional development.

Source: European Commission

The European Union's freight transport policy is aimed at ensuring security, dynamism and competitiveness in the field of transport. The transport sector is an important area for meeting the growing economy and its needs. More and more attention is paid to ensure the greening of the transport sector, emphasizing the reduction of emissions of greenhouse gases and other pollutants.

The European Union's transport policy in the context of this study is guided by two main directions:

- Liberalization and commercialization of the EU transport sector. Various restrictions and protections are being eliminated, creating a level playing field for both same and different types of transport competition, encouraging the attraction of private capital to improve infrastructure and privatization.
- Ensuring the safety of transport services and improving service quality, reducing the negative impact on humans and the environment, and reducing oil dependency. To achieve this purpose, legal regulation (common standards, certificates, licensing, rules, etc.), economic-financial measures (taxes, fines, promotion, etc.) are used. Infrastructure measures and soft efficiency measures are used to increase the quality of services, improve accessibility of transport.

1.1.2 Analysis of national legal and transport policy development documents

This part analyzes the main Lithuanian legal acts regulating freight transport.

Table 3 Key legal documents in the field of transport

Document title	Description
Transport Framework Law	This Law establishes the legal status of the transport infrastructure of the Republic of Lithuania, carriers and transport infrastructure managers, state aid in developing the general principles of transport infrastructure and its management, the legal status of transport infrastructure managers, their relations with owners and users of transport infrastructure, public service obligations, safety of traffic and other regulatory framework for relations in the field of transport activities.
Road Transport Code of the Republic of Lithuania	The Code regulates the organization and management of passenger, baggage, and cargo transportation. Also, it regulates transportation state management and control. It is mentioned in the Code that the State Administration of Road Transport is carried out by the Ministry of Transport and Communications and municipal authorities. Similarly, for carriage of passengers by buses and freight transport by road vehicles with a maximum authorized mass, including a trailer (semi-trailer) of more than 3.5 tons, only carriers holding a license issued in accordance with the established procedure may carry out remuneration.
The Railway Transport Code of the Republic of Lithuania	The main legal act regulating railway transport is the Lithuanian Rail Transport Code. It is mentioned in the Code that the public railway infrastructure (the railway infrastructure owned by the State of Lithuania for the purpose of meeting the needs of the society and economic operators - for passengers, luggage and (or) cargo) is owned by the State of Lithuania and it is not privatized. Also, the Public Transport Administration of Railways is carried out by the Government, the Ministry of Transport and Communications.
The Law on the Financing of the Road Maintenance and Development Program	The law states that managers of vehicles or their combinations, that is, registered goods vehicles, pay a road user fee for the use of trunk roads. For the use of state-owned land, regional or local roads (streets), the road user's fee is free. The set tax rates must be proportionate to the length of use of the journey. The monthly tariff must not exceed 10% of the annual rate, the weekly rate shall not exceed 5% of the annual rate, and the daily rate shall not be more than 2% of the annual rate. The law stipulates that all trunk roads are taxable, but the road tax does not apply to heavy vehicles traveling on national and local roads.

Source: Ministry of Transport and Communications of the Republic of Lithuania

The table below presents the main strategic documents of the Lithuanian transport sector, which can influence the formation of intermodal traffic flows.

Table 4 Transport Strategy Papers

Document title	Description
Long-term (till 2025) Lithuanian transport system development strategy	The main goals of the strategy are: in Lithuania, by the year 2025, a modern and balanced multimodal transport system, with its technical parameters, safety and the quality of the provided services at an equal to the level with the old EU Member States. It is emphasized that it is necessary to create modern public logistics centers in Kaunas, Klaipėda, Vilnius and, if necessary, in other regions (Panevėžys and Šiauliai), to integrate them into the network of transport logistics centers in the Baltic Sea Region. It is also mentioned that in the cargo sector, the concept of intermodal transport has to be realized by expanding 3 types of transport nodes: sea and river ports and the next generation logistics centers called land ports.
National Progress Program 2014-2020	The program aims to develop modern transport infrastructure and sustainable mobility, and to introduce security measures in the railway sector. In order to create a favorable environment for economic growth and development of transport infrastructure, priority is given to investments in the main transport infrastructure nodes (roads and railways). It is stated that in the period from 2014 to 2020, commitments for the construction of a European railway track will continue. The document highlights the lack of competition in Lithuania and the lack of promotion of a competitive environment and points out that the principles of competition must be implemented in services of general interest, including on railways.
National Program for the Development of Transport for 2014-2022	The strategic goal of the program is to create a sustainable, environmentally friendly, competitive and high added value creating Lithuanian transport system. Upon reaching the strategic goal, the communication system will ensure high-quality, efficient, continuous and sustainable mobility of the members of the public and the transportation of goods, and high-quality logistics services. Main goals: To install a new, also update and upgrade existing international and local railway infrastructure. To deploy intelligent transport systems and technologies to help ensure better mobility of passengers and goods on the TEN-T roads, as well as on other public and urban roads, including railways. Establish and develop infrastructure of public logistics centers and ensure their connection with international transport corridors; To carry out an active international transport policy in order to ensure the largest share of the country's economy in the world (European and Asian) and regional (Baltic Sea) trading markets and logistics services.

Source: Ministry of Transport and Communications of the Republic of Lithuania

National documents, like in the European Union's, reflect similar key transport policies:

- Competitiveness promotion. It is emphasized that the principles of competition must be implemented in services of general interest, including railways.
- The communication system must be sustainable and environmentally friendly, it must create a high added value.

1.1.3 Evaluation of the impact of legal and transport policy documents on the development of North-South freight flows

The main European Union directives, which were analyzed in section 1.1.1, are the basis for the formation of intermodal transport. The directives promote combined transport operations, eliminating permitting procedures and quantitative restrictions for combined transport operations. In addition, it is encouraged to provide financial support to carriers using combined transport. It is also emphasized that road vehicles operating in the initial and final stages of the CT chain must be fully or at least partially exempted from road charges. Thus, with the introduction of similar legal measures, an alternative to intermodal transport can become attractive. These measures could also help change the opinion of road carriers on cooperation with other modes of transport.

The European Union's strategic plans also provide for the development of intermodal transport. One of the goals of the European Union's White Paper is to reduce emissions (about 60%), which means increasing the role of the European Railway Agency. By 2030, the goal is to achieve that 30% of freight will be transported by rail, and by 2050 it is expected to reach even 50%. In addition, introduction of transport-related information and communication technologies are called to ensure better and more integrated traffic management, as well as to simplify administrative procedures for improving freight logistics, the ability to locate and track cargo, optimizing schedules and traffic flows.

After analyzing Lithuanian strategic documents in the field of transport, it can be argued that at the national level, it is also encouraged to develop intermodal transport. Strategic documents emphasize that in the freight sector, the concept of intermodal transport must be realized by expanding 3 types of transport nodes: sea and river ports and the next generation logistics centers called land ports. Also, the documents emphasize the lack of competition in Lithuania, that the principles of competition must be implemented in services of general interest, including on railways.

However, the analysis of Lithuanian basic legislation has shown that Lithuania does not have a legal basis that directly promotes the formation of intermodal transport; on the contrary, relatively less favored roads than rail infrastructure charges favor road transport carriers. Also, it is necessary to note that in Lithuania railroad carriers pay excise taxes on fuel, which has a supervised road infrastructure, while the railway infrastructure is supervised by carriers' profits. It also distorts competition to the detriment of rail transport.

1.2 Study of the freight flows formation and reasons for choosing the mode of transport

The section presents the main reasons for choosing a mode of transport. The statistical economic data, the reasons for the formation of cargo flows, and detailed overview of cargo by different modes of transport (by country, nomenclature) are analyzed.

1.2.1 Macroeconomic causes of freight flows formation

In order to analyze cargo flows useful for Lithuania, it is necessary to review the general statistics of the countries where goods are transported to Lithuania. As China is the second largest trading partner of the EU, and the goods mostly arrive to ports of European countries, from which containers are transported, including transit through Lithuania, the following countries were selected for analysis: Germany, Poland, Italy, Russia, the Netherlands, Finland, Latvia, Belgium, Estonia, Lithuania, China and France. In order to understand the potential of trade in these countries and the associated freight flows, the trends of GDP, exports and imports from these countries were reviewed.

The GDP trend reflects the country's economic development and economic convergence. It is worth noting that in most of the analyzed countries, the largest increase in GDP occurred in 2017 (see Chart 1). Eurostat data confirmed the forecast published by the International Monetary Fund in January 2018, stating that the global economy will grow by 3.9% in 2018 and 2019, while the developed economy will grow at its fastest pace since the 2009 crisis year. The economic growth of the countries was also driven by the policy of the European Central Bank, a zero-interest rate and a quantitative incentive program, which brought tens of billions of euros into the European market. Thus, it can be assumed that GDP will grow even more in the euro area, while growing GDP will mean that production and trade volumes will increase in the countries.

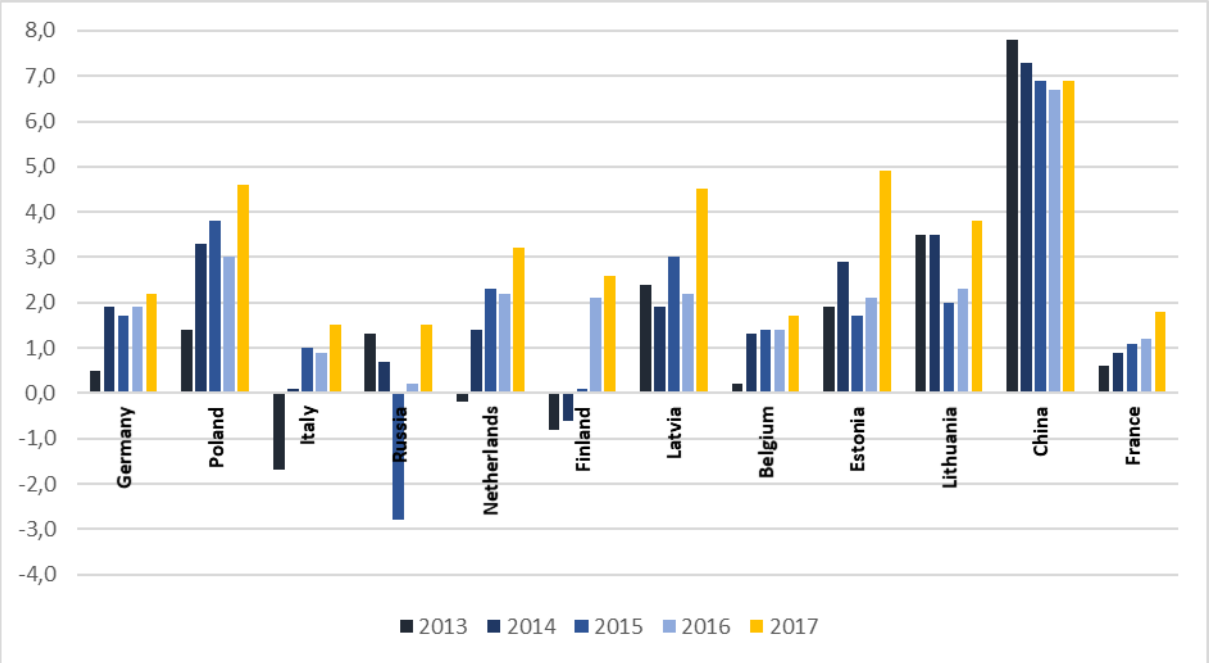


Chart 1 GDP change % During the period from 2013 to 2017
Source: Eurostat

The GDP growth rate of the 12 countries outlined in Chart 1 shows that the GDP of all countries increased from 2013 to 2017. Although the changes were not dynamic, it is clear that only Finland's GDP growth has been increasing every year since 2013. This was due to the collapse of former technology giant “Nokia” in 2016, as well as to the recession in neighboring Russia (which ended in December 2017). In 2013, this indicator was -0.8, but by 2017 it was 2.6%. The GDP growth in this country shows that cargo flows and the purchase of raw materials have increased.

From the list of countries examined, the fastest-growing GDP in China ranged between 6.7 and 7.8, but over the five-year period, three years (2014 to 2016), the change in growth was reduced by about 0.3 percentage points. Although experts predicted GDP growth of 6.5% in 2017, 0.2 percentage points lower than in 2016, the Chinese economy was able to rise and in 2017 GDP growth was 6.9%. According to Gene Ma, Chief Economist of China at the International Finance Institute in Washington, "The most important engine is much better industry performance, with many things to consider: recovering exports, very low stocks, strong retail sales and investment-driven demand." Given the pace of this indicator at the level of the countries concerned, China is one of the country's largest issuing countries.

Despite a slight decline in GDP growth over the three years, Chinese exports reached 2.64 trillion euros (according to OECD data for 2016). Of the analyzed countries, China exports the largest share to Germany - 3.2% of total exports, and slightly less to the Netherlands (2.8%) (see Chart 2). Germany is an importer of Chinese products, about 50% of all purchases are

various devices, but also an important exporter to China. Germany itself imports (total 10% import) from China more than exports to it.

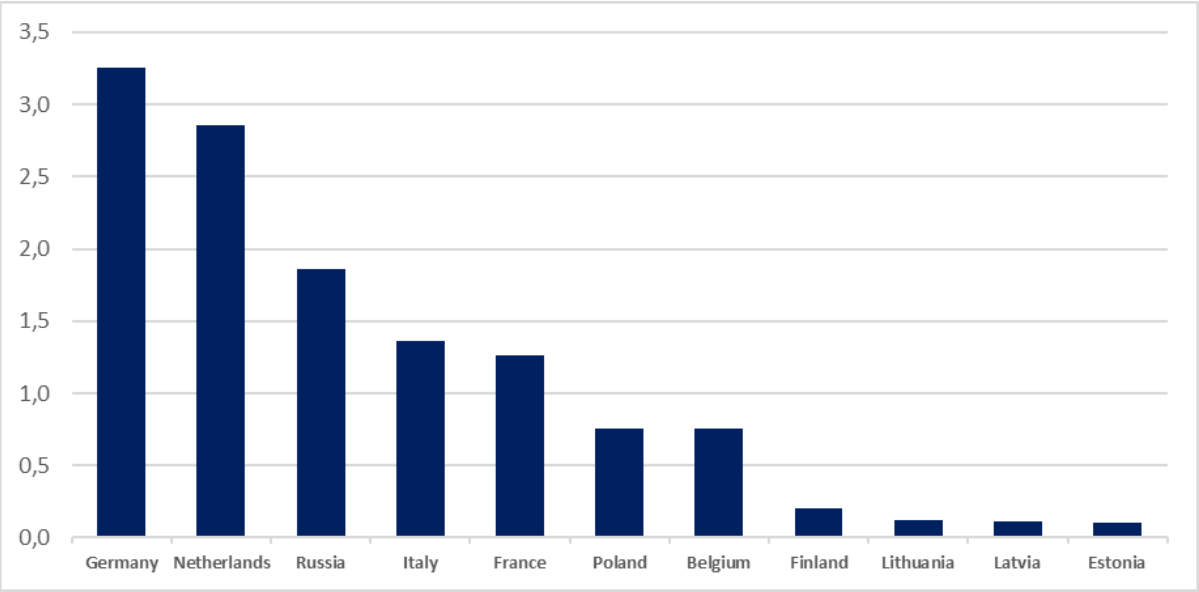


Chart 2 Chinese export volume in 2016, percent

Source: Eurostat

Chart 2 shows that from the analyzed countries, the smallest part from China is exported to the Baltic countries. These countries mainly buy equipment (Lithuania - 35% of total exports from China, Latvia 34%, and Estonia - 52%). In order not to ship empty containers, China imports wood from Lithuania, which China lacks.

Given the statistics on imports, according to Eurostat data for 2016, Poland imports the most (23%) from Germany, slightly less than China, Russia, Italy and France. It is noted that in all countries Germany is among the main 5 importing countries. In general, intra-EU trade accounts for 59% of German exports. Consequently, most of the freight flows are from Germany. In the Baltic States, Latvia mainly imports from Lithuania (18%), Lithuania - from Russia (14%), and Estonia - from Germany (11%).

In summary, it can be argued that most of Germany imports from China, while the analyzed countries - from Germany, therefore cargo can potentially be transported through Lithuania. The analysis of macroeconomic trends shows that this potential is positive - the analyzed economies will grow, which will lead to even more intensive trade and freight flows. Also, the fact that China exports to Germany is most likely to conclude that China is currently shipping by sea and continues to distribute it by road. In order to reduce transportation time (container transport between the Chinese and Germany takes up to 90 days, rail transport is up to 14) and emissions (rail freight consumes up to 10 times less fuel per 100 kilometers than road transport for the same cargo quantity), it makes sense to carry more freight by rail.

1.2.2 Overview of cargo transportation in the region

Taking into account the types of cargo transportation, for the purpose of fast transportation, freight is transported by road, because of its high maneuverability, door-to-door transport, high speed (depending on the density of the area's road network) and the possibility to transport small consignments. However, small vehicle capacities increase the cost of transport, while speed and maneuverability increase the risk of accidents.

Table 5 Road transport, million tons

Country	2013	2014	2015	2016
Estonia	31,1	27,4	28,2	34,6
Latvia	60,6	62,2	62,6	63,4
Lithuania	52,3	57,6	58,6	63,6
Belgium	300,6	299,5	264,0	255,6
Finland	274,6	280,1	271,9	279,0
Netherlands	642,1	639,8	641,5	656,4
Poland	1 300,6	1 300,4	1 265,0	1 313,7
France	1 999,9	1 918,6	1 796,8	1 727,6
Germany	2 938,7	3 052,6	3 035,3	3 111,9
European Union	13 772,0	13 989,2	14 099,1	14 209,1

Source: Eurostat

Table 5 shows that, from a number of countries analyzed, most of the goods transported by road were in Germany due to the large quantities of exported goods. Another trend is the fact that, despite the objectives and recommendations of the White Paper and the declaration of EU transport policy, the volume of freight transported by road has increased in all countries except Belgium.

Lithuania is no exception. This is reflected and analyzed by the data of the Lithuanian Department of Statistics on the Lithuanian cargo transportation by road during the period from 2014 to 2017 - the volume of cargo transported by road increased significantly from 58 million tons up to 77 million tons, or by almost 34 percent. Although ecologically, this is not a positive trend, but the situation reflected in Chart 3 essentially shows that, as demand for goods increases, the volume of transportation increases and also reveals a positive trend in the flow of goods that can be transported by rail.

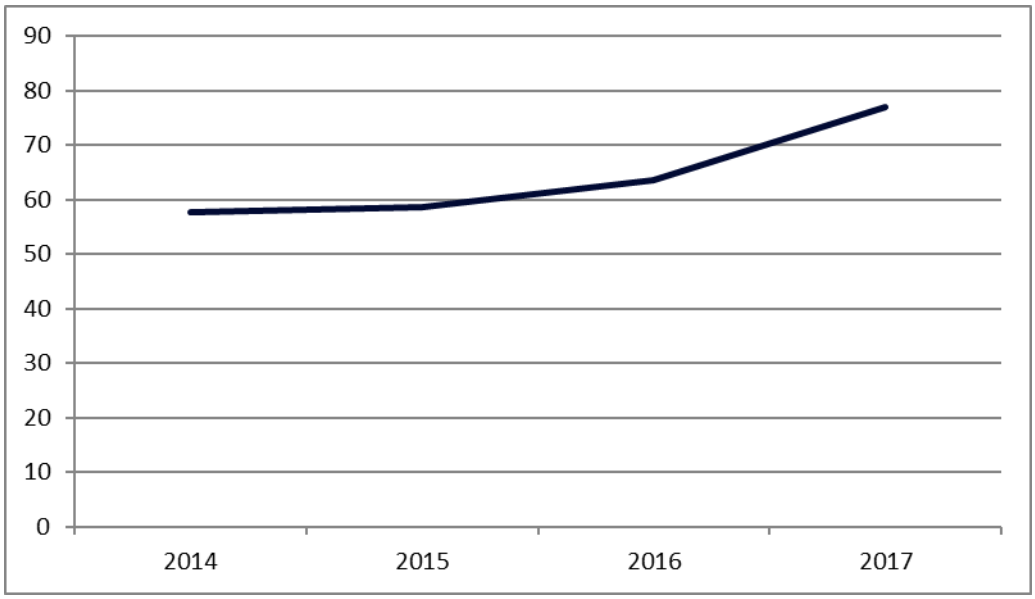


Chart 3 Carriage of goods by road in Lithuania, million tons

Source: Lithuanian Department of Statistics

Sea transport is traditionally used by countries with well-developed infrastructure and a favorable geographical location. For example, Germany and Netherlands are located on the North Sea, which directly connects the Atlantic Ocean. The use of sea transport is common in the transport of bulk and heavy cargoes, as there is the possibility of massive intermodal carriage, the logistical cost per unit (tone or container) is reduced due to economies of scale and also requires a relatively lower investment than maintenance of roads and practically endless (unlimited) lines bandwidth (restrictions only arise from port facility performance and ship capacity). However, sea transport also has its negative qualities, such as weather dependence (and at the same time more risky), and the need for significant investments in port and terminal infrastructure, which increases the overall cost.

