Recommendations and Action Plan for Intermodal Nodal Point development

Work Package 2

Activity 2.2.5

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

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Abbreviations

AIS	Automatic Identification System
CEF	Connecting Europe Facility
CIM	Contrat de transport international ferroviaire des marchandises
CIS	Commonwealth of Independent States
C-ITS	Cooperative Intelligent Transport Systems
CMR	Contrat de Transport International de Marchandises par Route
DGG	Deutsche GVZ Gesellschaft
DSM	Digital Single Market
DTLF	Digital Transport and Logistics Forum
EFSI	European Fund for Strategic Investments
ERDF	European Regional Development Fund
ERTMS	European Rail Traffic Management System
ESIF	European Structural and Investment Fund
ETCS	European Train Control System
EU	European Union
EUSBSR	European Union Strategy for the Baltic Sea Region
FTIP	Federal Transport Infrastructure Plan
GHG	Greenhouse gas
GSM-R	Global System for Mobile Communications for Railways
HA	Hectare
ICT	Information and Communication Technologies
IOT	Internet of Things
IIOT	Industrial Internet of Things
IT	Information Technology
ITS	Intelligent Transport Systems
ITU	Intermodal Transport Unit
KM	Kilometre
KPI	Key Performance Indicator
LU	Loading Unit

M2M	Machine-to-Machine
MEC	Multi-access Edge Computing
PI	Physical Internet
RIS	River Information System
S2R	Shift2Rail
SERA	Single European Railway Area
SWOT	Strength, Weaknesses, Opportunities, Threats
TEN-T	Trans-European Transport Network
TEU	Twenty Foot Equivalent Unit
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
V2X	Vehicle-to-Everything
WP	Work Package

Executive Summary

‘North Sea Baltic connector of regions’ aims to improve the sustainable accessibility to passenger and freight transport in the Eastern Baltic Sea Region. The project takes the European Union (EU) Trans-European Transport Network (TEN-T) Infrastructure Policy implementation to a regional and local level and connects the Core Network Corridor of the North Sea - Baltic to the catchment area and access routes in the Eastern Baltic Sea Region. This is done through logistics-, long distance commuter services- and transnational community- and transport branding. The project outputs will facilitate interoperability and bring a transnational perspective into spatial planning and policymaking. Work package (WP) 2 focusses on intermodal logistics aspects and is divided into various sub-activities that aim to aid increasing interoperability and competitiveness of intermodal transport services.

The transport sector is a key contributor to the economy in the European Union, adding a gross overall value of 4.8 per cent, or 548 billion Euros for the 28 EU countries. It is furthermore an essential sector for the integration process and for the achievement of an internal market, providing economic growth and jobs. The transport sector on the other hand is responsible for 25 per cent of Europe’s greenhouse gas emissions. The transport sector therefore should embrace a modal shift to enable a greening of transportation and to utilise opportunities and capacities that arise from new green field projects such as ‘Rail Baltica’ and the development of its intermodal infrastructure accordingly.

The European Union has provided instruments for the fostering of, and increase in, the utilisation of sustainable transports such as rail or inland waterway transports. The ‘Combined Transport Directive’ has been a pillar for the promotion of multimodal transportation and is further supported through other European policies and a study undertaken in 2014. After 25 years, the Directive went under revision and is one of the elements to foster the utilisation of multimodal solutions in transport- and logistics chains. On the financial side, the European Union has therefore put in place financial instruments to support measures that boost intermodal or multimodal transports. The ‘Connecting Europe Facility’ is one such instrument, but there are also the ‘European Fund for Strategic Investment’, the ‘European Structural and Investment Fund’, but also the research programme ‘Horizon 2020’. To further underline the importance of multimodality and sustainable transport, EU Transport Commissioner Violeta

Bulc made 2018 the ‘Year of Multimodality’ during which key thematic areas such as digitalisation, economic incentives, supporting multimodal infrastructure- and innovation were discussed and promoted. The topics were integral parts of events such as the ‘TEN-T Days’, the ‘European Mobility week’, ‘Conference on Sustainable Urban Mobility Plans’, the ‘Transport Research Arena’, the ‘High-level Conference on European Multimodal Freight Transport’ and many more.

The digitalisation aspect is mostly in correlation with the work done in WP 2.3. The findings and discussion regarding digitalisation in intermodal or multimodal transportation can be found in the corresponding reports ‘Review of ICT solutions supporting intermodal transport sector’ (WP 2.3.1) and ‘Recommendations for information systems developers’ (WP 2.3.3). A more general overview with a concise outline of the entire WP 2.3 is the report 2.4.3.

The Eastern Baltic Sea Region faces low internal and external cohesion and accessibility but has substantial untapped potential. Accessibility is pivotal in order to unlock growth potential. The transport development in the Eastern Baltic Sea Region is lagging as developments are commonly focused on the urban nodes. ‘Rail Baltica’ will tackle the missing link between the northern and the southern part of the North Sea - Baltic corridor and create cohesion to the region by connecting the existing East-West routes, with traditionally strong volumes of freight, with the new North-South route(s).

The European Union has paved the way towards a ‘Single European Railway Area’ and, with ‘Rail Freight Corridors’ that are corresponding to the TEN-T network and financial instruments provided, things have come a long way. However, there is still room for improvement to further the competitiveness and development of more efficient and up-to-date solutions to promote the railway sector and through that the intermodal transport sector. The alignment of the rail freight corridors to the TEN-T network ought to establish interconnectivity and interoperability. However, this can only be achieved through the removal of bottlenecks, the expansion of network capacity, and by bridging missing infrastructure links. This underlines the complexity of the European Commission’s goal to complete the Core Network by 2030 and the Comprehensive Network by 2050. Both financially and organisationally wise. Even with the segmentation into several corridors, the investment needs far outweigh the available funding. The establish-

ment of the ‘Connecting Europe Facility’ and the ‘Horizon 2020’ programme are good examples of the European Commission’s attempts to leverage available funds with public-private cooperation.

The project ‘NSB CoRe’ itself is co-financed through one of the financial instruments provided that is part of the European Union’s cohesion policy. The project partners stress the importance of such funds and the cross-border cooperation to further the necessary progress in intermodality, interoperability and sustainable transport and mobility as such In Europe. These kinds of projects have great added-value and help the European Commission and the Member States to fulfil their endeavour to reach the goals set by 2050. The ‘Rail Baltica’ undertaking is one such example. The project partners have worked closely together with European Union Corridor Coordinators, national and regional decision-makers from the Member States and their representing stakeholders in the ‘Rail Baltica’ undertaking. The partners have furthermore involved stakeholders from logistics and shippers to disseminate about the ‘Rail Baltica’ project, the North Sea – Baltic Corridor and its corresponding rail freight corridor.

The imminent departure of the United Kingdom from the European Union and the ending of the current multiannual financial framework period provide an opportunity to modernise a framework that has been in place since 1998. However, it also leaves a ‘hole’ in the budget due to less funds available from now 27 instead of 28 Member States. The discussion on the new multiannual financial framework is still ongoing and differs in the structure compared to the current one, with a decision expected to be made during 2019. The ‘European Parliamentary Research Service’ stresses three scenarios and a budget of € 273 billion for the multiannual financial framework. The TEN-T Core Network is estimated to need € 750 billion in investments and the largest shares coming from Member States’ budget. Even with the above-mentioned usage of funds provided, there will not be enough. The leveraging of funds and resources is therefore inevitable if a progress in decarbonisation and in mobility is to be made.

Disseminating the progress in intermodal transport and on existing gaps to relevant stakeholders is important. Persuasive efforts and lobbying are necessary in various areas of intermodal transportation. One of those areas is the sharing of data amongst intermodal transport stakeholders. The ‘chicken and egg’ problem has been discussed for quite some time, but still hinders investments and cooperation between stakeholders. This furthermore hinders the effi-

ciency of intermodal logistics chains. A one-stop-shop offer, currently only offered in a fragmented manner for the differing transport modes at best, is also curbed through this. The awareness of railway infrastructure undertakings is also important. The long-term added-value to the general public and region is often not well known and on the business side potentials may not be the focus of businesses at presence. Whilst major infrastructure projects focus on the future, the industry mostly focuses on the presence. Fostering the discussion, awareness and open-mindedness of all stakeholders involved and those who might use the infrastructure in the future therefore is important.

1. Aim

The NSB CoRe project enhances regional development in the Baltic Sea Region (BSR) by improving internal and external accessibility of the region along the North Sea - Baltic TEN-T Core Network Corridor. The acronym ‘NSB CoRe’ stands for ‘North Sea Baltic Connector of Regions’.

WP 2 focuses on intermodal logistics. Activities in 2.2 focus on providing stakeholders with the instruments and framework conditions to support the investment into new intermodal infrastructure and services for the North Sea – Baltic Corridor area. Through this intermodal transport is promoted and the economic competitiveness is strengthened. This was achieved through the following activities:

- Identification of existing and planned intermodal nodal points infrastructure along the North Sea – Baltic Corridor
- European nodal point best practice identification
- Benchmarking analysis within said corridor

These activities then built the foundation for this ‘Recommendation and Action Plan for intermodal nodal points’. The following chapters in this report therefore aim to provide a background-, outline stakeholder groups this activity focuses on and to provide these stakeholders with a more in-depth overview of transport policy and funding sources and requirements of European intermodal rail-road hinterland terminals

Due to the nature of the generated document, the results from Activity 2.2 are coordinated with the spatial planning activities of Activity 4.

