



North Sea Baltic Connector of Regions
Interreg Baltic Sea Region programme 2014–2020

Nodal points benchmarking analysis within the NSB Corridor

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1 Introduction

Modern global economy is characterised by increasing rivalry for sales markets and new customers, with companies continuously striving to find ways to achieve competitive advantage. The advantage may be achieved by such means as shortening delivery time of goods from a manufacturer to a customer or by improving the efficiency of the turnover of goods. Smooth transport of goods is gaining on importance. Reloading points, where goods are transferred to a different means of transport, e.g. from sea to road transport or vice versa, are, however, a bottleneck in the trade of goods. Stopping time of ships, trains or transported goods to a large degree depends on the reloading technology applied.

One of such reloading points are container terminals, which represent a significant element of national economies. On a national level, they allow companies to carry out international exchange of goods with overseas countries. They are also an important factor influencing economic security. On a regional level, on the other hand, they are a significant factor determining the growth of cities (port cities in particular). It is, therefore, in every country's interest to have container terminals. However, for transport to a final destination to be reasonable from an economic perspective, they must operate smoothly and be competitive. Particularly as the quantity of goods transported in container units is growing year by year, and is estimated at approx. 25% of global volume.¹

1 Background and structure

The comparative analysis of container terminals within the NSB CoRe corridor was based on predefined indicators and criteria for assessing the infrastructure of reloading nodes prepared as part of executing Activity 2.2.3. "Summary of assessment indicators and criteria for nodal point infrastructure". The present report has also been prepared on the basis of issues specified in the "AS IS ANALYSIS" (ref. no. NSB CoRe, WP 2, Activity 2.2.1) and "Best Practices of Intermodal Nodal Points" (ref. no. NSB CoRe, WP 2, Activity 2.2.2) reports.

Due to the limited possibility to obtain data for the analysis (only one terminal agreed to provide access to detailed data), the terminals were compared on the basis of publicly available data published on the Internet, which prevented the authors from analysing certain indicators. Obtained results were presented and described in two sections which correspond to a division into qualitative and quantitative indicators, as instructed in Activity 2.2.3.

2 Review of analysed terminals

The comparative analysis included 24 container terminals located in 6 Baltic states that belong to the North Sea Baltic Corridor: Germany, Poland, Lithuania, Latvia, Estonia and Finland. The terminals have been marked red on the map.

¹ Jones Lang LaSalle. (2013). Polish container ports: new directions for the development of the logistics market. Warsaw: Jones Lang LaSalle

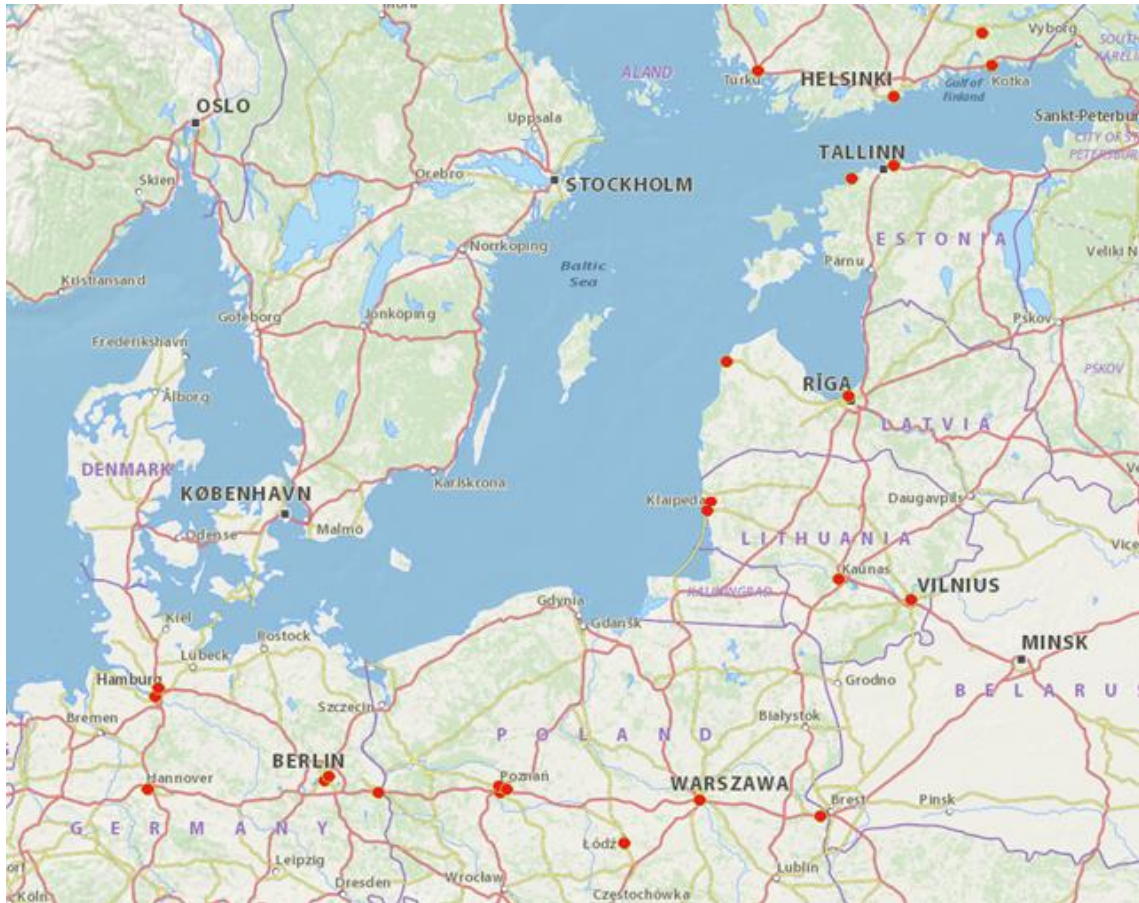


Figure 1 Location of analysed container terminals on a map

Source: ILIM's study based on a Viamichelin map

The selection of terminals for analysis was based on the "Nodal point infrastructure analysis as is analysis report", Activity 2.2.1, and on remarks of NSB CoRe project partners. There are six terminals in Germany, six in Poland, four in Finland, four in Lithuania, two in Latvia and two in Estonia. The following table presents a list of locations with names of specific container terminals. The first column provides the country in which the terminal is located. The remaining columns include information such as the city, the name of the terminal and whether the terminal is a part of the North Sea Baltic transport corridor.