Table 6 Transport by sea, million tons

Country	2012	2013	2014	2015	2016
Estonia	40,3	39,3	39,9	31,4	30,2
Lithuania	41,0	39,8	41,1	43,1	46,2
Latvia	71,0	65,5	70,0	66,1	59,3
Poland	57,9	63,2	67,8	68,4	71,6
Finland	96,4	98,2	98,5	91,9	98,7
Belgium	222,4	226,6	237,3	241,1	252,6
France	291,9	293,2	289,9	289,2	283,1
Germany	290,4	294,5	300,8	292,5	293,5
Italy	388,5	370,2	348,3	364,1	365,6
Netherlands	550,9	556,6	568,9	593,4	588,2

Source: Eurostat

Table 6 analyzes the data, how many million tons per year the country transport by sea. It is noted that large quantities are transported by Germany, France, Italy and the Netherlands

due to the fact that these countries are geographically located at the seas which are part of the ocean and have seaports adapted for such quantities, a well-developed road and rail network, large consumption markets and strong economy.

When analyzing cargo transportation by sea, it is evident that from 2014 about 2 million tons more are transported each year by sea transport by Lithuania, and Latvian and Estonian ports (as the main Lithuanian competitors) are reloading less and less freight.

Transportation of goods by rail is up to 10 times less polluting than road transport. Transportation by rail ensures the regularity of transport, low dependence on weather conditions, the ability to carry large volumes (up to 3000-6000 tons, depending on the national network restrictions) simultaneously, the possibility to carry oversized cargo and low cost of transport.

Table 7 Transportation by rail, million. tons

Country	2012	2013	2014	2015	2016	
Belgium	-	-	-	-	-	
Estonia		44,7	43,7	36,3	28,0	25,4
Finland		35,3	36,4	37,0	33,4	36,2
Netherlands		37,6	38,9	39,4	41,7	42,6
Lithuania		49,4	48,0	49,0	48,1	47,7
Latvia		60,6	55,8	57,0	55,6	47,8
Italy		88,5	88,0	90,9	92,3	92,9
France		87,5	92,7	90,8	95,5	89,1
Poland		230,9	232,6	227,8	224,3	222,5
Germany		366,1	373,7	365,0	367,3	363,5

Source: Eurostat

Analyzing the data in Table 7, it is evident that Germany on average every year transport 367 million tons of cargo. Of the remaining countries analyzed, Poland also stands out, which transmits an average of 227 million tons per year, although this indicator is lower than Germany, but compared with other countries, it is a high indicator. It is also important to note another trend - the amount of freight carried by rail in all countries during the analyzed period either dropped or, with a few percent error, remained the same. This is an important indicator in the context of the EU transport policy discussed above and positive trends in road freight transport.

Looking at the Lithuanian cargo transportation by rail, according to the data of the Lithuanian Department of Statistics, it is observed that from 2015 to 2017 this indicator has increased and in 2017 it reached 52.6 million. tons.

However, in Lithuania, although rail freight transportation is relatively high, it should be noted that bulk of the goods transported are oil products, powdery and liquid fertilizers, grain. Meanwhile, the share of palletized goods in railways in Lithuania is very small. In Western Europe, the prevailing incentive for rail freight is focused on palletized cargo, which today, thanks to road transport superiority, is mainly carried by trucks.

Table 8 shows that the amount of goods imported by rail into Lithuanian territory is significantly higher than exported. This is due to the fact that rail transport is for the most part

partly transported from Belarus for export, mainly for fertilizers, oil and other raw materials, for further shipment by sea, while the return is usually carried out by empty wagons and imports to Belarus or other CIS and the East countries usually consists of a finished product, which is more often transported by road (due to mobility and transport time).

Table 8 Lithuanian cargo transportation by rail, million. tons

	2013	2014	2015	2016	2017
Total by type of freight	48,0	49,0	48,1	47,7	52,6
Inland transport	15,1	14,5	14,4	15,1	15,5
Brought to the country	15,8	20,1	20,6	19,7	20,8
Left the country	5,1	4,2	4,1	3.9	4.7
Transit	12,1	10,3	8,9	9,0	11,7

Source: Lithuanian Department of Statistics

Although air transport is characterized by high speed, flexibility and maneuverability, this type of transport is the least-used means of transport because of high prices (compared to other means of transport). This method of transportation is mainly used in Germany. The absence of high added value factories and the lack of and / or a relatively low level of air transport logistics infrastructure do not create opportunities for other countries to compete with Germany in the short term. Nevertheless, in the context of the research, it should be noted that practically one territory, only 10 km radius with Karmėlava Airport, KIT, well-developed road transport network and FEZ, where any industrial company can set up, creates the potential for increasing air transportation in Lithuania in the long-term perspective.

Table 9 Transport by air, in tons

Country	2012	2013	2014	2015	2016
Estonia	23 760	20 862	19 432	16 014	13 863
Latvia	31 460	52 473	31 439	16 809	17 922
Lithuania	15 425	19 789	17 972	19 912	19 270
Poland	74 444	78 695	91 379	98 376	110 583
Finland	195 623	192 492	190 575	181 833	185 995
Italy	789 531	814 024	857 816	916 070	979 226
Belgium	1 068 414	1 004 772	1 035 592	1 158 610	1 153 781
Netherlands	1 563 499	1 620 017	1 727 443	1 712 011	1 754 737
France	1 754 514	1 738 064	2 353 594	2 380 383	2 525 390
Germany	4 447 687	4 422 985	4 479 866	4 496 007	4 651 820

Source: Eurostat

The Baltic States and Poland use the least air transport as a means of transport from the analyzed countries.

According to the data of the Lithuanian Department of Statistics, in the perspective of 2013-2017, the volumes of cargo transportation by air transport varied between 13 and 16 thousand tons, but no significant breakthrough or decline has been noted.

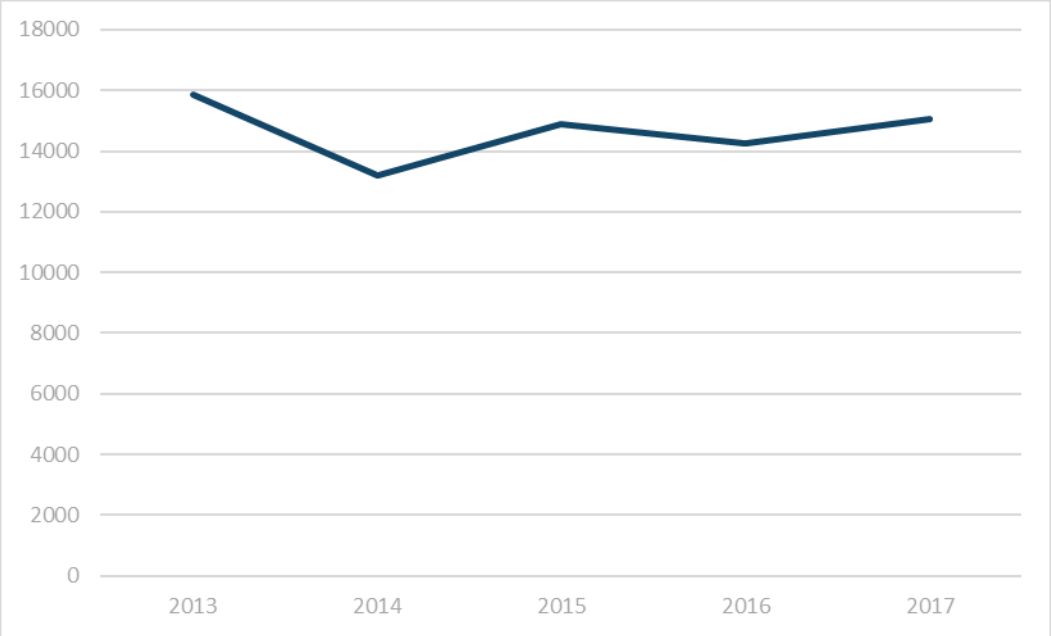


Chart 4 Transport by air in Lithuania, in tons
Source: Lithuanian Department of Statistics

1.2.3 Overview of freight transport by rail

The following is an analysis of where the countries transport cargo by rail according to their nomenclature. The analysis used Eurostat data.

After examining the cargo transportation by rail, it is evident that the following products are mainly transported by this transport: basic metals (metal products, except machinery and equipment), coke and refined petroleum products, metal ores and other mining and quarrying products (peat, uranium and thorium), coal and lignite and crude oil and natural gas (source: Eurostat). From this, it can be concluded that traditionally railway transport is used for raw materials.

Coal, lignite, oil and natural gas are mostly exported by Poland, on average, 88.3 million tons per year. Germany - 41 million tons per year, and Latvia - 19.8 million tons. Metal ores and other mining and quarrying products from the analyzed countries are mainly transported from Germany and Poland (an average of 51 million tons per year). Coke and refined petroleum products are mainly transported by Germany, Latvia and Poland. And the main metals - Germany, about 60.7 million tons annually.

When analyzing the countries where freight transport by rail takes place, it is observed that Sweden transport the largest volume to Germany, which average annual volume reaches 2.9

million tons. Large quantities of goods transported to Sweden are from Germany and Norway, and in smaller volumes from France (about 123 000 tons), from the Netherlands (about 36 000 tons) and Poland (151 000 tons). In the context of the research, the most important is the transportation of cargo to Russia (where their goods are transported by Estonia, Latvia, Poland, Finland, Lithuania and Germany) and in the opposite direction. The Baltic countries, including Poland and Finland, are exporting products to Ukraine. As many countries export their goods now bypassing the territory of Lithuania or by using road transport, it is possible to transport these goods from road to rail transport for carriage through Lithuania, shortening the route and saving costs.

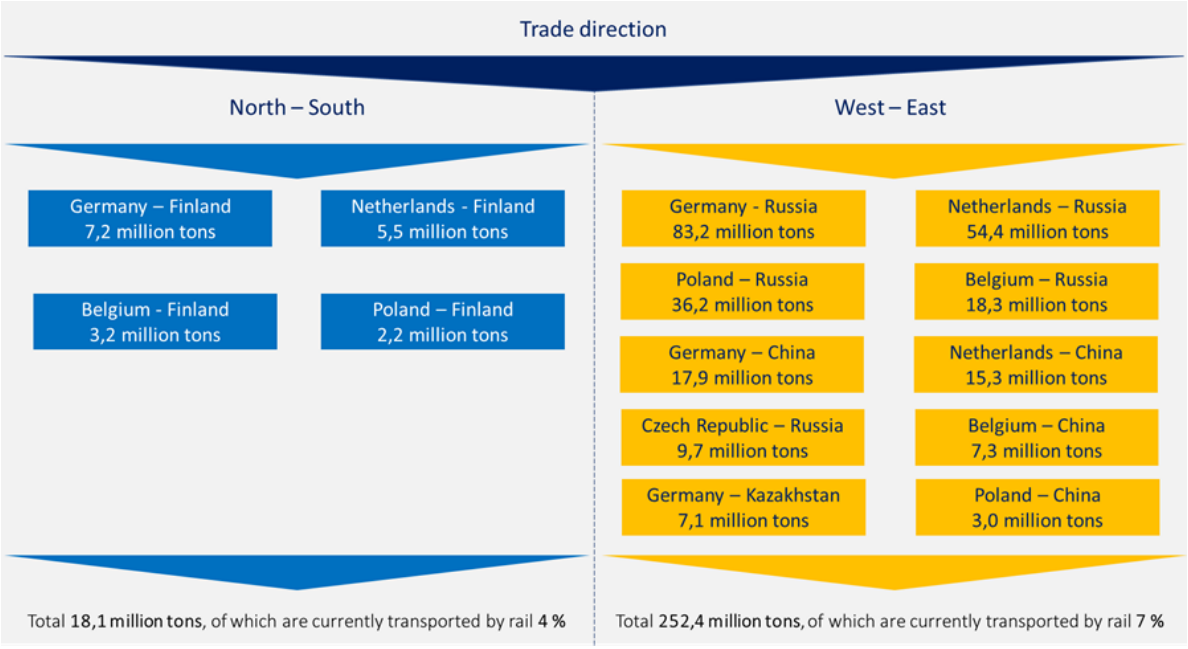


Chart 5 Average trade flows for 2007-2017, million tons, according to directions and rail freight potential
Source: made by the consultant, based on Eurostat data

The full potential of freight rail freight, calculated on the basis of historical annual trade flows for the years 2007-2017, is summarized in the diagram presented in Chart 5. From it, it can be concluded that the cargo that is currently transported by means other than railway transport and can potentially be transported through Lithuania is more than 250 million tons. It is understandable that this is the maximum absolute number but given the fact that the Rail Baltica project will be fully completed only in 2025 (the limiting factor for rail freight) and taking into account the growing economy of the countries under study (the promoting factor for rail freight), in the long run it would be realistic to speak about an additional 25-30 million tons of freight transported by rail through Lithuania.

1.2.4 Overview of freight transport by road

The following is an analysis (using Eurostat data) of where the countries transport cargo by road according to their nomenclature.

Mostly transported by road: agriculture, hunting and forestry products (fish and other fishery products), metal ores and other mining and quarrying products (peat, uranium and thorium), food products, beverages and tobacco, non-metallic minerals and secondary raw materials (municipal waste and other wastes) (source: Eurostat).

Agriculture, hunting and forestry products are transported from Russia to Finland and from Germany to Poland. Although in 2012 1.2 million tons of these products were transported, by 2016 the production volume has decreased to 836 thousand tons.

Table 10 Export of agricultural products, thousand tons

Loading area	Unloading area	2012	2013	2014	2015	2016
Russia	Finland	796	698	1.093	231	511
Germany	Poland	1.235	716	599	682	836
Netherlands	Germany	1.090	1.014	995	1.141	1.300
Belgium	Netherlands	1.703	1.677	1.598	1.390	1.613
France	Belgium	1.340	1.345	1.692	1.844	1.171
Germany	Netherlands	2.005	2.026	2.365	2.071	2.355

Source: Eurostat

Foods, beverages and tobacco are shipped in large quantities from Belgium to the Netherlands, but it is worth noting that Poland and Finland transport these products, albeit in small quantities (up to several thousand tons per year) to the Baltic States.

Non-metallic mineral products of about 2 million tons transported annually from Germany to Poland. Russia, Italy and Germany transport up to 10 thousand tons annually to the Baltic States. However, Sweden carried only 8 thousand tons to Poland in 2012, in 2013 - 21 thousand, in 2014 - 45 thousand, although none in 2015, in 2016 the transportation of these products has increased to 288 thousand tons per year (see Chart 6).

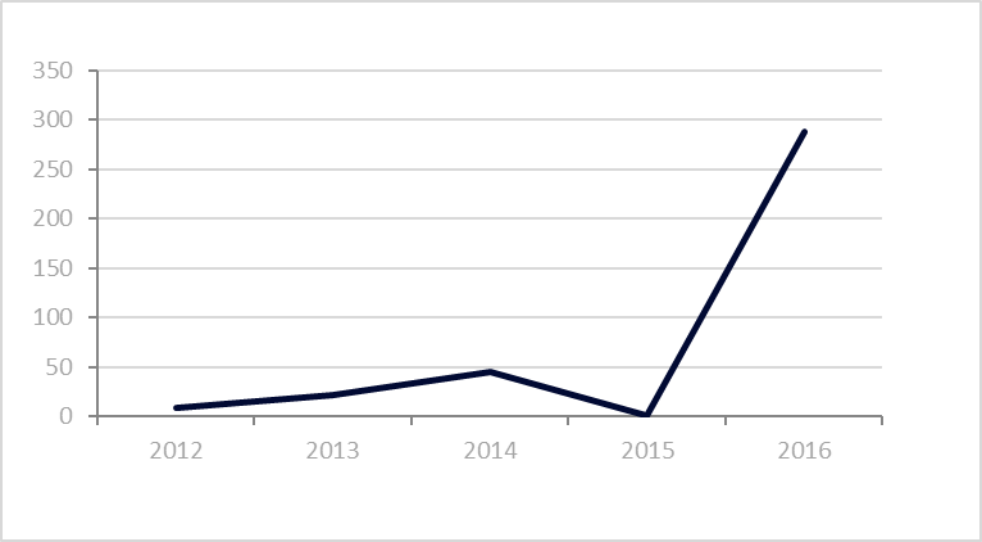


Chart 6 Swedish exports of non-metallic mineral products to Poland, thousand tons
Source: Eurostat

Metal ores and other mining and quarrying products from 2012 to 2015 were transported from Germany to Poland over 1 million tons per year, but in 2016 the transportation of these products decreased to 590 thousand tons.

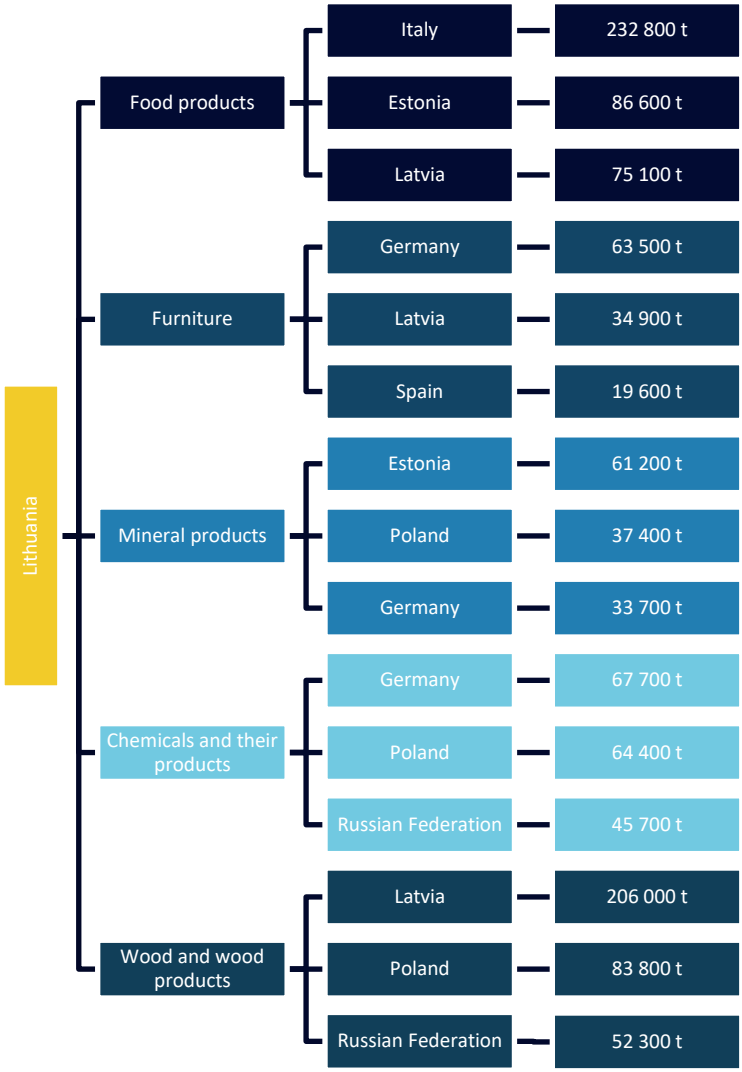
Table 11 The direction of export of metal ore by roads, thousand tons

Loading area	Unloading area	2012	2013	2014	2015	2016
Netherlands	Belgium	1.118	698	706	514	399
Belgium	Netherlands	1.018	820	952	1.100	910
Germany	Poland	1.323	1.137	1.035	1.207	590
Belgium	France	2.731	3.584	4.467	2.499	2.495
Germany	Netherlands	5.972	3.477	4.447	3.877	4.693

Source: Eurostat

In Lithuania, the largest volumes of cargo from the EU come from Estonia (449.4 thousand tons), from Latvia (997.2 thousand tons), from Italy (460.9 thousand tons), from Poland (484.8 thousand tons) and from Germany (599.4 thousand tons).