2. Background

The EU aims to lower greenhouse gas (GHG) emissions by 2020 and 2050 to conjoin with other nations in the aim to reduce global warming as agreed in Paris 2015. To be able to reach the 2020 targets, the EU has realised that changes must be made to meet the set targets and developed a new strategy in 2016.

The strategy sees one way in streamlining the transport sector, its performance and hence GHG emissions in inter- or multimodality (European Parliament, 2017; European Commission, 2016a). The EU set up a core- and Comprehensive Network, the Trans-European Transport Network, and nine corridors therein to increase connectivity between Member States and to remove infrastructure and technological hindrances (European Commission, 2016b; European Commission, 2014a; European Commission, 2013a). Germany is crossed by six, and Hamburg by three of the Core Network Corridors (Rah, 2016; European Union, 2016a). One of which is the 'North Sea – Baltic Corridor' (European Union, 2014). Poland is the second biggest country within the 'North Sea – Baltic' corridor and is crossed by two Core Network Corridors. Namely the 'North Sea – Baltic' and the 'Baltic Adriatic' corridor.

The European Union has created work plans to steer the short- and long-term progress of the corridors. The work plan for the 'North Sea – Baltic Corridor' was created by Mrs. Trautmann as the corridor coordinator (European Commission, 2016c).

In addition to these corridors, the EU has created rail freight corridors to create a 'Single European Railway Area' tackling identified infrastructure issues and promoting the mode of transport rail (European Parliament, 2016a). The rail freight corridor that matches the 'North Sea – Baltic Corridor' is the 'Rail Freight Corridor 8' (Rail Freight Corridor 8, 2016). The 'North Sea – Baltic Corridor' is characterised by long distances and poor transport connections. This cross-cutting issue is underlined with one of the ambitions of the 'European Union Strategy for the Baltic Sea Region' (EUSBSR) being to bridge the Eastern European Member States and those in the far north with the remainder of Europe (European Commission, 2017a).

The Baltic States, Poland and Finland have declared to intensify their collaboration on closing the infrastructure gap through the 'Rail Baltica' project (Rail Baltica, 2017c).

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3. Stakeholder

The intermodal logistics work package focusses on freight forwarders, intermodal operators, rail carriers, container terminals, intermodal nodal point infrastructure operators, and road carriers. Whilst one sub-activity looks at the business requirements and networking needs and another at Information and Communication Technology (ICT) solutions for intermodal transport, the sub-activity this report is based on – concentrates on nodal point infrastructure. This report aims to not only be used within the project, but also in the discussion between the interrelated projects TENTacle and Scandria2Act and in any other forthcoming nodal point development action. Thus, the stakeholder groups this report aims for – also includes policy stakeholders on a local-, national- and Europe-wide level.

The ‘Recommendation and Action Plan on Intermodal Nodal Points’ furthermore aims to assist to identify potentials that in turn will increase the attractiveness of intermodal transport along the North Sea – Baltic Corridor itself.

4. Transport Policy and Funding Sources

The transport sector is not only a key sector, but also a key contributor to the economy in the European Union. It sustains 11 million jobs in Europe and added a gross overall value of 4.8 per cent for the 28 EU countries, equalling € 548 billion. It is essential for the EU's integration process and for achieving an internal market, providing economic growth and jobs (European Union, 2016b).

The individual Member States have sovereignty over their infrastructure. The establishment of the new transport policy therefore enabled the EU, without executive power, to ensure a coordinated employment and improvement of a Europe-wide transport network infrastructure. The national transport policy of the Member States is aligned, and it is thus possible to create a unified transport network in Europe (European Commission, 2014c). The impact of such policy is illustrated in figure 1 below. These orchestrated actions are a breakthrough for the European Union and brings the EU a step closer to a single European market.

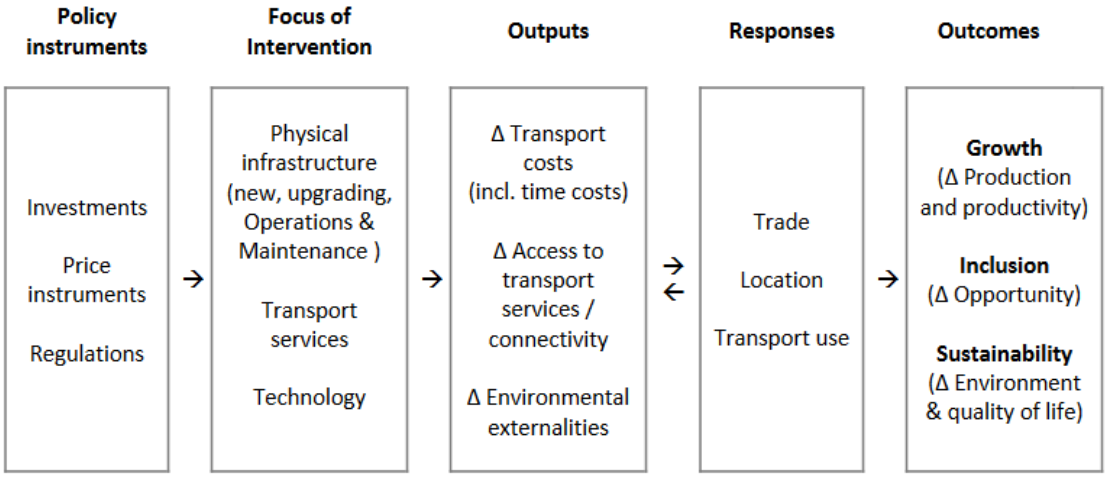


Figure 1: Impacts of transport policies: the mechanisms (Berg et al, 2015)

The White Paper 'Roadmap to a Single European Transport Area', outlines goals for a competitive and resource efficient transport system (Citizens Information, 2014). One of the goals is to shift 30 per cent of road freight above 300 km travelling distance to other modes, such as

rail, by 2030 and more than 50 per cent by 2050. Another goal is a fully functional EU-wide multimodal TEN-T ‘Core Network’ by 2030 with a capacity network by 2050. The manifested goals highlight the importance of transportation as the basis for the European economy and society to remain fully competitive and all its regions fully integrated into the world to assure future prosperity for the European continent (European Commission, 2016j).

The Member States have further agreed on the establishment of the ‘Connecting Europe Facility’ (CEF) to ensure funding reaching the aims of this new transport policy (European Commission, 2014b; European Commission, 2017b).

The EU has introduced an array of methods to allow the improvement of legislation and to include the feedback from companies and the general public. Matters that can be addressed are for example: roadmaps, impact assessments, legislative proposals and so called ‘fitness checks’ (‘REFIT’). This also makes the governance more open and transparent.

The following sub-chapters address some of the most important backbones of European transport policy and funding possibilities that support the promotion of intermodal terminal infrastructure and connectivity. This enables the EU to fulfil its identified resource efficient and sustainable approach in the long run (European Union, 2016b; European Commission, 2011; European Commission, 2014b).

4.1. Single European Railway Area

In the mid-1990s the EU drafted the White Paper ‘A Strategy for Revitalising the Community’s Railways’ as a response to declining market shares of the railway sector and growing awareness of negative effects that result from public and cargo transportation in general. One of the identified issues, adding to the competitive disadvantage, was the missing of an internal market at community level (European Commission, 1996).

The Commission made a series of proposals, one of which being the creation of a ‘number of trans-European railway freeways for freight’ (European Commission, 1996). The Commission presented further suggestions for a more efficient legislation in 1998 that had then been adopted in 2001. The Directives inter alia allowed access to the trans-European network, progress options in freight transportation and proposed a ‘one-stop-shop’ (European Commission, 2016e). The previous Directives were joined into a sole document (European Parliament, 2017) and Directive 2012/34/EU (European Commission, 2012) then established the ‘Single European Railway Area’. The Directives were merged into a single act and extensive and significant adjustments made that addressed issues on competition, regulation and investment that were identified during the past decade (European Commission, 2014c).

Even though the railway sector has come a long way, it is still facing several drawbacks (European Parliament, 2016a). The Commission therefore suggested six legislative countermeasures for the improvement of the competitiveness of the rail sector (European Commission, 2016f). This is commonly referred to as the ‘fourth railway package’ (Scordamaglia and Katsarova, 2016) and part of which was the amendment of Directive 2012/34/EU adopted in December 2016, to reflect the opening of the market for domestic passenger transports and governance of railway infrastructure (European Commission, 2016g). This improvement of competitiveness and the development of more efficient and up-to-date solutions will help promote the railway sector and as a result the intermodal transport sector.

The European transport infrastructure is characterised by the Trans-European Transport Network and is broken down into a ‘core’- and a ‘comprehensive’ network. The establishment of interconnectivity and interoperability of national transport networks is aimed to be achieved through them. Resource-efficient and sustainable interconnection and interoperability can be achieved through the expansion of capacity by the removal of bottlenecks and bridging missing

infrastructure links, optimisation where necessary, as well as by ensuring a better modal integration across the network (Publication Office, 2013).

The objective to complete the Core Network by 2030 and the Comprehensive Network by 2050 is complex, both financially and organisational wise. Therefore, the former was broken down into nine multimodal network corridors embracing all transport modes: air, road, and rail, maritime and inland waterways. The Core Network embodies strategically important nodes and links of the TEN-T. Figure 2 on the following page gives an overview of the TEN-T network. The 'North Sea – Baltic Corridor' is one of them (European Commission, 2016b; European Union, 2016a).

The guideline for the TEN-T outlines the objectives for the creation of this network and the definition of requirements for the different transport modes and the related infrastructure. The general priorities are outlined in chapter two and article 10. The railway parts covered in chapter two, section one - articles 11 to 13 and the multimodal transport in chapter two - section six and articles 27 to 29, are most relevant (Publication Office, 2013) for this document.