Table 1 List of analysed container terminals

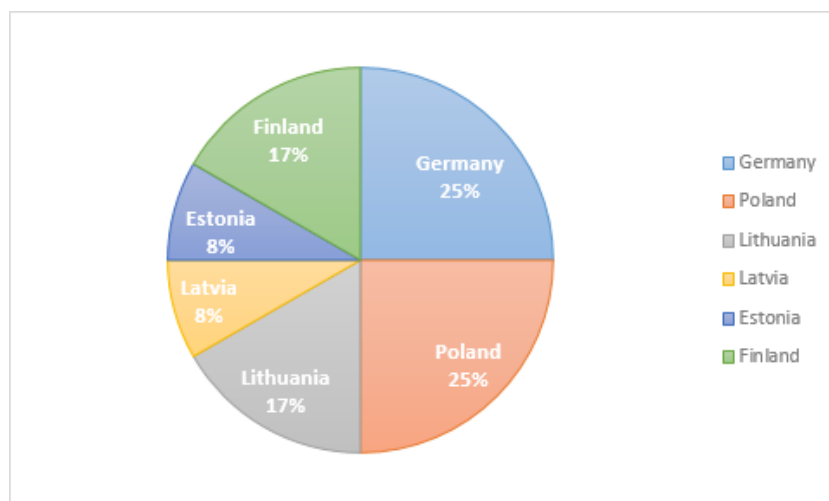
Country	Location	Name	NSB CoRe
Germany	Berlin Großbeeren	GVZ Berlin Großbeeren	yes/no
	Berlin	Berlin Westhafen	yes
	Frankfurt/ Oder	Terminal Frankfurt (Oder)	yes
	Hannover	Hannover CTH - Nordhafen	yes
	Hamburg	DUSS-Terminal Hamburg-Billwerder	yes

<i>Poland</i>	Hamburg	Hamburg Container Terminal Altenwerder CTA	yes
	Gdańki	POLZUG INTERMODAL POLSKA Sp. z o.o. HUB Terminal Poznań	yes
	Swarzędz	CLIP Terminal	yes
	Małaszewicze	Małaszewicze Logistics Center	yes
	Poznań	Franowo Container Terminal	yes
	Warsaw	Terminal Kontenerowy Warszawa	yes
	Łódź	Spedcont Łódź	yes
<i>Lithuania</i>	Kaunas	Kaunas Intermodal Terminal	yes
	Vilnius	Vilnius Intermodal Terminal	yes
	Klaipeda	Klaipeda Container Terminal (KKT)	yes
	Klaipeda	Klaipedos Smelte (MSC)	yes
<i>Latvia</i>	Ventspils	Noord Natie Ventspils Terminals	yes
	Riga	SIA Baltic Container Terminal	yes
<i>Estonia</i>	Harju / Tallin	Muuga Container Terminal	yes
	Paldiski	Paldiski South Harbour - Esteve Terminal AS	no
<i>Finland</i>	Kouvola	Cargo East Terminal (CET) Kouvola	no
	Helsinki	Vuosaari Container Terminal	yes
	Kotka	Mussalo Container Terminal-Kotka	no
	Turku	Turku Container Terminal	no

Source: ILiM's study

Data concerning the country in which terminals are located has been grouped and presented in a graph showing the percentage share of terminals per country in the studied group.

Figure 1 Percentage share of studied container terminals according to location



Source: ILiM's study

Half of the container terminals are located in Germany and in Poland, which results, among others, from the number of operating container terminals in total and the number of container terminals located within the NSB CoRe corridor.

Data concerning selected container terminals have been complemented in cooperation with partners from all six countries. Since it was not possible to complement all data, the size of sample in the analyses is not always equal to the amount of analysed terminals (24) Therefore, the size of the sample will be provided in the beginning of each analysis.

3 Qualitative Indicators

The category includes basic information concerning container terminals and covers access to infrastructure, electrification of tracks, possibility to expand the terminal and the point-based system (direct or shuttle train).

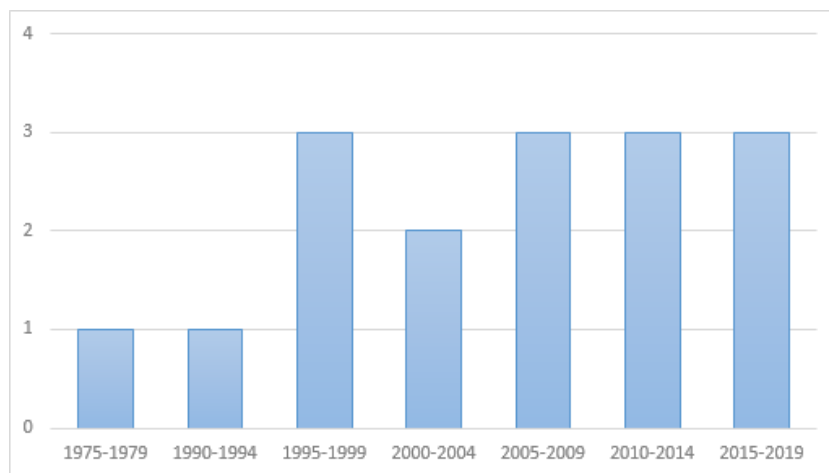
3.1 Basic data

Basic data includes information concerning terminals, such as the year of construction, the scope of intermodality, area and working hours.

- Year of construction

Age of the existing network of nodal points was verified. The analysis covered 16 container terminals, as it was impossible to obtain data for 8 terminals. The terminals were grouped according to the year of construction. Each group covers a period of 5 years, starting from the construction of the oldest container terminal in 1975 until the present day. The graph presented on the following page shows quantitative share of each group. The vertical axis presents the number of container terminals built, while the horizontal axis shows the ranges of construction dates.

Figure 2 Years in which container terminals were built



Source: ILiM's study

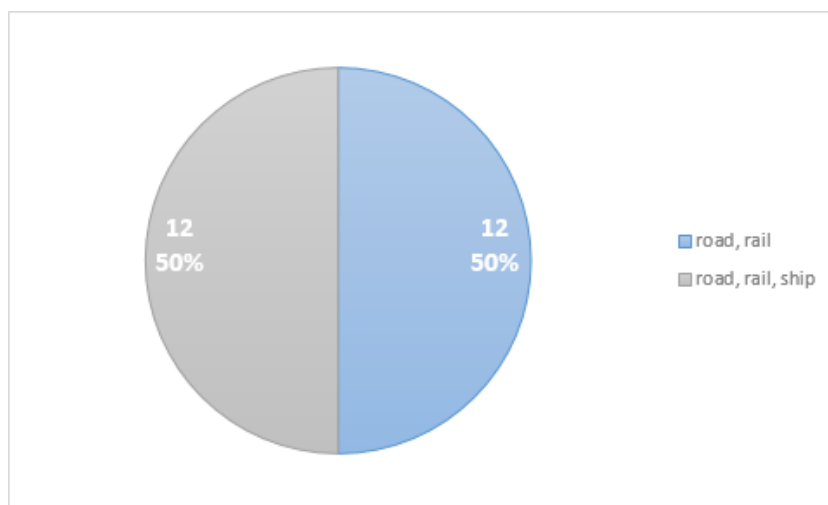
The analysis did not identify any prevalent period in which the largest number of terminals were built. However, a continuous growth in the number of terminals in the last 23 years, with a relatively even distribution of values for each period, was observed. Reloading nodes in the NSB CoRe are characterised by varied technical condition, which results from the fact that they were built or upgraded in different years. The oldest terminal is the terminal in Małaszewicze, built in 1975. It was upgraded in 2010, its capacity, however, remains too low and its operators complain about an insufficient amount of rails, which is detrimental to smooth reception of trainsets. Attention should

also be drawn to diversified technological development. An example of this trend is the unique Hamburg Container Terminal Altenwerder CTA nodal point in Germany, which has already implemented a technology employing automatic vehicles operating the terminal. Furthermore, Hamburg Hafen und Logistik AG (HHLA) will test automated and autonomous lorries to increase efficiency, reduce fuel consumption and improve overall traffic flow. Project partnership between HHLA and MAN Truck & Bus, named Hamburg TruckPilot, was established. The partnership will cover tests in HHLA Altenwerder (CTA) terminal container and along a 70-kilometre section of the A7 motorway, which will serve as an environment for field tests. The purpose of the project is to analyse and verify exact requirements referring to the integration of autonomously driven lorries in the process of automatic reloading of containers. The first of the three phases is scheduled for wrap-up by the end of 2018. ²