In addition, it is important to predict which goods are mainly imported to Lithuania and from which countries (see Chart 7).



Nomenclature - Countries from which transported - Cargo weight

Chart 7 Importing goods to Lithuania from several TOP 3 countries
Source: Lithuanian Department of Statistics

Taking into account Lithuania's imports according to the nomenclature, largest amounts of imported food products are from Italy (232.8 thousand tons), furniture from Germany (63.5 thousand tons), mineral products from Estonia (61.2 thousand tons), chemicals from Germany (67.7 thousand tons) and Poland (64.4 thousand tons), wood and wood products from Latvia (206 thousand tons).

From Lithuania, chemicals and their products are mainly exported to Poland (72.7 thousand tons), to the Czech Republic (64.2 thousand tons), wood and its products to Germany (123.3 thousand tons), to Latvia (72.4 thousand tons) and to Poland (71.1 thousand tons). 340.5 thousand tons of food products from Lithuania are transported to Latvia by road, to Estonia - 130.9 thousand tons, to Russian Federation - 115.1 thousand tons. 69 percent of agricultural

products from Lithuania are bought by Latvia. According to general export statistics, Lithuania sells most of its products to Latvia.

Summarizing and in order to schematically illustrate the results of the analysis and to present the differences between competing means of transport, the main and current potential flows of rail freight in Lithuania are shown in the map below (see Chart 8) in light gray and dark blue. The thickness of the line is selected in proportion to the volume of cargo. The estimated maximum flow of potential exceeds the existing volumes of rail freight by more than 10 times. Cargo flows across the Lithuanian-Latvian border are far lower than the possible cargo flows in other directions, but even in the direction of Latvia, the potential cargo flows considerably exceed the existing freight transportation by rail.

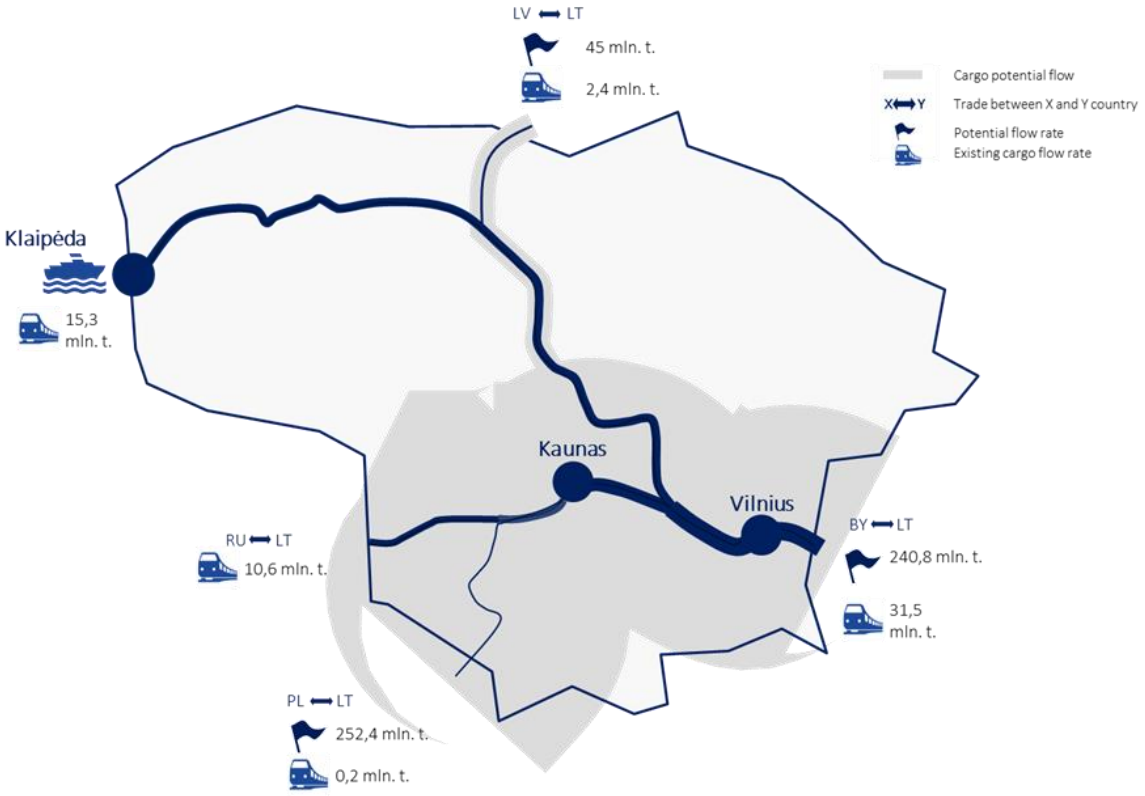


Chart 8 Cargo Potential Flow Map
Source: made by the consultant according to the Eurostat data

The main flow of possible traffic through Lithuania is observed in the direction East - West - East, and the largest flow of potential traffic - through the border between Lithuania and Poland.

1.2.5 European Union structural funds support for the transport sector

For the period 2014-2020 the transport sector is expected to receive 1,102 billion euros investment from EU funds: 295 million euros from ERDF and 807 million euros from SF. Under Priority 4 "Promoting Energy Efficiency and Renewable Energy Production and

Utilization" 2014-2020, 7 measures are financed, and 12 measures are financed under Priority 6 "Development of Sustainable Transport and Main Networks Infrastructure".

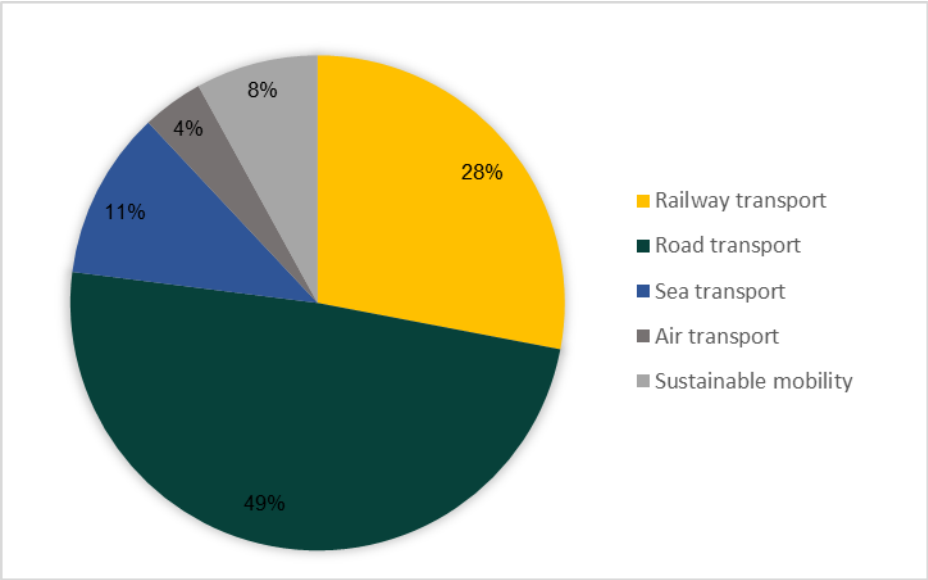


Chart 9 Support from the European Union Structural Funds to the transport sector
Source: Lithuanian Department of Statistics

In the transport sector, most investments will be needed to modernize road and rail infrastructure: 49% for roads and for railways – 28% of the funds for this sector in the framework of the 2014-2020 EU Funds Investment Action Program, which again shows a contradiction with EU policy and the aim of promoting rail transport.

1.3 Qualitative and quantitative studies of shippers and recipients, including reasons for the choice, legal, technological and economic barriers to rail transport

The subsection covers the main trends related to the choice of mode of transport and the barriers to the carriage of goods by rail.

1.3.1 Study of the reasons for choosing the type of transport

Both the planning of investments in business development and the activities already carried out, the selection of the appropriate method of transportation is very important, since, depending on the production activity, the logistics costs usually range from 15 to 40 operating costs, in turn transporting alone is one third of all logistics costs.

After analyzing primary and secondary sources and after logistic experts focus group discussion, summarizing the results, the main reasons for choosing the mode of transport, are shown in Chart 10.

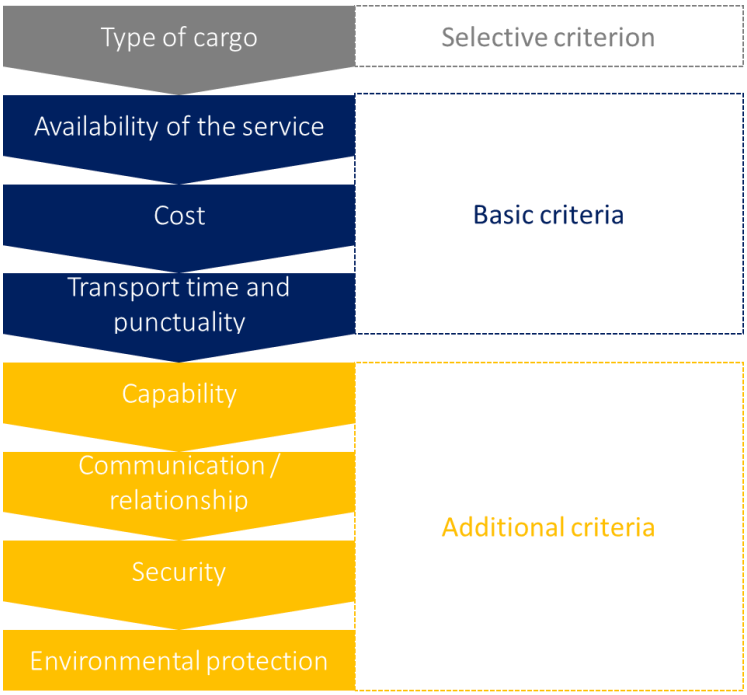


Chart 10 Selection criteria for transport
Source: made by the consultant

The choice of the mode of transport is determined first by the selective criterion - the type of cargo. Knowing which cargo will be transported, the mode of transport chosen must have economic value. Summarizing the results of the research, it turned out that if the cargo does not have specific requirements and it is possible to choose between modes of transportation, then the price and transit time and punctuality of delivery are greatly influencing the decision. One of the main weaknesses in rail freight transportation is the lack of cooperation between freight forwarders and lack of information on transportation services. Therefore, before determining the price of the freight and when it will be delivered, it is very important that the customer is provided with a proper and qualitative service, answers to queries and provides all known information.

The list of key criteria for transport selection given in Chart 10 above is given in an order of priority according to expert judgment. The main criteria are the first three: availability of the service, price, transport time and punctuality. All other criteria are more secondary and taken into account only if the customer receives several equal offers in terms of price and shipping time.

Regarding the choice of mode of transport, separately for each mode the situation is very objectively and visibly revealed by the analysis of the EU logistics sector commissioned by the European Commission, which results are summarized in Table 12.

Table 12 Assessment of the type of transport according to individual criteria

Criteria	Railway transport	Road transport	Sea transport
Cost			
Transport time			
Flexibility			
Reliability			
Infrastructure network			
Transport frequency			
Capability			
Security			
Tracking of freight movement			
Ecological aspects			

leading ahead of other modes of transport

an advantage over other modes of transport

the mode of transport is no different from the others

transport has disadvantages over other

the mode of transport is behind others

Source: European Commission

It can therefore be concluded that the main positive reasons for the choice of rail are the possibility of transporting large or large cargoes, the reliability, safety and environment of the entire transport chain. On the other hand, there is a relatively slow, infrequent, inflexible infrastructure network.

One of the main advantages of the road is a very dense network of infrastructure, as well as high transport frequency and high flexibility when ordering transportation services. However, capability and environmental aspects remain the shortcomings of this mode of transport.

Sea transport is usually chosen for long distances or cross-country routes, for example from smaller ports to major ports such as Hamburg or Rotterdam. The main advantage is the transportation of large volumes of cargo. The security criteria may vary depending on the length of the routes.

For reasons of objectivity, it should be noted that the causes or barriers of the main means of transport identified in the study are for the overall examination and self-assessment of the

freight transport market. It is concluded that in each case the justification of the transport selection criteria is subjective, because the importance of the criteria depends on the type of industry and the decision maker.

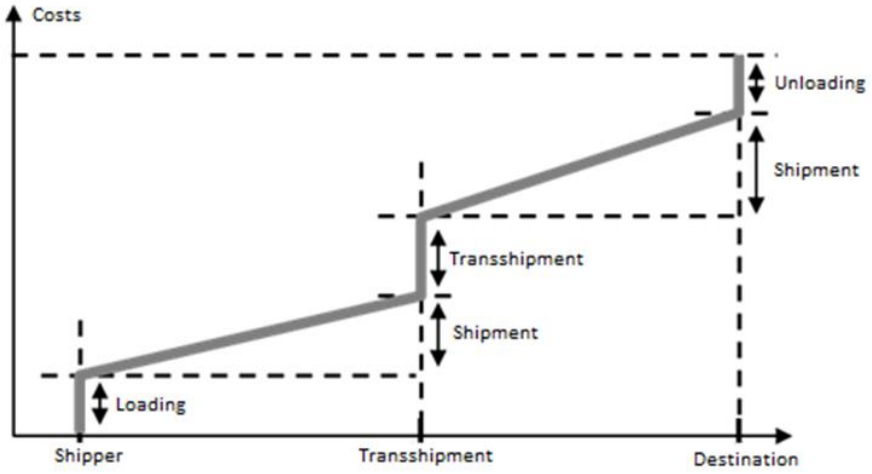


Chart 11 Value of transshipment costs in the case of combined transport
Source: A. Jaržemskis, V. Jaržemskis, Krovininis transportas. Vilnius: Technika, 2014 m.

The freight cost depends on the distance, but the transshipment price often represents a significant part of the total price. In the case of intermodal road – railroad transport combination, where many shippers and recipients have the ability to send and receive goods by road, transshipment between road and railway are often unavoidable, often even twice, which is a very significant factor in terms of cost when it comes to combined transport.

The greater the total transport distance, the higher the cost of transshipment to the total cost. This illustration is shown in the Chart 12 below. Only at a certain distance, there is a so-called breaking point, where it is already worthwhile to transport goods by combining road and rail transport.

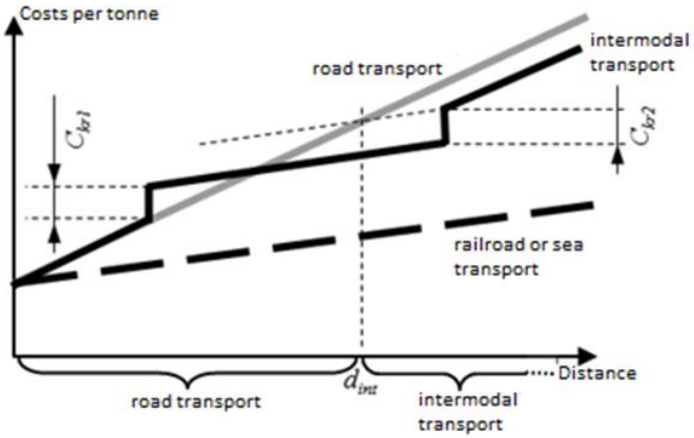


Chart 12 Principle of breaking point in combined transport
Source: A. Jaržemskis, V. Jaržemskis, Krovininis transportas. Vilnius: Technika, 2014 m.

With the specific costs of the combined road and rail intermodal terminal (Ckr1 and Ckr2), considering the cost of both handling (reloading, etc.) and time costs, and knowing the cost of rail and road (often direct) dependence on distance, it is possible to find a critical intermodal terminal distance - dint (Chart 12).

In any case, these theoretical principles only work when a trusted service is organized intermodally and the shipper has the option to either transport by road or intermodal.

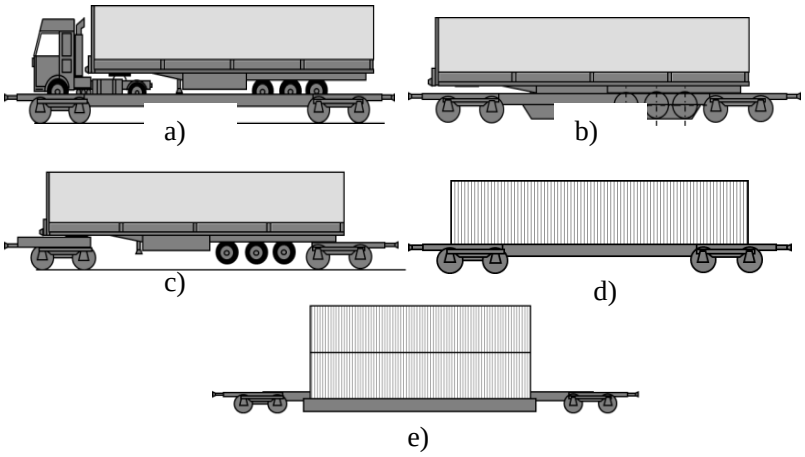


Chart 13 Methods of transport of semitrailers and containers by rail
Source: A. Jaržemskis, V. Jaržemskis, Krovininis transportas. Vilnius: Technika, 2014 m.

Despite the promotion of intermodal transport in Europe, railways account for 5% of the market for long distance freight. The average distance traveled by private train operators in Europe over international routes is 800-850 km. Two-thirds of the volume of these shipments is generated in order to cross the Alps, which is not due to the efficiency or advantages of the railways, but because of the purely geographic circumstances in which it is not possible to cross the Alps otherwise, or restrictions and financial instruments (e.g. Switzerland, Austria). On the other hand, intermodal trains are not so fast. The average speed of shuttle trains is 45-55 km / h, not including the loading and unloading of intermodal loading units. Meanwhile, trucks reach average speeds between 60 and 70 kilometers per hour, depending on the road and time of day.

Railways also don't shine in punctuality, although it has a fundamental advantage over road traffic in terms of traffic congestion, accidents and weather. In practice, railway transport is inferior to road transport in terms of punctuality due to organizational reasons. On average, only 40-50% of intermodal transport in Europe is carried out at scheduled times. One of the best indicators achieved by Kombi-Netz 2000+ is 90 percent of the carriage without delay. In the Brenger intermodal connection, 80-90 percent of the carriage is delivered without delay. However, these figures are offset by the reliability of road transport in terms of delivery time, which is 99 percent.

Combined rail and road freight are transported by direct route in accordance to scheduled timetables. Carriage is carried out on the basis of passenger schedules. If traditionally, rail transport is carried out in accordance with the principles "when a full train formation is formed", combined transport by rail is carried out regardless of whether all railway wagons are loaded with intermodal loading units. The market is offered a continuous train for the transport of intermodal loading units and this market - intermodal load units' owners or their representatives – forwarders, responds to the supply.

In Western Europe containers are transported by rail under the so-called freight liner or shuttle train system. These are chassis with specialist trains with standard ISO containers. This type of train consists of interconnected standard platforms for the transport of all types of ISO containers. These trains guarantee regular carriage at high speed between two points, without overhaul, in highly loaded areas with specially designed and equipped terminals. The purpose of these terminals is to quickly reload containers from rail to car and vice versa, and in some cases from one train to another. The feature of terminals is container cranes, which handle containers up to 12 m long and 30 t gross weight. This equipment is not available at all railway stations, so the container trains of the mentioned system operate only between dedicated terminals. There are quite a lot of such terminals in Western Europe - in Germany 85, in France 42, in Italy 40, and in Spain 37. In Lithuania, such terminals are located in Palemonas, Paneriai and Šeštokai, Klaipėda.

Another important aspect of intermodal transport is the critical cargo volume.

