KAUNO UNIVERSITY OF TECHNOLOGY

FACULTY OF MECHANICAL ENGINEERING AND DESIGN

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RESEARCH OF RAIL BALTICA PROJECT IMPACT ON LOGISTIC PROCESSES OF KAUNAS PUBLIC LOGISTICS CENTRE

Final Master's project

Supervisor

Prof. dr. Artūras Keršys

KAUNAS, 2015

KAUNAS UNIVERSITY OF TECHNOLOGY

FACULTY OF MECHNICAL ENGINEERING AND DESIGN

DEPARTMENT OF MANUFACTURING ENGINEERING

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Final Master's Degree project

Industrial engineering and management (kodas 62108T211)

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KAUNAS, 2015

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Industrial engineering and management, code 62108T211
(Title and code of the programme)

"RESEARCH OF RAIL BALTICA PROJECT IMPACT ON LOGISTIC PROCESSES OF KAUNAS PUBLIC LOGISTICS CENTRE"

DECLARATION OF ACADEMIC HONESTY

8 June 2015
Kaunas

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Simaškaitė, M. Title of the final project: „ ***Research of Rail Baltica project impact on logistic processes of Kaunas public logistics centre " final*** master's project supervisor prof. dr. Artūras Keršys; Kaunas University of Technology, faculty of mechanical engineering and design, industrial engineering department.

Kaunas, 2015. 48 pages.

SUMMARY

The purpose of the research project is to investigate the impact of the project Rail Baltica to Kaunas Public Logistics Centre performance, assessing the potential of cargo flows and their service in Kaunas intermodal terminal. The project included the analysis of current situation of the "Rail Baltica" project and its significance for the transport intermodality and also the main European transport network interconnectivity factors, showing how the project would be beneficial. The project also included the investigation of the project impact on the cargo flows to and from Lithuania and Kaunas intermodal terminal operational efficiency when serving cargo flows, introducing the recommendation to improve efficiency of the Kaunas intermodal terminal infrastructure by installing a reservoir rail route in the terminal.

Key words: intermodality, Rail Baltica, TEN-T, cargo flow.

Simaškaitė, M. Baigiamojo projekto pavadinimas: ***„Rail Baltica projekto įtakos Kauno viešojo logistikos centro veiklai tyrimas“*** baigiamasis projektas / vadovas prof. dr. Artūras Keršys; Kauno technologijos universitetas, Mechanikos inžinerijos ir dizaino fakultetas, gamybos inžinerijos katedra.

Kaunas, 2015. 48 psl.

SANTRAUKA

Projekto tikslas yra ištirti "Rail Baltica" projekto įtaką Kauno viešojo logistikos centro veiklai vertinant potencialius konteinerinių krovinių srautus ir jų aptarnavimą Kauno intermodaliniame terminale. Projekte analizuojama esamo projekto situacijos analizė, pagrindinių transporto tinklo jungčių efektyvumą lemiančių projekto veiksniai bei reikšmės transporto intermodalumui Lietuvoje. Tyrimas parodė projekto įtakos konteinerinio tipo krovinių srautus iš/į Lietuvą bei Kauno intermodalinio terminalo veiklos efektyvumą aptarnaujant konteinerinio tipo krovinius.

Raktiniai žodžiai: intermodalumas, Rail Baltica, TEN-T, krovinių srautas.

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INTRODUCTION

The purpose of the research project is to investigate the impact of the project Rail Baltica to Kaunas Public Logistics Centre performance, assessing the potential of cargo flows and their service in Kaunas intermodal terminal.

The tasks of this research are:

- To analyse current situation of the "Rail Baltica" project;
- To analyse the main European transport network interconnectivity factors which determine the efficiency of the project;
- To investigate the project impact on the cargo flows to and from Lithuania;
- To investigate Kaunas intermodal terminal operational efficiency when serving cargo flows;
- To analyse "Rail Baltica" project's significance for the transport intermodality in Lithuania.

The institutions of the European Union (EU) refer to the "Rail Baltica" project as a strategic long-term railway project which aims at developing high-quality passenger communication and freight transportation among the Baltic States and Poland as well as through the centre in Warsaw: among the Baltic States and other EU countries. (Fig. 1).

Fig. 1. Rail Baltica in relation to TEN-T Core Network Corridors [1]

The modernised railway lines would enable an effective land communication among the Baltic and North European countries (especially Finland) and Central Asia in length of time. The improved railway communication will provide environmental benefits, reduce traffic jams in the European road

network, improve the accesses to the Baltic States and promote a more rapid regional development in the related countries. The long-term objective of the international "Rail Baltica" project is to thoroughly realize the principles related to the combination of various means of transport, their interrelation, reliability, safety and security, as well as to create favourable conditions for using the most environment-friendly means of transport.

1. INTERMODALITY IN TRANSPORT CHAINS

The collaboration of two or more transport modes is quite regular and common practice in the freight transport business, yet there are a number of different approaches to the intermodality and not common consensus has been reached for universal use. In the science literature there can be found different definitions to the intermodality (e.g. multi-modal transport, combined transport, intermodal transport and co-modality).

In 1997, The European Commission came up with a definition like this: "Intermodality is a characteristic of a transport system that allows at least two different modes to be used in an integrated manner in a door-to-door transport chain. In addition, intermodal transportation is a quality factor of the level of integration between different transport modes. In that respect more intermodality means more integration and complementarity between modes, which provides scope for a more efficient use of the transport system". [2].

Using this definition it can be determined that transport agents are as a source of integral part of intermodal transport service, which means that the Freight Forwarder (FF) that organises and manages the various agents, aiming to get the most out of each party in favour of the overall performance of the transport service. [3] The role of freight forwarding is to make the work synergetic. This way it helps to seek for more qualitative performance and reduce the waste within. Furthermore, this means that is not only adding individual performances together but rather a complex synergetic teamwork. Whereas, the multi-modal transport is only a pile of transport service set-up in one place.

1.1. Four major functions define an intermodal transport chain [4] (Fig.2, 3, 4):

a) **Composition**. The process of assembling and consolidating freight at a terminal that offers an intermodal interface between a local and/or regional distribution system and a national and/or international distribution system. Ideally, loads of freight coming from different suppliers are assembled at distribution centres so they can be forwarded to high capacity modes such as rail and maritime shipping. The dominant mode for such a process is trucking as it offers flexibility and door-to-door services. Activities such as packaging and warehousing are also included in the composition process, which is closely linked with the function of production.

b) **Connection (transfer)**. Involves a consolidated modal flow, such as a freight train or a containership, between at least two terminals, which takes place over national or international freight distribution systems. The efficiency of a connection is mainly derived from economies of scale, such as double stacking containerships, coupled with an adequate frequency of service.

c) **Interchange**. The major intermodal function takes place at terminals whose purpose is to provide an efficient continuity within a transport chain. Those terminals are dominantly within the realm of national or international freight distribution systems, with ports (transhipment hubs) being the most notable example.

d) **Decomposition**. Once a load of freight has reached a terminal close to its destination, it has to be fragmented and transferred to the local/regional freight distribution system. Often represents one of the most difficult segments of distribution. This function, which is linked with the function of consumption, dominantly occurs within urban areas and involves unique distribution problems also known as urban logistics.

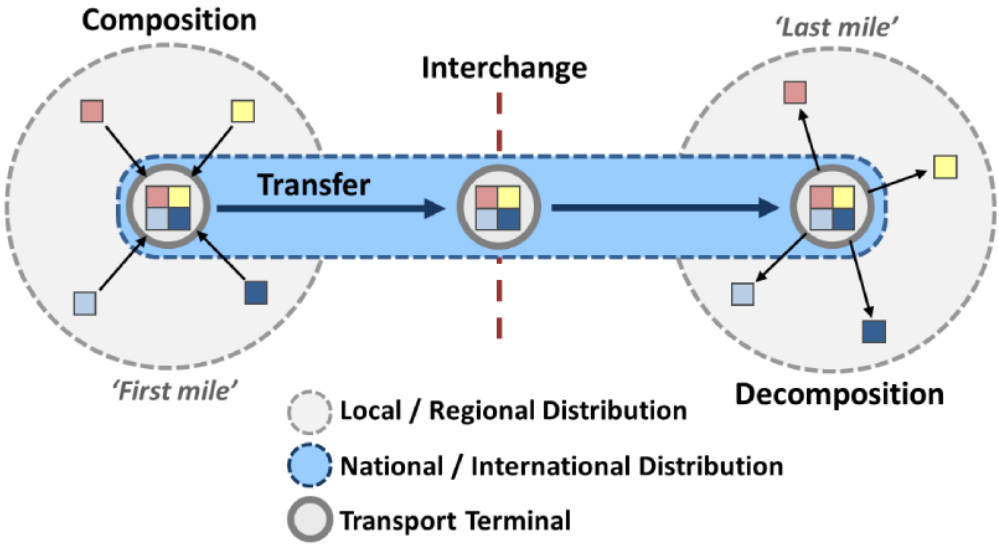

Fig.2. Four major functions define an intermodal transport chain [4]

Fig.3. the intermodal transport chain [4]

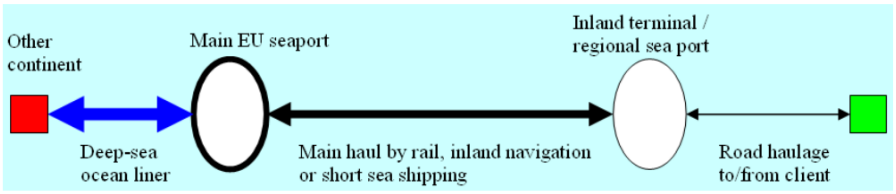

Fig.4. Schematic overview of maritime intermodal transport chain [4]

1.2. Road transportation in intermodal transport chain

Road transportation is without a doubt, one of the most oldest and popular modes of transport. Cause of this popularity are the flexibility (the trucks can reach furthest places of lands), compatibility (roads are useful from country to country), speed (for short and medium distances it is the fastest mode), cost (fixed costs are the lowest, especially for short distance). Although aspects of speed and cost are continually re-evaluated because of the costs of fuels and amount of traffic in the roads. The financial crisis in 2009, disturbed the extension of roads and maintenance of the network of roads.

1.3. Rail in intermodal transport chain

Nowadays railway is not that attractive mode of transport as other types. The reasons for this are time factor, where time is consumed by waiting and shunting hours and also the cost factor, where costs of fuel for the railway are relatively high. Although historically, railways have been regarded as a green and sustainable transport mode. However, this reputation has been questioned in recent times as the true energy performance of modern rolling stock is under scrutiny. As a result there is now a significant incentive for the rail industry and public institutions to establish an enhanced culture of sustainability, befitting the demands of a 21st century transport mode. Whichever the approach, a whole systems perspective is essential to effectively tackle the issue of sustainability.

Rail is already one of the cleanest and safest modes of transport, but it cannot afford to rest on its reputation. The automotive industry has demonstrated that better technology can reduce emissions while maintaining vehicle performance. The rail industry has also seen performance improvements. Newer designs of diesel engines are more efficient than their predecessors and modern semiconductor-controlled trains have lower losses than the resistor-controlled trains they replaced. However this benefit has been used to increase performance and not to reduce energy consumption. Higher speeds, better acceleration, better disabled access, more stringent safety provisions and wider use of air conditioning have all contributed to a growth in energy consumption per seat. [5]

2. TRANS-EUROPEAN TRANSPORT NETWORKS (TEN-T)

The Trans-European Transport Networks (TEN-T) are a planned set of road, rail, air and water transport networks in the European Union. The TEN-T networks are part of a wider system of Trans-European Networks (TENs), including a telecommunications network (eTEN) and a proposed energy network (TEN-E or Ten-Energy). The European Commission adopted the first action plans on trans-European networks in 1990.[6]

TEN-T envisages coordinated improvements to primary roads, railways, inland waterways, airports, seaports, inland ports and traffic management systems, providing integrated and intermodal long-distance, high-speed routes. A decision to adopt TEN-T was made by the European Parliament and Council in July 1996.[7] he EU works to promote the networks by a combination of leadership, coordination, issuance of guidelines and funding aspects of development.