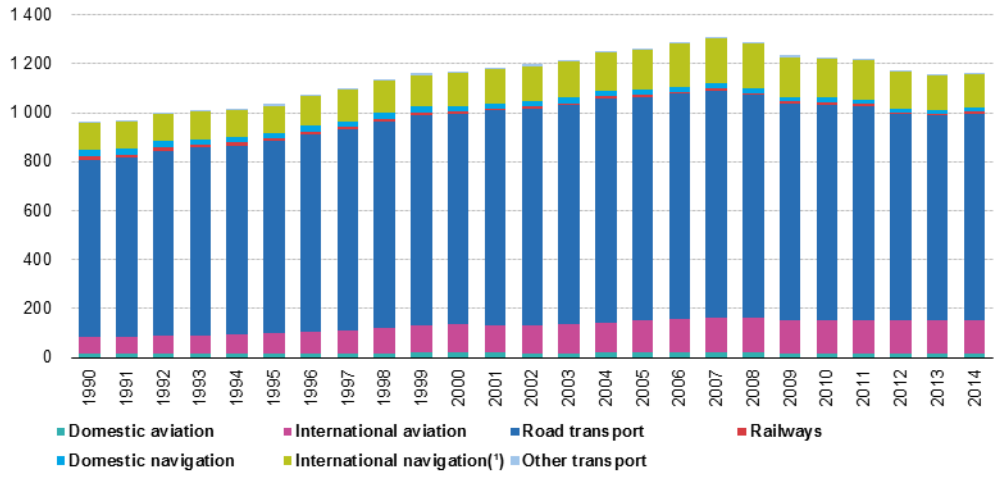
Funding for these measures can be received through the 'Connecting Europe Facility' (CEF). The transport nodes subject to this document, and in the countries along the 'North Sea – Baltic Corridor' and the corridor itself will be analysed and discussed in chapter five accordingly.

Figure 2: Excerpt from TEN-T Core Network Corridor Map (European Commission, 2013a)

4.2. Combined Transport Directive

The goal of a single market ought to be accomplished at lowest costs to the civilisation (OECD, 1998). The European Union's measures in transport policy aim to encourage the use of adequate transport offers and fair competition (Finger and Holvad, 2013), but also boosting transportation via rail with its better carbon footprint.

The 'Combined Transport Directive' 92/106/EEC was introduced to establish '…common rules for certain types of combined transport of goods between Member States' (European Commission, 1992). It was also established as a mechanism to cut back on negative externalities such as congestion and GHG emission. A comparison of GHG emissions between 1990 and 2014 is illustrated in figure 3 below.



(1) Not included in the EU emissions totals relevant for the energy and climate packages
Source: EEA, republised by Eurostat (online data code: env_air_gge)

Figure 3: Greenhouse gas emissions of transport, EU-28, 1990-2014 (EuroStat, 2017)

Whilst the emissions from trucks have gone down in recent years, they had continuously gone up until 2007 and still represent about 75 per cent of the emissions associated to the transport sector (EuroStat, 2017). The 'Combined Transport Directive' backs other modes of transport, such as rail, regarding long distance transports in order to promote more resource efficient and

environmentally friendly transport solutions. The EU underscores its aim to reduce GHG emission and negative externalities through this (European Commission, 2017c).

As part of the ongoing legislative analysis, the Commission had contracted an 'Analysis of the EU Combined Transport' in 2015. This report concluded that the Directive is an essential part of a sustainable development of multimodal transport, even though – with its over 20 years of existence, it was somewhat out-of-date in some respects (European Commission, 2015).

The EU thereafter produced a 'roadmap' for an impact assessment of amendments to the 'Combined Transport Directive' (European Commission, 2017d) and based inter alia upon public feedback and the REFIT, more commonly referred to as 'fitness check' of the Combined Transport Directive. This REFIT analysis was carried out at the beginning of 2017 and over a period of three months (European Commission, 2017c). The check reaffirmed the validity of the Directive and that road transport still dominates the transport sector due to its higher flexibility and lower investment costs, along with its negative externalities (European Commission, 2016h). It also repeated what was found in the analysis of the Commission (European Commission, 2015) – the efficiency of the Directive has room for improvement and thus should be revised (European Commission, 2016h). More specifically, the proposal suggested changes that would for example clarify, simplify and extend the definition of combined transport, allow for flexibility with specific geographical or operational constraints, and the provision of economic support through Member States is intended. A coordination of the Member States' economic support with the neighbours to avoid overlapping investments is required. Further aims are an improved monitoring of the eligibility and enforcement conditions, improved reporting and monitoring conditions of the Directive and to increase the effectiveness of incentives. With that, the Commission proposes to expand the Directive's reach to domestic transports and at the same time limiting each road leg to 150 km in distance or 20 per cent of the distance of the whole combined transport route when it amounts to more than the above-mentioned 150 km (Pape, 2018; Auito, 2018).

4.3. Transport Policy of Member States along North Sea – Baltic Corridor

The following paragraphs will look at measures undertaken by Member States along the 'North Sea – Baltic Corridor' to assure the establishment of such a network, reducing hindrances, enhance the cohesion of the EU and devoted towards establishing the single European transport area (European Commission, 2016b). How these measures affect identified nodes in the countries along the corridor will be discussed in the next chapters.

The German Federal Government looks after 7,675 km of waterways, 37,775 km of operated railway lines, about 40,000 km of federal highways and 12,800 km federal motorways (Federal Ministry of Transport and Digital Infrastructure, 2014). Transport policy is an important topic and high on the political agenda due to the topographic position within Europe and the resulting traffic load on Germany's roads (Fichert, 2017).

The government has created a series of master- and action plans over the past years to better enable the focus on a transport network that will withstand the anticipated increase by 40 per cent of freight traffic on roads, and 43 per cent of rail freight traffic by 2030 (Federal Ministry of Transport and Digital Infrastructure, 2014). In the 'Masterplan for Freight Transport and Logistics' (Federal Ministry of Transport and Digital Infrastructure, 2008) the Ministry outlined the intended transport policy objective to form an integrated transport policy. This policy was to be based on three arms: innovation-, investment- and regulation (Kellermann, 2008).

The policy is outlined and implemented through the long-term plan of the Ministry – the 'Federal Transport Infrastructure Plan' (FTIP), which is usually valid for ten to fifteen years (Federal Ministry of Transport and Digital Infrastructure, 2017a). This long-term plan is one of the most important tools for German transport policy.

The innovation arm is implemented through policy measures such as 'technology-neutral funding'. The investment arm is implemented by continuously investing in infrastructure. In 2014, the ministry had 10.5 billion Euros available for such investments. Lastly, an example for the regulatory arm is the 'Directive on funding for terminal infrastructure for Combined Transport of non-federally owned companies' (Federal Ministry of Transport and Digital Infrastructure, 2014).

The Directive provides private companies with the opportunity to gain funding of up to 80 per cent (Federal Ministry of Transport and Digital Infrastructure, 2017b). The overall context of this federal funding is the goal to expand the technical handling capacity on average by 9,000 loading units per million Euros of funding (Federal Ministry of Transport and Digital Infrastructure, 2017b). In 2013, 1.4 million truck-km and 28.4 billion ton-km of transport performance were moved to rail or inland waterway alone (Federal Ministry of Finance, 2017).

The CEF granted funding of just under 200 million Euros in 2016, of which 54 million Euros were for the core and Comprehensive Network (European Commission, 2016i). The FTIP foresees funding of about 270 billion Euros by 2030. Roughly 140 billion Euros are planned for the preservation of the infrastructure. Just under 100 billion Euros are planned for the creation and enhancement of construction plans. The average spending for railways is expected to be 1.8 billion Euros per annum and with that reduce capacity bottlenecks of about 800 km in length (Federal Ministry of Transport and Digital Infrastructure, 2016).

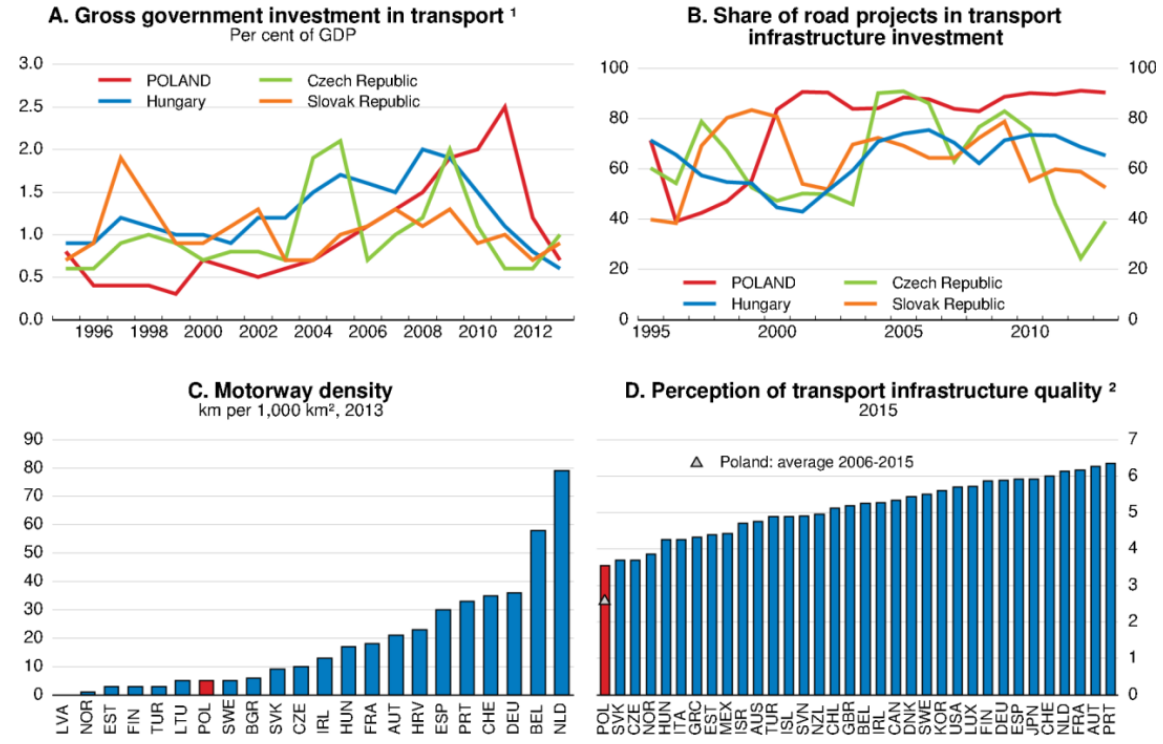
Transport policy in Poland is mostly handled by the Ministry of Infrastructure and Construction (Ministerstwo Infrastruktury i Budownictwa). Specifically, about transport execution; -expansion ; -investment and funding. The Ministry looks after such aspects as the transport development strategy, the TEN-T and the railway development programme. The coordination between various levels of governments, as well as among jurisdictions has caused disorganisation in the past. However, there are voluntary instruments in place to increase partnership amongst municipalities on such issues. A law was put in place that envisages the creation of metropolitan governance associations within the area of transport (Goujard, 2016).