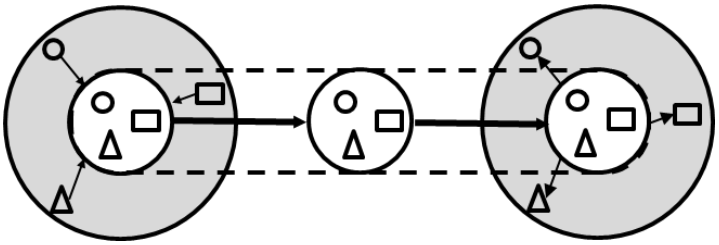


Chart 14 The critical volume for intermodal solutions

Source: A. Jaržemskis, V. Jaržemskis, Krovininis transportas. Vilnius: Technika, 2014 m.

The significance of critical cargo volume is confirmed by Smart Continent in an interview with the managers of the factories operating in Kaunas FEZ. When a load of only a few semi-trailers is generated per week, when such quantity of cargo is accumulated, it is not stored in the warehouse, and is immediately sent to the recipient. To draw up a train account, at least 50 semitrailers with the same destination should take one - two days. Not even one-third of that is generated by all Kaunas FEZ factories.

In the absence of a sufficient amount of cargo in the same direction from the destination, intermodal transport is implemented by applying the route and stopping principle.

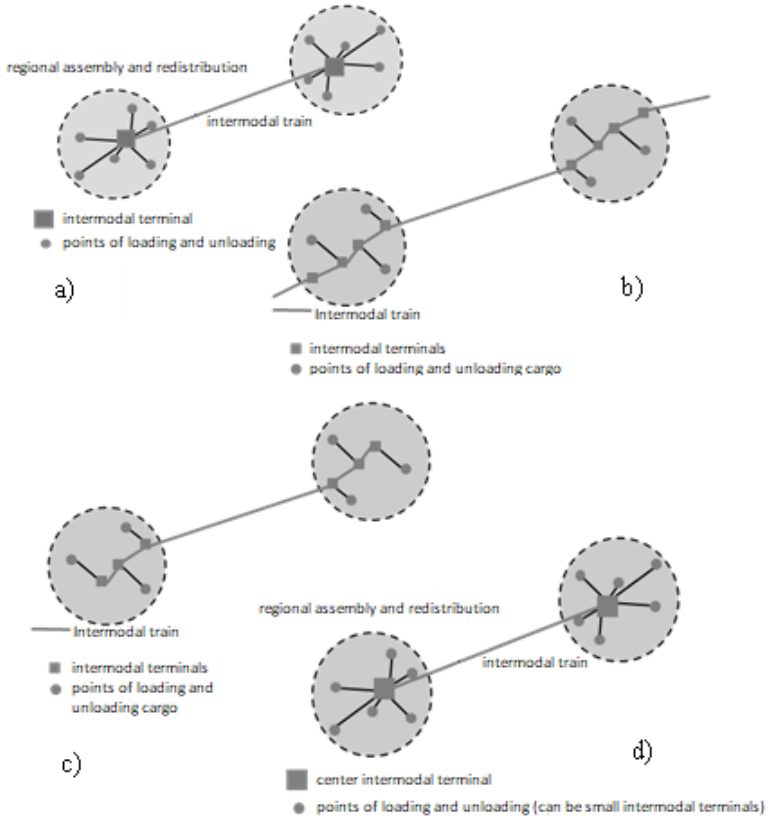


Chart 15 Intermodal Terminals: a) Direct Terminal Terminals, b) Terminals in the Corridor, c) Fixed Route d) Center and radius principle

Source: A. Jaržemskis, V. Jaržemskis, Krovininis transportas. Vilnius: Technika, 2014 m.

In a terminal in the corridor, there are also several semi-trailers or containers that are grouped into a shuttle train. Terminals can thus be assigned to:

- Terminals for direct connections. These are terminals that are located near the consignors and consignees of the cargo. This means that the volumes of these terminals are limited and, at the same time, limit the capacity of the terminals. The reloading requirements depend on how long the train is at the station. Despite the fact that the train is standing all day, as it is today common in Europe, the terminal is mostly used in the morning and in the evening, when there is a need for fast reloading. Despite the fact that many ITU reloading technologies have been developed over the past thirty years, most of these terminals use portals for cranes, overhead lines and access lanes for cars. Trains are stationary in this type of terminal with a fixed number of wagons. On regular routes, trains ride back and forth. If the terminals are not loaded with even streams, then the portal cranes are not sufficiently used. In this regard, it is advisable to use alternative cheaper ITU loading technologies. Technological solutions are offered by various companies: Mercedes-Benz's Kombi-Lifter, ABB Henschel's WAS Wagon, AGEVE's Supertrans,

Wiesköttter System, Rautaruukki's Wheelless System, Chalmers Titan cassette are designed with the goal of not requiring large terminal equipment. Nevertheless, these systems usually require specially modified intermodal loading units, which in turn causes the issue of their production costs and utilization rates. In many cases, in this type of transport, such a specification goes back empty in the reverse direction, which is economically inefficient.

- Terminals for corridors. In the case of this transport, each train travels to several terminals a day. In this case, there is a very high requirement of the reloading speed. This principle is justified when it is impossible to concentrate a sufficient flow of cargo on one terminal. Due to the fact that reloading the terminal cannot be time-consuming, it requires rapid reload and prompt co-ordination of ITU within the terminal. This causes problems because in many cases, such terminals do not generate high-flow, are not large and do not have enough space for convenient operation management. The corridor principle is quite well developed in the industrial regions of Germany, where the industry is located in a relatively longitudinal area along the Rhine. For example, fast loading systems are offered on the market by Krupp (Fast Handling System), Noell (Fast Transshipment System), Mannesmann Transmodal (Transterminal), O'MAHONY. Such terminals utilize innovative horizontal loading technologies, trough system, and also use vertical handling with mobile loading tools such as mobile forklift trucks.
- Terminals in the concept of center and radius. The peculiarity of this method is that cargo from the peripheral terminals is accumulated in the central terminal. The Central Terminal generates large intermodal flows; however, it also automatically creates the need for the ITU to accumulate. Trains transported in semi-trailers can usually be transported faster by road than waiting for the accumulation terminal, so there is no great success with the central storage terminal. Containers and replaceable tanks are transported in this way.
- Terminals for fixed routes. Requirements for these terminals are similar to those for corridors - quick reloading. The difference is that there are fewer volumes on fixed terminals.

The case of the Kaunas FEZ and the Palemonas Intermodal Terminal, when the critical mass of the cargo is not generated, can be solved by the concept of the terminal corridor, while the corridor North Sea - the Baltic Sea is an initiative promoted by the European Union. Therefore, it is meaningful for both managers of the Kaunas FEZ and Palemonas Intermodal Terminal to make contacts with analogue terminals along the corridor.

1.3.2 Lithuanian case study on the reasons for choosing the mode of transport

Lithuanian case study was carried out an extended survey of logistics operators and their customers and was conducted along the corridor North Sea - the Baltic Sea. In Lithuania, respondents surveyed by Smart Continent in 2017. The results of the survey are an integral part of the project's NSBS Core 2 work package "Intermodal Logistics".

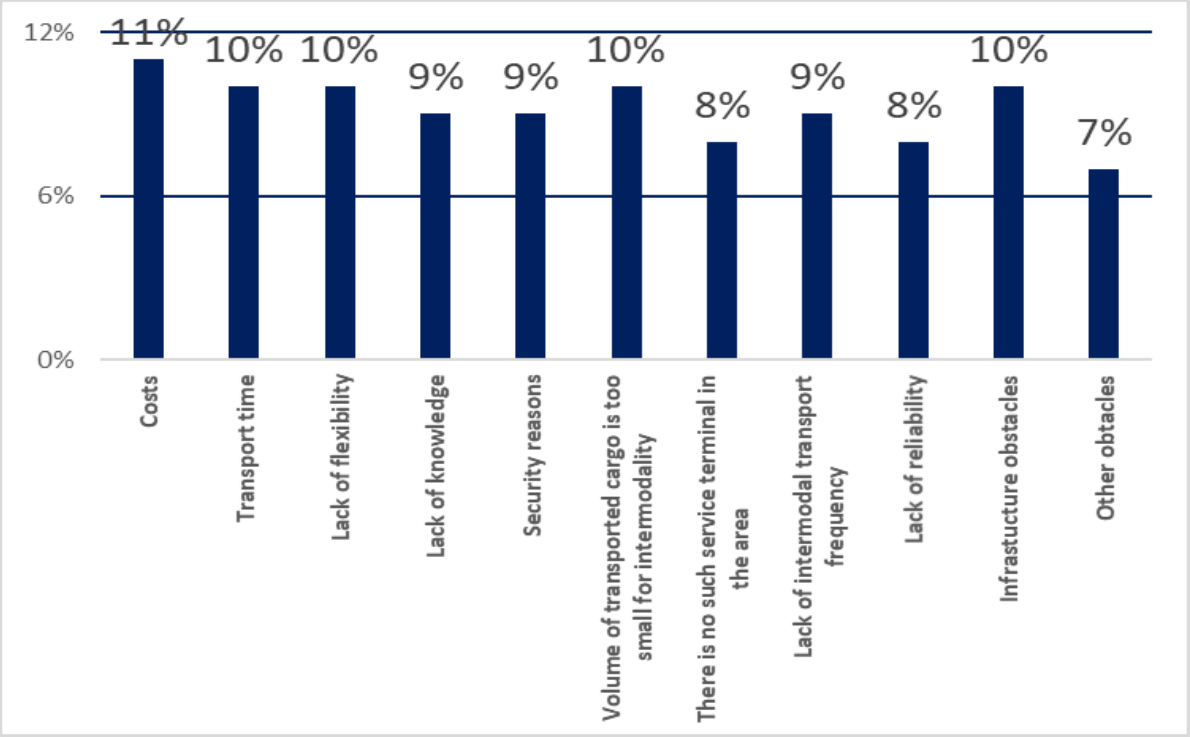


Chart 16 Barriers to the use of combined transport (intermodal) in transport
Source: During NSBS Core project, Smart Continent conducted an extended survey of logistics service users

The entire case study in Lithuania is available on the NSBS Core website[1]. Logistics users have highlighted the fact that costs (cost) and transportation time are the most important criteria for choosing logistics services, while road transport is one way or the other ahead of rail transport.

[1] https://www.uudenmaanliitto.fi/en/projects/nsb_core_north_sea_baltic_connector_of_regions

1.3.3 Study of barriers to rail freight

Cargo transportation by rail causes various obstacles for both clients / freight forwarders and carriers / operators. Chart 17 shows the main obstacles for customers and freight forwarders, which causes railway transport not to be chosen.

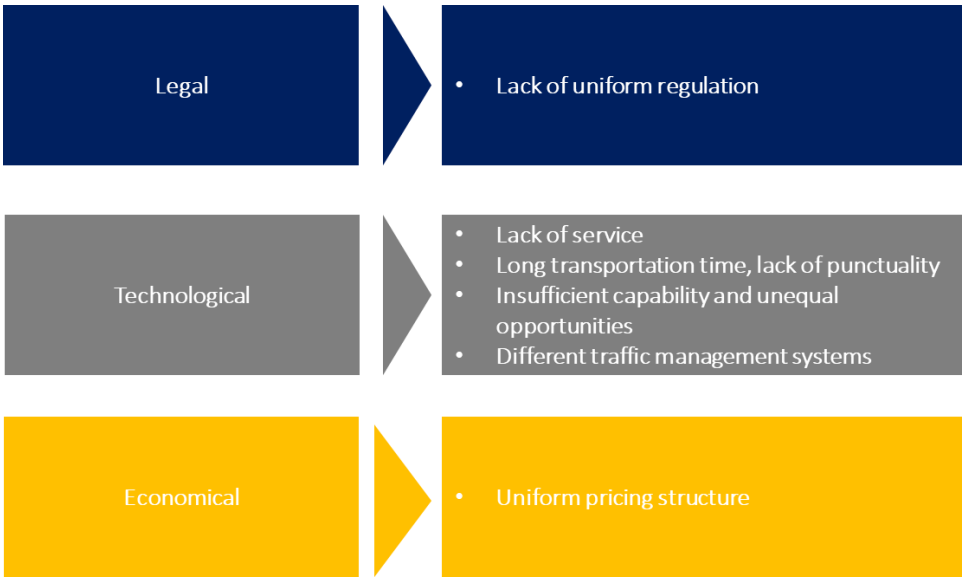


Chart 17 Legal, technological and economic barriers to rail transport
Source: made by the consultant

As freight forwarders usually organize carriages and act as intermediaries, all barriers that are noticeable to customers are common to freight forwarders as they are the same customers for carriers or operators.

The above-mentioned barriers are essentially due to the following reasons:

- Inaccessibility of information services at international level;
- Lack of Uniform freight transportation systems between the 1435mm and 1520mm wide railroad tracks;
- Train delays of 1435 mm in the network, influenced by intense traffic, in turn, determined by the sharp competition between carriers for the same cargo;
- Relatively long operation time at railway stations (compared to road transport terminals);
- Different alarm systems in different countries;
- Different infrastructure and transportation pricing in different countries;
- High first / last mile costs.

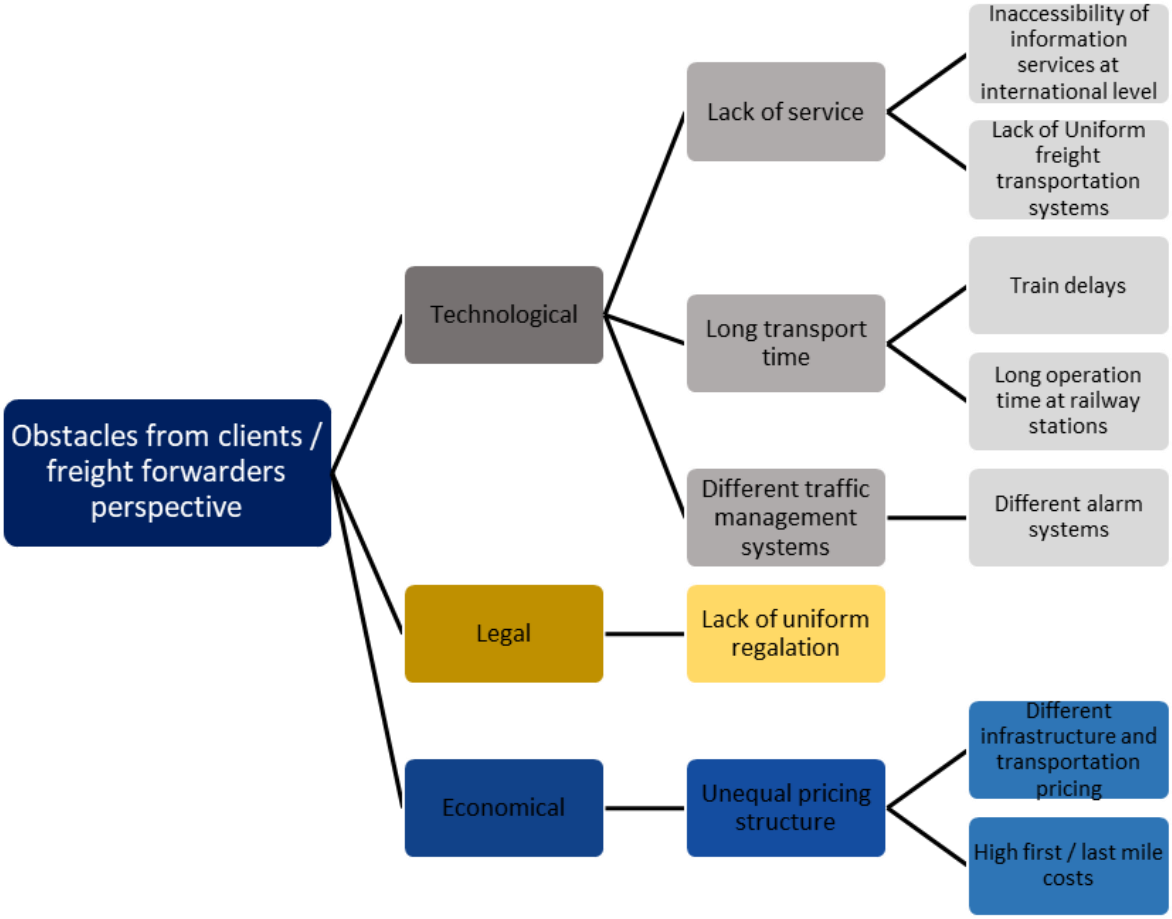


Chart 18 Barriers from client / forwarder

Source: made by the consultant

Barriers to client / forwarder perspectives are divided into 3 areas: technological, legal and economic barriers. (see Figure 18). The following is a more detailed description of the reasons for each of the barriers identified.

- Lack of service. The inaccessibility of the required information and the peculiarities of the communication of the operators or carriers with the client can be an essential reason for choosing the mode of transport. Carriers / Freight Forwarders often refuse to offer or offer rail transport services when they are inquired about

the carriage of goods by rail on a route that carriers / forwarders have not organized. For example, although the railway infrastructure exists and there are no legal obstacles, it is difficult to carry goods in Pakruojis - Berlin, because such a route is not traditionally transported by rail. In this case, the barriers mentioned above are usually mentioned, or are offered by road or sea transport due to simpler administrative processes. Once you have agreed that you can carry out transport by rail, the customer is notified that he should not expect a quick response / information.

- Another technological obstacle is the lack of a unified system of rail freight transport between the EU and the CIS. The European Commission's legislation does not allow the EU Member States to cooperate among themselves with several carriers, at the geopolitical level, it promotes carriers' competition, assuming that the market will automatically resolve all issues, despite the fact that, as shown in 1.2. chapter, freight flows are not growing by rail. Also, due to this, there are a number of problems in transporting goods across different corridors as carriers' fragmentation is felt. The railway companies of CIS countries have been working together for some time and the cargo can be taken from any starting point to the desired destination. The same can be seen in the case of small carriers as they must work together on a large network. Contrary to what is expected, due to intense competition and competitive advantages, large national carriers, in front of the smaller, the largest operators and carriers, enter into corridors and practically do not let their competitors enter.
- The railway network in the identified potential directions is designed for freight and passenger trains. Traffic management procedures for controlling train paths must be implemented due to the rational operation of the rail network. This is done by each infrastructure manager individually. However, traffic management procedures are not adapted to the needs of freight rail transport, even in freight corridors. For this reason, railways are finding it difficult to compete with other modes of transport, such as road transport, whose infrastructure is easily accessible in all EU countries.
- Long transport time. Cargo trains are delayed due to the large number of competing operators and the amount of transshipment on the route. Punctuality is one of the main expectations of the client that may result in both depreciation of production and certain losses due to timely fulfillment of obligations. In the case of rail transport, according to the CIM rules, the delay of a freight train of up to 7 days is permissible and non-reimbursable. For these reasons, freight forwarders organize freight transport rather than rail. The reason for the irregularity of freight trains is that the EU gives priority in railway to passenger transport. Also, the

transport of trains has a few minuses - a small (compared with road transport) average freight train speed, long freight train operations in stations.

- Different traffic management systems. Locomotives crossing a state border must have at least two or three signaling systems installed on the vehicle, as a national alarm system must also be fitted to the locomotive entering the country.

The main economic obstacle is unequal pricing structure. It covers different charges for freight trains and high first / last mile costs.

- Different charging. Freight trains are taxed for each mileage of a railway infrastructure, when this is not always applicable to road transport, especially in cases where a certain EU Member State has tax-free roads. On average, infrastructure charges on railways account for about 20% of the cost of transportation, on the roads - up to 9% of the cost of transportation. In other EU countries, lorries usually have to pay toll only on motorways. This situation further reduces the competitiveness of freight rail transport compared to road transport.
- • If the final point of the route is located further from the railway trunk, there will be disproportionately high first / last mile costs. On average, transportation in EU from rail terminal to the door costs EUR 300/ TEU, for e.g. the same TEU carriage on the Warsaw-Moscow route costs about 1000 EUR/ TEU.

Systemic barriers that require different regulation are mutually important for the carrier and the operator, as they cannot offer the customer the service they want. Therefore, certain barriers are assessed as equally relevant for both the carrier and the operator.
Barriers from the carrier perspective are divided into 3 areas: technological, legal and economic barriers (see Chart 19). An obstacle is decisive for the following reasons:

- There is no general activity regulation;
- Problems with Security Instruction permissions;
- Change of driver at the border control point;
- Maximum train length differences;
- Rail networks are not interoperable;
- The costs of side effects on nature by the railroads is not taken into account;
- Different charges for freight and intercity trains;
- More EU funds have been allocated to road, not railway transport (see chapter 1.2.5).