As of January 2014, the European Union has a new transport infrastructure policy that connects the continent between East and West, North and South. This policy aims to close the gaps between Member States' transport networks, remove bottlenecks that still hamper the smooth functioning of the internal market and overcome technical barriers such as incompatible standards for railway traffic. It promotes and strengthens seamless transport chains for passenger and freight, while keeping up with future technological trends. This project will help the economy in its recovery and growth, with a budget of €26 billion up to 2020. [8]

The TEN-T policy supports the completion of 30 Priority Projects, representing high European added value, as well as projects of common interest and traffic management systems that will play a key role in facilitating the mobility of goods and passengers within the EU.

The TEN-T Programme has a budget of €8.013 billion for the current 2007-2013 spending framework. Multi-annual and annual work programmes set the specific objectives and priorities to be met. The budget for the Multi-Annual Programme, which targets the highest priorities of the TEN-T including the 30 Priority Projects as well as the horizontal priorities, represents 80-85% of the total available through the TEN-T Programme for the period 2007-2013. Now, the whole TEN-T network requires 700 euro billion of financial investment for the corridors to be operational by 2030 to be fully developed. The Fig. 5 shows the projects mapping across Europe, which will be established by 2020.

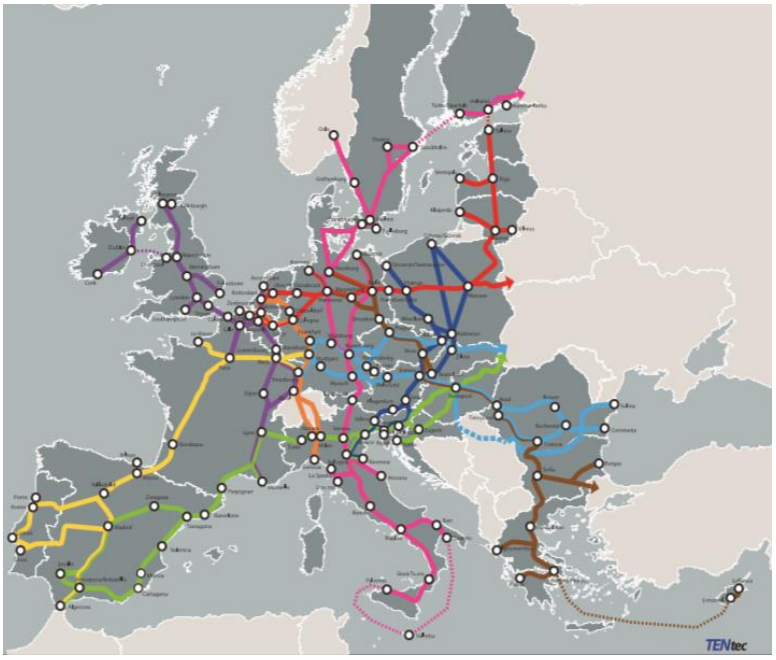

Fig.5. Trans-European Transport Networks (TEN-T) mapping [8]

2.1. Linkage between North Sea and Baltic region. European perspective.

Among all the projects of TEN-T the 3 200 km long North Sea-Baltic corridor is the one of the most economically diverse and most profitable corridors among others in European Union. This corridor has 16 core network airports, 13 core network seaports, 18 core network inland ports and 17 core network rail-road terminals. The corridor connects the capitals of 8 countries (in sequence by map) Helsinki, Tallinn, Riga, Vilnius, Warsaw, berlin, Brussels and Amsterdam. It is scientifically proved that the Baltic Sea Macro region in the north-east is the fastest developing region in the European Union. So the benefit of the corridor is that it connects the leading seaports in the Western Europe with this highly developing region. This corridor has effective inland waterways from North Sea to Berlin as well as several leading logistics hot spots in Europe. (Fig.6), which shows the interconnectivity of the corridor in the current state). It has high number of freight and passengers between countries such as Finland, Germany, Netherlands and Belgium, however the long section between Warsaw and Tallinn has insufficient transport infrastructure and lack of international transport services, highly demanding on road transportation. This project marks the potential economic growth of the Baltic region, although this is the most challenging area of the whole project that is why the urgent measures have been taken by introducing and establishing Rail Baltic/Rail Baltica project.

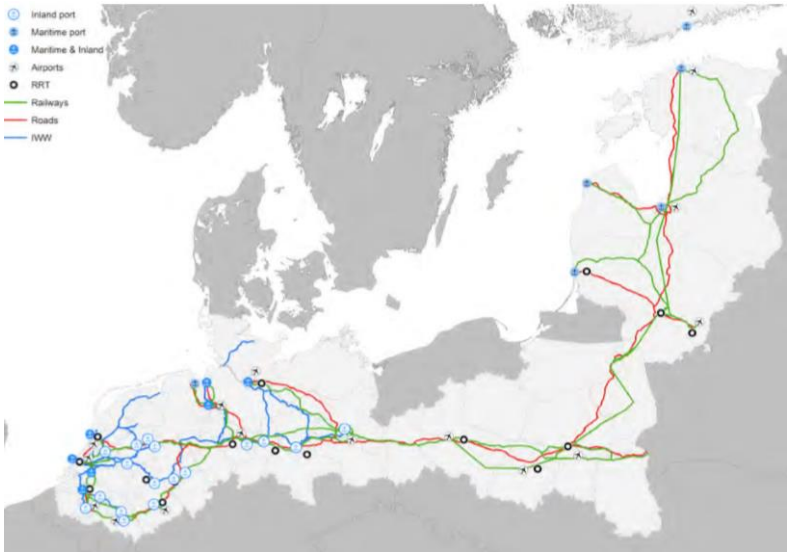

Fig. 6. Alignment of North Sea – Baltic infrastructure and logistical spots within the corridor [9]

When looking at the current state of play (Fig.7. under), which shows randomly spread dots, that presents what types of transportation is used commonly in the region, it can we concluded that there is a huge misbalance between different types of transport modes.

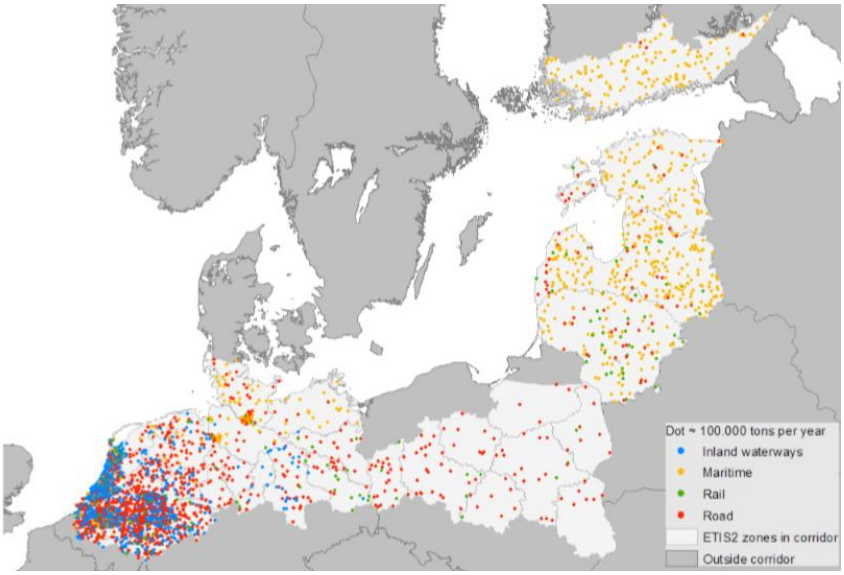

Fig.7. Origins of international freight transport flows within the corridor catchment area by the transport mode. [xx] Source: ETISplus2010 [9]

When looking from the significant perspective of timing e.g. passenger transport from Belgium to other areas within the corridor, the air transportation stays the fastest way, although not the most cost environmentally efficient, but the time aspect wins in this situation. (Fig.8 under).

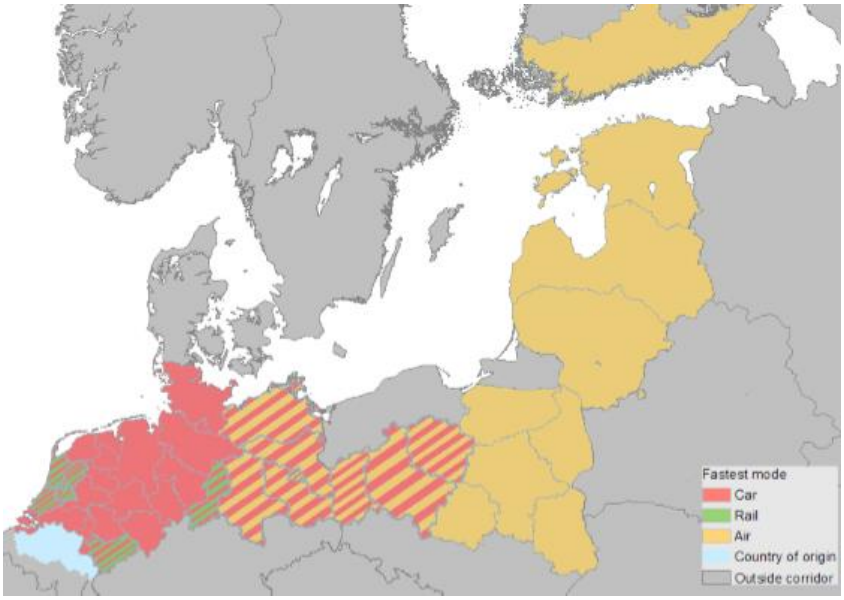

Fig.8. Indication of the fastest mode for passenger transport from Belgium to other areas within the corridor. [9]

Furthermore, the Lithuanian perspective looks even more severe, when looking at Fig.9 (under). It shows the connectivity of cargos with other areas for cargo export in tons per year, and how the Lithuanian export is spread within the corridor. The maritime mode is still essential with western areas and rail as well as roads within Baltic area. Unfortunately the middle area of Germany and Poland is not that developed as it could be, which would increase export rate and increase national economy as well.

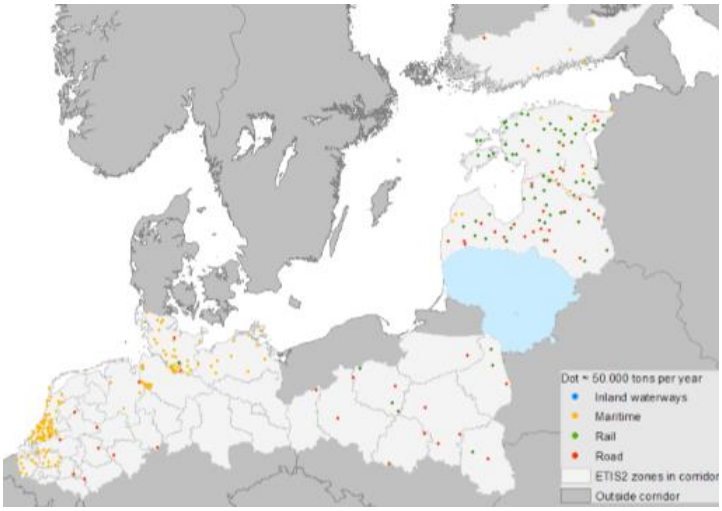

Fig.9. Lithuanian cargo export in tons per year [9]

According to the statistics of international cargo transport (in tons) from Poland within the North Sea-Baltic corridor the road type of transport remains the essential mode used by Polish companies for transporting (Fig.10). Only some areas are reached by railway. Although, Poland has the largest economy in the Central Europe and sixth largest economy in European Union, where exporting

manufacturing goods in large tonnage is essential part of economy. In this situattion the Lithuania receive quite small amount of export from poland, although it is a neighbouring country.

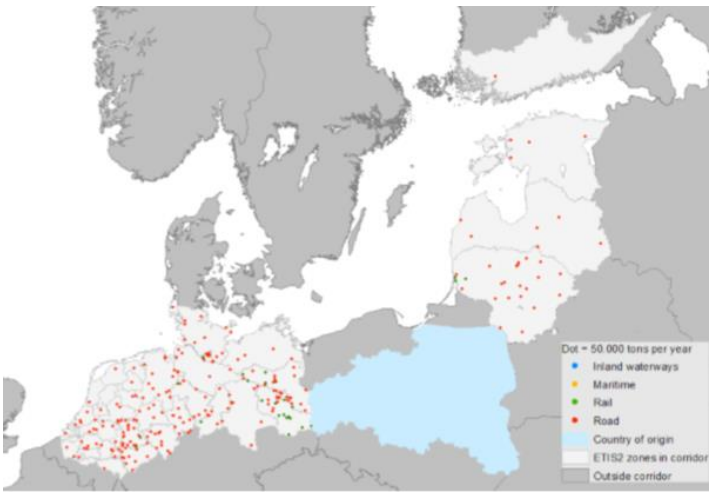

Fig. 10. Polish cargo export in tons per year [9]

When looking into the Fig.11., where the German situation is showed. This countrie‘s companies uses wide range of transport modes. Mainly maritime and road modes of transport refering to Lithuania. The quantity is much higher than from Poland, but it could be increased by railway, and could be much more similar situation to Belgium, Netherlands or Poland, as it can be seen in the Fig.xx where tonnage per year is much higher than comparing to Lithuanian incoming cargo from Germany.