There are three programmes or strategies that are directly related to transport policy in Poland. The national transport strategy, the national road construction- and the national railway programme.

The strategy is the first overarching strategy for transport in Poland and was issued in 2013. The goal of the strategy was a better coordination of transport mode and the relevant infrastructure projects. The strategy intents to enhance transport in terms of access, safety and efficiency. The strategy also put in place criteria that will enable the selection of projects within the strategy that are eligible for EU funding, available to Member States in the period of 2014 – 2020.

The national road- and railway programmes are mode-specific programmes, within the strategy, with a time span of 2014 to 2023. They are provided with national funds and have been issued in 2015. While the road construction programme played a major role in the previous funding period up to 2013, the railway programme is now a priority under the new funding period. The road sector is still represented by PLN 107 billion or around 40 billion Euros. The national railway programme is set to spend PLN 67.5 billion or about 16 billion Euros. Therefore, although the rail sector is named as a focus in the strategy, it still is provided with lower funding than the road sector (Goujard, 2016; European Commission, 2016j).

The unevenness in transport investments is provided in an overview focussing on investments, road transport projects share, density of motorways and infrastructure quality in figure 4 below. To counteract this imbalance, it is important to improve the allocation of access rights to railway operators, reduce access charges and delays that are based on outdated infrastructure control systems (Goujard 2016; European Commission, 2016j).



1. Gross government fixed capital formation (general government).
2. Index for road transport, from the lowest perceived quality (0) to the highest (7).

Figure 4: Public transport investment increased, remains unbalanced (Goujard, 2016)

The EU moreover has recently underlined its endeavour to complete the TEN-T network by providing Poland with 338 million Euros of funding. The funds are for the realisation of the Polish Białystok – Elk line section, belonging to the 'Rail Baltica' line and representing 80 per cent of the Polish 'Rail Baltica' line section (European Commission, 2017e).

The transport policies of the Baltic States outline the importance of the 'Rail Baltica' project and their traditional East-West connections. All three countries note the potential of their geographic location and possible trade with the riparian Commonwealth of Independent States (CIS) states and Asia through the Eurasian land bridge. The countries identified the need to diversify the cargo flow and the opportunity of the connection to Central- and Western Europe and offering value-added services to the transport sector. Latvia further identified the 'Arctic' route to be a potential new cargo flow. All three Baltic countries are potential distribution hubs for cargo from and to Scandinavia over the Eurasian land bridge.

The provision of accurate infrastructure offers the possibilities to establish such added values to the transport sector and the settlement of international businesses. The availability of European Union funds and the interest to foster an internal transport network to connect all relevant regions and to strengthen competitiveness overlap and therefore the countries intend to comply with the completion of the network as outlined by the European Union (Estonian Government, 2012; Ministry of Economic Affairs, 2013; Cross-Sectoral Coordination Centre, 2010; Transport Policy Guidelines, 2013; Lithuanian Government, 2013; Ministry of Transport and Communication, 2017).

The Baltic Countries – Estonia, Latvia and Lithuania have been cooperating in the preparation and construction of one of the biggest infrastructure projects in the EU, the 'Rail Baltic' or 'Rail Baltica'. The European Commission also refers to this as a priority project, as it is part of the 'North Sea – Baltic Corridor' and is set to be completed in several steps. The major goals are the completion of the Baltic section by 2025 and the completion on the corridor by 2030. Figure 5 provides an overview of the 'Rail Baltica' project overall timeline.

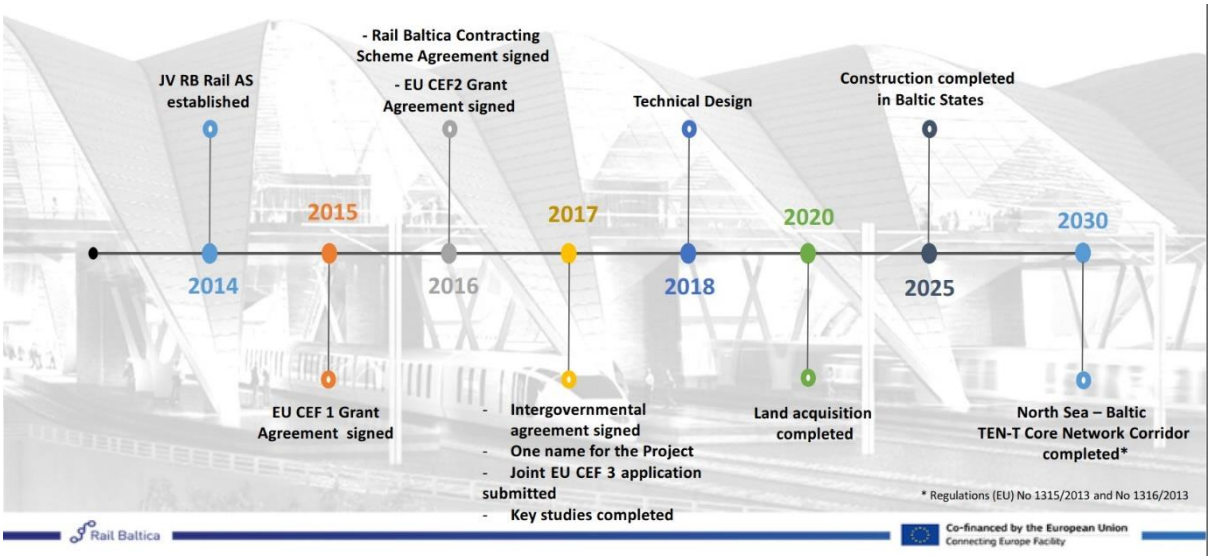


Figure 5: Global Project Time Line: Baltic States (Bramans, 2017)

The aim is to link Finland, Estonia, Latvia, Lithuania and Poland with modern railway infrastructure based on the European gauge of 1435 mm rails. The size of this undertaking can be emphasized by considering exemplary numbers: 870 km length; cooperation of three countries; more than five billion Euros investments and three multimodal terminals to be integrated (Rail Baltica, 2017a). The connection to the corridor is illustrated in figure 6. The three Baltic States have signed documents that represent their agreement on the development of the 'Rail Baltica' and on enhanced cooperation between the Baltic States, Finland and Poland (Rail Baltica, 2017b; Rail Baltica, 2017c).

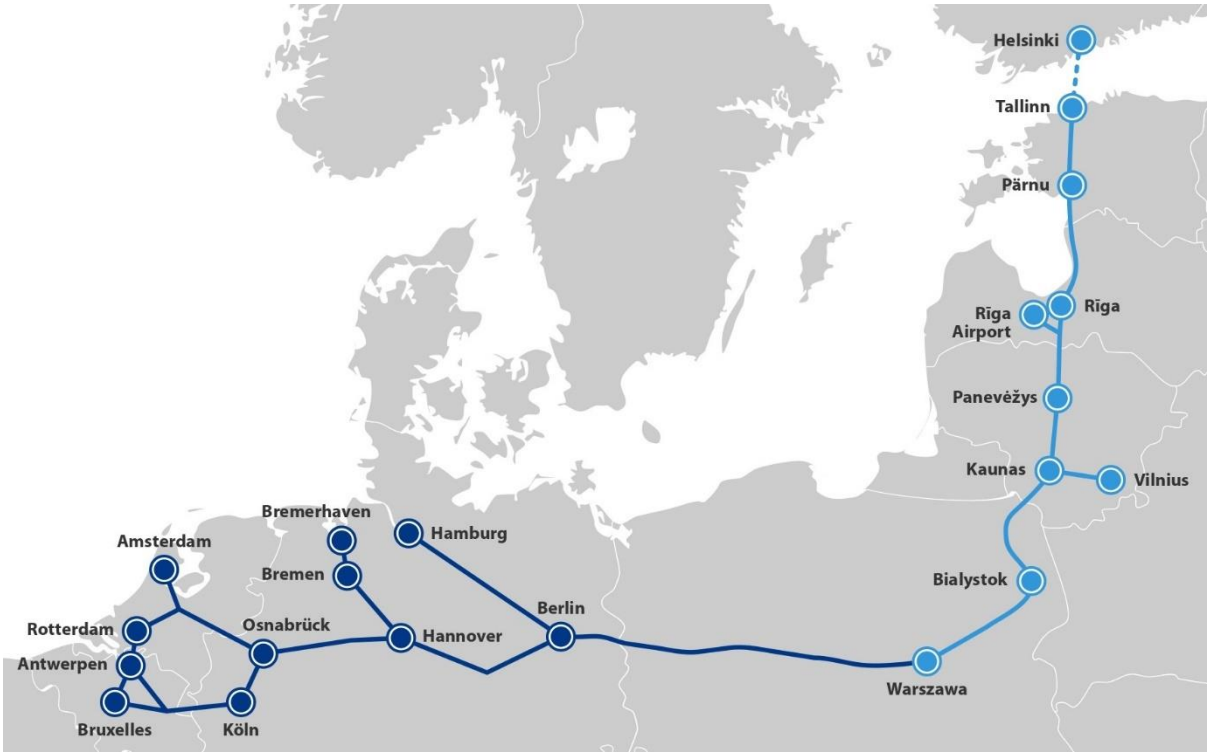


Figure 6: Rail Baltica North Sea - Baltic Network (Rail Baltica, 2017d)