- Scope of intermodality

The type of intermodality of reloading nodes (road, rail, ship) was verified. The analysis covered all 24 container terminals. The terminals were grouped according to the scope of intermodality. The two groups were: terminals handling road and rail transport and terminals handling road, rail and sea transport. The graph on the following page presents a percentage and quantitative share of each group.

Figure 3 Scope of intermodality



Source: ILiM's study

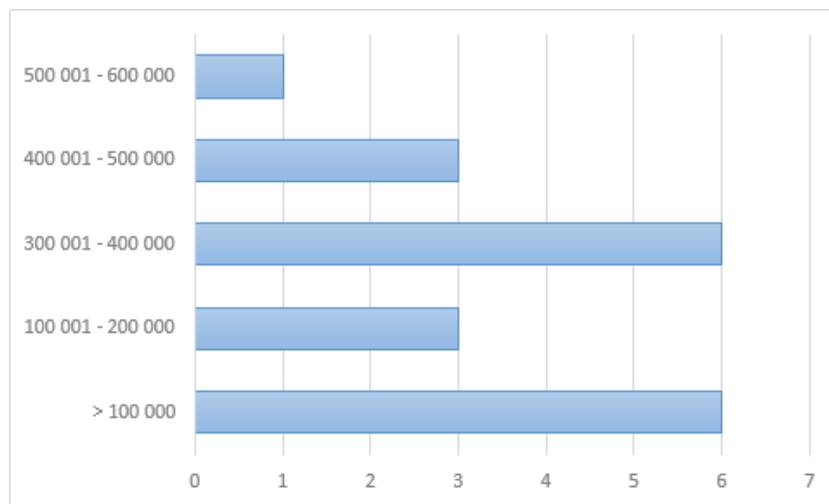
Neither of the groups prevails - half of the terminals handle road and rail transport, whereas the other half handles road, rail and sea transport. It results from the location of terminals: a part of them is situated in inland areas, without access to sea or river, which makes it impossible for them to handle ships.

- Total area /m2/

² HHLA Corporate Communications (2018) HHLA and MAN Launch “hamburg truckpilot” to test automated and autonomously driving trucks [reading date 2018-10-17] <https://hlla.de/en/2018/10/test-autonomously-driving-trucks.html?type=7>

The terminals were compared in terms of area occupied. The analysis covered 19 container terminals, as it was impossible to obtain data for 5 terminals. The terminals were divided into groups according to their area in square metres. The first group included terminals with an area up to 100 thousand sq m, each successive group being up to 100 thousand sq m larger. The graph presents quantitative share of each group. The vertical axis presents the area of terminals, while the horizontal axis depicts their amount.

Figure 4 Total area /m²/



Source: ILiM's study

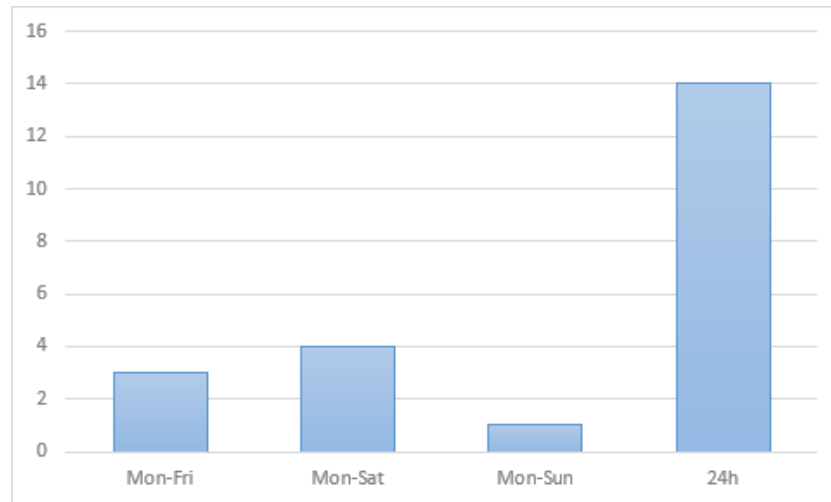
There is a visible differentiation in the area of terminals within the North Sea Baltic transport corridor. Terminals with an area below 100 thousand sq m and terminals with an area between 300 thousand and 400 thousand sq m are most numerous. Latvian SIA Baltic Container Terminal, with its area of 570 000 sq m, is the largest of all of the terminals analysed.³

- Working Hours

To check the availability of nodal points, their working hours were also compared. The analysis covered 22 container terminals, as it was impossible to obtain data for 2 terminals. Terminals were divided into groups according to their working hours. The terminals that have specified opening hours, but it is possible for them to operate 24 hours a day, were recognised as places available 24 hours a day. The vertical axis in the graph depicts the number of terminals, whereas the horizontal axis represents weekdays they are available on.

Figure 5 Weekdays the terminals are available on

³ BCT Baltic Container Terminal (2018) Infrastructure [reading date 2018-10-17] <http://www.bct.lv/en/info/infrastructure>



Source: ILiM's study

The analysis shows that all of the terminals are available from Monday to Friday in different hours, with some of them additionally opened on Saturday or on Saturday and Sunday. 64% of the terminals are available 24 hours a day.

3.2 Accessibility

The analysis covered all of the terminals. For motorways and express roads, it was assumed that a terminal was considered to have access to a specific type of road if the distance to it did not exceed 15 km. Road infrastructure in the vicinity of NSB corridor terminals is well-developed, 88% of analysed terminals have access to motorways and 96% of them have access to express roads.

The study further analysed if the terminals were well-communicated with ports. 83% of the terminals are well-communicated with the nearest port, or located in a port.

3.3 Electrified tracks

The study presented the development of DC-supplied railway tracks, i.e. the ones that are not powered from overhead contact lines. The analysis covered 13 container terminals, as it was impossible to obtain data for 11 terminals. The terminals were divided according to their location. Table columns included the following information: no - absence of electrified tracks, yes - presence of electrified tracks, not yet - planned construction of electrified tracks, data n.a. – data is not available. Column and row "Total" present a quantitative summary. The table presents the quantitative share of a specific group.