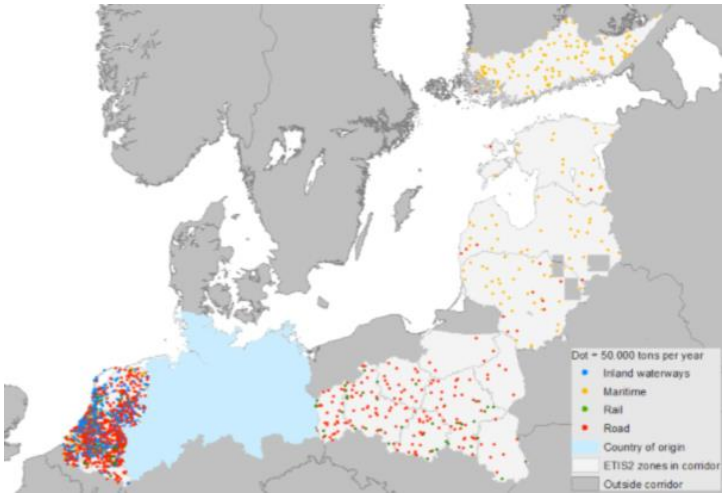

Fig.11. German cargo export in tons per year [9]

Looking futuristically to this project, the estimated freight transport volumes when using road and rail modes, it could look like in the Fig.12. under by 2030.

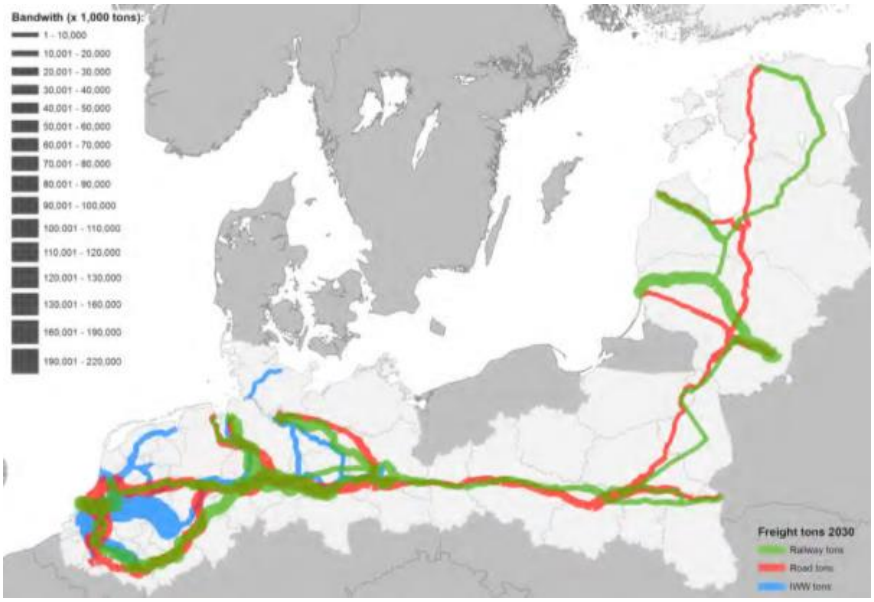

Fig.12. Estimated freight tonnages by section in 2030 [9]

The political component of the fourth rail package, proposed by the European Commission, aims to make direct award of contracts an exception in the future in order to introduce competition on national markets. LV presidency has a present role of infrastructure manager, power of national oversight bodies, etc. Rail transport needs to be further opened to competition. This will lower prices for customers and costs for rail industry, promote innovation and improve quality. The 4th Railway Package4 of European Commission, that is currently being discussed presents a number of important proposals that can improve quality and reduce costs of railway services in Europe and can contribute to creating a true single market for transport. Unfortunately technical pillar is not implemented efficiently. Making better use of smart logistics, more focus on smart logistics and ICT solutions to improve transport efficiency. This includes the wider deployment of intelligent transport systems. Companies must have the flexibility to choose their preferred mode of transport. It is important that a so-called "modal shift" is not forced against the free market because it may lead to significant losses in cost efficiency and put the competitiveness of European companies in danger.

3. RAIL BALTICA GROWTH CORRIDOR (RBGC)

The European political leaders with the Europe 2020 strategy acknowledge that the growth of economic performance and well-being for Europeans are based on education, research and innovation, strive for low-carbon economy and reduction of poverty. The method to reach these goals is to set clear and reachable targets and perform improved economic governance.

In the overall goal for economic growth transport and logistics play a significant role as businesses of infrastructure construction and management, operations, and service. The regulations on emissions, noise and other environmental damages have a direct impact on transport and logistics, which feeds positively the process to- wards green and sustainable European economy. [10]

In the European transport network, the Eastern Baltic Sea Region, consisting of Finland, Estonia, Latvia, Lithuania, Poland and Germany, remains the last corner of low interconnectivity and lack of multimodality. Due to the political and historic reasons of the 1900's – the Soviet influence in Baltic States and Poland and geographical location of Fenno-Scandia in the northern most corner of Europe, the transport networks have not developed as positively as in Europe in general. The Eastern Baltic Sea Region is the last region in Europe that lacks a modern railway connection both within the region and to the continental Europe. Currently, the transport flows in the Baltic States are heavily biased and dominated by road transport in all transport except in transit rail cargo from the Baltic ports to the third countries on east. [1]

Since Estonia, Latvia, Lithuania, and Poland joined the European Union in 2004 the European Commission has run a program to improve their railway network to connect these countries better to the rest of the EU countries. The priority project Nr 27 in the Trans-European Transport Network (TEN-T), Rail Baltica, has consisted of a large number of 1435 and 1520 mm infrastructure reconstruction works in the new Member States and these works are gradually being finalized. Once this improved railway infrastructure is ready, it could be operationalized into moderately fast international train connections, and this has a task to take place by the end of year 2015. (Fig.13) [11]

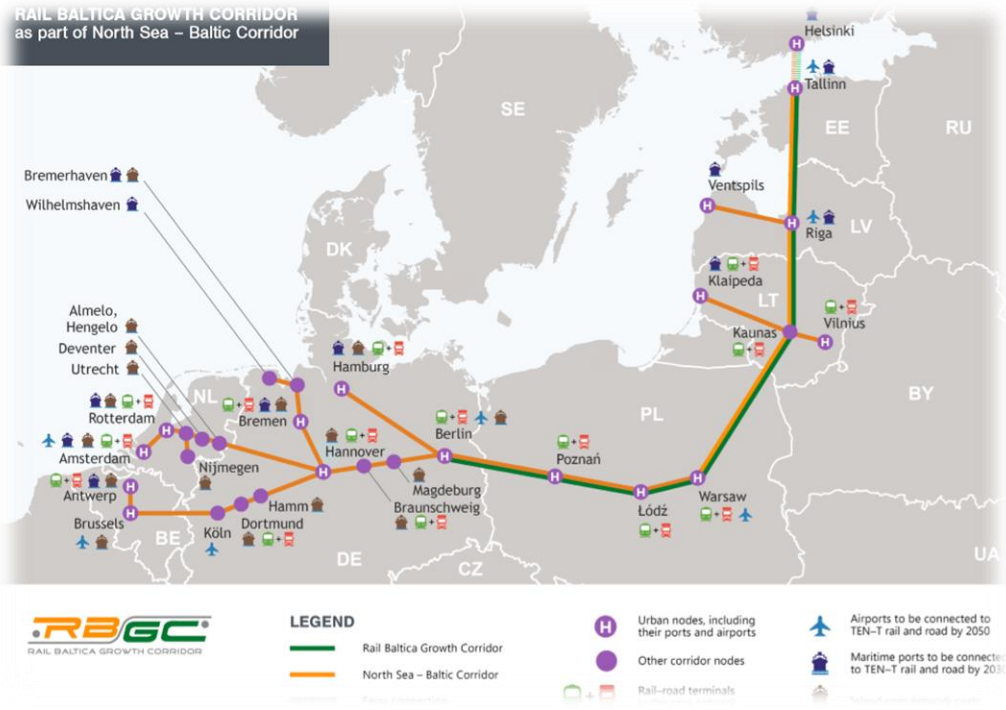

Fig. 13. Rail Baltica growth corridor as part of North Sea – Baltic corridor [1]

The vision of Rail Baltic is empowered by its potential ability to bring the Eastern Baltic Sea Region to the same level of interconnectivity in transport as the other parts of EU have already reached, whereas the Gross domestic products (GDP) are in the growth (Fig. 14). The biggest growth has Latvia, followed by Lithuania.

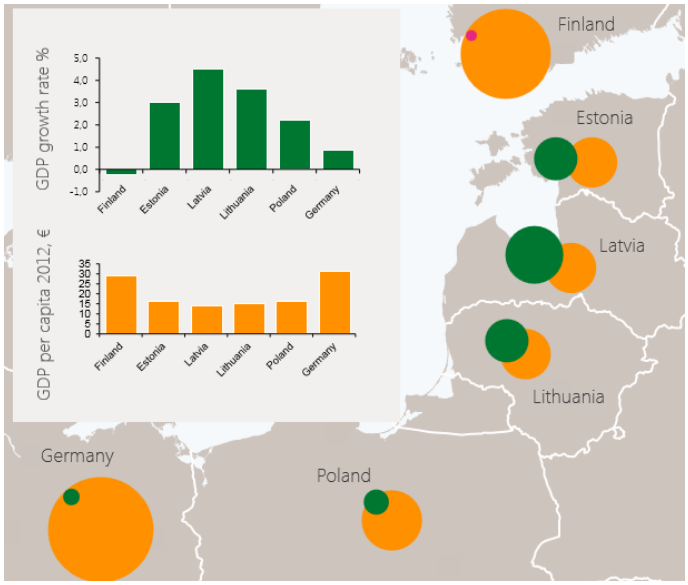

Fig. 14. Countries GDP rates along Rail Baltica growth corridor [1]

The vision arise from purpose which is indicated in this data in Fig.15 and Fig.16. These data shows quality of roads and railroads in the countries of Rail Baltica.

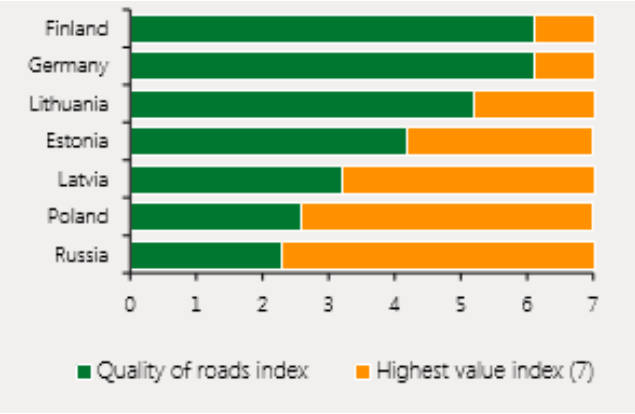

Fig. 15. Quality of road infrastructure [1]

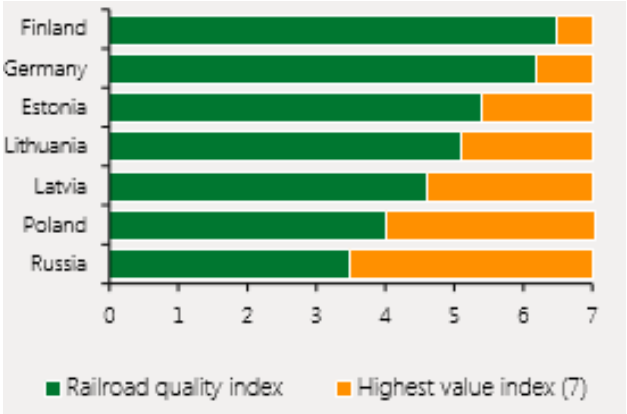

Fig. 16. Quality of railroad infrastructure [1]

The vision shifts a major part of freight transport from road to rail, and this structural shift would mean stronger greening of transport than anywhere in Europe. Besides the greening effect, Rail Baltic when fully operationalized would lower transport costs and make local production far more competitive in the European market. The positive consequences that can be foreseen for Rail Baltic include higher mobility of commuters, visitors and tourists, which means better cohesion, increased foreign investments because of improved accessibility, higher income for transport operators because of overall increased multimodality and green transport capacity.