Technological obstacles are decisive from the lack of service, long transport times and uneven opportunities for carriers.

- Lack of service. As there is no general (1435 and 1520mm gauge railways) regulation, the transport of goods by railways is complicated.
- Carriage in geographic areas covered by the multilateral national legislative system is used in different languages and there are no rules for the use of common wagons, so it is not clear how empty wagons are transmitted for loading or empty wagon returning, who is responsible for their repairs and costs.
- Prolonged procedures for the approval of vehicles and the issue of safety certificates for railway companies in different EU countries
- Each vehicle must have a permission issued by a safety instruction which takes a very long time to get (from 0.5 years for a new locomotive to 2 years if the locomotive is used) also its expensive - all the additional costs associated with the permits issued by the national safety authorities constitute about 1.6 million euros per vehicle.
- Long transportation time. In case of international transportation, the locomotive driver must be able to communicate in the language of the country where the locomotive is managed. Consequently, unlike in the aviation sector with only one working language - English, it is usually necessary to change the locomotive driver at the border control point, which requires additional administrative processes and extends the time of transportation.
- Uneven opportunities. Maximum train length differences - for example, in Belgium and the Netherlands, trains can be 700 m., Germany – 560-700 m., Poland – 600-650 m., Lithuania – 1500 m. long. As a result, the competitiveness of rail freight is significantly reduced.

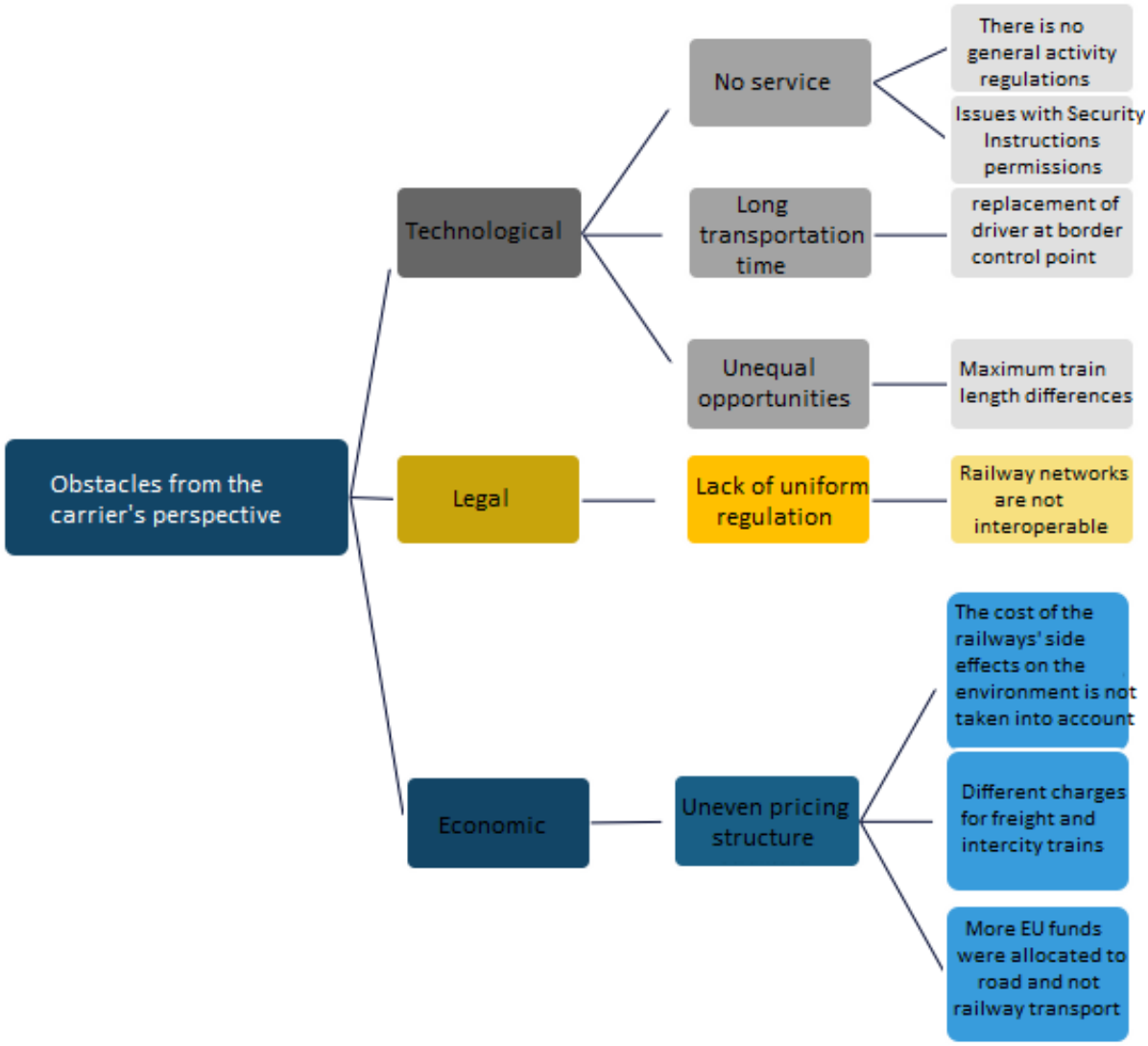


Chart 19 Obstacles from the carrier's perspective
Source: made by the consultant

The main legal obstacle is the lack of uniform regulation. The European Union's rail network consists of 26 separate railway networks that are not fully interoperable and have a large number of different infrastructure managers, national safety authorities and different national rules governing the diversification of route allocation, management and pricing. All this reduces the competitiveness of rail freight transport.

Economical obstacle – unequal pricing structure - involves different charges for freight and intercity trains, the divergent allocation of EU funds between road and railway transport, Attention to train pollution rates. The environmental side effects, pollution, congestion and accident consequences of rail and road transport are not fully taken into account in determining the price consumers have to pay for access to infrastructure.

Summarizing the obstacles from the carrier and the perspective of the client / forwarder, based on the market research, from seven of the obstacles identified distinguishes two main obstacles:

- Lack of service because:
  - Railway carriers are fragmented, working only on separate parts of the EU railway network, they are encouraged to compete rather than cooperate.
  - There is no common system for the sharing of wagons between carriers (including settlements and responsibilities);
  - Co-operation between carriers is possible mainly through operators, as it is very difficult to work across the network through bilateral agreements (especially if there is many carriers), and the carrier agreements themselves can in most cases violate EU competitive conditions;
  - The EU rail regulatory framework (e.g. rail infrastructure capacity allocation rules) focuses on passenger trains and shuttle freight trains (operating on passenger train principles)
- Cost, because:
  - Taxes on road and rail infrastructure in the EU member states (including Lithuania) differ 3-5 times;
  - In the case of rail transport, additional costs are added: first and last mile, overloading from 1435 mm to 1520 mm, container lease;
  - The absence of reverse intermodal cargo transported by rail (e.g. from Moscow to Europe and from Europe to China);
  - 40-foot containers are not optimized for Euro pallets, they can only contain 25 Euro pallets (dimensions 800 x 1200 mm). Trucks can stack 33 Euro pallets that is 32% more pallets than 40-foot containers can stack;
  - The lower external costs of road transport (pollution, road deaths, noise) are not taken into account.
  - Due to the specificity of road transport activities, lower freight costs are possible, for example: the possibility of employing foreign workers using the services of a rental agency, registered in a foreign country. In this way, a road transport company does not need to pay taxes related to the maintenance of a worker, and the state loses some of the budget revenues.

Without eliminating the two main obstacles mentioned above, the railway sector cannot expect higher transshipment volume through Lithuania, as such transportation services is uncompetitive in terms of road transport.

1.4 Investigation of interactions between the Kaunas Public Logistics Center (Intermodal Terminal in Palemonas) and Kaunas Free Economic Zone, considering the obstacles to economic, technological and legal interactions

The subsection contains an analysis of the operation of Kaunas FEZ and Kaunas Intermodal Terminal, analyzing possible interactions between them. Evaluation of technical capacity as well as economic and legal obstacles.

1.4.1 Analysis of Kaunas FEZ functioning

Kaunas Free Economic Zone is located at the intersection of the main transport corridors (see Chart 20).

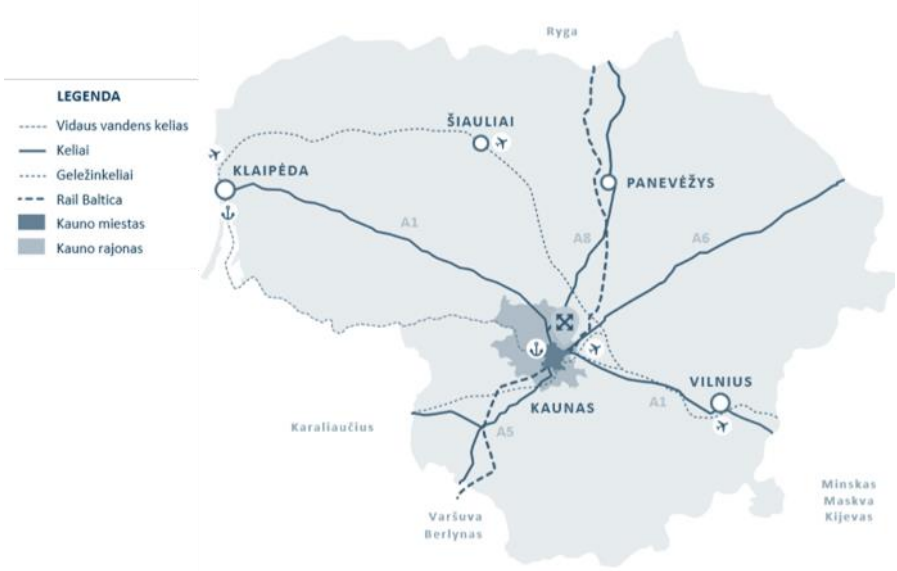


Chart 20 Location of the Kaunas FEZ in the context of the country
Source: Kaunas FEZ

Kaunas FEZ has a 534 ha industrial development area, where land plots with fully equipped infrastructure are offered. It is attractive with a convenient geographical location, tax benefits provided by the state and a quick set-up process. Kaunas FEZ is also conveniently accessible from all over Lithuania. The quality of road pavement in Lithuania is among the best in Europe. Lithuania is No. 1 in Central and Eastern Europe in terms of transport and rail infrastructure / Global Competitiveness Report by World Economic Forum, 2014.

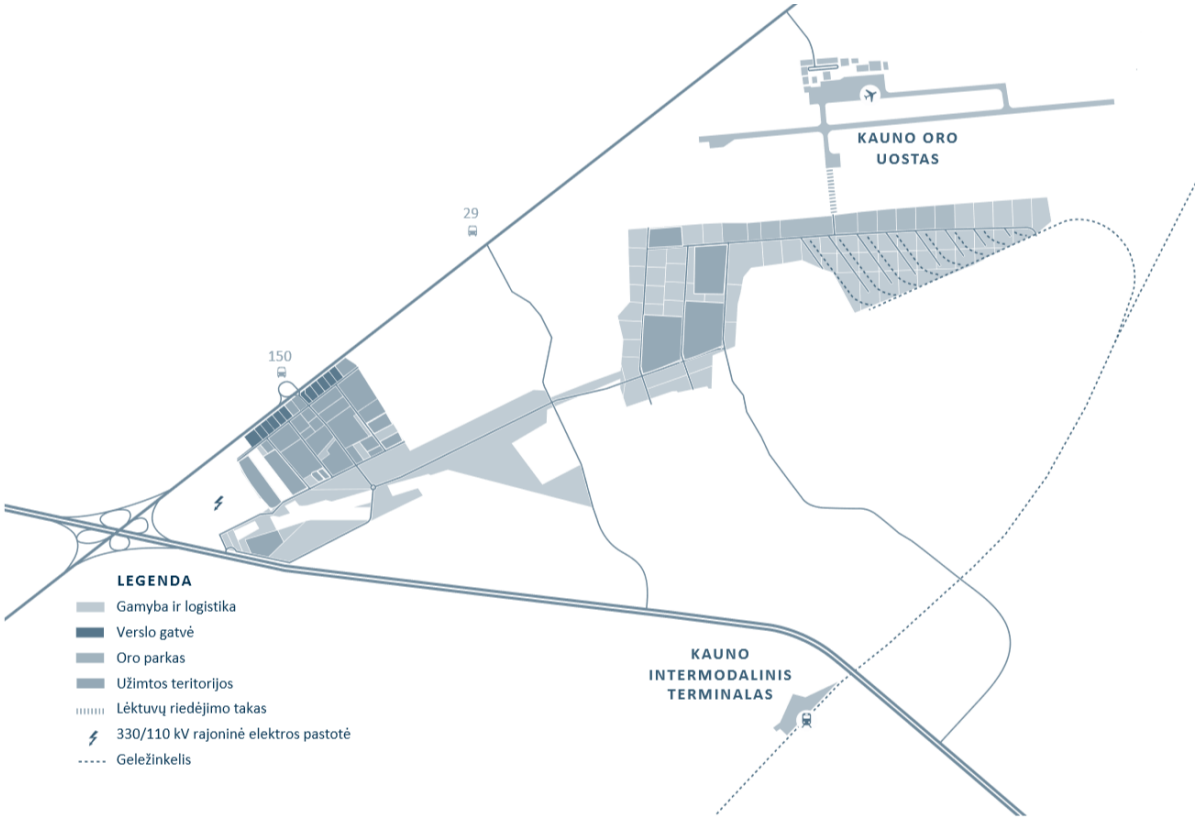


Chart 21 Kaunas FEZ territory
Source: Kaunas FEZ

Road connection: The A6 motorway runs from Warsaw to St. Petersburg through the other Baltic capitals - Riga and Tallinn. Motorway A1 connects Kaunas FEZ with Klaipeda Seaport and Vilnius and stretches towards Minsk, Kiev and Moscow[2].

Kaunas Free Economic Zone can offer an excellent strategic location for businesses, parcels with well-developed infrastructure, tax incentives, a reliable business environment, specialized territories, management company experience, and skilled workforce in the region. Chart 22 shows Kaunas FEZ partners.

Chart 22 Kaunas FEZ Partners
Source: Kaunas FEZ

[2] http://ftz.lt/apie-kauno-lez/

The Kaunas FEZ potential is complemented by a well-developed industrial and business infrastructure, which is one of the essential criteria for choosing an investment location. Kaunas District Municipality in every way encourages investments.

The Neighborhood of the Airport and the Free Economic Zone of Kaunas (FEZ) allows aviation companies to offer an exclusive place to their business. The well-developed infrastructure of Kaunas Airport, FEZ tax incentives and strategically convenient location in Eastern Europe.

Kaunas FEZ develops different territories according to the nature of the activities of the companies:

- Production and logistics area. For most plots, detailed plans have been prepared, they have the necessary infrastructure. The area of production and logistics is currently the most dynamic part of Kaunas FEZ territory. It is home to manufacturing, electronics and automation, logistics and distribution, food industry and pharmaceutical companies.

Table 13 Products produced by Kaunas FEZ

Area	Company	Production made
PRODUCTION	„CONTINENTAL“	Tires
	„HELLA“	Lighting systems for the automotive industry
	„RUN ENGINEERING“	Automated water equipment
	„FINNFOAM“	Thermal insulating materials (XPS - Extruded foam, FF-PIR - Polyisocyanurate plates, FF-EPS - Polystyrene foam)
	„KAMĖ“	Bathroom furniture
	„KOPA“	booklets, brochures, instant lottery tickets, posters, flyers, art books, business cards, catalogs, price lists, letters - envelopes, calendars, corporate identity, books, unique press solutions
	„LITTEC“	Stamps
	„PERALTIS“	Disposable paper cups
	„RYTERNA“	Garage door
	„ROKOR“	Monocrystalline sapphire (corundum) plates
ELECTRONICS AND AUTOMATION	„ELINTA“	Manufacturing of computer vision systems, electric vehicle components, bicycle friction gears

Area	Company	Production made
FOOD INDUSTRY AND PHARMACY	„ACONITUM“	Medications and nutritional supplements
	„PIENAS LT“	Concentrated whole milk, micellar casein and whey proteins (-85, MiccC-85, MSPC-80) also produced carbohydrate (lactose) concentrate - milk permeate (MPP).
	„VIČIŪNAI“	Frozen fish

Source: made by the consultant

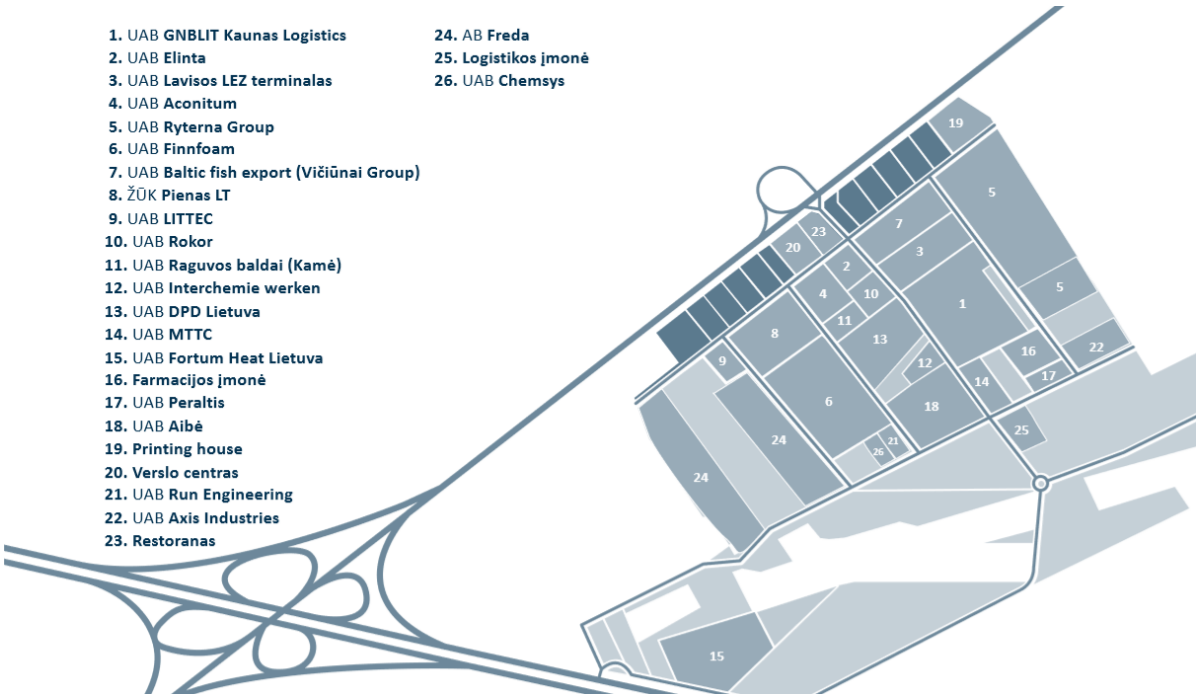


Chart 23 Kaunas FEZ Production and Logistics Area

Source: Kaunas FEZ

- • Air Park. Kaunas Free Economic Zone shares a common border with Kaunas International Airport, which extends over 3 km, along with the allocation of land plots for the development of aviation industry-related businesses. Due to the territory of the FEZ and the airport take-off path, which will soon connect, the “Air Park” area is particularly attractive to airline companies, aircraft maintenance, aviation industry (aircraft picking, testing and marketing). Here, they can have access to the runway also use the tax and customs privileges provided by the FEZ.

Chart 24 Kaunas FEZ Air Park
Source: Kaunas FEZ

- • Business Street. A complex of upcoming buildings offering land plots suitable for offices and hotels. Plans for offices are about 12 hectares. It will be an easily accessible area with a well-developed vehicle parking system and modern office space that meets today's requirements. Excellent visibility, modern business neighborhood, convenient arrival and departure. Currently, there are 13 plots with prepared detailed plans. From Kaunas you can reach the area by bicycle trail. The traffic volume of the street is about 20.4 thousand cars.

Chart 25 Kaunas FEZ Business Street
Source: Kaunas FEZ

The territory of the FEZ offers: land plots with developed infrastructure for the development of real estate, leased storage areas, will soon lease office space in the first business center.