Table 2 Electrified tracks

Country	no	yes	till 2022	till 2027	data n.a.	Total
Estonia	2					2
Finland					4	4
Germany		2			4	6
Latvia	2					2
Lithuania			3	1		4
Poland	2	1			3	6
Total	6	3	3	1	11	24

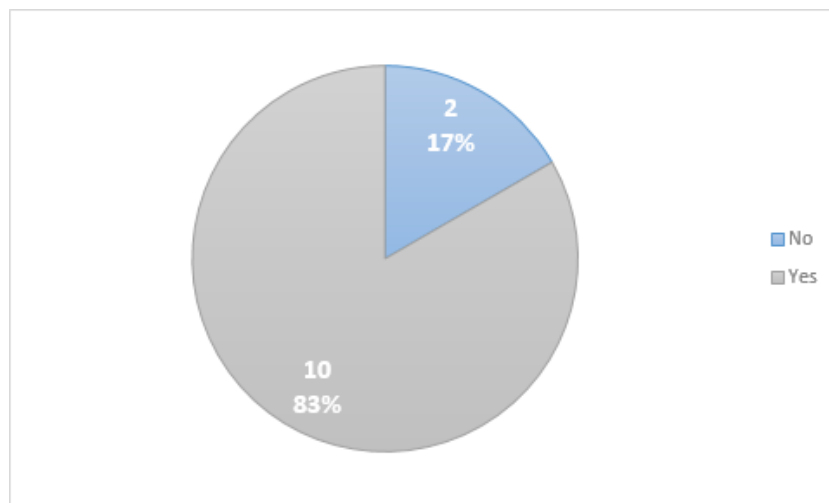
Source: ILiM's study

As at the present moment, 3 nodal points analysed (23%) have electrified tracks, tracks in three Lithuanian terminals: Kaunas Intermodal Terminal, Vilnius Intermodal Terminal, Klaipeda Container Terminal (KKT) are to be electrified by 2022, track in Klaipedos Smelte (MSC) will be electrified by 2027, and 6 terminals do not have electrified track and are not planning to build it.

3.4 Possibility to expand terminal

The analysis verified what percentage amount of terminals are capable of expansion. It covered 12 container terminals, as it was impossible to obtain data for 12 terminals. Terminals were divided into two groups: yes – terminals with a possibility to expand, no – terminals incapable of expansion. The graph presents percentage and quantitative share of each group.

Figure 6 Possibility to expand nodal points



Source: ILiM's study

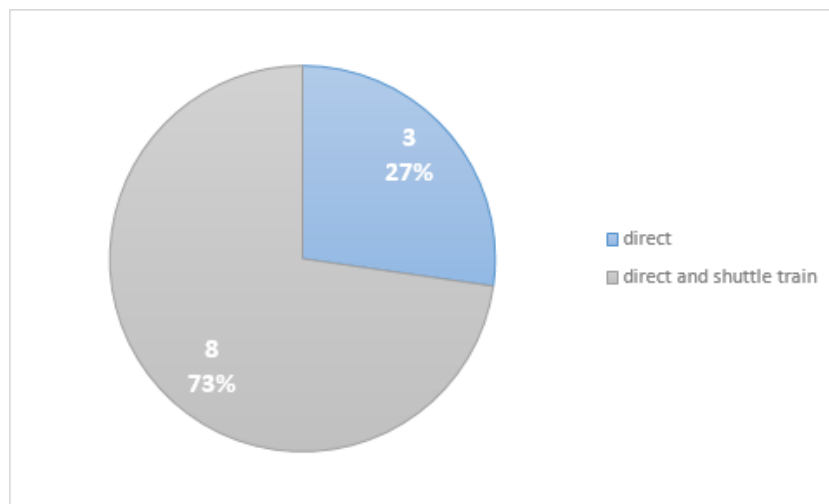
83% of analysed terminals have a possibility to expand, while the remaining 17% do not. Incapability of expansion may result from a terminal's location in a port. Continuously growing flow of cargo, increased shipping, larger tonnage of ships and growing number of incoming vessels have an impact on expansion projects, which directly influences the possibilities of expanding terminals located in ports. A good example is the Klaipeda Container Terminal, located in the port of Klaipeda, where turnover doubled from 15m tonnes to 36m tonnes in 1999-2014. Annual throughput of the Klaipeda port is over 60m tonnes. It is assumed, however, that by 2025, due to the growing turnover of goods, the port's throughput will be used to the full extent. The port's current territory, historically located next to the town, is intensively used for reloading activities, which is why existing terminals and warehouses cannot be expanded - the area of the port is limited. With the purpose to increase the port's reloading capacity, plans for constructing Baltmax Outerport in the port of Klaipeda were developed.⁴

⁴ [7] Port of Klaipėda (2015) The Port Of Klaipėda Discover A Proven Way! [reading date 2018-10-17] [http://www.portofklaipeda.lt/uploads/Leidiniai/EN%20Brosiura%20\(sumazinta\).pdf](http://www.portofklaipeda.lt/uploads/Leidiniai/EN%20Brosiura%20(sumazinta).pdf)

3.5 Production system

Production systems were also analysed. The analysis covered 11 container terminals, as it was impossible to obtain data for 13 terminals. Terminals were divided into two groups: direct – when the train is on a direct route and shuttle train – when the train is on a direct route and shuttle route. The graph presents percentage and quantitative share of each group.

Figure 7 Production system



Source: ILiM's study

A considerable majority of terminals handles trains moving both directly and on shuttle (73%). The remaining 27% of the terminals only handles direct trains.

4 Quantitative Indicators

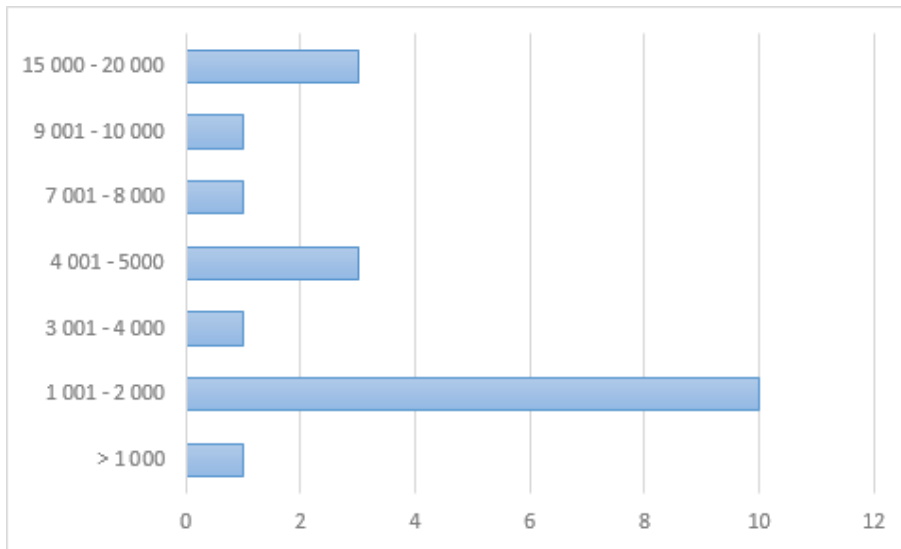
As part of this category, the following indicators were drawn up: storage and cargo handling, supported type of logistic units, reefer and dangerous goods, track infrastructure, equipment and truck area for waiting.