3.1. Rail Baltica project aims

The Republic of Lithuania takes part in the implementation of the international transport project "Rail Baltica" which is going to connect Warsaw, Kaunas, Riga and Tallinn by a high-quality railway line, and also Helsinki by a railway bridge. "Rail Baltica" route is the priority project No. 27 of trans-European transport network. The institutions of the European Union (EU) refer to the "Rail Baltica" project as a strategic long-term railway project which aims at developing high-quality passenger communication and freight transportation among the Baltic States, Poland and other EU countries. The long-term objective of the international "Rail Baltica" project is to thoroughly realize the principles related to the combination of various means of transport, their interrelation, reliability, safety and security, as well as to create favourable conditions for using the most environment-friendly means of transport. [12]

Taking into consideration the amount of freight and number of cars in the South-North direction that grew recent years, the objectives of the project "Rail Baltica" are the following:

a) to improve the communication among the EU and Baltic countries, consistently expand passenger and freight mobility by creating more favourable conditions for passenger, combined

transport, logistics and intermodal transportations in this TEN-T (Trans-European Transport Network) network axis;

b) to promote economic development and support sustainable international transport for passenger and freight transportation on the regional and national level by giving special attention to more effective activity of railway managers in the international corridors, and compatibility with other means of transport. Actions for this task in different locations are:

c) to rationalise the use of railway infrastructure and improve the quality of transport services by reducing the transportation time, increasing the stream of passengers and freight, as well as the amount of trains. Actions for this task are:

d) to increase the effectiveness in the exploitation of the line after competition the project by using new type rolling stock, having a greater axle load, and European gauge standards for intermodal transportations;

e) to introduce environmental protection measures in the "Rail Baltica" segment;

f) to increase security in construction of different-level crossroads and installation of modern alarm and video surveillance systems;

g) To connect two railway systems (Russian standard wide and European standard gauge) in the intersection of I and IX transport corridors in this way connecting them to Klaipeda, Kaliningrad and Kiev segments.

Actions for infrastructure investments are as mentioned [1]:

a) investigation, visualisation and popularisation of the benefits of the following;

b) Rail Baltica investment and its link to Warsaw;

c) "Y" rail investment and its link to Berlin;

d) Investments in the Helsinki, Tallinn and St. Petersburg triangle;

e) Realisation of spatial planning activities to prepare investments;

f) Realisation of small-scale improvements and organisational measures to improve the quality of transport connections.

Actions for multimodal hubs in different locations are as mentioned [1]:

a) Helsinki: Reorganisation of freight and passenger transport in the urban environment, including regional corridors;

b) Tallinn: Looking for the best location for the Rail Baltic station;

c) Riga: Development perspectives of the future hub and impact on urban development Kaunas & Vilnius: Creating logistics centres and linking them to business locations;

d) Białystok & Ełk with Podlaskie & Warmińsko-Mazurskie: Identifying strategies to capitalise the Rail Baltic investment and to preserve the environment;
e) Warsaw: Benefits for metropolitan transport and incentives for the further integration of railway stations and public transport system;
f) Mazovia: Looking for the best location of logistics centres in North-Eastern Mazovia;
g) Łódź: Creating the New Centre of Łódź;
h) Łódzkie & Poznań: Developing the logistics location;
i) Berlin: Linking the main station and the BER airport to urban transport and Western Poland;
j) Brandenburg: Quality development of logistics & business locations, looking for strategies to shift cargo from road to rail.

Actions for facilitation of cooperation are as mentioned [12]:

a) Establishing a joint cooperation platform for the corridor from Helsinki/Tallinn to Warsaw and Berlin for joint promotion activities, networking and the exchange of experiences;
b) Linking the activities of the platform to the EUSBSR Interregional level;
c) Helsinki-Tallinn cooperation platform;
d) Rail Baltic Joint Venture;
e) Creating a regional alliance for the support of Rail Baltic in North-Eastern Poland, taking care for regular contacts and exchange with Lithuanian partners;
f) Intensifying the work of the "Transport Round Table" of the Oder-Partnership in terms of a) practical improvements and b) support of intergovernmental agreements and negotiations;
g) Extending the EU-Spirit network Local level;
h) Creating local and regional stakeholder partnerships for the development of multimodal hubs, in particular in freight transport.
i) Rail Baltica: Finland has been invited to join the Baltic states as a shareholder in the consortium that will implement the Rail Baltica project, the railway between Tallinn and Warsaw
j) Finland: "We are interested in land communications with the centre of Europe and in greater competition" said the official. Rail Baltica hopes to obtain co-financing under the connecting Europe Facility.

4. EXISTING INTERMODAL PORTS IN THE NORTH SEA-BALTIC CORRIDOR OF TEN-T

Based on analysis mentioned before on European economic and transportation sector, the TEN-T and Rail Baltica development is major leap towards more stable economy of Lithuania, commonwealth and growth of GDP. Nevertheless, it is necessary to know fundamental players in the area, in order to evaluate our own capacity and show measurable opportunities for the business of Lithuania (Baltic region). In this section the streamline is further Baltic region because of the similar current situation. The major players in this North Sea-Baltic corridor have been chosen by the size, quantity and global popularity (Fig.17).

Furthermore, the key hub was chosen Poland because, of current situation analysis, because Poland currently does not have a line with North-East European countries, only with Šeštokai, that gives the quite clear view of what cargo can be expected by the establishment of Rail Baltica as clearly can be seen from mapping (Fig 17). Poland the dominance of road transport is confirmed. There are important freight transport links within the catchment area connecting Poland with all parts of Germany, the Netherlands, Belgium, and Lithuania. Rail destinations are located mainly in the eastern part of Germany.

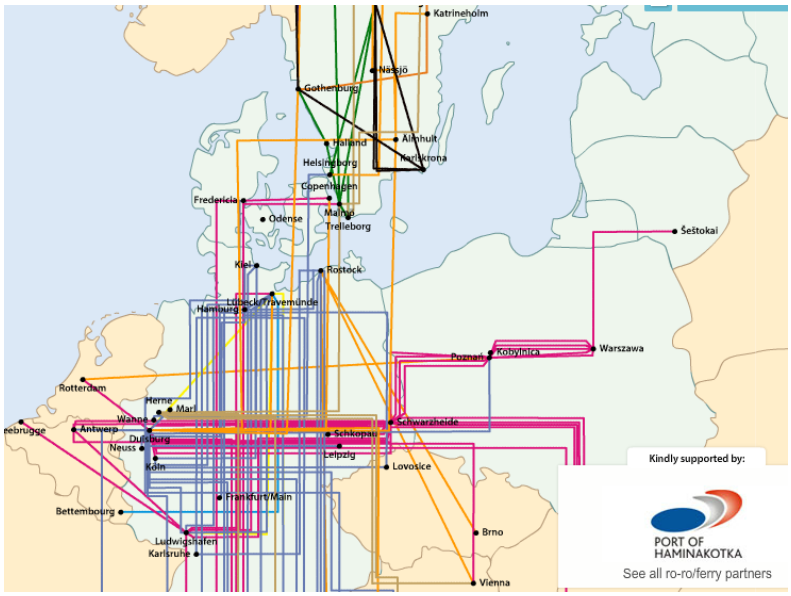

Fig. 17. Major existing railways routes in Europe. [13]

As can be seen from the Fig.18. below, which shows also shows main existing intermodal terminals, the rail transportation has about not more than 10% of usage. The road transportation remains the most popular mode of transport, although as mentioned before, the railway transportation have much

more benefits comparing to other types of modes. But the main issue in this situation for the main ports are the infrastructure and partnership agreements in the railway transportation which is much less than in road transportation.

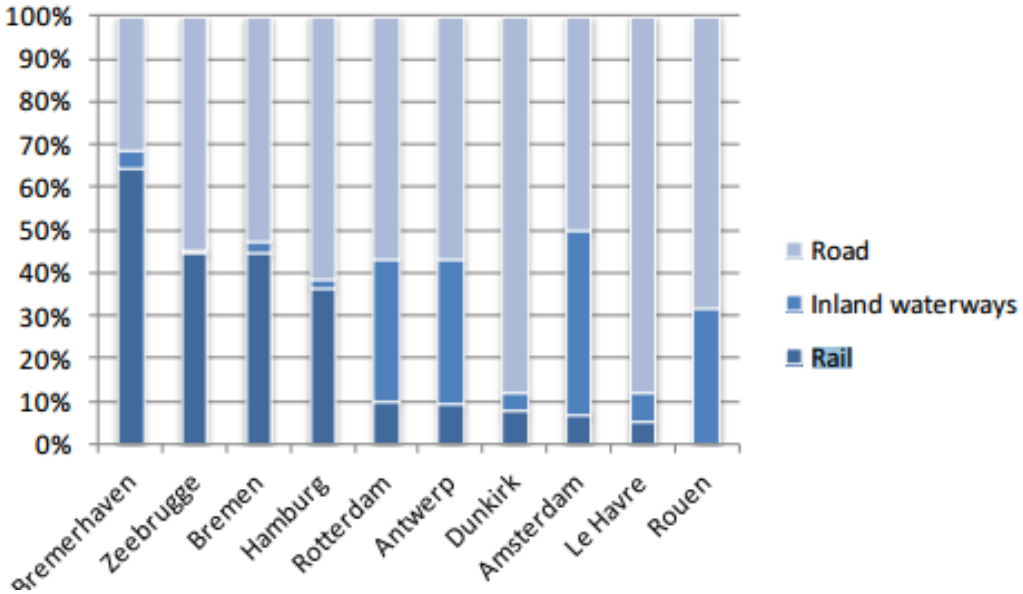

Fig.18. Modal split hinterland traffic of main ports in western part of the TEN-T corridor. [14]

The freight transport between Poland and Germany plays a fairly significant role. According to statistics the major flow from Lithuania goes Russia and Belarus, which together holds 77% of cargo transferred by railway from or through Lithuania. (Fig.19), where as a cargo flow to Poland is 7,4% and to Germany is 0.1% This situation is unfortunate for the Lithuanian business sector, because Germany is one the of the seven strongest economies in the world, although Germany is the second largest export partner for Lithuania with 7.2% of export goods goes to Germany from this Baltic state, which in overall stands in fifth place. This statistics is according to Lithuanian Ministry of Foreign Affairs, data in the year of 2013. [15]

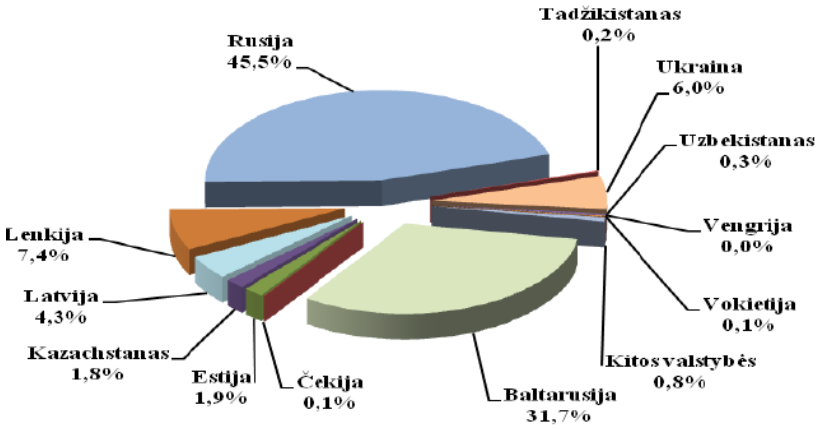

Fig.19. Cargo percentage according to receiving countries though Lithuanian railway in 2013. [15]

4.1. Ports performance in the North Sea-Baltic corridor

Ports, hubs and intermodal terminals are essential part of North Sea-Baltic corridor, enhancing overall performance of logistical processes in the corridor. This section main ports are described in a detail manner.