As part of the project implementation, a Cost-Benefit-Analysis was carried out. Three scenarios looked at transit-, import- and export cargo for the Baltic States. The forecast indicated that the type of shipment is divided in such a manner that the transit traffic is slightly above the import or export freight traffic (Rail Baltica, 2017e). Economic and socio-economic aspects were also considered. The Analysis suggests that cargo flows will develop positively. Upfront financing is necessary, although the project will finance itself in the long run, and has positive economic effects (Rail Baltica, 2017e). The European Union supported the 'Rail Baltica' project once again by providing the Baltic States with further funding of 110 million Euros. The project has received more than one billion Euros of funds through previous funding by the 'Connecting Europe Facility' (European Commission, 2017e). An overview of national policy documents covering transport aspects is provided in table 1 on the following page.

Table 1: Overview of national policy instruments covering transport aspects (own contribution)

Germany	Poland	Estonia	Latvia	Lithuania
Federal Transport Infrastructure Plan	National Transport Strategy	Estonia 2030+	Sustainable Development Strategy of Latvia until 2030	National Reform Programme 2013
Masterplan Freight Transport & Logistics	National Road Programme	Transport Development Plan	Transport Policy Guidelines	National Transport Development
Combined Transport infrastructure funding	National Rail Programme			

4.4. Examples of European Funding Possibilities

The financial crisis has led to a decrease in infrastructure investments in Europe. In order to ensure that the investment gaps are covered and to reach the estimated 500 billion Euros of investments required, the European Union has introduced a variety of measures (European Commission, 2017f).

The ‘Connecting Europe Facility’ was established to finance the removal of identified hindrances and broken threads within the European transport-, energy- and digital infrastructure (European Commission, 2013b).

The total amount of funding available for TEN-T projects is just over 24 billion Euros until 2020. The funding is split into two groups of eligibility. One for all Member States and one for those that have access to the Cohesion Fund. Cohesion Fund eligible Member States are those that have a gross national income that is more than 90 per cent below the EU average. In the 2014 - 2020 funding period, this was true for 15 Member States. The following countries along the North Sea – Baltic corridor are amongst these 15 Member States: Estonia, Latvia, Lithuania and Poland (European Parliament, 2019). The funds are mainly provided in terms of grants, programme support actions, or commitment to the financial instruments such as the Marguerite Fund. The allocation of the funds is outlined in the Multi-Annual Work Programmes. The first had a funding volume of 11 billion Euros. The programme consists of projects that are either already singled out in ‘Appendix I’ of the CEF regulation or commit to the fulfilment of the ‘Motorways of the Sea’ and the ‘European Rail Traffic Management System’ (ERTMS) priorities. Some of the areas covered include cross-border projects for the modes of transport and their related hindrances; multimodal logistics; ‘Intelligent Transport Systems’; e-infrastructure; multimodality, state-of-the-art technology and innovation. This targeted funding approach aims at bettering the efficiency and fostering the visibility of the backbone of European mobility - the Core Network Corridors (European Commission, 2017g; European Commission, 2017b). The allocation of funds is illustrated on the following page in figure 7.

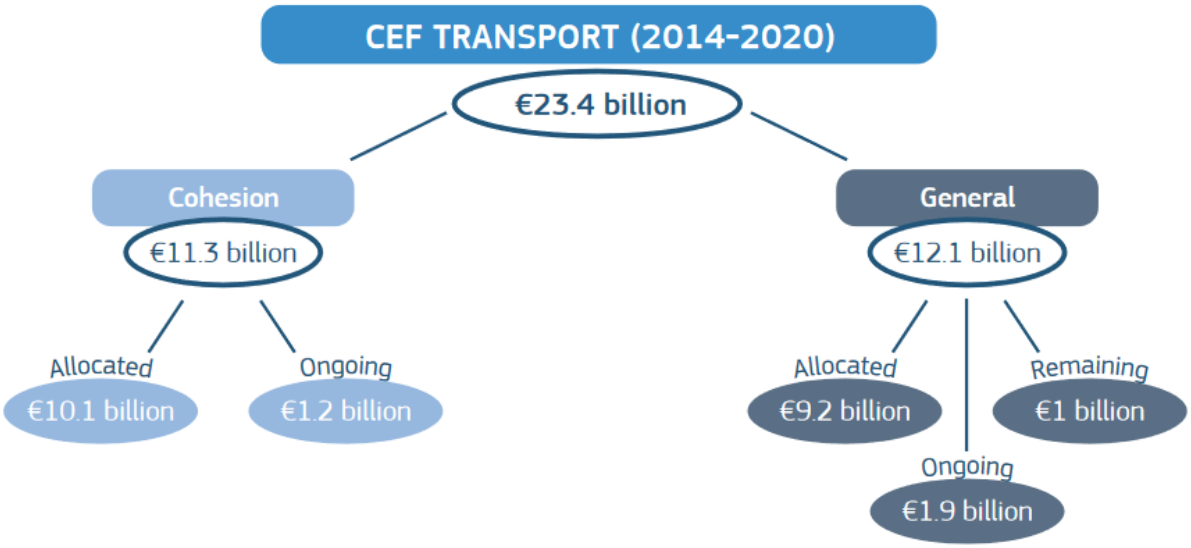


Figure 7: CEF Transport funds and allocation (European Commission 2017h)

The latest proposal of funding was in the form of 2.7 billion Euros for just over 150 transport projects. Of the 2.7 billion Euros, 1.8 billion Euros are for Cohesion Fund eligible Member States and will release a further 4.7 billion Euros of funds from public and private parties. The biggest share of the funds is released towards the advancement of the European rail network, the decarbonisation and enhancing of the road and 'Intelligent Transport Systems' (European Commission, 2017i).

The Connecting Europe Facility has furthermore carried out a so-called 'blended' call that provides a further billion Euros in funding, if applicants utilise additional funding sources from financial institutions such as the European Investment Bank. Through this combination of funding sources, more projects can be realised to ensure critical and infrastructure focussed investment. This is particularly important, considering that the suggested funding required by 2020 far exceeds the available funding through the CEF instrument. For example, in the 2014-2015 period, projects applied for more than twofold of funding available through CEF for that time frame (European Commission, 2017h).

Another way of investing in the railway sector is through research and innovation. The European Union has set up the programme 'Horizon 2020' for this, with 77 billion Euros total funds available between 2014 and 2020. For the area of 'smart, green and integrated transport' there

are 2.9 billion Euros available (European Commission, 2017j). A key measure to support the progression in the 'Single European Railway Area', is the joint undertaking 'Shift2Rail' that emerged from the 'Horizon 2020' programme.

'Shift2Rail' is a public-private partnership founded by the European Union and eight partners from the different branches of the rail trade. The aim of this cooperation is to promote innovation in the railway sector and with that maintain Europe's capacity and position in the railway market globally. Innovation and implementations resulting therefrom will aid with the accomplishment of the 'Single European Railway Area'. The estimated budget will be 920 million Euros up to 2020 of which 450 million Euro will be funded by the European Union.

Additional support can be granted through other investment programmes such as the Connecting Europe Facility, which is discussed in the next section of this chapter (Shift2Rail, 2014).

The public-private partnership created a Master Plan that outlines five so called 'innovation programmes' that cover all aspects of the 'Shift2Rail' scheme. With the five programmes being cross-cutting topics covering the entire railway sector and its complex setup, a further coordination was therefore put in place that is looking at the overarching aspects (Shift2Rail, 2017a). This approach is illustrated in figure 8 on the following page.

These programmes and overarching aspects will be utilised to fulfil the mission of contributing to cutting the railway transport life-cycle costs, increasing reliability and punctuality by 50 per cent and to double the capacity (Shift2Rail, 2017b).

The research and innovation programme has already generated various projects with varying levels of funding from the European Union. Each of them looking at different aspects of the five 'innovation programmes'. Issues that are covering various areas, are looked at under the cross-cutting aspect. Furthermore, the European Union outlines those projects that are deemed ground breaking or leading the way to the future. They are often referred to as 'lighthouse' or 'flagship' projects. Within the 'Shift2Rail' funding, already over a dozen of projects have been branded as such and underline their importance for the innovation in the railway sector (Shift2Rail, 2017c).