4.1 Storage and cargo handling

- Storage capacity /TEU/

Storage capacity of a terminal is a value which characterises the terminal's ability to store a specific amount of intermodal transport units in warehouse space according to defined rules. Terminal's storage capacity in TEU indicates how many 20ft-long containers can be stored in the terminal at the same time. The analysis covered 20 container terminals, as it was impossible to obtain data for 4 terminals. The terminals were divided into groups according to possible storage value. The first group included terminals with capacity below 1000 TEU, with each successive group up to 1000 TEU larger, until 10000. Terminals with the largest capacity, above 15000 TEU, were grouped together. The graph presents the quantitative share of each group. The vertical axis represents terminal capacity, while the horizontal axis depicts their amount.

Figure 8 Storage capacity /TEU/



Source: ILiM's study

Storage capacity of a half of analysed nodal points is between 1000-2000 TEU, with other terminals being quite diversified in terms of their container storage capacity. Two terminals with the largest storage capacity are located in Lithuania. These are: Klaipeda Container Terminal (KKT) 18000 TEU⁵ and Klaipedos Smelte (MSC) 20000 TEU⁶.

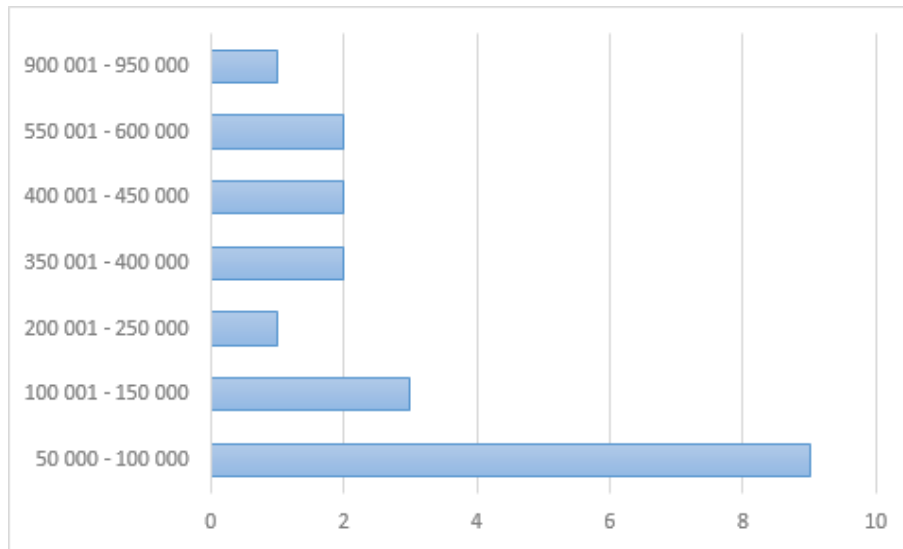
- Cargo handling capacity per year /TEU/

Terminal's cargo handling capacity is a value which determines the ability to reload a specific number or intermodal a year. This value, expressed in TEU, shows how many 20ft-long containers may can reloaded by the terminal annually. Reloading capacities of container terminals were compared. The analysis covered 20 container terminals, as it was impossible to obtain data for 4 terminals. Terminals were divided into groups according to their annual cargo handling capacity. The first group included terminals able to reload 50000 – 1000000 TEU a year, each successive group being larger by 50000 TEU until 950000 TEU. The graph on the following page presents the quantitative share of each group. The vertical axis presents annual cargo handling capacities, and the horizontal axis depicts the size of the group.

Figure 9 Cargo handling capacity per year /TEU/

⁵ UAB Klaipėdos Konteinerių Terminalas (2018) Container terminal technical characteristics [reading date 2018-10-17] <http://www.terminalas.lt/en/terminals/container-terminal/>

⁶ Klaipedos Smelte (2018) Container terminal services [reading date 2018-10-17] <http://www.smelte.lt/en/services/container-terminalservices/>



Source: ILiM's study

The largest group (45%) includes terminals whose annual cargo handling capacity is between 50 thousand and 100 thousand TEU. The remaining 55% of terminals are considerably diversified, with 25% having large cargo handling capacity, exceeding 500 thousand TEU.

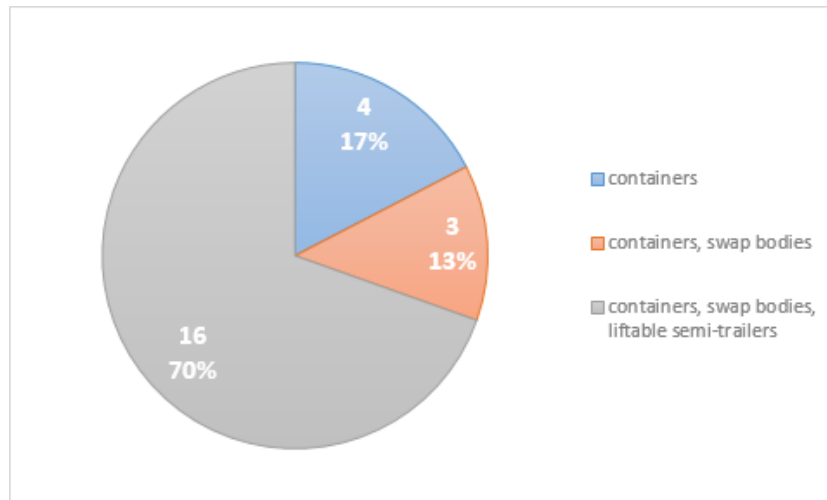
The terminal with the largest cargo handling capacity of all the terminals included in the study is Container Terminal Altenwerder (CTA). Hamburger Hafen und Logistik AG completed the expansion of this terminal in 2016. CTA has nine tracks, instead of the previous seven. The expansion increased the terminal's capacity by 140,000 standard containers (TEU) to 930,000 TEU per year. Since 2010, annual container throughput at the CTA rail terminal has risen by almost 20 percent to 769,000 TEU in 2015. It means that CTA's terminal had the highest throughput of any container rail terminal in Germany.⁷

4.2 Supported type of logistic units

Terminals were verified in terms of intermodal transport units (ITU) handled. Three basic ITUs were identified: containers, swap bodies and liftable semi-trailers. Containers are usually metal boxes of standard size and structure, used for transporting goods (usually packed in cardboard boxes, packages, boxes or bags). A swap body (or swop body) is one of the types of standard freight containers for road and rail transport. This container type may also be called an exchangeable container or an interchangeable unit. A liftable semi-trailer is a type of a trailer used for transporting objects, without a front axle, designed so that the part of the semi-trailer with the cargo is mounted on the rear axle of the tractor, jointly forming an articulated vehicle able to lift and load cargo as in the case of containers and swap bodies. The analysis verified which ITUs nodal points handle. It covered 23 container terminals, as it was impossible to obtain data for 1 terminal. The graph on the following page presents a percentage and quantitative share of each group.