4.1.1. Port of Antwerp (Belgium)

Port of Antwerp is the one that can easily be called a major international port and not only for maritime transportation, but also as a hub of intermodal transportation. According to statistics of the port in 2013 [xx], the 36% of the cargo goes within the Europe continent. The Fig.20. below shows the cargo flow by rail to other countries within Europe. Current situation shows that partners with Antwerp are only Bialystok, Leipzig and Lubeck, who are in the North Sea-Baltic corridor, with 24 million tonnes of freight per year, 250 laden goods trains per day from 820 destinations in 23 countries and 26 rail fans with 9 combined rail container terminals. This shows low engagement with North-East region of European Union.

Fig.20. Cargo flow from Port of Antwerp [16]

Although as well as the TEN-T project, Port of Antwerp has also intensions to broader the relations with Polish partners. In 2007, rail freight volumes between Belgium and Poland were about 170,000 ton (Belgium to Poland) and 332,000 ton (Poland to Belgium). Currently, from Belgium to Poland, the commodities mainly transported by rail are foodstuffs and manufactured intermediate and final goods (which are transported mainly in intermodal transport units). From Poland to Belgium mainly metal products and - to a lesser extend - also chemicals, manufactured goods and foodstuffs are transported. Concerning the other commodities, the volumes are zero or close to zero. This trade pattern is also visible in the rail transport corridor between the Czech Republic and Belgium.

For future years (Fig.21.), Belgium to Poland volume ranges between 271,000 ton in the low growth scenario for 2020 to 558,000 ton for the year 2030 and 718,000 ton for the year 2040 in the high growth scenario. In the medium scenario, transport volumes grow from 309,000 in 2020 to 516,000 in 2040. Belgium to Czech Republic volumes ranges between 33,000 ton in the low growth scenario for 2020 to approximately 57,000 ton for the year 2030 and 69,000 ton for the year 2040 in the high growth scenario. In the medium scenario transport flows vary from 37,000 in 2020 to about 53,000 in 2040. We would, however, like to point out here that – given the set-up of the model – the predictions for the year 2040 are less reliable and should be treated with care. Vice versa, for both Poland and the Czech Republic, the growth figures from these countries to Belgium are expected to develop much faster, although these remain rather low for the Czech Republic compared to Poland. From Poland to Belgium the volumes ranges between 436,000 ton in the low growth scenario for 2020 to about 700,000 in the middle scenario in 2030 to even more than 1.6 million ton in the high growth scenario for the year 2030; especially the metal products are expected to grow considerably. The predictions for the year 2040 in the high scenario go even further but, as mentioned before, are less reliable.

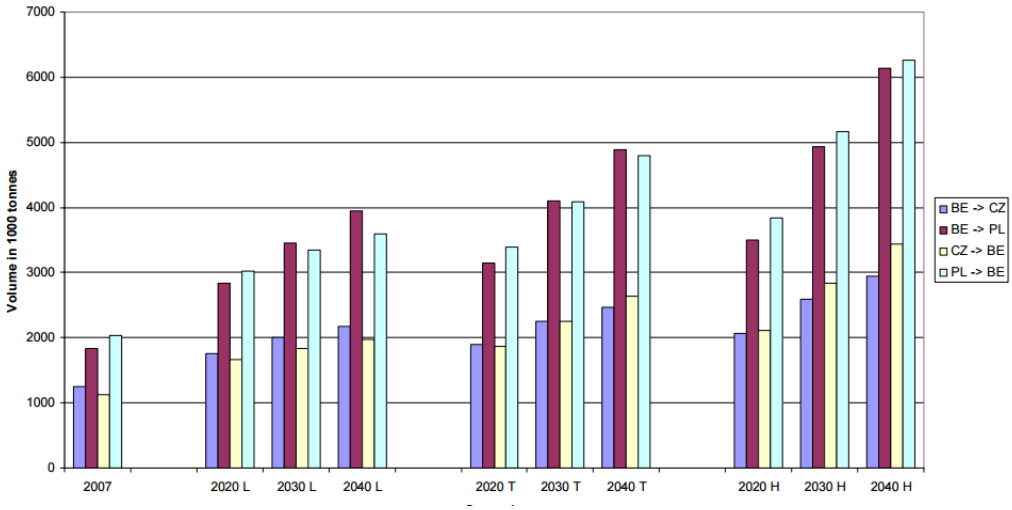

Fig. 21. Total volume between Poland/Czech Republic and Belgium. [17]

Although this can be seen as a huge potential for a bilateral partnership, it still confronts some barriers like within the port the most important bridge Lillobrug needs to be closed for trains to pass and opened for deep-sea vessels to pass. At the moment, priority is often given to the deep-sea vessels and the trains have to wait. This affects the transit time and reliability of trains. The use of One-Stop-Shop (OSS) for applying train paths on international corridors is rather limited. In the case where certain company did use OSS, it did not function properly. Certain private undertaking has tried applying the same train paths via OSS and via individual infrastructure managers. The result was that this undertaking received response from the individual infrastructure managers much quicker than from OSS. The reason that OSS gives slow response is speculated to be lack of good communication between the corridor infrastructure managers. The speed of infrastructure manager to respond to requests from railway undertaking for ad-hoc train paths has an impact on the waiting time of the train service during its operation. Response from ProRail is rather quick; usually within 45 minutes; response speed from Infrabel is also improved; response from DB Netz is relatively slower: 6 – 8 hours. The yearly-based train path application process is considered rather rigid and longsome for freight services. This system forces the operational planning made by the rail operator to be finalized before paths are requested and also to be fixed one year in advance. This is not always convenient and realistic for the operator, given the market dynamics, adjustments to service offerings, frequent fluctuations in volume and economic conditions.

Terminals in Belgium are not open 24/7. The fact that in the weekends terminals are closed and tracks are closed for maintenance is not convenient for the service operation, which also could be an issue for Lithuanian terminals. There is some level of information exchange between Infrabel and the railway undertakings. But there is lack of information exchange down to the rail operators who have direct contact with the end customers who are the stakeholders that want to know at any time the location

of their train/wagons/cargoes, how long it will still take to the final destination, and estimated arrival time. Study exploiting the possibility of creating a rail freight corridor linking Poland and Belgium. [17]

Before the stretch Montzen – Aachen West was fully electrified, all trains (>1100 tons) from Germany needed to be pushed by diesel push-locos from Aachen West till Montzen due to a steep climb. This increases operational costs of the railway undertakings. The condition has been improved since the electrification since January 2009. Big push-locomotives are in most cases not needed anymore with TRAXX multi-system locomotives. Trains can go directly to Aachen without the need to stop at Montzen yard for changing locomotives. Also the rail infrastructure capacity within port of Antwerp is generally saturated. Besides, the length of the rail track at Noordzee Terminal (913) is considered to be not long enough. Trains are split up at this terminal for loading and unloading. And also maximum train length: the maximum length of freight trains is in principle 600 m excluding traction units (In comparison, the maximum length of passenger trains: towed units is 400 m or 16 vehicles).

4.1.2. Port of Amsterdam/Rotterdam (Netherlands)

Rotterdam and Amsterdam can be considered ports that have significance for the whole of Europe. It still remains major players in the continent with 44% incoming and 46.5% outgoing cargo through the port according to data of Port of Amsterdam in 2012. [18] Rotterdam is unmistakably the main hub port in Europe for containers and dry and liquid bulk, whereas Amsterdam is a major hub for petrol, steel and cacao. Most of their hinterlands are located outside the Netherlands, with Rotterdam being the main port for large parts of Germany, as well as a major port for Central Europe and Eastern Europe, Switzerland and northern Italy. Exporting and importing firms in these regions benefit from the efficient operations of both the port of Rotterdam and Amsterdam.

4.1.3. Intermodal terminal of Berlin (Germany)

Berlin is the densest economical centre - and therefore a region with a high potential for transport demand - in the Berlin-Brandenburg region. A second concentration can be found around Frankfurt (Oder), as well on the German and the Polish side of the border.

The most important industries in the Berlin-Brandenburg region consist of the production of data processing machines, electronic and optical products, vendor parts for the automotive industry, machinery, food and fodder, paper and cardboard, rubber and plastic products and wood products. Pharmaceuticals also do have a considerable production value in the region, but are due to their very high value density not so suited for intermodal transport.

Intermodal transport infrastructure with rising turnover figures and available capacities for cargo handling, warehousing and other value-added services. Currently, approx. 7 ha of city-owned commercial premises are being developed to the north of the Intermodal Terminal for the purpose of

developing a rail-based logistics centre to accommodate the establishment of additional rail-based service providers, producers and logistics companies on site.

Rail logistics centre specifications are [19]: directly linked to the north of the Intermodal Terminal; total area approx. is 77,000 m²; individually divisible areas measuring are 1,000 m²; exclusively are for rail-specific services, production and logistics are possible; owner of the premises is City of Frankfurt (Oder); procurement of planning permit by the City under the General Railways Act; development of the area according to investor requirements by the City.

4.1.4. Intermodal terminal of Warsaw (Poland)

Law/legislation n no regulations in the Polish law that would standardise transport organisers' activity, such as: detailed regulations concerning the activity detailed description of responsibility detailed description of general and specific rights n domestic and international intermodal waybill n definition of basic terms n understanding the specificity of intermodal transport

Infrastructure In 2009, Polish tracks were used by approx. 7 thousand trains each day, including slightly more than 100 intermodal trains. In Poland, the share of intermodal transport in overall rail transport has remained on an invariably low 2% level for years, while the European average has been constantly increasing and exceeded the level of ten-odd percent a long time ago.

The condition of more than 25% of the infrastructure is unsatisfactory n Average traction train speed does not exceed 30 km/h n More than 1000 km of railway lines are currently being modernised or rebuilt.

Basic technical parameters [20] (target values):

a) total area: 58 hectares, including intermodal terminal and logistics centre
b) operational area of the intermodal terminal: 250 000 m^2
c) warehouse and production areas
d) annual handling capacity of terminal: over 1 million TEU
e) storage capacity of terminal: 20.000 TEU
f) railway sidings supported by reachstackers and gantry cranes
g) workshop for repair and restoration of containers
h) current connections for reefers and isotherms
i) customs agencies, forwarders

Intermodal Container Yard, dry port, is a modern facility which allows efficient cargo handling operations and optimization of supply chain. ICY will be located in Zajączkowo Tczewskie (Pomorskie Province), as a background for Tricity's (Gdansk, Gdynia, Sopot) marine terminals. Investment will improve transport accessibility of Pomorskie Province and allow Gdansk and Gdynia to be more competitive ports on Baltic Sea. [20]

4.2. Schemes and structures used in the North sea-Baltic corridor intermodal terminals

There are various schemes and structures that can be used for the transmitting cargo from mode of transport to the other. According to Baltic Maritime Centre's analysis shown below (Fig. 22), generally can be said that the crane is at utmost beneficial type of machinery for transmission. Although not in every case, as well as transport modes, various transmission modes used synergistically can benefit the terminal overall performance. This chapter shows, how different schemes and modals can be used in the terminals, what are their benefits and drawbacks, as well, what good practices can be adjusted to the Kaunas public logistics centre.