Activities of Kaunas FEZ:

- Industrial process automation
- Warehousing and logistics
- Pharmaceutical preparations
- Insulation board manufacturing
- Production of automatic garage doors
- Wholesale food supplements production
- Monocrystalline sapphire cultivation and plate production
- Furniture production
- Fish processing.

Since the establishment of the first investor in 2005, 634 million Euros were attracted to Kaunas FEZ. Of which 70% is made up of foreign direct investment. Currently, there are 32 Lithuanian and foreign companies operating in the FEZ area, and almost 5000 jobs have been created.

The neighborhood of Kaunas Airport and Kaunas FEZ makes Kaunas an attractive place to receive and dispatch cargo. The 3,250-meter long take-off and runway of the airport enables all types of airplanes to be used to handle current and projected air traffic flows.

Tax relief in Kaunas FEZ: production or logistics companies investing more than 1 million euros or services companies (Article 15, Paragraph 3 of the Republic of Lithuania Law on the Basics of Free Economic Zones) invests more than 100 thousand euros and has more than 20 employees:

- do not pay profit tax for the first ten reporting periods;
- the other five reporting periods pay only 50% of the Lithuanian corporate tax (Income tax rate in Lithuania in 2015 is 15%).

Table 14 Tax Relief

Tax	FEZ	Elsewhere in Lithuania
Income tax	0 % (the first 10 years)	15 %
Income tax	7,5 % (following 5 years)	15 %
Real estate tax	0 %	1 %
Dividend tax	0 % (for foreign investors)	15 %

Source: Kaunas FEZ

There is no need to pay a real estate tax in the FEZ. Similarly, dividends received by foreign investors in the Kaunas Free Economic Zone are not taxed in accordance with the procedure established by the Law on Profit Tax of the Republic of Lithuania.[3]

1.4.2 Description of Kaunas Intermodal Terminal (KIT)

Kaunas Intermodal Terminal (KIT) operates next to the Palemonas Railroad Line, just 4 km from the Kaunas FEZ. Creation of KIT in Palemonas was chosen as a convenient geographical center of the country - here is a well-developed railway infrastructure and convenient connection with the main roads of the country (A1 and A6 motorways, etc.), alongside I and IX transport corridors, Kaunas International Airport, close to Klaipeda, Kaliningrad seaports, opening roads to Western, Eastern European markets, CIS countries. Here should also intersect two different gauge rail gauges - 1435mm and 1520mm. On the 1435mm., the cargo "North Sea - Baltic Sea Corridor" in 2025 will be able to be transported through Lithuania and / or with value-added operations between FEZs, between Western Europe and Finland. On the 1520mm., the cargo, when transshipped, KITs can be transported in the direction of West-East. It is this latter direction which as analyzed in the previous chapters has the greatest potential.

Services:

- Container handling on railway platforms and semi-trailers
- Servicing for sea containers, tank containers (cistern containers) and refrigeration containers
- Up to 45 days free container storage
- Customs services (open type customs warehouse type A)
- State plant production service
- State Food and Veterinary Service
- Document submission and accounting through the electronic data management system "Freight" - (“Krovinys”)
- Container direct loading between 1435 mm and 1520 mm gauge platforms.

Infrastructure:

- Four railways - a useful road length of 1360 m. (two roads - track 1520 mm, two roads - track 1435 mm)
- A storage area of 1120 TEU containers.
- 16 TEU places for refrigerated containers.

[3] http://ftz.lt/kodel-kauno-lez/mokesciu-lengvatos/

- Internal equipment:
- Gantry crane - A lifting capacity of 40 t with automatic 20, 40, 45 feet container and semi-trailer gripper.
- Tow truck with 1 axle semi-trailer - platform for container transport.

Maximum container capacity for terminal railway containers:

- track 1520 mm – 96 TEU;
- track 1435 mm – 96 TEU.

1.4.3 Technological interaction between FEZ and KIT

Kaunas Free Economic Zone is located at Inovacijų street 3 in Biruliškės, Kaunas region, while the Kaunas intermodal terminal - Palemonas street 78, Kaunas district (see Chart 26). The chart shows that the connection between the Kaunas Public Logistics Center (Intermodal Terminal Palemonas) and the Kaunas Free Economic Zone is possible only on several roads, there is no railway connection. The distance between these objects is 10.9 kilometers, the straight distance is 4.5 kilometers.

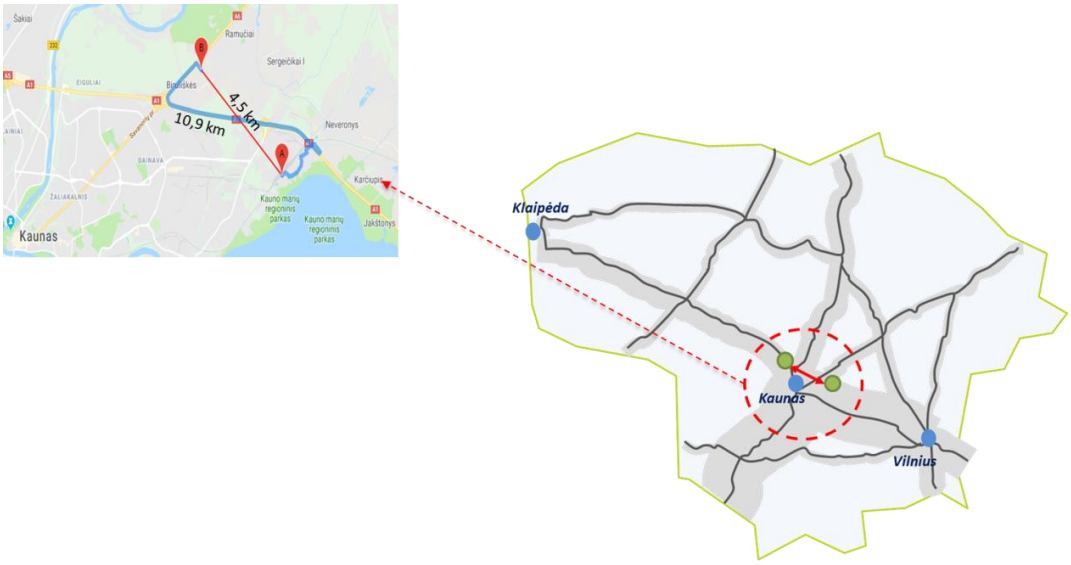


Chart 26 Distance between Intermodal Terminal in Palemonas and Kaunas Free Economic Zone
Source: made by the consultant, based on the data of www.zemelapis.lt

At present, cargo from the Kaunas Public Logistics Center to Kaunas Free Economic Zone can only be transported by road (10.9 km). This illustrative schematic diagram is presented in Chart 27.

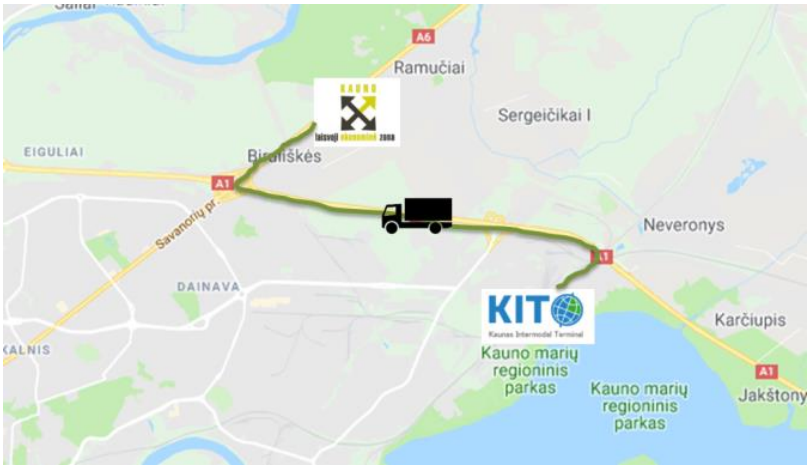


Chart 27 Freight transport by road

Source: made by the consultant, based on the data of www.zemelapis.lt

Although road transport is characterized by greater flexibility and speed than rail transport, long-distance road transportation also has a negative side: traffic congestion in cities and around them transforms this mode of transport into a completely non-organic and not so fast way of transportation. By ignoring the investment required for the construction of access roads, from the perspectives of constant urban development, there is no traffic jams in the transport of goods by rail. Also, cargo transportation using roads is not as safe as a railroad considering the physical safety of the goods transported (and of the vehicles themselves).

1.4.4 Foreseen Technological interaction between FEZ and KIT

The direct rail link between the Palemonas terminal and the FEZ site will allow FEZ-based companies to effectively use the railway infrastructure (4.5 km).

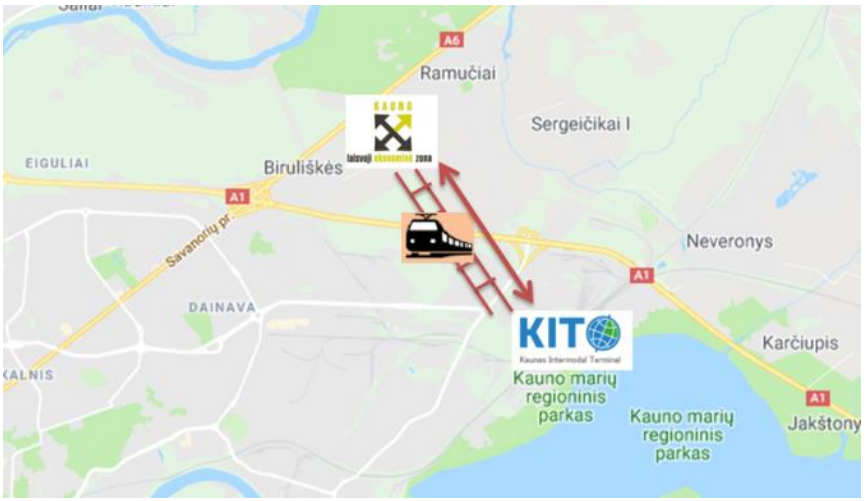


Chart 28 Carriage of goods by rail

Source: made by the consultant, based on the data of www.zemelapis.lt

Cargo transportation by rail is one of the most reliable and environmentally friendly modes of transport. The transportation of goods by rail has its advantages over other methods of cargo transportation:

- Oversize and non-compliant technical loading conditions cargo transportation (such cargo that would be difficult to transport by land);
- Possibility to transport various loads at any time of year;
- Excellent solution for large loads, as one journey can transport much more than other vehicles;
- This is a way to reduce freight costs;
- Faster delivery (In this case, the distance by road will be 10.9 km., by rail - 4.5 km.).

Also, due to technological interoperability, it is important to note that there are currently no wagons designed and licensed for 1520mm wide track to transport semitrailers. Considering the fact that more than half of all goods in Lithuania are transported by road and the fact that the transportation of semi-trailers is convenient due to the possibility to deliver goods to the final destination promptly (without additional cargo handling), such wagons should be purchased by LG as soon as possible.

Summing up the technological interoperability, it is important to emphasize that the greatest technological interoperability obstacle is the absence of a 1435mm wide track to KIT and between KIT and FEZ. Therefore, as a temporary alternative, road freight between KIT and FEZ was offered as long as there was a missing link.

1.4.5 Economic interaction between FEZ and KIT

Taking into account different, but closely interrelated FEZs (development of customer development activities) and KITs (terminal management) activities, the economic interaction between FEZ and KITs is possible in synergy between these two objects as a public logistics center, and each individually specializing in providing and developing their services. Also, because of the obstacle to technological interactions (lack of a railway linkage) Lithuanian Railways in a short term should ensure road freight transport. Schematically this is depicted in Chart 29 below.

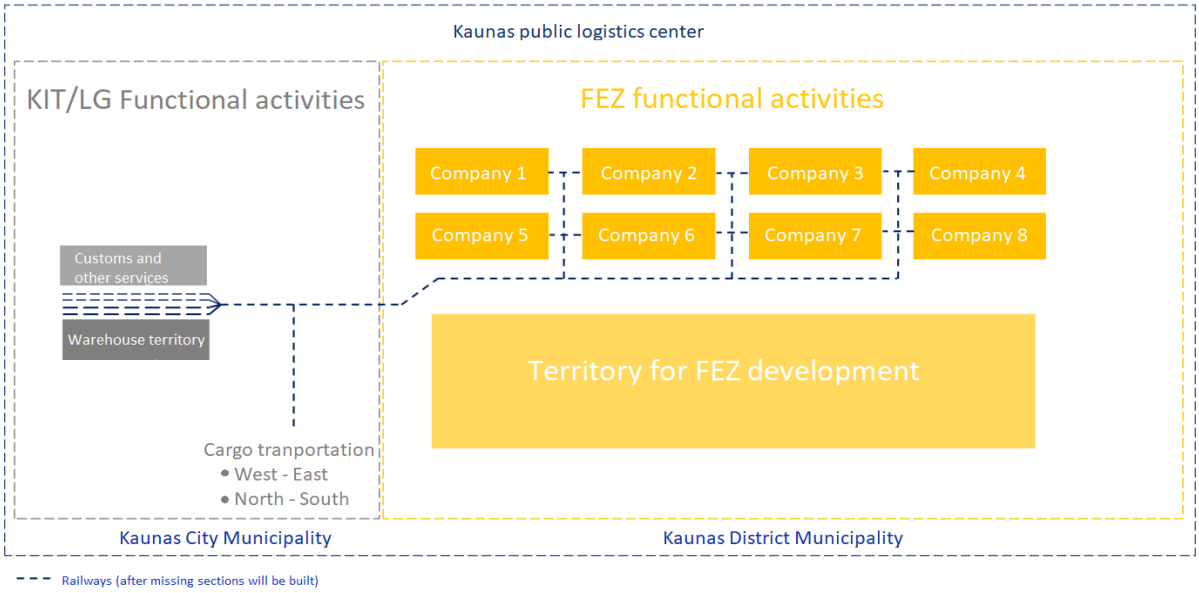


Chart 29 Economic interaction between FEZ and KIT
Source: made by the consultant

Taking into account the above scheme, it is necessary to say that the economic interaction between FEZ and KIT is perceived as a synergy between the activities carried out by these objects (FEZ is looking for investors in its development area with well-developed engineering communications, and LG provides logistics services to FEZ-based companies, i.e. y warehousing, distribution, customs and freight transportation).

1.4.6 Legal restrictions for the interaction between FEZ and KIT

In the legal context, the interaction between FEZ and KIT is not substantially limited if it was chosen that LG and KIT will carry out operations on freight (LG) and terminal (KIT) and will not carry out the development of the site, since Palemonas territory has land restrictions (there will probably not be any free territory in Palemonas, suitable for logistics park). If a decision was made to establish Kaunas VLC in Palemonas, the development of a logistics park could be implemented in cooperation with already established companies (AB Lytagra and AB Kauno Tiekimas). From the perspective of the FEZ, there would be no legal restrictions as the FEZ would continue to develop the territory with tax incentives, as regulated by the Law on Free Economic Zones. Similarly, from LG side there would be no major restrictions, because KIT, as a terminal, which is part of the public rail infrastructure, would provide its services and LG would ensure rail freight, as regulated by the Railway Code and related legislation. The only legal limitation of interoperability could arise in the transport of goods between FEZs and CITs in the short term using a temporary alternative - road transport, as the issue of customs procedures can potentially arise. However, this should not result in major failures, as KITs are provided with customs brokers and all necessary services.

1.5 Interaction model of Kaunas Public Logistics Center (Intermodal Terminal Palemonas) and Kaunas Free Economic Zone, including co-operation schemes and economic implications of the model operation and the necessary conditions for the model to function

In order to prepare a model for interaction between Kaunas Intermodal Terminal and Kaunas Free Economic Zone, it is necessary to define:

- model participants;
- participants' functions;
- contact points (cooperation schemes);
- the necessary conditions for model to work;

Therefore, this section 1.5 is subdivided into sub-sections corresponding to the above-described aspects and is summarized in the model schema given in section 1.5.5.

1.5.1 Model participants

The model participants in the context of this study are reflected in Chart 30. It is very important to realize that the motive for co-operation between the model participants must be one and the same - the largest number of clients, both KIT and the Kaunas FEZ, and the greatest number of cargos generated by them (clients). It is also very important to emphasize that both KIT and FEZ are interested in cooperating de facto - the more companies will operate in FEZ the more intermodal units will loaded by KIT and vice versa. The more freight will be transported by rail to / from Kaunas and loaded in KIT, the more likely Kaunas will be seen as an efficient regional logistics center, thus encouraging companies to invest in FEZ.

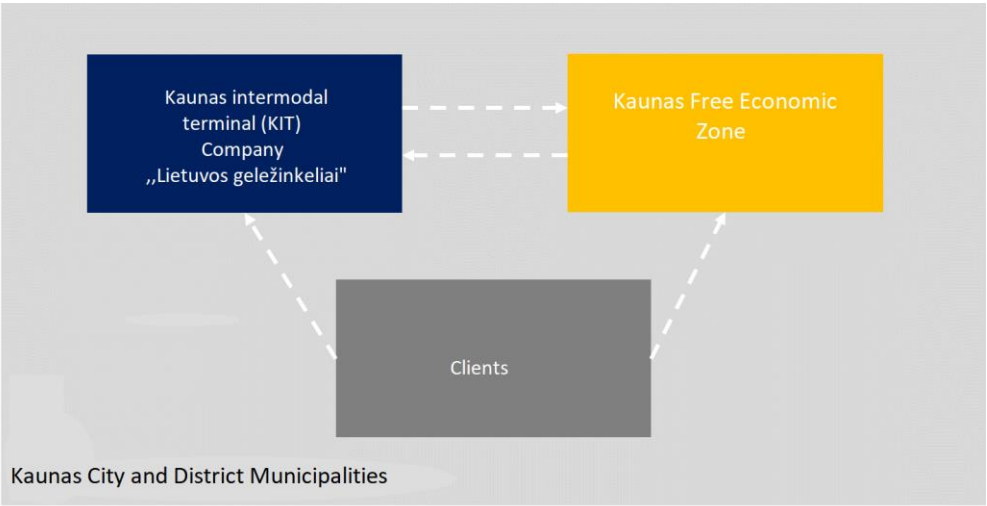


Chart 30 Model participants
Source: made by the consultant

Brief description of each of the participants in the model of Chart 30:

- Kaunas City and District Municipalities – geographic areas with KIT and FEZ, administered by municipal administration;
- Kaunas Intermodal Terminal (KIT) / Company ,,Lietuvos geležinkeliai“ - a company providing rail freight services, a public rail infrastructure and a company that provides its development. At the same time, the company is also the operator of Kaunas Intermodal Terminal, which ensures cargo reloading between different widths (1435mm and 1520mm);
- Kaunas Free Economic Zone - 534 ha industrial development area located in Kaunas district with tax incentives, as defined in the Law on the Basics of Free Economic Zones, which offers land with fully equipped infrastructure;
- Customers are business entities currently carrying or potentially capable of carrying freight by rail and / or operating and / or potentially capable of operating in FEZ.

1.5.2 Functions of the model participants

In order to evaluate the interactions of the participants in the model, it is necessary to understand the current functions of the participants, their constraints and what functions should be offered (what should be abandoned, and / or new ones taken). Table 15 below summarizes the roles of each of the participants, and the next section identifies contact points that arise from the relationship between functions.