Figure 10 Supported type of logistic units

⁷ HHLA Hamburger Hafen und Logistik AG (2016) Expansion of Germany's largest container rail terminal completed [reading date 2018-10-17] <https://hlla.de/en/sustainability/latest/2016/07/expansion-cta-rail-terminal.html>



Source: ILiM's study

A considerable majority of terminals (70%) handles all three types of intermodal transport units, 13% handles containers and swap bodies, whereas 17% handles container units only.

4.3 Reefer and dangerous goods

- Available for reefer

Reefers are used for storing and transporting temperature-sensitive goods, having the ability to maintain desired temperature above or below zero. Refrigerated transport is used by companies representing various sectors, such as pharmaceuticals, food, agriculture, chemistry or cosmetics. The transport of goods in controlled temperature allows keeping products fresh, preserving their required parameters and consumer properties. Refrigerated transport frequently makes it possible to transport dangerous or fragile goods without the risk of damage or loss. Irrespective of the nature or scale of refrigerated transport, it requires the use of special containers, which ensure specific thermal conditions, such as heating, cooling or deep freezing of transported products. Properly adapted containers make it possible to transport goods in various temperature zones, which allows optimising and adapting the logistics of carriers. Container walls are composed of layers which maintain constant temperature, and are equipped with a cooling unit which regulates temperature between -25 and +25°C. They are powered by electricity or fuelled with diesel oil.

The analysis verified which nodal points are capable of handling reefers. It covered 23 container terminals, as it was impossible to obtain data for 1 terminal. The graph on the following page presents a percentage and quantitative share of each group.

All of the nodal points analysed enable product storage in controlled temperature. However, they differ in the number of plugs. Data on the available number of reefer plugs were obtained for 8 terminals.

Table 3 Quantity of available reefer plugs

Country	Name	No. of reefer plugs available
Poland	CLIP Terminal	60

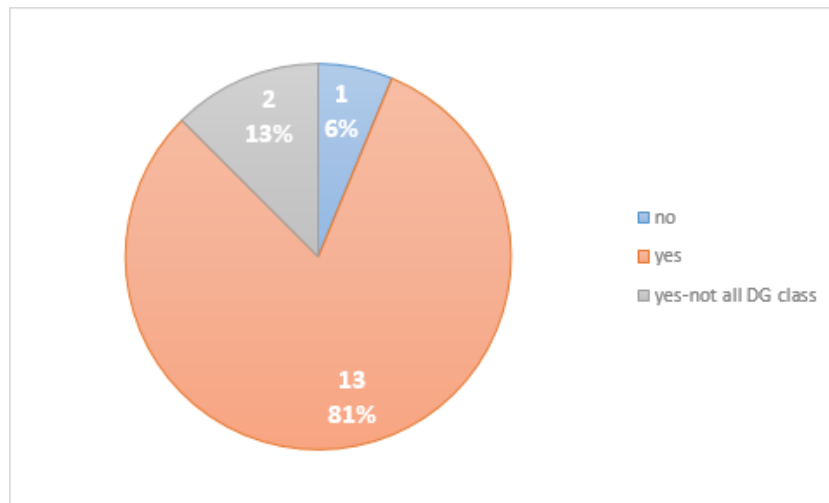
Lithuania	Kaunas Intermodal Terminal	164
Lithuania	Vilnius Intermodal Terminal	164
Lithuania	Klaipeda Container Terminal (KKT)	450
Lithuania	Klaipedos Smelte (MSC)	657
Latvia	SIA Baltic Container Terminal	500
Estonia	Muuga Container Terminal - Transiidikeskuse AS (HHLA)	404
Estonia	Paldiski South Harbour - ESTEVE AS	20

Source: ILiM's study

- Dangerous Goods

According to the definition provided in ADR, "dangerous goods" are materials and objects the transport of which is prohibited or allowed only on terms provided in ADR. These goods may be transported in units, in bulk or in cisterns. Dangerous goods may be in a solid (loose, granular or pasty materials), liquid or gas form. The analysis verified which of the studied terminals handled dangerous goods. It covered 16 container terminals, as it was impossible to obtain data for 8 terminals. The graph presents percentage and quantitative share of each group.

Figure 11 Available for dangerous goods



Source: ILiM's study

Only one of the terminals, Noord Natie Ventspils Terminals, Latvia, does not handle dangerous loads. It should be noted that both terminals located in Estonia (Muuga Harbour - Muuga Container Terminal - Transiidikeskuse AS (HHLA) and Paldiski South Harbour - ESTEVE AS) do not handle all ADR classes, and that very dangerous goods are not allowed for storage in the port at all.

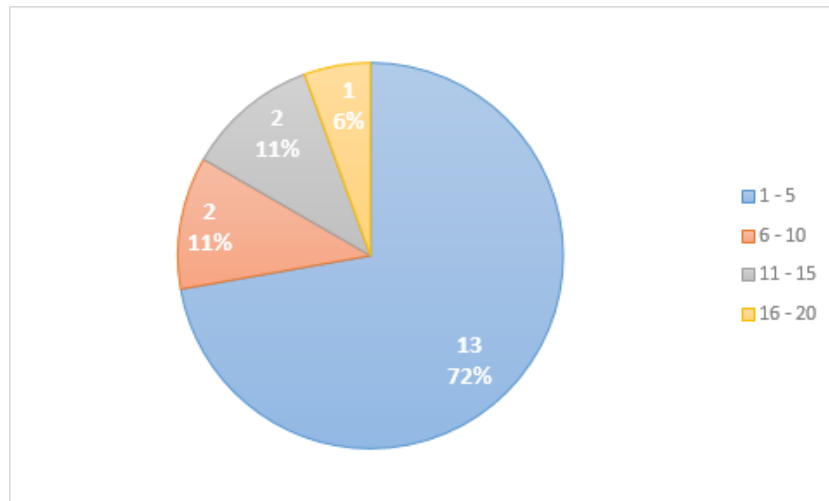
4.4 Track infrastructure

This category groups all of the information concerning terminals, such as the number of tracks for reloading, the length of all tracks or track gauge.

- Number of tracks for reloading /pcs./

The number of tracks available for reloading was compared. The analysis covered 18 container terminals, as it was impossible to obtain data for 6 terminals. Terminals were divided into groups according to the amount of reloading tracks. The first group included terminals with 1-5 reloading tracks, each successive group larger by 5 tracks. The graph presents percentage and quantitative share of each group.