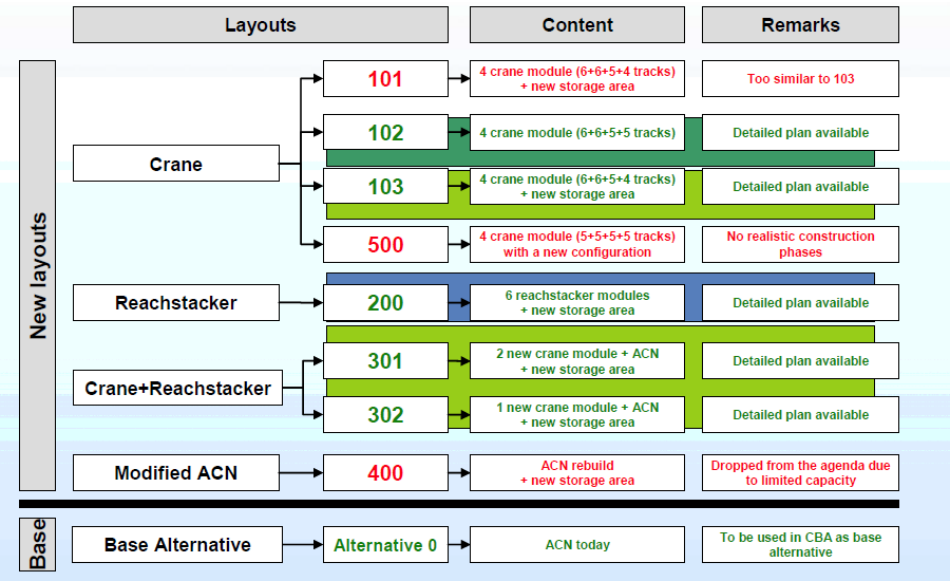

Fig.22. Baltic maritime centre. Evaluation of different layouts for Oslo intermodal terminal [21]

4.2.1. Terminal structure used in Port of Antwerp (Belgium)

The Fig.23. shows the Antwerp terminal scheme, how the cargo is transported from rail to road transport. The benefit of this scheme is that the terminal allows not only to transmit the cargo effectively directly to truck but also allows to storage the cargo, if the trucks are not ready for the receiving cargo. In this particular terminal, cargo for companies like BASF and HUPAC are provided.

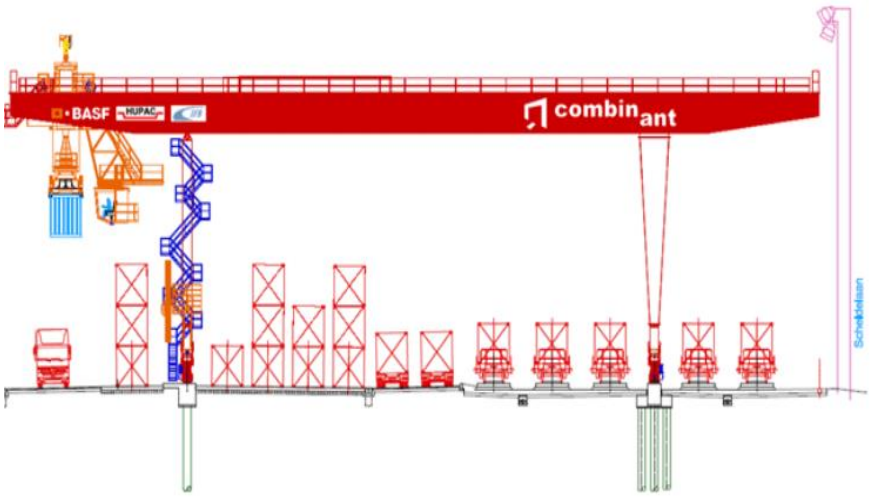

Fig. 23. The Antwerp intermodal terminal transmission scheme of cargo between rail and road modes [22]

Other type of transmitting cargo is using crane cranes like shown in the Fig.24. This approves the flexibility of the service operator, either to storage or transmit cargo to trucks, manoeuvring in the field is much easier and much less usage of land and much less terminal construction, although it requires more human interactions, higher fuel consumption and more frequent maintenance. This lead to higher expenditures for the companies periodically comparing to initial investment in stable terminal like the one before in Fig.23.

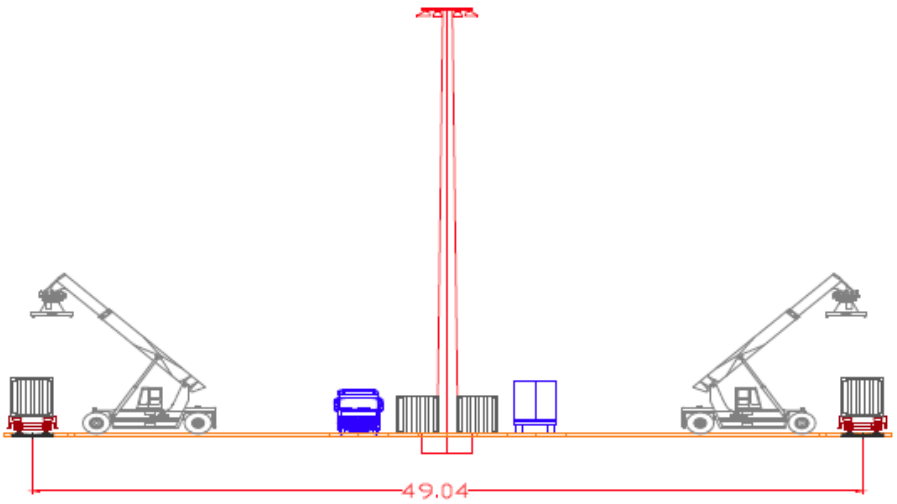

Fig.24. Crane used in Port of Antwerp. [22]

4.2.2. Terminal structure used in Berlin (Germany)

In this case, Berlin intermodal logistics terminal has advanced structure, which is showed in Fig.25. and Fig.26., like transition, storage of cargos and other important functions that are relevant for smooth operations management and accomplishment. The scheme is quite similar to Kaunas intermodal

terminal, but has merit in the cargo storage area, which is more developed and planned according to incoming cargo flow and absent of other modes of transport to move the cargo from railway. Other major benefit of this kind of scheme is the infrastructure, which allows to manage the incoming cargo flow more efficiently because of the reservoir track that is installed, allowing operation managers to divide the trains by priority and availability of the receiving trucks. If the truck for particular cargo is ready to receive cargo, it goes by one track, if not goes to reservoir track, where if the cargo is storage in the facilities[1]. It saves a lot of time and avoids unnecessary delays in the terminal, which lead to reducing indirect costs.

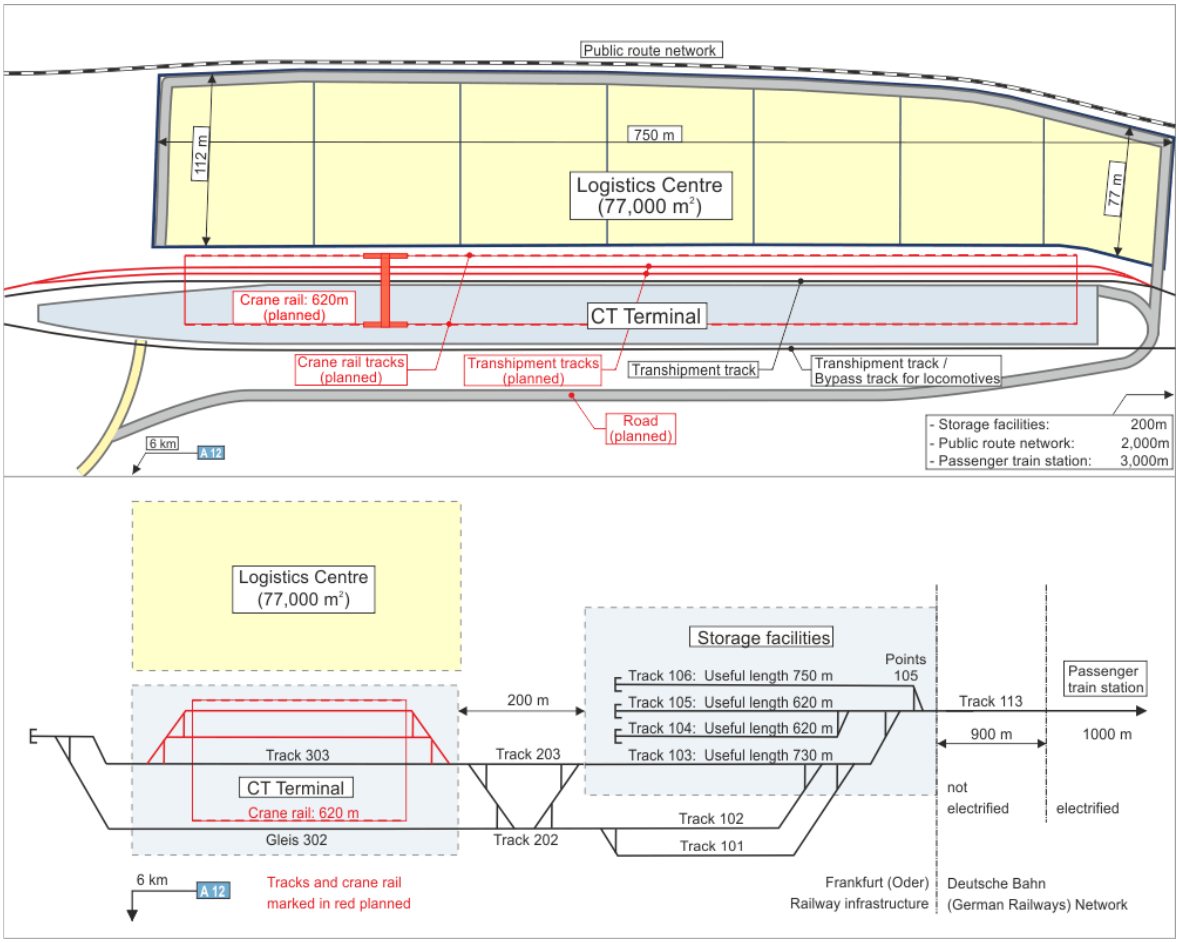

Fig. 25. Berlin intermodal logistics terminal scheme [23]

[1] The research part of this project describes the issue in greater detail

Fig.26. Berlin intermodal logistics terminal visualization [23]

4.2.3. Public logistics Centre (PLC) in Kaunas

Kaunas is located in the junction of two important freight corridors. On the one hand, the vicinity of Klaipeda and Kaliningrad ports and on the other hand the intersecting rail lines, which with the construction of Rail Baltica, will use two different gauges, may further increase the demand for inter-modal transport facilities.

The distances from Kaunas to Port of Klaipeda, Port of Kaliningrad and Vilnius are 220 km, 250km and 100km respectively. Kaunas public logistic centre will consist of a logistic park (an area for warehousing, distribution, value-added activities) and Kaunas inter-modal terminal. The Kaunas inter-modal terminal is intended to be an intermediary that provides a public service combining access to transport infrastructure, freight handling facilities and markets for goods. Construction completion is expected in July 2014 – The logistic park is still in a feasibility assessment stage. [24]

High quality transport connections to Warsaw, one of the fastest growing major cities in Europe, can potentially boost the economy of Białystok. The construction of Rail Baltic reduces the train travel times to a level facilitating commuting between the two cities. A better rail connection can also enhance the distribution channels for the food processing industries to the wider European market. Kaunas and Białystok are both cities where food processing is the largest industry resulting in transportation needs to markets elsewhere. This means that the two cities are also originations of freight highlighting a potential area for further collaboration. Road infrastructure in Poland is in poor condition in comparison to other RBGC countries – only Russia has lower index figures. At the same time road transports and number of vehicle transports are growing rapidly, which raises the question of sustain- ability of the road infrastructure in Poland in years to come. Rail Baltic would provide more efficient use of railroad capacity both in terms of passenger and freight transport. This could ease the excessive burden of road infrastructure in Poland. Via Baltic development is faced by environmental constraints in North-East

Poland's important nature conservation areas. The improvement of the existing rail line from Warsaw to Białystok and Kaunas can potentially have a significant impact on the economies of the two cities and further. It is of vital importance to work together with the other RBGC partners to understand how rail freight can be increased on the existing line. [12]

Kaunas is an important transport location as routes from the Klaipeda Port, Kaliningrad (Russia), Latvia, Poland, Russia and Belarus intersect in the city. This makes it also an ideal location for a logistics hub. The City of Kaunas is seeking to capitalize on the logistic hub by investing in intermodal terminal to facilitate the interchange of different modes of transport. It will be important for the other cities to understand how Kaunas has taken an advantage from the Free Economic Zone and intermodal logistic services in developing its logistics industry.

The construction of Rail Baltic would create a platform for commuting duopolies to be formed between Riga and Tallinn as well as Riga and Kaunas/Vilnius. Such duopolies would increase the size of the economic area around each of the main cities enhancing their economic growth and job creation potential.