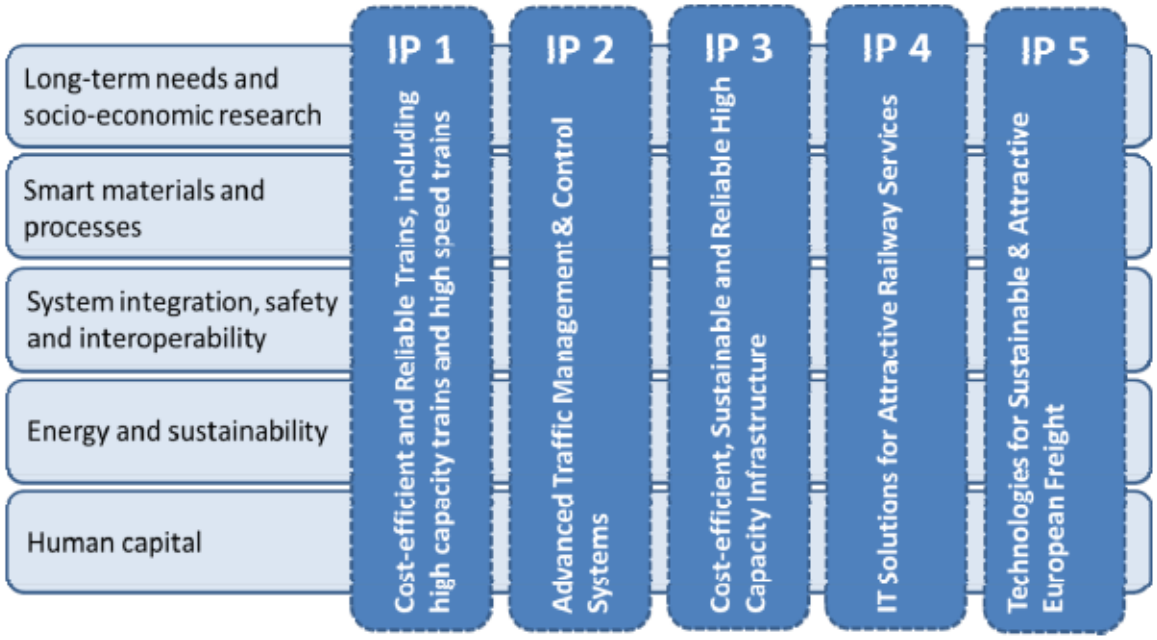


Figure 8: Shift2Rail systems approach and cross-cutting themes (Shift2Rail, 2017a)

The 'European Fund for Strategic Investments' (EFSI) from the European Investment Bank, the European Investment Fund and the European Commission is another form of funding. It is a combination of the European Investment Bank's own budget and a guarantee backed by the European Union budget totalling 21 billion Euros. The goal is to unlatch further investments of 315 billion Euros by the end of 2018 and to provide funding to projects with economic feasibility that otherwise may face difficulty to find funding. They must be indispensable for the economy in Europe (European Investment Bank, 2017).

The European Structural and Investment Funds (ESIF) focusses on the topics: research and innovation, digital technologies, supporting the low-carbon economy, sustainable management of natural resources and small businesses. In terms of investments for transportation, the last two topics are negligible. Relevant examples of transport investments within the ESIF are the Cohesion Fund and the European Regional Development Fund (ERDF) (European Commission, 2017k).

The Cohesion Fund's focal point is on projects that focus on the TEN-T and environmental aspect, regarding transport and energy, with a total budget of 63.4 billion Euros. The Cohesion

Fund wants to reduce mercantile and societal imbalances (European Commission, 2017l). The Cohesion Fund more precisely will finance under CEF and regarding the priority projects of the TEN-T, where the ‘Rail Baltica’ is one of them (European Commission, 2017m).

The ERDF has its investments set out in ‘thematic concentration’. One of them is the ‘low-carbon economy’. The ERDF has similar intentions to the Cohesion Fund. It however focusses on improving regional shortcomings (European Commission, 2017n). Figure 9 on the next page provides an overview of the funding possibilities discussed above.

CEF
· 23.4 billion Euros of which 11.3 billion Cohesion Fund · Between 20 and 85 per cent of co-financing possible · Examples of priorities: Cross-border, missing links, bottlenecks, pre-identified projects, interoperability, innovation

Shift2Rail
· 450 million Euros co-finance of EU and 490 million Euros by railway sector · 100 per cent co-finance rate for research and innovation actions and coordination and support actions · 70 per cent funding for innovation actions

EFSI
· 16 billion Euros guarantee from EU budget aiming to mobilise 315 billion by 2018 and 500 billion by 2020 · Examples of priorities: Infrastructure and Innovation, SME · 6 per cent investment in transport sector · A guarantee that intends to help lending and through that provide funding. Direct investment or multisector framework loans are possible too. The European Investment Bank can also make equity investments and through that provide funding in particular market areas · EFSI and ESIF funding can be combined · lower loan interest rates than elsewhere, but depend on risk of project

ESIF examples
ERDF
· About 11 billion Euros for Germany, about 40 billion Euros for Poland, roughly 2 billion for Estonia, close to 2.5 billion for Latvia and 3.5 billion Euros for Lithuania have been allocated for the period 2014-2020 · Up to 85 per cent co-funding rate · Example priorities: Innovation and research, low-carbon economy
Cohesion Fund
· 11.3 billion Euros CEF of a total of 63.4 billion Euros; Poland has further access to about 23 billion Euros, Estonia to just over 1 billion, Latvia to a little under 1.5 billion Euros and Lithuania to just over 2 billion Euros additional Cohesion Funds · Up to 85 per cent funding · Examples of priorities: Research and innovation, supporting low-carbon economy

Figure 9: Funding possibilities overview (own contribution; Shift2Rail, 2016; European Commission (2017g; 2017n); European Structural and Investment (2016a; 2016b; 2016c; 2016d; 2016e))

5. Requirements of European Intermodal Rail-Road Hinterland Terminals

The rail-road intermodal terminals analysed in the following sections are: Hamburg and Berlin-Großbeeren in Germany; Łódź, Poznań and Warsaw in Poland; and Kaunas, Klaipėda, and Vilnius in Lithuania (European Union, 2014). Estonia's main logistics hub is the port of Tallinn. It is therefore a Core Network node, but not a Core Network rail-road terminal (European Commission, 2016c). An overview of the location of the nodes is provided in figure 10 below.

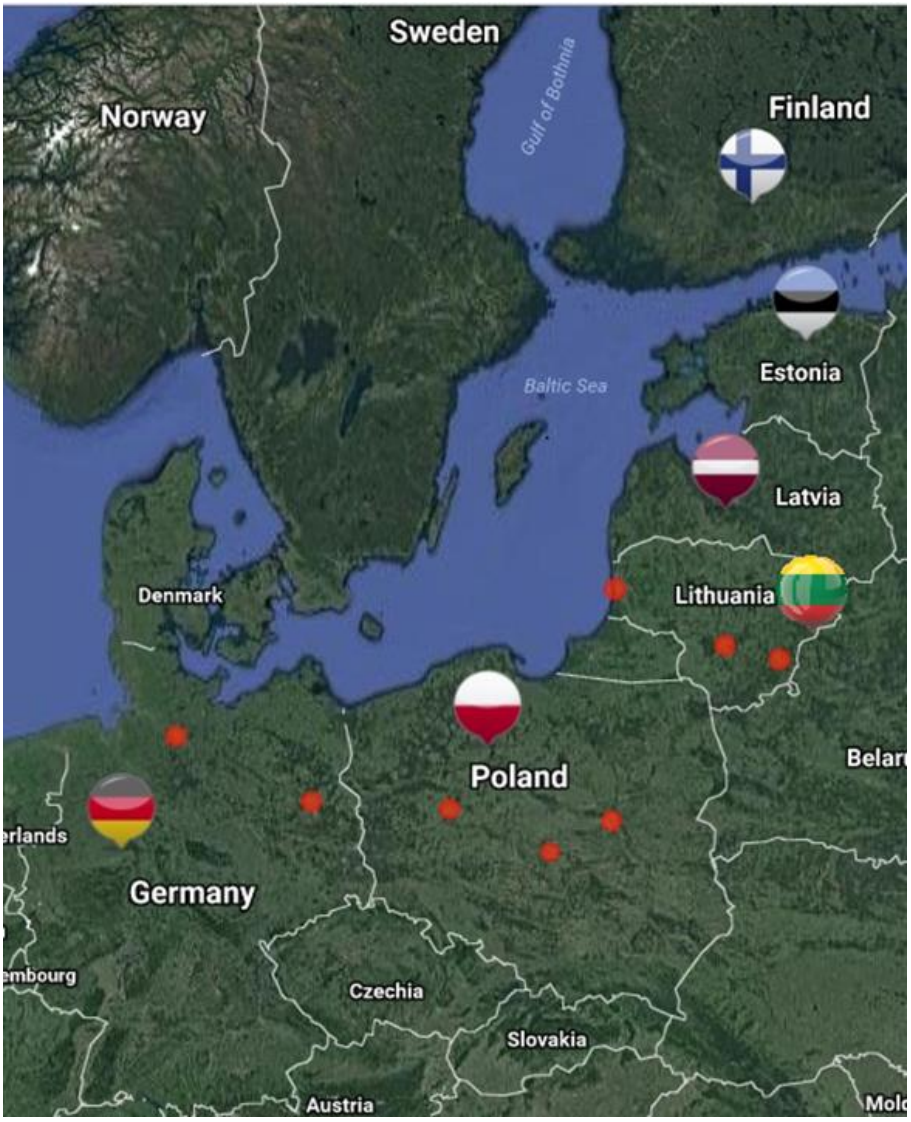


Figure 10: Rail-road terminal locations 'NSB Corridor' (own work; Scribble Maps, 2017)

Hamburg is the largest railway port in Europe and has various terminals that are connected to the railway network (Hamburg Port Authority, 2015). They all have between five to ten railway tracks of 700 m in length and the relevant handling equipment (Eurokombi, 2017; Hansen, 2017). Containers can be delivered directly to the terminals by all modes of transport. Intermodal Transport Units (ITUs) can be delivered either to the Kombi-Transeuropa Terminal, the Eurokombi, or the DUSS Terminal Billwerder outside the port area which is used to load and unload intermodal trains. This, in combination with the port railway network and the marshalling yard in Maschen, provides the Port of Hamburg with an efficient connection to the hinterland. Hamburg also has a traditionally strong hinterland towards Poland with more than 70 marketed train departures per week (Hafen Hamburg Marketing, 2017a).