Figure 12 Number of tracks for reloading /pcs./



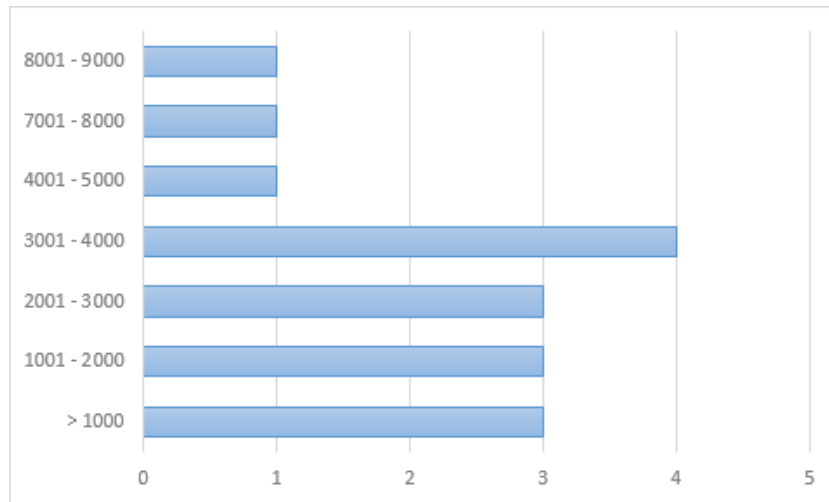
Source: ILiM's study

The considerable majority of terminals (72%) has 1-5 tracks for reloading. Muuga Harbour - Muuga Container Terminal - Transiidikeskuse AS (HHLA), Estonia, has loading/unloading area with two tracks (whole train split into 2 parts), loading/unloading area with 4 tracks (whole train in 4 parts). Paldiski South Harbour - ESTEVE AS, Estonia - There are railtracks on quays and port territory where loading/unloading of containers on/from rails is provided, however, the number of available tracks is not provided. Klaipėdos Smelte (MSC), Lithuania, has the largest number of tracks (16).

- Total length of tracks

Total length of tracks available in nodal points was verified. The analysis covered 18 container terminals, as it was impossible to obtain data for 6 terminals. Terminals were divided into groups according to the total length amount of reloading tracks. The first group included terminals with 1-5 reloading tracks, each successive group being larger by 5 tracks. The graph presents the quantitative share of each group. The vertical axis presents the total length of tracks in metres, and the horizontal axis depicts the size of the group.

Figure 13 Total length of tracks /m/



Source: ILiM's study

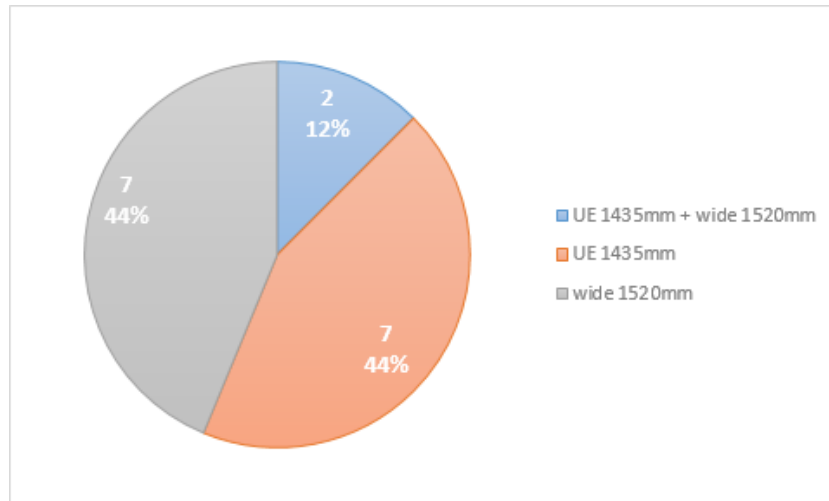
Total length of tracks in most of the terminals does not exceed 4000m. In this range, the group with the total track length of 3001-4000 km was most numerous. On the other hand, Klaipėdos Smeltė (MSC), Lithuania, has the longest track of all the nodal points (8175m). Most frequently occurring track lengths are 600-800m. Tracks of certain terminals, however, are less than 400m. The results are very diversified in this area.

- Track gauge UE 1435mm and wide 1520mm

The current European standard track gauge is 1435 mm (the distance between inner surface of upper parts of rails is 1435 mm). However, it is not the only track gauge applied within NSB Corridor. In Eastern European countries, the track gauge of 1520mm is commonly used. This track gauge, also called the Russian track gauge (the distance between inner surface of upper parts of rails is 1520 mm) is most common in the countries of the former Soviet Union, Mongolia and in Finland (1524mm version). There is a certain tolerance with which trains suitable for one track gauge can use rails compliant with the second track gauge. For example, the 1520mm track is practically compatible with the 1524 track, so the movement of trains between Russia and Finland does not require wheel span adjustment. In the event of switching from 1520mm to 1435mm, however, wheel span must be adjusted.

The analysis verified what track gauges are handled by the terminals. It covered 16 container terminals, as it was impossible to obtain data for 8 terminals. Terminals were divided into three groups according to track gauges handled: UE 1435mm + wide 1520mm, UE 1435mm, wide 1520mm. The graph on the following page presents the percentage and quantitative share of each group.

Figure 14 Track gauge UE 1435mm and wide 1520mm



Source: ILiM's study

There are currently two container terminals that handle both track gauges. These are Małaszewicze Logistics Center, Poland and Vilnius Intermodal Terminal, Lithuania. Muuga Harbour - Muuga Container Terminal - Transiidikeskuse AS (HHLA), Estonia, presently handles 1520m wide tracks. In relation to Rail Baltic, new railway station and terminal(s) is planned in Muuga port. After the upgrade, the terminal will handle 1435mm-wide tracks. The investment is scheduled to start in 2025.

4.5 Equipment

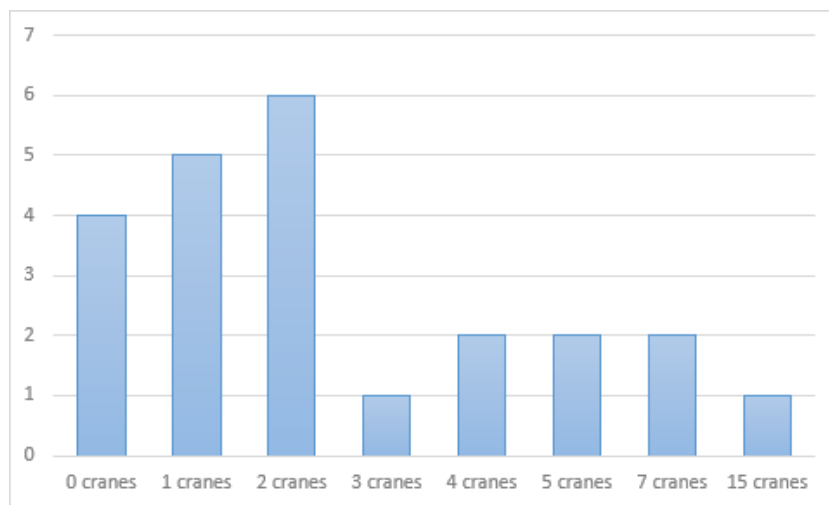
These include mechanical components that comprise the equipment of terminals and are used for cargo handling. Changes in the dimensions or technical-operational parameters of incoming ships, loads, reloading or transport devices influence the need to adapt service technology, or even to reorganise the port's entire spacial arrangement. On the present technological level, vertical and horizontal reloading technologies are most commonly applied technologies. Terminals are equipped with different types of devices used for reloading. For the purposes of the study, overhead cranes and mobile cranes were selected.