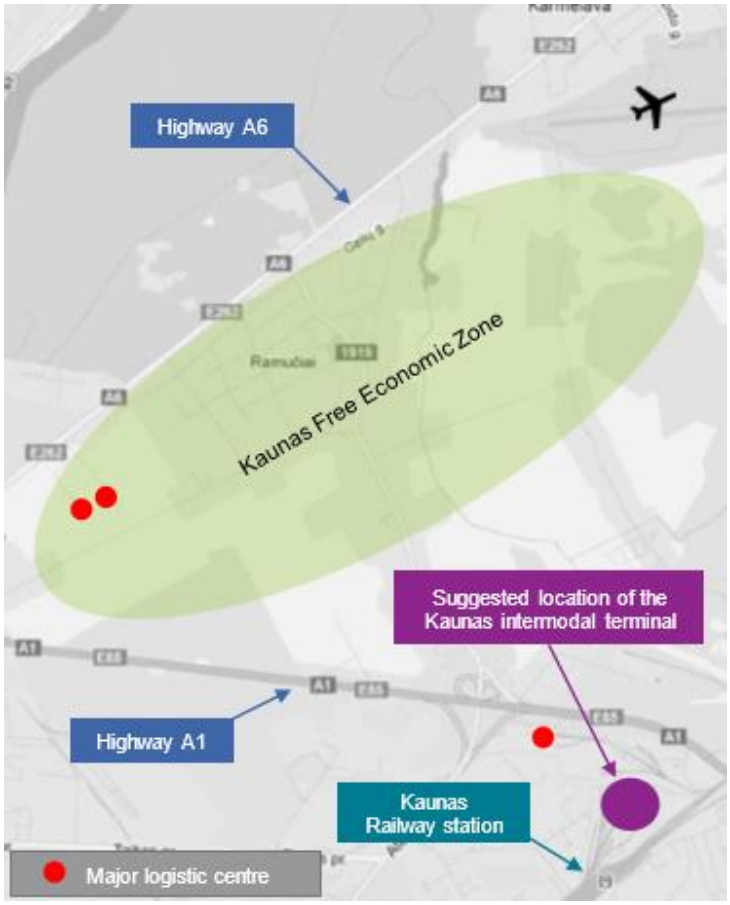

Fig. 27. Kaunas inter-modal terminal [12]

Kaunas public logistics centre (Fig. 27) direct beneficiaries - Kaunas public logistics centre service users. Estimated centre's infrastructure impact direct beneficiaries is for freight transportation time and costs. The establishment of Kaunas centre will create new freight routes using multiple modes and the

increased movement of freight routes and the number of frequency. It will save the railway infrastructure users' time and transportation costs. Logistics activities will be brought out of the city and development concentrated in the centre's area, where all the necessary freight services will be provided. Project's impact for the society:

- Road traffic accidents, air pollution and noise exposure reduction;
- Additional jobs and value-added creation;
- Project income and tax revenues;
- Direct investment.

Given the fact that PLC (Fig.28) will allow to increase the volume of traffic rail transport system in Lithuania and even more will help to ensure European transport policy principles and objectives, e.g. environmentally friendly and economical use of transport, traffic safety, reduced pollution, reduced road congestion by heavy duty vehicles, the development of international transport corridors. The terminal will not only change the track point, but at the same time and this will serve Kaunas region at present and in Kaunas for new import and export companies. The newly installed access roads, reconstructed intersections and city streets, will be able to be used by both PLC users and local residents.

Fig. 28. Visualization of Kaunas PLC and free economy zone [24]

According to preliminary calculations, the overall value of the investment PLC foundation will seek 241.9 million litas. These investments will form Palemonas intermodal terminal, PLC installation at Karmėlavos Territory, street modernization works (Ateities pl. different levels around and the modernization in the streets of Palemonas intermodal terminal facilities) costs.

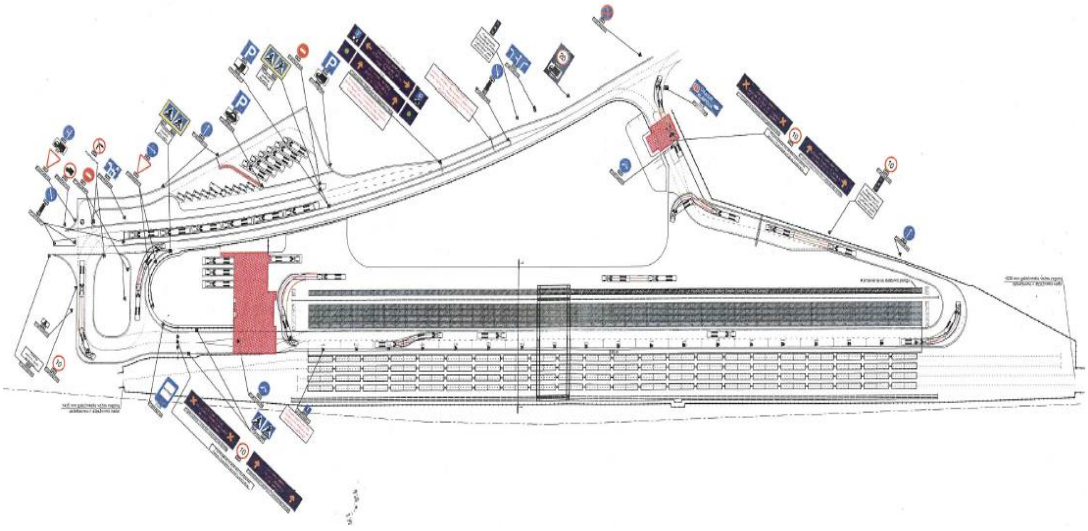

Fig.29. Kaunas Public logistics centre overall scheme [24]

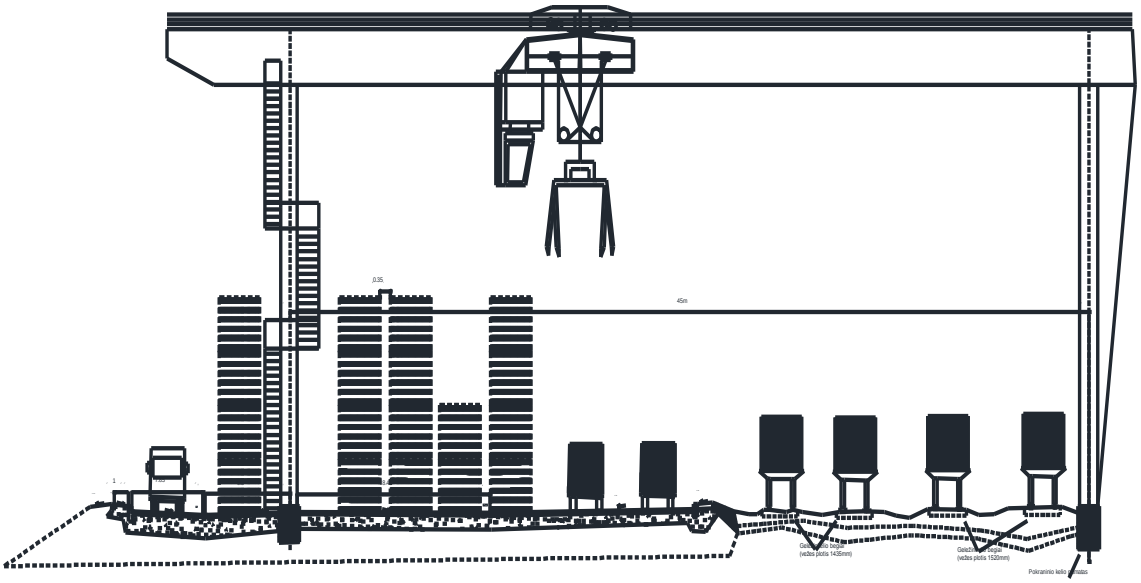

Fig. 30. The Kaunas intermodal terminal's scheme

When comparing the different ports, hubs and terminal in the corridor, the Kaunas intermodal terminal (Fig.30) is one of smaller scale terminals, but geographically, logistically and economically plays a crucial role in the whole network, although it could enhanced and improved in order to service a higher number of incoming cargo.

5. RESEARCH PART

The previous analysis shows how the region, the corridor (North sea-Baltic) and whole TEN-T would win in the situation (see section xx), when Rail Baltica corridor starts to act continuously. But looking from the perspective of Lithuanian business sector and especially operators, the essence is not only in macroeconomic level.

It is also important to know and analyse the timing of the operations and how it would affect economically, to look strategically at the flowchart of processes and benefit from it. Because time of operations costs for the whole supply chain and longer times' directly affects competiveness in the sector. The question for the business, if it is better to stay with maritime - road transportation or use the new intermodal way, in this case from maritime - rail - road (Lithuanian case).

5.1. Transportation time chart of cargo (Honk Kong – Kaunas)

For every company the time and cost ratio is the main essence for the growth and development of the company as well as satisfying their clients. The cost of the product not only includes production and material expenses but also transportation or cargo are part of product as well. The more effective and fluent transportation is the more company can be effective in their own work. The Fig.31. and Fig. 32. shows how the product is transported and how much time does it take. It pictures the product or material journey from the manufacturer in Honk Kong to the buyer in Kaunas (Lithuania) in a simplified scheme (fig.31). According to statistics of 2012 by Lithuanian Statistics department [xx], China was 13th biggest import partner with Lithuania, there was a 1845,5 million litas and 2,1 percent of all product import into Lithuania. The main products are electrical machinery and equipment, mineral fuels, mechanical appliances and raw material like ores, slag and ashes. Assume that in this case we use mechanical component like screw or nut, which are used for assembling machineries in the Lithuanian company in Kaunas. Usage of such type of product is a case study. Other types of goods have different specifications and features like raw materials, where tanks are used and different regulatory framework should be followed.

In this time chart (Fig.31.) the transportation time, movement time within a port or terminal, obligatory, juridical or optional delays are also included. As a regular flowchart, this time chart starts from the cargo transportation by road to Port of Honk Kong (2), which usually takes 1-3 days. Further, the cargo should be storage within the port to wait till all the cargos are ready to be containerized (3). The next step (4) is the cargo storage to containers. Then possible delay/waiting for the container ship to be ready to receive containers (5) and then the next step would be containers are moved to ship (6). Going further the delay/waiting for departure of the ship (7) as well for possible legal, obligatory or other related issues and then actual shipping the containers through the oceans (8) which could take up

to 30 days (average time calculated). When the ship reaches the Port of Antwerp, it could take 1-2 days for mooring and etc. (9). Further, containers are moved within the Port of Antwerp, these are usual logistical processes (10). The next step of the timing chart shows (11) the possible delay/waiting in the port for infrastructure to be ready for spreading the cargo through different modes of transport (12). The cargo, which reaches the Port of Antwerp spread among all countries of European Union, mainly to Mediterranean and North Sea-Baltic corridors. For the next step it is assumed cargo related with Kaunas, which would be ready for the transportation by railway waiting to travel (13). Cargo transportation by railway through the whole North Sea-Baltic corridor could take around 4-5 days (14), including optional stops, crossing borders and dealing with customs. When the cargo arrives at the Kaunas Intermodal terminal, it should take no more than 1 day to move the cargo from railway to road transportation or storage place within the terminal (15). There could be a possible delay if the trucks are not ready to receive cargo taking 1-2 days (16). When it is ready, the cargo is taken by road to a customer (17), who ordered the goods from Honk Kong. According to the time chart, the timing of the cargo movement through the whole supply chain could take around **45,5-57,5** days of logistical processes.

Note: the time was taken according to statistics and data of Europe-China trade project (II) [25], annual report of Port of Antwerp in 2013 [26] and European Commission report on TEN-T [27].

No.	Step in the supply chain	Time	Additional information
1	Start at HONK KONG manufacturer		
2	**Cargo transportation by road to port of Honk Kong**	**1-3 days**	
3	Delay/waiting	1 day	For transportation cargo within the Port of Honk Kong
4	Cargo movement to the containers in the port	1 day	Logistical processes within the port
5	Delay/waiting	0,5 day	For the containers transportation to ship
6	Container cargo movement to ship	1 days	Logistical processes within the port
7	Delay/waiting	1-3 days	For the ship departure
8	**Ship transportation to Port of Antwerp**	**~30 days**	**Shipping through oceans to Port of Antwerp**
9	Delay/waiting	1-2 days	Ship mooring in the Port and waiting for the transmitting of containers in the Port
10	Containers movement in the Port of Antwerp	1-2 days	Logistical processes within the port
11	Delay/waiting	1 day	Waiting in the Port
12	Cargo from containers spreading through modes of transport	1 day	Logistical processes within the port
13	Delay/waiting	1-3 days	Waiting for the train movement
14	**Cargo transportation by railway through North Sea-Baltic corridor**	**4-5 days**	
15	Cargo movement in the Kaunas Intermodal terminal	1 day	
16	Delay/waiting	1-2 days	Optional delay if the truck is not ready
17	**Cargo transportation by road to company/manufacturer**	**1 day**	
18	End of the process in Kaunas		
TOTAL		**47,5-57,5 days**	

Fig.31. Time calculation of transportation (Honk Kong – Kaunas)

If assuming the whole supply chain's time for logistical processes takes 47,5-57,5 days then all the steps could be categorized into 3 areas. The 1st category is the actual transportation by different modes of transport takes around 36-39 days, then the 2nd category is movement within the logistical hubs (ports and terminals) that could take around 5-6 days and also the 3rd category - the delays could take around 6,5-12,5 days. (Fig. 32).