The German railway infrastructure is however facing capacity problems, besides others, because of steadily growing markets and shared train network by public and freight trains. These problems can lead to delays and have a negative effect on today's supply chains. There are also hindrances near Berlin specifically, and electrification and speed issues in general. Trains of 740 m length can be operated, however only during specific timeframes. The construction of overtaking tracks has been placed in the 'Federal Transport Infrastructure Plan'. Unfortunately, though, the priority for the construction however is rather low as there is a plethora of other projects to be considered in this long-term plan.

Another bottleneck is the operation of some combined transport terminals at capacity limit. The capacity limit is reached in some instances in general and in other cases during peak times (Deutsches Zentrum für Luft- und Raumfahrt e.V., 2016; European Commission, 2016c). The latter arises from growing vessel sizes and therefore more cargo volumes that need to be handled at times, or in relation to opening hours. The terminal operator 'Hamburger Hafen und Logistik AG' is working on what they refer to as 'Fuhre 2.0'. It is an obligatory pre-announcement of trucks for picking up or dropping off cargo and aims at an optimised spread of pick-ups and deliveries to reduce peaks and congestion (Hamburger Hafen und Logistik AG, 2017).

The Polish railway network was neglected in the past were the focus was more on the road sector. Since the Polish truck market is traditionally strong, this is understandable (Posaner, 2017). However, the new 'Operational Programme for Infrastructure and Environment 2014-2020' (Ministry of Infrastructure and Development, 2014) and the 'National Rail Plan to the Year 2023' (Ministry of Infrastructure and Development, 2016) by the Ministry of Infrastructure

and Development reflects this through considering the TEN-T and railway sector necessities. This is especially important, when considering the expected growth in container transportation of more than 300 per cent by 2025 (European Union, 2014).

Figure 11 below illustrates the existing intermodal terminals in Poland. Poznań has various rail-road terminals and benefits from its geographic position as a distribution point between Poland and Germany (European Commission, 2016c). The illustration highlights the accumulation of terminals around the ports, the nodes of the 'North Sea – Baltic Corridor' and the south-western industrial area of Poland.

Figure 11: Locations of intermodal terminals in Poland (Jaworski, 2016)

Wiśniewski (2017) highlighted the implementation necessity of the 'Y' line which would increase the capacity between the rail-road terminal nodes Poznań, Łódź and Warsaw. The implementation of the 'Y' line would reduce the speed-, train length- and axle load bottlenecks on that route and unlock the full potential of the E-20 route. Figure 12 below illustrates the Polish transport network, the TEN-T network and the economic- and capacity capability that could be released with the 'North Sea – Baltic' and the 'Baltic – Adriatic' corridor with the vicinity of the road-rail node triumvirate (Wiśniewski, 2017).

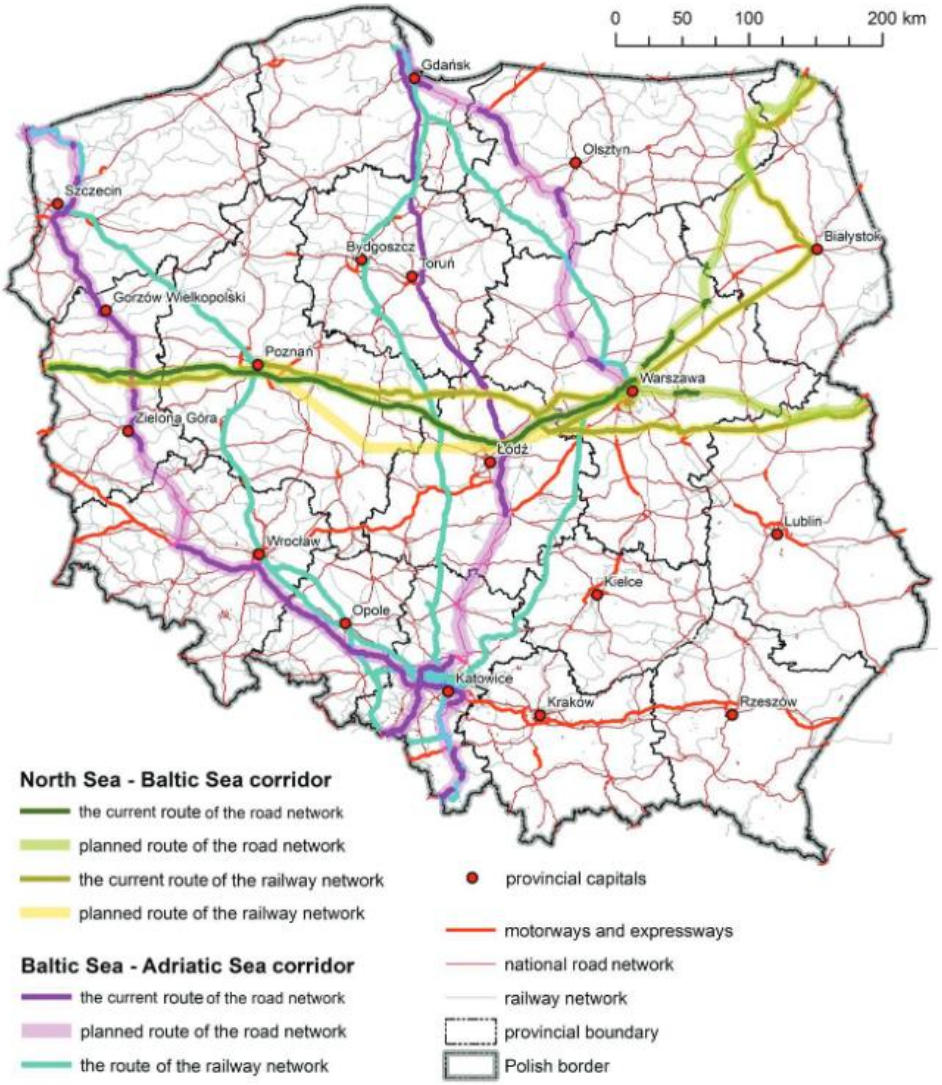


Figure 12: TEN-T Corridor and Polish Transport Network course (Wiśniewski, 2017)

The broad-gauge is still present in Finland, Poland and the Baltic States due to historic links to Russia, Belarus and Ukraine. This causes different technical requirements and reloading of cargo between the European 1435 mm gauge and the broad-gauge 1520 mm in the Baltic States (Community of European Railway and Infrastructure Companies, 2015).

The 'Rail Baltica' project is rectifying this through connecting the States with the European 1435 mm gauge. This connectivity is then underlined through the construction of the Kaunas- and Vilnius intermodal terminals. The Kaunas intermodal terminal has the speciality to have both, the European- and the broad gauge. The possibility to handle both railway gauges, with the traditional east-west cargo flow and trade with the CIS states and the location of these terminals, will aid to the provision of alternatives for cargo flows (Lithuanian Railway, 2015c; Community of European Railway and Infrastructure Companies, 2015).

A survey was carried out through face to face interviews and online participation, within the framework of the EU funded project 'North Sea – Baltic Connector of Regions' and various stakeholder groups involved in intermodal traffic were addressed. Feedback was received from 112 logistics service providers and 90 shippers. The aimed target group size for the end of the project was 145 per group. The intermediate results therefore were about 20 per cent short in terms of logistics service providers and about 40 per cent for the shipper's group. The latter group is very sensitive to surveys and often does not want to comment. One part of the preliminary findings was the major barriers for intermodal transportation. Figure 13 on the next page provides an overview of the barriers noted as most hindering the usage of intermodal transportation by the varying stakeholders involved in the transportation process. The factors cost, information availability and transport network were the top three barriers for most of the interviewees (Institute of Logistics and Warehousing, 2017). As illustrated on the next page, information is a very important aspect in today's logistics processes as they are part of the supply chain. This is underlined by 'DB Netze' pointing out that, especially for Germany, there is a need for intelligent handling of infrastructure with its high density of cargo and passenger trains and thus a more productive utilisation of existing areas through automation (Schulz, 2017). The European Commission is also acknowledging this through the focus on multimodality in 2018 (Bulc, 2017).