- Number of overhead cranes

An overhead crane, commonly called a bridge crane, is a type of crane found in industrial environments. An overhead crane consists of parallel runways with a travelling bridge spanning the gap. A hoist, the lifting component of a crane, travels along the bridge. If the bridge is rigidly supported on two or more legs running on a fixed rail at ground level, the crane is called a gantry crane or a goliath crane. They can range from enormous "full" gantry cranes, capable of lifting some of the heaviest loads in the world, to small shop cranes, used for tasks such as lifting automobile engines out of vehicles.

The number of overhead cranes available in nodal points was compared. The analysis covered all of the container terminals. Nodal points were divided into groups according to the number of all available overhead cranes. The graph on the following page presents the quantitative share of each group. The vertical axis presents annual cargo handling capacities, and the horizontal axis depicts the size of the group.

Figure 15 The number of available overhead cranes



Source: ILiM's study

Four of the terminals analysed do not have overhead cranes, whereas eleven terminals have one or two cranes. The largest number of gantry cranes, 15 items, operate in Hamburg Container Terminal Altenwerder CTA, Germany.⁸ The average loading capacity of cranes in terminals is 40 tonnes.

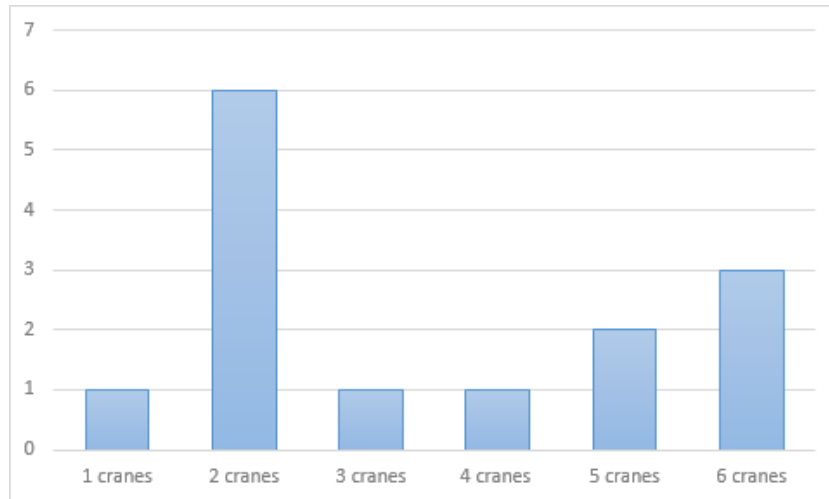
- Number of mobile cranes

Mobile crane is a lifting device mounted on a truck chassis or on a specially-built self-propelled chassis, used for reloading and installation works. A truck-crane consists of winches and a luffing jib mounted on a rotary platform (column), which enables lifting and lowering the load and moving it by rotating the platform and changing the reach. The machine may operate in two modes: transport mode and crane mode.

The number of overhead cranes available in nodal points was compared. The analysis covered 14 container terminals, as it was impossible to obtain data for 10 terminals. Terminals were divided into groups according to the number of all overhead cranes. The graph on the following page presents the quantitative share of each group. The vertical axis presents annual cargo handling capacities, and the horizontal axis depicts the size of the group.

⁸ HHLA Container Terminal Altenwerder (2018) Technical data altenwerder (CTA) [reading date 2018-10-17] <https://hlla.de/en/container/cta/technical-data.html>

Figure 16 The number of available mobile cranes



Source: ILiM's study

Terminals are most frequently equipped with 2 mobile cranes. A significant number of terminals has 6 mobile cranes, and their loading capacity is usually 41-45 tonnes. These values significantly depart from the standard in the case of two terminals: Klaipeda Container Terminal (KKT), Lithuania equipped with 2 STS; 2 RTG, with loading capacity of 124 tonnes, and Klaipedos Smelte (MSC), Lithuania, equipped with 3 STS; 7 RTG, with loading capacity of 104 tonnes. There are 6 RTG cranes for loading of containers in the storage area at Muuga Harbour - Muuga Container Terminal - Transiidikeskuse AS (HHLA) Estonia, one RMG for loading/unloading of containers to/from rail and 11 shuttle carriers for transportation of containers inside the terminal and loading/unloading to/from trucks, with loading capacity of 15-45 tonnes. It should also be noted that Hamburg Container Terminal Altenwerder CTA, Germany, has an automated Guided Vehicle (AGV) 77 + 14 Battery-AGV.

5 Summary

Projections on the development of intermodal cargo transport for the eastern part of North Sea Baltic are optimistic. Further development of transport is possible on condition that both linear (Rail Baltica) and point-based (container terminals) is good, effective and well-organised. Intermodal terminals have so far been built, which is well-understood, in places with large flows of cargo. Intermodal transport operators carried out a number of investments, which secured their current needs, but led to the fragmentation and, at the same time, consolidation of terminal infrastructure only in several most industrialised places in our part of Europe. Some of the terminals were built as provisional places for loading and unloading of intermodal units. Their quality does meet European standards. Terminals most frequently have short tracks and small, poor-quality storage yards. An element integrating the activity of terminals should be a network of cooperating intermodal terminals covering the entire North Sea Baltic transport corridor.

As a result of considerations and analyses, the following conclusions have been formulated:

- Half of analysed terminals have no access to a river or sea, and their growth depends to a large degree on the development of land infrastructure.
- The majority of terminals is available 24 hours a day or provide for a possibility to be available 24 hours a days after prior arrangements.
- Most of the terminals have capacity for expansion.
- Access to electrified tracks is poor, but there are plans the provide for their electrification.
- Storage capacity and cargo handling capacity are quite diversified. Prevalent capacity is 1000-2000 TEU, and prevalent cargo handling capacity is 50-100 thousand TEU.
- Terminals provide a broad variety of additional services, most of them being able to handle dangerous goods and reefers.
- The NSB CoRe corridor intermodal hubs have been built in different years and are also very diverse in terms of surface area, handling capacity, technical condition and technology
- Intermodal terminals have so far been built in uncoordinated manner, in places where large streams of cargo occur (the case of Poland).
- The growth of intermodal traffic is possible provided that there is an efficient and coordinated transport infrastructure, both linear (Rail Baltica) and points infrastructure - container terminal
- There is a need for an integrated and coordinated strategy for terminal development not on the local level but on the level of the entire corridor.
- Key elements that are important for intermodal transport development along the NSB corridor include the improvement of terminal networks through open access, digitalisation of exchanged information and cooperation between intermodal operators.

Continuous increase in the number of reloaded containers throughout the world proves the sector's high potential. Container terminals within the NSB CoRe corridor should aim at the optimisation of transport and maximum effectiveness by creating dynamic changes in the sector, in order to be able to serve an increased number of ships, trains and lorries. Execution of investment projects related to areas such as dredging quays, purchasing equipment making it possible to serve units with greater capacity and improving reloading processes is a necessary step. Sustainable management of the growth of container terminals located in ports and in inland areas, as well as the development of rail infrastructure, are of key significance. Container carriers may push the terminals unable to keep up with current trends to the sidelines. It should also be borne in mind that contemporary container terminals are not just infrastructure and equipment, but that they also involve automation and information technology. Tendencies related to the development of the reloading system observed in container terminals are directed mainly towards improving processes, their automation and streamlining the exchange of information.

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