No.	Type of process	Time
1	Transportation	36-39 days
2	Movement within a hub	5-6 days
3	Delay/waiting	6,5-12,5 days
TOTAL		**47,5-57,5 days**

Fig. 32. Time calculation of transportation divided into 3 categories

Taking into consideration the Fig. xx and Fig. xx, the Transportation takes a 77 % of the whole time of supply chain, where Movement in the hub takes 10 % and the delays/waiting could take around 13 % of the timing (Fig.33). But it is possible that it could take longer time than 13 %.

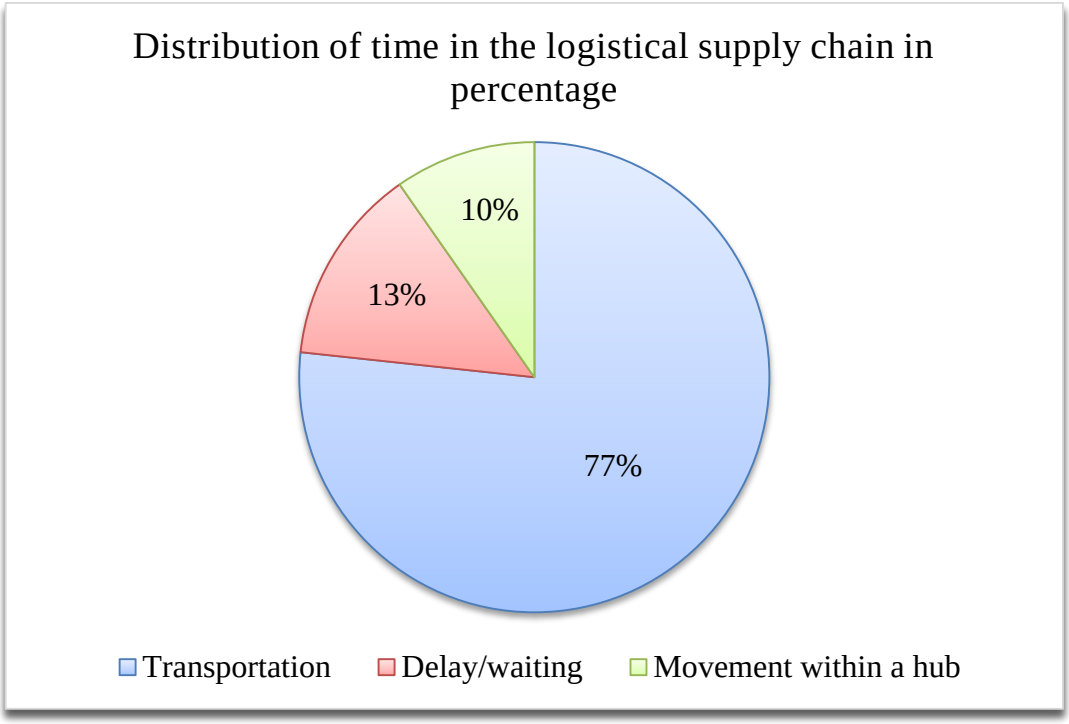

Fig. 33. Distribution of time in the logistical supply chain in percentage

The Europe – China connectivity is currently quite difficult and is time consuming. There is a possibility to lower these consumption using the „Sun Train“ which currently an agreement in co-operation with Lithuania, Belorussia, Russia, Kazakhstan, and China railway authorities start-up of new “block-train” shuttle service between Eastern Europe and Central Asia [28]. “Sun Train” makes use of a combination of 40’, 60‘, and 80’ railway platforms, offering clients complete flexibility for all their transport needs. This train could lower the time consumption from 47,5 days, which were calculated, to up 15 days. Also the Lithuanian terminals would become the essential part of the corridor from China to Europe, because geographically it is the most convenient EU member country for Central Asia. There are opportunities for cargo transportation by routes from Kazakhstan to the Baltic Sea and from China to Belgium through Šeštokai. From Kazakhstan through Russia and Belarus to Lithuania within 8 days. From China through Kazakhstan, Russia, Belarus, Poland, Germany, the Netherlands to Belgium within 18 days. Rendering distribution and warehousing services in Lithuania, Belgium, and China. Synergy with the northernmost ice-free port of Klaipeda in the Baltic Sea ensures cargo traffic all year round. [29]

5.2. Flowchart in Kaunas Intermodal Terminal

The figures below shows the cargo flow scheme (Fig.34) in the Kaunas terminal, and the efficiency in it when the cargo is coming to the terminal by railway. It shows to possibilities, how the cargo could be managed within the intermodal terminal.

The flowchart starts from the incoming cargo by railway to the intermodal terminal. Going down there are two possibilities, how the cargo could be managed. The REAL stands for present situation of the intermodal terminal supply chain and the OPTIONAL stands for the suggested supply chain.

If the choice is to take REAL situation, than the flowchart leads to using the crane to transfer the cargo by crane. The following step is choosing whether there are trucks ready to receive cargo or not. If the answer is positive, the trucks receive the cargo and then truck departs the terminal and goes to traffic. If the answer is negative, the cargo is transferred to storage place in the terminal, when it waits for the trucks to be ready to receive cargo. During whole process, the terminal (mainly the crane) can service only one train at the time.

If the choice is to take OPTIONAL situation, than the flowchart leads to decision, if the trucks are ready to receive cargo. If the answer is positive, then the cargo is transferred to trucks, they receive it and depart the terminal. If the answer is negative, then the train goes to reservoir route and the cargo is transferred to storage place, where it remains until the trucks are ready to receive cargo. The OPTIONAL version requires a bigger infrastructure at the terminal and initial investment in it, but saves time, because the terminal could service more than one train per time and lowers the amount of delays in the chain.

The whole scheme lowers from 4 processes in line till 3 processes in line, which also lowers the time consumption.

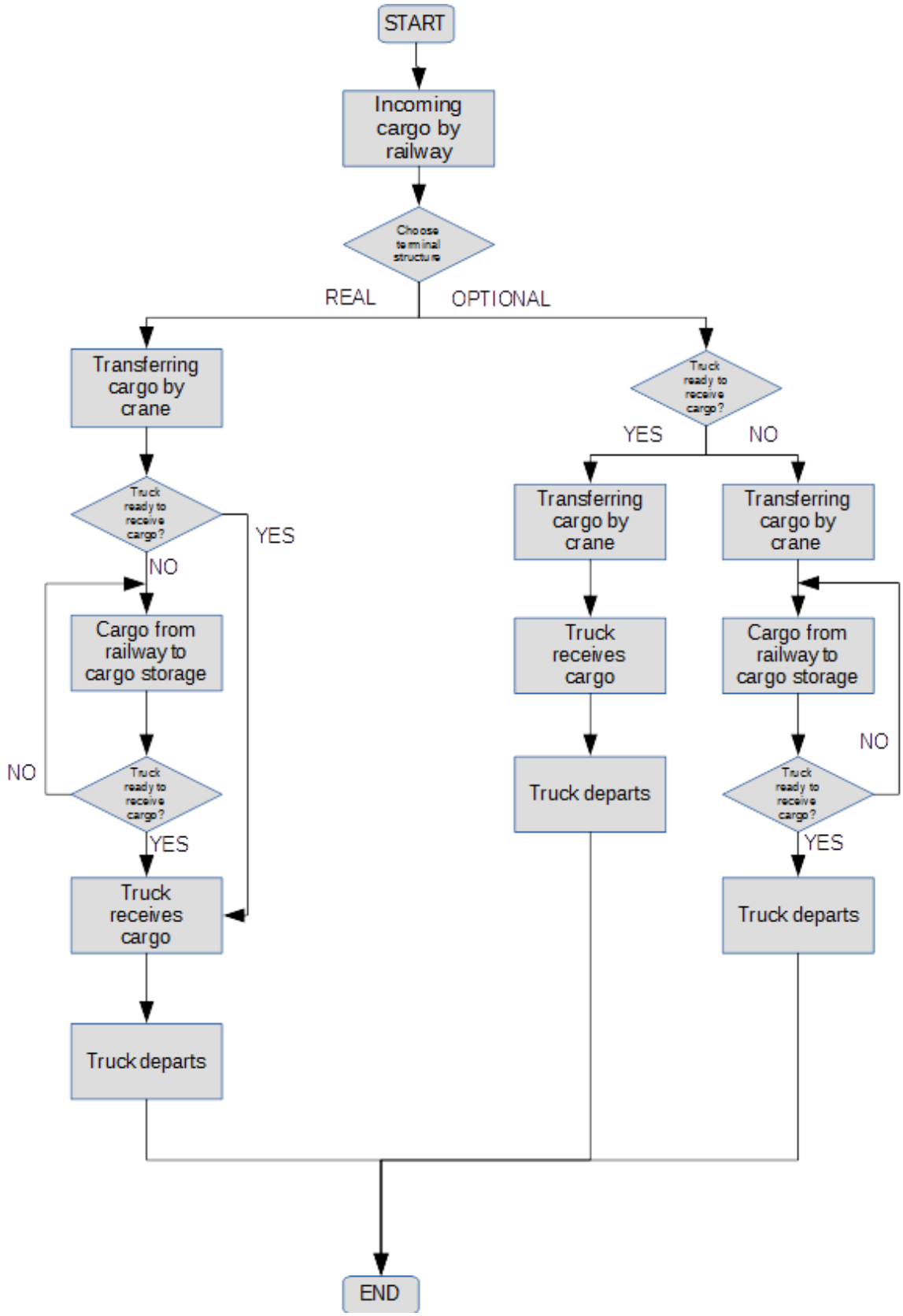

Fig.34. Cargo transferring flowchart from rail to road modes of transportation in the intermodal terminal

CONCLUSIONS

After fulfilling all the established aims which were set in order to implement the final Master's project the following conclusions are listed as follows.

- Rail Baltica railway in a multimodal transport corridor constitutes an important economic growth potential to the cities and regions. Rail Baltic as the largest transnational transport project of its time in the region has potential to bring internal cohesion to the Eastern Baltic Sea Region and make it an integral part of the European green transport network. The analysis of the project refers to that all researches and analysis defines the added value to national and international potential.
- Huge investments are needed to complete important trans-European transport networks and maintain the existing infrastructure. Yet, infrastructure is unequally developed in the eastern and western parts of the EU. Investment in infrastructure should be increased, for instance via the Connecting Europe Facility, and take a more prominent place in policy-making, ensuring high level public commitment in infrastructure investment. Market-based approach shall remain the cornerstone of transport and energy infrastructure development. Furthermore, EU funds should be targeted at projects with significant European added value, such as cross-border projects.
- Transport modes compete with each other, but should also be seen as complementary. To improve interoperability, clear and transparent requirements are needed, harmonised as much as possible at European level and implemented similarly across the EU. For the use of longer and heavier trucks in road transport and in view of the new TEN-T standards (aiming at 750 metres for freight trains) for the core network, rail infrastructure managers and rail operators should be encouraged to sort out where improvements are most worthwhile and can be achieved at reasonable costs in the years to come. The nodes of the corridor, big cities, play a double role in the corridor. Regions along the corridor may have partly same functions but their focus is broader regional development, including interests of smaller cities along the corridor and integration to domestic and external transport routes (Lithuanian case). These access links and nodes are a vital part in the core corridor itself. That is where the Kaunas plays a major part in the project as a hub city.
- The Kaunas Intermodal terminal should have a reservoir rail route, in order to increase efficiency, productivity and overall performance of the terminal related to Kaunas Public logistics centre's activities. This would lead to lower the indirect costs of the logistic processes.

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