Table 15 Model Participants and Their Functions

No.	Participant	Function	Description of the function / s, their importance
1	Municipalities	Affiliate search Strengthening the image of the region	According to the practice of foreign countries, in particular Scandinavia and Germany, cooperation between several municipalities (in this particular case, Kaunas city and district) can effectively help municipalities to take care of various joint tasks, for example, to jointly provide public administration services, manage their activities more efficiently and reduce costs by using mass production or specialization opportunities. Cooperation can also be useful for protecting the interests of municipalities through regional marketing activities. The experience of other countries also shows that cooperation between municipalities in positioning their united image and increasing their visibility makes the region a more attractive place to invest in for international business and to live for highly qualified workers. In addition, the unity of municipalities strengthens the confidence of companies already operating in this territory in future of stable business environment. Municipal co-operation benefits them financially in many respects. Although the direct benefits are hard to quantify, almost always (in 11 out of 13 cases) indirect benefits include the growth of service levels and quality, the enhancement of regional identity, the improvement of the image of municipalities and the improvement of cooperation between the municipality and neighboring municipalities. Increasing globalization has changed the rules of competition game, as competition between subjects in one region turns into competition

No.	Participant	Function	Description of the function / s, their importance
			between economic regions and sub-regions. It is believed that municipality is too small economically (as a market) and in population to compete with larger cities and areas of continental Europe, in addition to the fact that intermodal transport by rail is competitive (compared with road transport) for the carriage of goods over 800 km , and the FEZ aims to attract investors who would distribute their production from Kaunas and / or transport raw materials for production to Kaunas from all over Europe or even Eurasia. One municipality faces a greater financial burden in pursuing international investor search projects, therefore, in order to attract business, to increase the attractiveness of municipalities and the region, it is critical to cooperate more closely, coordinate resources and support local enterprises. Only cooperating regions can help their businesses by encouraging the development of collaborative networks, supporting joint enterprise marketing and supporting the efforts of export-producing companies to add value.
		Improving the conditions for attracting investors	One of the most critical functions to be performed by municipalities is the creation of such conditions for business that the region (and its FEZ in it) would be attractive for investment in business and competitive compared with its competitors - analogous territories in Poland, Latvia or elsewhere in the North-South direction. An overview of regional experience suggests that this is usually related to tax breaks, the supply of skilled workers, the length of bureaucratic procedures, and a sufficient level of transport and communication infrastructure.
		Ensuring the effectiveness of inter-institutional communication	Municipal partnership is critically important and accelerates the exchange of information, while attempting to coordinate individual but also related (KIT and FEZ) projects, developing additional railway infrastructure between these objects and addressing land management issues. The municipalities or their partnership unit must reduce the bureaucratic burden and shorten the length of public administration processes (construction permits, establishment of legal unit, etc..).
2	KIT/LG	KIT management	In essence, KIT activities, both in terms of foreign practice and in the real situation of KIT, consist of two main production groups (cargo handling) and management. Separately, the management function can be divided into the area management (supervision, security, control, traffic flow, administration of the site, etc.) and general management (search for new customers and business partners, management of leased premises and / or warehouse areas, operational efficiency control, etc.)
		Assurance of cargo transportation by rail	This is a fully commercial freight rail carrier function. Its implementation consists of: Freight carriage using railway-1435mm wide track between West European and KIT; Carriage of freight using 1435mm wide track between KIT and FEZ; Freight carriage using 1520mm wide track between CIS countries, Asia and KIT; Freight carriage using 1520mm wide track between KIT and LEZ. Attention is drawn to the fact that the Kaunas passenger station and KIT currently have no 1435mm rail track, it is likely that this connection could be built in 2020. It is also worth noting that the same rail track does not have automatic alarm (ERTMS), therefore, safe and over 40 km / h transportation of cargo through Poland / Lithuania - KIT will be available no earlier than 2024 It is also worth noting that at present there is no rail link between KIT and FEZ. Given these infrastructure constraints, LG should ensure a temporary connection between KIT and FEZ by own or hired road transport. In this way, investors could be shown that the connection is

No.	Participant	Function	Description of the function / s, their importance
			functioning and therefore investors can decide to invest in the FEZ right now, and not later when there will be a fully functioning rail link.
		Construction and maintenance of public railway infrastructure to the territory of the FEZ	At present, without the existence of a railroad link between KIT and LEZ and LG's trust in the management of the public railroad infrastructure, it is critically necessary to agree as soon as possible between LG and FEZ on the occurrence of such a connection. For its part, as regulated by the Railways Code and other related legislation, LG would be responsible for the maintenance of the railroad's infrastructure between KIT and FEZ, and the LEZ would be responsible for the installation of an access road to a customer site according to their individual needs. In this context it is necessary to emphasize that, although at present the KIT, due to the lack of a 1435mm connection with the Kaunas passenger station and is not loaded, with the appearance of such a connection and the emergence of a connection with Tallinn (planned in 2025), in the long run, cooperation between KIT production activities and FEZ development can become critical because of the limited capacity of the terminal. Therefore, KIT and FEZ should unconditionally cooperate in planning the needs of customers and developing the infrastructure they need to serve them.
3	FEZ	Investor search	The LEZ Management Company, in pursuing its objectives, cooperates with Kaunas City and Kaunas District Municipalities in the following areas in the framework of cooperation agreements: provision of municipal services in the area, use of buildings and infrastructure, exchange of mutually beneficial information, search for investors and other activities related to the development of the zone
		Territory management and development	
4	Clients	Execution of customer commercial activities	Both the operating FEZs and those potentially capable of operating there must clearly and responsibly identify their needs so that the FEZ can develop properly, and KITs can provide the necessary logistics capabilities.
		Formation of the needs of KIT and FEZ	Also, the identification of business needs for municipalities as interinstitutional coordinator, i.e. what conditions and / or incentives are needed to invest in a FEZ or expand its activities there.

Source: made by the consultant

1.5.3 Collaboration of the model participants (contact points)

Table 15 and the information analyzed in the previous chapters, summarized and schematically, show the contact points of the functions performed by the model participants in Table 16.

Table 16 Contact points for model participants

No.	Function	Contact with the function	Participant performing the function	Related participants
1	Affiliate search	2,3,4,8	Municipality	LEZ
2	Strengthening the image of the region	1,3,4,8	Municipality	LEZ
3	Improving the conditions for attracting investors	1,2,8,10	Municipality	LEZ, Clients
4	Ensuring the effectiveness of inter-institutional communication	1,2,3,8,10	Municipality	LEZ, Clients
5	KIT control	2,3,6,8,10,11	LG	LEZ, Clients
6	Assurance of cargo transportation by rail	2,3,5,7,8,10,11	LG	Municipality, LEZ, Clients
7	Continuous supervision of the public railway infrastructure	2,3,6,9,10,11	LG	Municipality, LEZ, Clients
8	Search for investors	2,3,5,6,9,10	LEZ	Municipality, LG, Clients
9	Territory management and development	2,3,8,10,11	LEZ	Municipality, LG, Clients
10	Execution of customer commercial activities	5,6,7,9,11	Clients	Municipality, LG, LEZ
11	Formation of the needs of KIT and FEZ	3,4,5,6,7,9	Clients	Municipality, LG, LEZ

Source: made by the consultant

1.5.4 Operating conditions for the model

Depending on the analysis given in section 1.4 and the functions of the model participants as specified in section 1.5, the necessary conditions for operating the model are as follows:

- To establish a single legal entity from Kaunas city and district municipalities, FEZ and KIT - the Entrepreneurship Center - in order to ensure co-operation promptly and with the expectations of all interested parties;
- To prepare the conditions for investors to attract a methodological document on improvement - investment guidelines - what type of investment can be expected for investors;
- To identify and periodically analyze the supply of qualified employees of the FEZ already operating companies and potentially capable (in accordance with section 2.1) analysis;

- Review the processes needed to carry out an investor - from setting up an enterprise to operating and / or licensing, simplifying and reducing their duration as much as possible;
- To insert a missing 1435mm railway section between Kaunas passenger station and KIT, between KIT and FEZ, and between KIT and Tallinn
- and to install an automatic alarm;
- Identify the needs of existing and potential FEZ customers for the transport of goods (final products and raw materials) by rail;
- According to clients' needs, to install railway access roads in the territory of the FEZ;
- Until the railway infrastructure is in place, ensure the carriage of goods between FEZ and KIT by road.

1.5.5 Collaborative Interaction Model Scheme

The model scheme has been developed on the basis that the necessary conditions must first be fulfilled, and the functions described above continue to be carried out, assuming that the necessary conditions have already been implemented. The functions are schematically represented by the contact points indicated in Section 1.5.3.

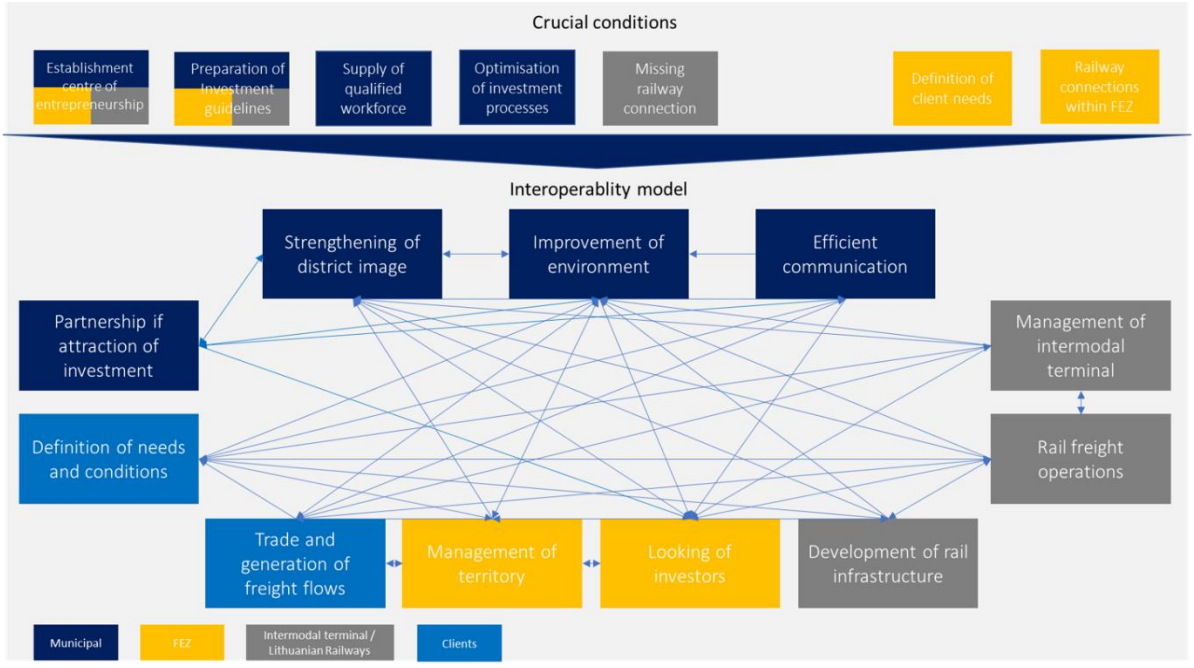


Chart 31 Model Scheme
Source: made by the consultant

2 Model of logistics operation in Lithuania in order to transport as much cargo as possible via Lithuania in the South-North route by rail

The chapter analyzes logistic objects operating in Lithuania, provides a detailed overview of potential shippers and carriers in the Kaunas region. Based on this and previous sections, the information analyzed provides a logistic model for operating in Lithuania, which would increase the volume of freight transport by rail.

2.1 Transport activities of logistic objects (consignors, consignees, logistics and transport companies, warehouses) in Lithuania, scope of their activities, modes of cargo transportation and warehousing

The subsection analyzes the largest transport companies operating in Lithuania, their geographical location, modes of cargo transportation. Details of the logistics objects in the Kaunas region are discussed.

2.1.1 Overview of the largest Lithuanian transport companies

This section will analyze the largest transport companies in Lithuania. Transport activities of enterprises, volumes of activities, methods of cargo transportation and warehousing are analyzed. The table below lists the largest transport companies in Lithuania, which were selected according to turnover and provided information, in which companies in the cities of Lithuania are located.

Table 17 List of companies and cities in which they are located

Company name	Turnover	Vilnius	Kaunas	Klaipėda	Šiauliai
UAB „Girteka logistics“	over 100 000 000 €	+			
UAB „Vlantana"	over 100 000 000 €			+	
UAB „Hegelmann transporte“	over 100 000 000 €		+	+	+
UAB „Baltic Transline“	50 000 001 - 100 000 000 €		+		
UAB „DSV Transport“	30 000 001 - 50 000 000 €	+		+	
UAB „Transimeksa“	30 000 001 - 50 000 000 €	+			+
UAB „Hoptransa“	30 000 001 - 50 000 000 €	+	+		
UAB „Transekspedicija“	20 000 001 - 30 000 000 €		+		
UAB „Arijus“	20 000 001 - 30 000 000 €	+		+	
UAB „ Tirola“	10 000 001 - 20 000 000 €		+		
Total		5	5	4	2

Source: made by the consultant

The table shows that most companies are located between Vilnius and Kaunas. Companies such as DSV Transport, Hegelmann Transporte and Transimeksa operate in several cities. The next diagram shows which modes of transport are used for carriage.

Table 18 Major transportation companies by mode of transport

Mode of transport	Company name
Road transport	UAB „Girteka logistics“
	UAB „Transekspedicija“
	UAB „Hegelmann transporte“
	UAB „Baltic Transline“
	UAB „ Tirola“
Road, air and sea transport	UAB „Transimeksa“
	UAB „DSV Transport“
Road and rail transport	UAB „Vlantana"
Road, air, sea and rail transport	UAB „Hoptransa“
Road and sea transport	UAB „Arijus“

Source: made by the consultant

As it is evident from the table, the general tendency that freight is mainly transported by road and only UAB "Vlantana", JSC "Hoptransa" organizes transportation by rail. Also, the following table shows the volumes of each company's cargo. It is possible to notice that one of the largest transportation company is UAB DSV Transport and, although cargo is transported by road, air and sea, almost half of all provided transport services consist of transport by road.

Table 19 Freight of major transport companies

Company name	Number of transported cargos per year
UAB „Girteka logistics“	320 000[4]
UAB „Vlantana"	98 900
UAB „Transekspedicija“	48 000
UAB „DSV Transport“	576 000
UAB „ Arijus“	n/d
UAB „Tirola“	n/d
UAB „Hegelmann transporte“	n/d
UAB „Transimeksa“	n/d
UAB „Hoptransa“	n/d
UAB „Baltic Transline“	n/d

Source: made by the consultant

Also, from the map below (see Chart 32), it can be seen that companies are located in strategically convenient locations. Mostly in Vilnius and Kaunas (5 each). For example, UAB “Transekspedicija” is located in a new modern transport and logistics center in a strategically

[4] Skaičiuojami tik pilni kroviniai

convenient place near the Via Baltica highway and, as can be seen in the table above, only uses road transport.

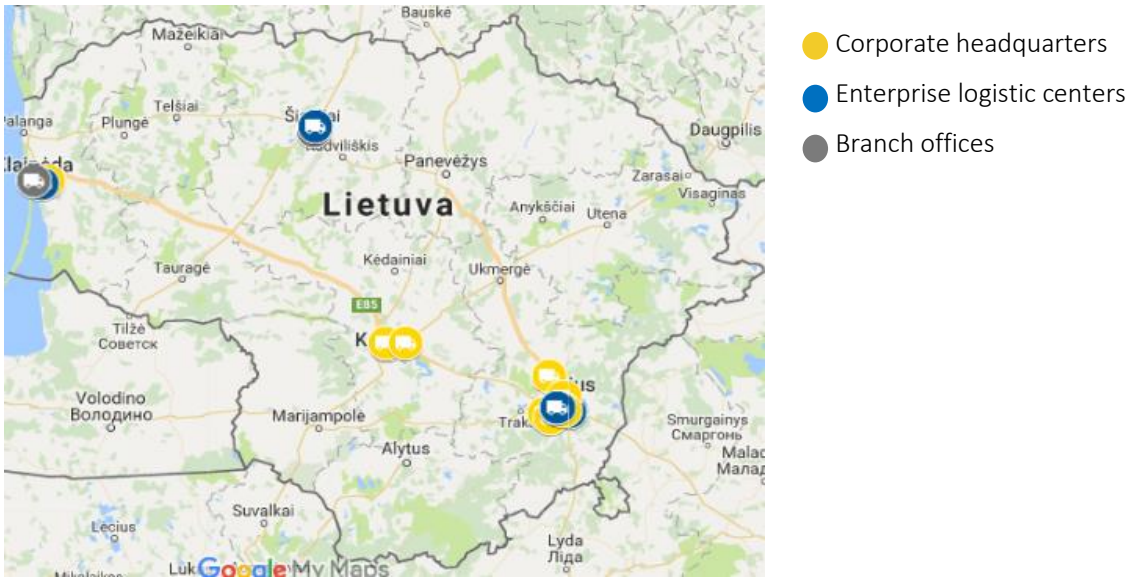


Chart 32 Distribution of the largest transport companies in Lithuania
Source: made by the consultant

Thus, after analyzing the largest transport companies, it can be concluded that there are mostly companies located in Vilnius and Kaunas, most of the transport companies transport goods by road and are located in strategically convenient places close to main roads.

As this research is focused specifically on the Kaunas region, the next section will analyze the transport companies in Kaunas.

2.1.2 Overview of logistics companies operating in Kaunas region

The main objective of this section is to analyze the largest transport companies operating in Kaunas. Which modes of transport are used for transporting goods, where the enterprises are located in the city of Kaunas and the extent of the operation of the enterprises. In this section, transport companies were also selected according to turnover. Below is a table with a list of companies and turnover.

Table 20 Freight of major transport companies

Company name	Turnover 2016 m.	Kaunas	Klaipėda	Panevėžys	Vilnius
UAB „Vykom“	10 000 001 – 20 000 000 EUR	+			
UAB „Kamida“	10 000 001 – 20 000 000 EUR	+			
UAB „ Vytauto paslaugos“	10 000 001 – 20 000 000 EUR	+			
UAB „Jungtinės transporto pajėgos“	5 000 001 – 10 000 000 EUR	+			
UAB „Petva“	5 000 001 – 10 000 000 EUR	+			
UAB „Vilterra“	3 000 001 – 5 000 000 EUR	+			

UAB „Prime line“	3 000 001 – 5 000 000 EUR	+	+	+	
UAB „Nordcarrier“	3 000 001 – 5 000 000 EUR	+			
UAB „Kauno logistikos agentūra“	500 001 – 1 000 000 EUR	+			
UAB „Trans To“	500 001 – 1 000 000 EUR	+	+		+

Source: made by the consultant

From the information provided in the table, there is a general tendency that most companies are based in Kaunas and have no branches in other cities, but it can be noted that UAB Trans To is the only one from the list which has branches in the largest cities of Lithuania. The company's departments are located in Kaunas, Vilnius and Klaipėda. Also, the only company from the list is not organizing international cargo transportation. The following is an analysis of mode of transport is chosen. Table 21 below lists the companies by type of transport.

Table 21 Types of cargo transportation by major transport companies

Mode of transport	Company name
Road transport	UAB „Vilterra“
	UAB „Patva“
	UAB „Kauno logistikos agentūra“
	UAB „Nordcarrrier“
	UAB „ Prime Line“
	UAB „Trans To“
	UAB „Kamida“
Road, sea transport	UAB „Vykom“
Road, air, sea transport	UAB „Vytauto paslaugos"
Road, air, sea, rail transport	UAB „Jungtinės transporto paslaugos“

Source: made by the consultant

The table clearly shows the prevalence of road transportation between the Kaunas transport enterprises, and rail transport, according to publicly available information, is used by only one company - the "Jungtinės transporto paslaugos". The following map (see Chart 33) shows the location of the largest Kaunas transport companies in Kaunas city. The map shows that companies are divided into two directions. One direction is Vilnius - Kaunas - Klaipėda highway, and the other direction is the highway Kaunas - Daugavpils. In addition, in these directions a larger proportion of companies organize cargo transportation.

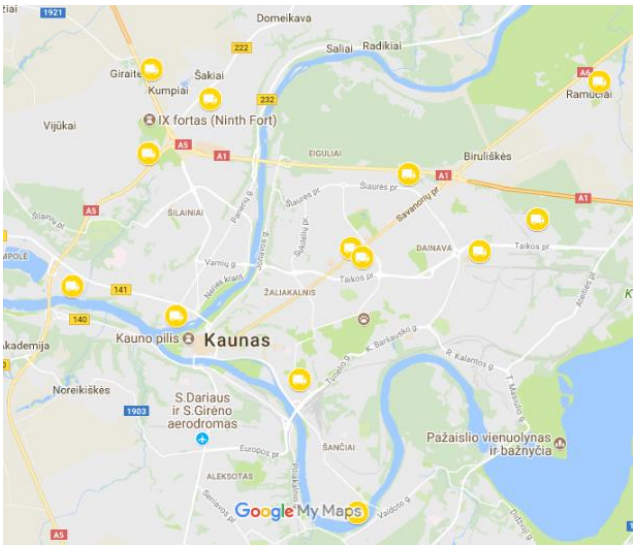


Chart 33 Distribution of transport companies operating in Kaunas
Source: made by the consultant

2.1.3 Review of shippers / recipients operating in Kaunas region

This section analyzes cargo consignors and recipients based in Kaunas. The enterprises of the transport and logistics services located within the radius of 10 km around the territory near Karmėlava and Palemonas are analyzed. Palemonas area is chosen because it is located near the Kaunas Intermodal Terminal and Karmėlava - as it is closer to the territory of Kaunas FEZ.

Table 22 Consumers of transport and logistics services around Karmėlava 10 km radius

Company name	Turnover 2016 m.
UAB „Kesko Senukai Lithuania“	Over 100 000 000 EUR
AB „Lytagra“	Over 100 000 000 EUR
UAB „Vičiūnai ir ko“	Over 100 000 000 EUR
UAB „Kitron“	50 000 001 – 100 000 000 EUR
UAB „Bidfood lietuva“	10 000 001 – 20 000 000 EUR
UAB „Filipopolis“	5 000 001 – 10 000 000 EUR
UAB „Ignera“	5 000 001 – 10 000 000 EUR
UAB „Elinta“	3 000 001 – 5 000 001 EUR

Source: made by the consultant

The table lists companies that are 10 km around the territory near Karmėlava and provides their turnover. According to turnover, the three largest companies are “Kesko Senukai Lithuania”, “Lytagra”, “Vičiūnai ir ko”, whose turnover amounts to more than 100,000,000 million euros. Chart 34 below shows that “Kesko Senukai Lithuania” and “Lytagra” have a similar range of goods that are traded, while “Vičiūnai and Ko” are oriented towards wholesale

food trade. Also, “Kitron” and “Bidfood Lietuva” companies are more focused on exports to other countries.

Chart 34 Areas of production of enterprises operating around Karmėlava
Source: made by the consultant

Table 23 below shows how much and what companies are located around the Palemonas area within a radius of 10 km. Having analyzed the companies around Palemonas and Karmėlava and their turnover, it is clear that companies around Palemonas are smaller. The largest company located around Palemonas is “Mechel Nemunas”, whose turnover is only 30-50 million, and around Karmėlava territory there are even three companies with over 100 million EUR turnover.

Table 23 Users of transport and logistics services in the 10 km radius around Palemonas

Company name	Turnover 2016 m.
UAB „Mechel Nemunas“	30 000 001 - 50 000 000 EUR
AB „Volfas Engelman“	30 000 001 - 50 000 000 EUR
UAB „Bjarnum“	1 000 001 - 2 000 000 EUR
UAB „Kauno žuvis“	1 000 001 - 2 000 000 EUR
UAB „Lavisos koncernas“	1 000 001 - 2 000 000 EUR

Source: made by the consultant

Also, Chart 35 below depicts the areas of shippers / receivers. From all the information provided, it is observed that the companies are divided into three areas, those that are oriented towards exports, the other area is wholesale, and the third is the production of alcoholic beverages.

UAB „Mechel Nemunas“	The largest producer of wire, nails and metal network in the Baltic region. The products are sold in Latvia and Estonia, but are also very popular in Germany, France, Italy, Spain, the Netherlands, Sweden, Poland, Switzerland, the Czech Republic, the United Kingdom, the USA and other countries.
AB „VOLFAS ENGELMAN“	Manufacturing of alcoholic and soft drinks
UAB „Bjarnum“	Various furniture components, fully finished garden and home furniture, frames, partitions. The main partner is Sweden.
UAB „Kauno žuvis“	Wholesale trade of fish, temperature and non-temperature regime warehouses, office lease, cargo handling – unloading / loading.
UAB „LAVISOS KONCERNAS“	Raw materials for food industry production, supply, sale and export to more than 20 countries.

Chart 35 Areas of production of enterprises operating around Palemonas
Source: made by the consultant

Below (see Chart 36), the location of businesses appears on the map. The black color is Kaunas terminal, and the red - Kaunas FEZ. From the map, it can be noted that there are no general trends related to the location of the companies.

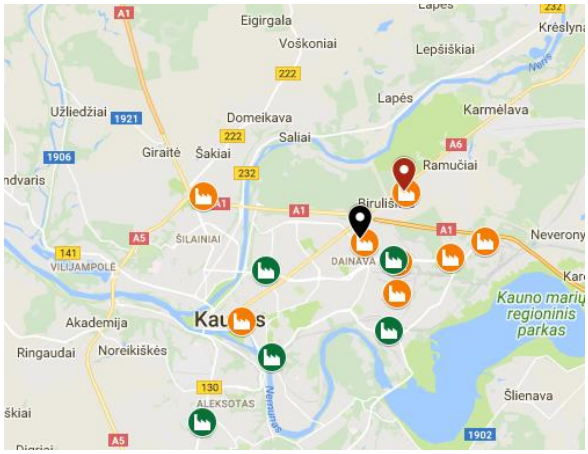


Chart 36 Mapping the senders / receivers of cargo located around Karmėlava and Palemonas
Source: made by the consultant

To summarize this section, it can be concluded that both the largest Lithuanian transport companies and the consignors / consignees are potential customers of the FEZ because they operate outside the territory of the FEZ. At the same time, they are potential customers of KIT and LG, as most of the transportation activity is carried out by road. Another important conclusion in the context of the research is that the largest Lithuanian transport companies are located in Vilnius and Kaunas, which is directly related to the conclusion of Section 1 of the analysis that the largest cargo potential is in the direction of West-East. Therefore, Chapter 1 summarizes the model indicating what should be done to carry more cargo through the Kaunas region, and Chapter 2 will complete the model, summarizing the entire study and demonstrating what should be done to bring more freight from the road to rail transport.

2.2 Logistics model of operation in Lithuania, due to which goods would be transported by rail

In order to develop a logistic model of operation, it is necessary to define:

- model participants;
- participants' functions;
- contact points;
- the necessary conditions for model operation;

Therefore, this section 2.2 is further subdivided into sub-sections corresponding to the above-described aspects and summarizes the model schema given in section 2.2.5.

2.2.1 Model participants

The participants in this model are:

- Potential customers, homogeneous for Lithuanian logistics companies and consignors / consignees located in the Kaunas region, forming the potential specified in 1.2.2. section;
- AB "Lietuvos geležinkeliai", railroad carrier in the North-South and West-East directions;
- Kaunas Free Economic Zone as a developer of an industrial territory;
- Other relevant authorities periodically required to address the necessary conditions.

The interaction of these participants is schematically illustrated by Chart 37 below.

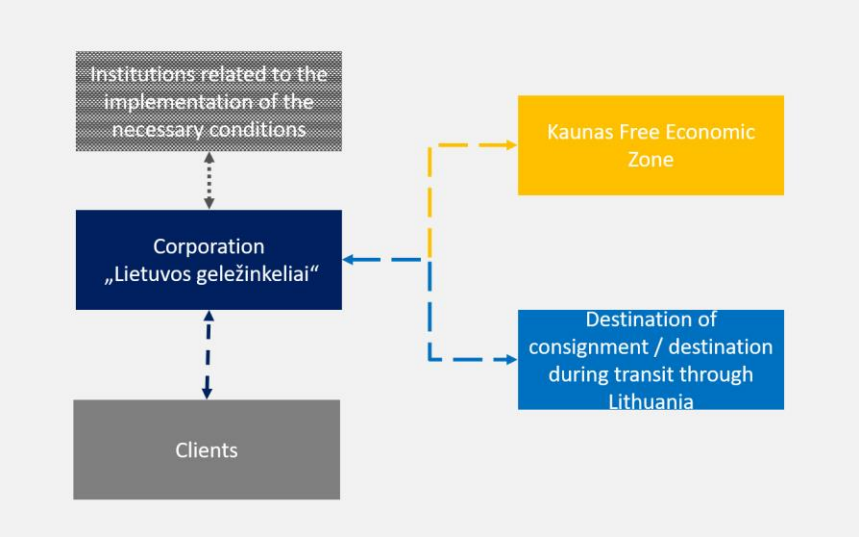


Chart 37 Model Participants
Source: made by the consultant

2.2.2 Model participants' functions

In order to evaluate the interactions of the participants in the model, it is necessary to understand the current functions of the participants, their constraints, bottlenecks, and, in line with the good practice of other countries, what functions should be offered (i.e., what should be abandoned, and / or new ones taken). Table 24 below gives structured functions for each of the participants, and the next section identifies contact points that arise from the relationship between functions.

Table 24 Model participants and their functions

No.	Participant	Function	Description and importance of the function
1	Institutions related to the amendment of the necessary conditions	Changing the legal environment related to the transportation of semi-trailers	The results of the study showed that, in the current regulatory environment governing road and rail transport conditions, road transport has better competitive conditions, which means that the transport of goods by trucks is cheaper than rail on all selected routes. It is also noted that this is a regional problem for rail freight transport, and not specific countries (such as Poland, Lithuania, Belarus, Latvia or Estonia). When analyzing the reasons for the obstacles, it was found that the European Commission's initiatives to move as many freights on the railroad are not implemented, since the volume of goods transported by rail remains the same every year, while the volume of goods transported by several means is increasing. For this reason, in order to overcome the main obstacles identified, it is first necessary to change the regulatory environment in the region in order to eliminate discriminatory conditions for railways compared with road transport. The service of transport of semi-trains by rail can have a significant effect on the increase of cargo volume in transit through Lithuania. Following the analysis of international trade between the countries of the West - East, it has been established that in the mainland transportation by rail, semitrailers are more advantageous than containers due to the following reasons: • large truck traffic flows across the EU-CIS borders; • This alternative is not used on a 1520 mm track railroad, which means that there is a significant potential for such a service on the market; • the transportation of semi-trailers by rail eliminates the essential barrier - the unequal possibilities of load of semitrailers and containers (differences between the type of cargo) - by comparing the number of transported pallets. The formation of this product requires a change in legal regulation, ensuring that semi-trailers can be transported by rail in the CIS. At present, EU trucks and semi-trailers are counted as separate transport units and their transportation by rail is not restricted, semi-trailers can cross national borders irrespective of whether they are tramped on a tow or rail. Meanwhile, the main obstacle for the transportation of semi-trailers between the EU and the CIS countries - a truck with a semi-trailer at the customs office is accounted as 1 transport unit. For this reason, semi-trailers cannot cross the borders of the EU and third countries if they are transported by rail, separate from the towing vehicle.

No.	Participant	Function	Description and importance of the function
		Increasing road taxes and promoting rail transport	As already mentioned in the study, in order to make the price of rail transport services competitive, in comparison with road transport in the West-East and North-South directions, road charges should be increased from **1.5 times** (for the Netherlands-Finland route) up to **10 times** (on the Polish-Finnish route). In addition to this increase, road traffic restrictions, longer rest periods should be applied, taking into account the example of Switzerland and Austria (the only EU-state in which rail transport has grown) and subsidizing rail freight, taking into account the fact that the external costs of transport by rail are lower than external costs of road transport;
		Determination of fuel excise collection mechanism for road transport	Carriers pay a large part of the fuel excise tax on the railways, but the charges collected are used to improve road infrastructure, and the railway infrastructure is managed by the railway infrastructure manager himself at his own expense. Changing the mechanism for collecting the road transport excise duty is necessary for rail transport in order to take over part of the freight transported by the truck. Based on the current system, a tractor truck crossing Lithuania's border and transit through the country without stopping fueling it, paying no excise tax to Lithuania, and also importing smuggled fuel into the country.
2	LG	Development of freight rail activity to attract potential flow of goods	When analyzing the reasons for the "lack of service and time" and "lack of punctuality", it was found that the lack of a rail transport service has the greatest influence on these obstacles, therefore, customers can not quickly receive rail freight services (including transport costs, other conditions), as well as freight forwarders Instead of rail, they offer goods for transport by road. Identified barriers and their determinants could best be addressed by the development of LG services with partners in the EU and the CIS, possibly through the establishment of international carriers, the formation of a new service and the expansion of the customer network. Similarly, LG or a newly established operator should arrange wagon-capable semi-trailers without tow trucks. The 1435mm wide rail network, though deficient, is, in principle, a wagon. Meanwhile, the 1520mm network, due to the legal barrier already mentioned, still does not exist for such wagons. Although on the one hand this is an obstacle requiring investment in a certain sense, but at the same time due to its high potential, it is also a potential business opportunity for LG, especially due to the unique situation of Lithuania and especially Kaunas, because there is a 1435mm and 1520mm track and the largest potential flow, as the research shows, are in the West (dominated by a 1435mm network) - East (dominated by a 1520mm network) direction.
3	LEZ	Territory management and development	See section 1.5
4	Clients	Changes in the logistics chain (from road to rail)	Customers currently using road transport should clearly state their expectations and opportunities to start using rail freight and transfer activities to the territory of the FEZ.

No.	Participant	Function	Description and importance of the function
			If the first option does not require additional investment in practice (with the proviso that the transport of semi-trailer trucks without trucks) and additional training and / or operational changes from the perspective of potential customers, the second alternative is much more important to time, investment and operational change. Therefore, in light of the foregoing, customers potentially able to transfer their activities to the FEZ must understand the motive of the transfer of activities and be prepared for it both financially and operationally. A special measure of LG and FEZ pricing, for example, is that enterprises that transfer their activities to the FEZ are subject to special relief for rail freight. In this way, not only will the transfer of activities be encouraged, but also a part of the freight being diverted to 10 times more environmentally friendly rail transport (compared to road transport).

Source: made by the consultant

2.2.3 Collaboration of the model participants (contact points)

Table 24 and the information analyzed in the previous chapters, in a summarized and schematic way, showing the contact points of the functions performed by the model participants, is shown Table 25.

Table 25 Points of contact of the model participants

No.	Function	Contact with another function	Participant performing the function	Related participants
1	Changing the legal environment related to the transportation of semi-trailers	4,6	Institutions	LG, clients
2	Increasing road taxes and promoting rail transport	4,6	Institutions	LG, clients
3	Determination of fuel excise collection mechanism for road transport	4,6	Institutions	LG, clients
4	Development of freight rail activity to attract potential flow of goods	5,6	LG	LEZ, clients
5	Territory management and development	4,6	LEZ	LG, clients
6	Changes in the logistics chain (from road to rail)	4,5	Clients	LG

Source: made by the consultant

2.2.4 Operating conditions for the model

Taking into account the results of the study and the functions of the model participants as defined in section 2.2, the following conditions are required for the model's operation:

- To prepare a socio-economic analysis of changes in legislation;
- Make necessary legislative changes at national and regional level;
- Take a decision on the implementation of a regional freight transport activity (EU-CIS) model - whether to operate on the basis of a commercial partnership or to establish a single legal entity;
- Form the required wagon fleet;
- Implement the necessary conditions for the KIT and FEZ interoperability model.

2.2.5 Scheme for cargo shipment model

The model scheme has been developed on the basis that the necessary conditions must first be fulfilled, and the functions described above continue to be carried out, assuming that the necessary conditions have already been implemented. The functions are schematically represented by the contact points indicated in section 2.2.3.

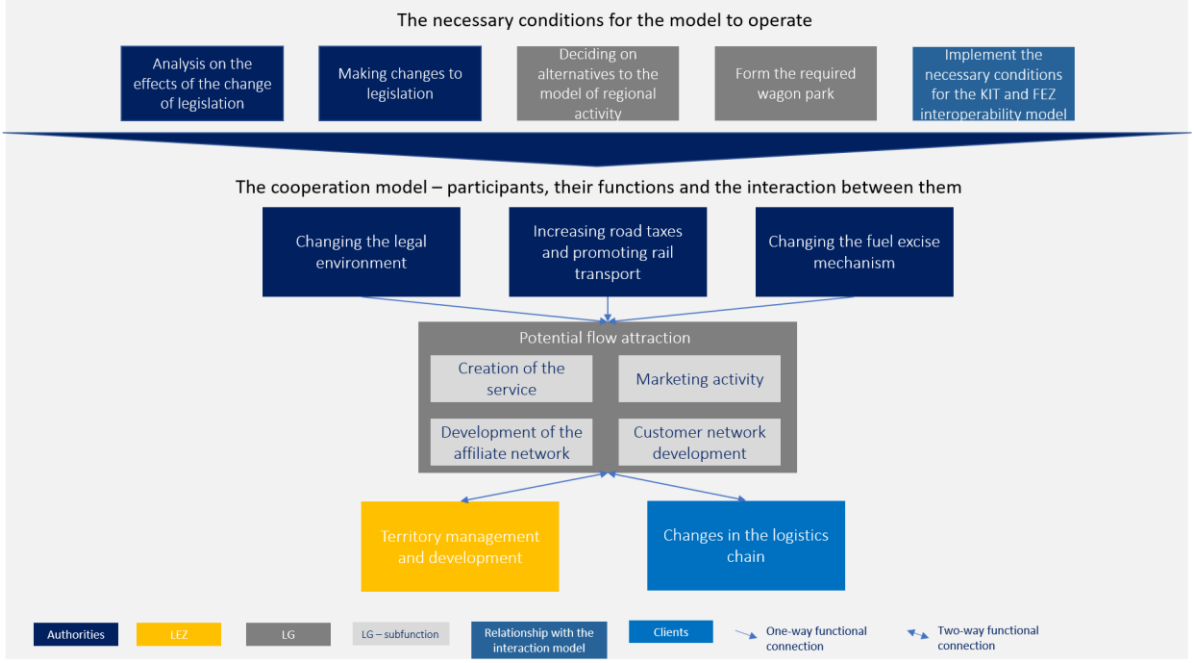


Chart 38 Model Scheme
Source: made by the consultant

3 Research conclusions

1. In the analysis of European Union and Lithuanian transport policy, there is a discrepancy between the EU's aspirations (by 2030 30% of freight will be transported by rail, and by 2050 it is expected to reach 50%) and Lithuania's transport policy Lithuania does not have a legal basis that directly promotes the formation of intermodal transport, on the contrary, relatively less favored roads than rail infrastructure charges favor road transport carriers. Also, it is necessary to note that in Lithuania railroad carriers pay excise taxes on fuel, which accounts for supervision of road infrastructure, while the railway infrastructure is supervised by the profit generated by the carriers;
2. It was identified that in the transport sector in Lithuania the investments will be mostly for modernization of road infrastructure: 49% for roads, 28% for railways, which again reflects the opposition to EU policy and the aim of promoting rail transport;
3. In the analysis of cargo flows, it has been determined that the potential of rail freight in the North-South direction is 17 million tons, while in the West - East direction - 235 million tons;
4. The main obstacles hindering the transportation of goods by rail are the absence of a service (in Lithuania's interaction with the 1435mm wide rail network) and the price (due to 3-5 times fewer roads than the railway infrastructure charge and the first / last mile delivery costs);
5. In order to ensure synergy between Kaunas FEZ and KIT, it is necessary:
    5.1. To establish a single legal entity from the Kaunas City and District Municipalities, the FEZ and the KIT - the Entrepreneurship Center - in order to ensure co-operation promptly and in the light of the expectations of all interested parties;
    5.2. To prepare conditions for investors to attract a methodological document on improvement - investment guidelines - to what extent investors could expect investment at what kind of preferences;
    5.3. To identify and periodically analyze the supply of qualified employees of FEZ already operating companies and potentially capable (in accordance with section 2.1) analysis;
    5.4. Review the processes required to make an investor - from setting up an enterprise to operating and / or licensing, simplifying and reducing their duration as much as possible;
    5.5. To make a missing 1435mm railway section between Kaunas Station and KIT, between KIT and FEZ, and between KIT and Tallinn, to install an automatic signaling and a

distribution station for the formation of trains with 1435mm wide track in the railway network;

5.6. Identify the needs of existing and potential FEZ customers for transportation of goods (final products and raw materials) by rail;

5.7. According to clients' needs, to install railway access roads in the territory of the FEZ;

5.8. Until the railway infrastructure is in place, ensure the transportation of cargo between the FEZ and the KIT by road.

6. In order to ensure the greatest possible volume of goods transported from road to rail, it is necessary:

6.1. To implement the necessary conditions for the model of interoperability between KIT and FEZ;

6.2. To prepare a socio-economic analysis of changes in legislation;

6.3. Make necessary legislative changes at national and regional level;

6.4. Take a decision on the implementation of regional freight transport (in the EU-CIS context) - whether to operate on the basis of a commercial partnership or to establish a single legal entity;

6.5. Form the required wagon park.

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