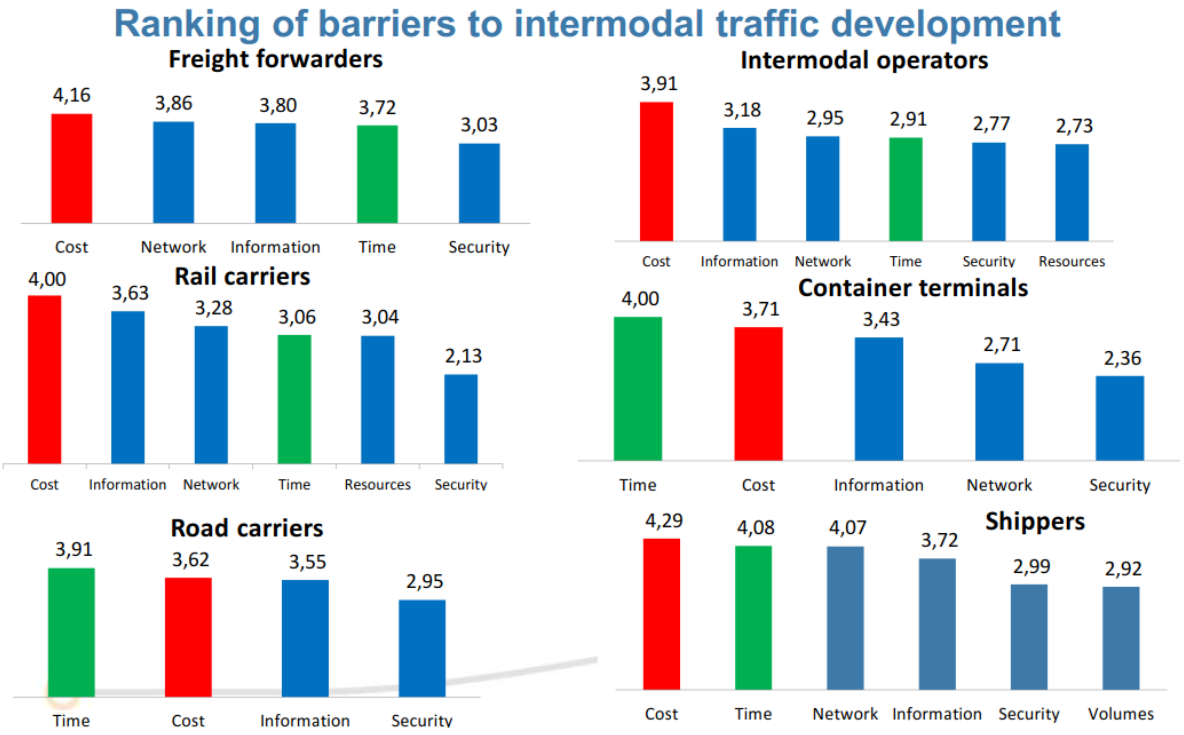


Figure 13: Identified intermodal traffic barriers (Institute of Logistics and Warehousing, 2017b); n = 90 shippers and n = 112 logistics service provider

Parties involved in multimodal transport have furthermore issued a position paper on ‘e-Communication and Digitalisation in Logistics’ in which the achievement of productivity and constancy is underlined as a necessity for businesses along the logistics and supply chain and to be able to compete with other modes of transport as individuals or a transport sector as a whole (Union Internationale Pour Le Transport Combine Rail-Route, 2017). They therefore welcome the Estonian Presidency’s work and effort to push the creation of a ‘digital Europe’, as well as pushing the industrial progress and gaining from the progress on an individual, business or society level (Estonian EU Secretariat, 2017).

The survey also identified that the ‘Rail Baltica’ project is relatively unknown among German shippers, although the interviewees showed interest upon elaboration during the process of the survey. The awareness about this project and its potentials therefore would need to be improved and was brought on the agenda of the ‘North Sea – Baltic Connector of Regions’

partners. Further to the barriers, the survey also identified some potential drivers, opportunities and threats for the future of the West Europe – Baltic States connection. An overview is provided in figure 14 below and a strengths, weaknesses, opportunities and threats (SWOT) analysis can be found at the end of this chapter.

Figure 14: Future of West Europe – Baltic States connection (Institute of Logistics and Warehousing 2017)

Data on transport is scarce, differs in type and capacity and can contrast considerably between modes of transport. The data sets mostly relate to specific transport legs, rather than considering the entire supply chain (McKinnon, 2015). This was also noted from the survey, carried out by the project partners of 'North Sea Baltic – Connector of Regions' (Institute of Logistics and Warehousing, 2017). Many participants of the value chain claimed information to be important, as seen in figure 14 above. However, they were reluctant to share data to improve the information flow. There is still big uncertainty considering 'Big Data', 'Internet of Things' and who owns the data.

There have been several approaches to identify performance measures to better analyse the status quo of transport issues. Some of them have macro-level considerations such as policy, as well as micro-level considerations on business and terminal. On the other hand, there are considerations with a wider scope and separated into clusters and used in the 'European Ranking of Freight Villages'.

The 'Logistics Performance Index' of the World Bank is an example of an international benchmarking tool for logistics performance (World Bank, 2017). Other initiatives on European Commission level to push the data quality are: the 'Mobility Package', or the 'Digital Transport and Logistics Forum' that focus on e-documents and digitalisation in general with respect to logistics processes (Union Internationale Pour Le Transport Combiné Rail-Route, 2017).

With the feedback from the survey and a literature review, the partners of the 'North Sea – Baltic Connector of Regions' project have compiled a set of qualitative and quantitative indicators that ensure the compliance with the TEN-T network corridor approach, transport policy considerations and business requirements. The indicators consider the criteria that the EU defined for the creation of a 'Transport Core Network' (European Commission, 2014a). The set of indicators are illustrated in table 2 and table 3 on the following page.

With the consideration of key performance indicators (KPIs) already reflected upon in other Work Plans (European Commission, 2016k) and comparability of infrastructure across Europe (Nestler and Nobel, 2016), the qualitative and quantitative indicators illustrated in table 2 and table 3 on the next page were chosen, further narrowed down and the data sampled accordingly for the comparison of the rail-road terminals Hamburg, Berlin-Großbeeren, Łódź, Poznań, Warsaw, Kaunas, Klaipėda, and Vilnius.

In terms of qualitative identifiers, most terminals fulfil the future requirement of 750 m train length, only when splitting them in half. The Baltic terminals in Vilnius and Kaunas were planned in such a manner that the 750 m requirement was considered. All nodes offered direct and shuttle trains and where connected to relevant roads-, railway lines and ports. Most where however not electrified. This requires the pantograph to be switched off and that the locomotive rolls out and then engages the pantograph on the other side of the terminal. Alternatively, a shunting locomotive may be used.

Table 2: Terminal comparison indicators (Hafen Hamburg Marketing, 2017b)

Qualitative Indicators
Opening Hours
Length of tracks at terminal
Value Added Services (e.g. EDI, Track and Trace, Cleaning, Customs)
Possibility to expand terminal
Production system (e.g. direct or shuttle train)
Accessibility
- Connection to roads of significance
- Connection to railway lines of significance
- Connection to sea-ports
Service Frequency (departures / week)
Electrified tracks
Proximity to market (catchment area of terminal, industry zones)

Table 3: Terminal comparison indicators (Hafen Hamburg Marketing, 2017b)

Quantitative Indicators
Storage capacity (ha, Twenty Foot Equivalent Unit (TEU), Loading Units (LU), m^2)
- Available for reefer / cooled loading units
- Dangerous Goods (DG) cargo
Handling Capacity (loading units' p.a.)
Number or rail tracks - Length of tracks in meter - Track gauge
Cranes - Number available - Crane load possible (tons)
Number of buffer tracks
Truck parking lots

The quantitative analysis showed that except for the Baltic States, all analysed nodes utilise the European gauge. The storage capacity of all nodes was above 1000 units, except for Großbeeren. However, the Großbeeren terminal is directly connected to the freight village Berlin-East and therefore the storage capacity at the terminal does not have to be that high. Most of the nodes had the ability to handle cooled loading units or reefers. Furthermore, all nodes had at least one buffer track. Additionally, all terminals had truck parking available, except for

Lodz. The detailed quantitative and qualitative analysis carried out within the project 'North Sea – Baltic Connector of Regions' can be found in the report 'Nodal Point Infrastructure KPIs', activity 2.2.3 (HHM 2017b; HHM 2017c)..

Within the framework of the 'North Sea – Baltic Connector of Regions' programme the project partner VASAB, together with other project partners, carried out a SWOT analysis of the 'North Sea – Baltic Corridor'. Some of the important strengths of the corridor are: the extensive infrastructure available, the planning of further infrastructure connections across the border, and the currently available funding opportunities. Examples for the cooperation are the 'Rail Baltica' project, or the 'Joint future concept 2030' between Poland and Germany (Berlin Brandenburg, 2017). The cooperation in improving the infrastructure connections will for example bring accessibility opportunities, increase economic opportunities for the regions along the corridor and trigger harmonisation in various standards. A summary of the strength and opportunities is illustrated in figure 15 below.

Figure 15: SO - Analysis – Summary discussed at EUSBSR Forum Berlin (VASAB, 2017)

One of its opportunities is currently one of its weaknesses. There are, for example, different standards in respect to railway gauge, signalling systems and planning periods. Therefore, there are missing connections in some areas of the corridor. The 'Rail Baltica' Project is an attempt to rectify this. However, due to the administrative approach and, as suggested from the survey, too little knowledge about the project itself, the establishment of this infrastructure link might be too slow. One possible threat to the corridor is the decline in available funding. The funding period is nearing its end and new programmes are under preparation. It cannot yet be foreseen if there will be changes in the focus of funding. Therefore, it is possible that further funding will be denied. This can be a decisive factor on the completion of the project and other infrastructure projects related to the corridor. Other threats that are not foreseeable are the geopolitical situation and the economic growth along the corridor. A summary of the weaknesses and threats are illustrated in figure 16 below.

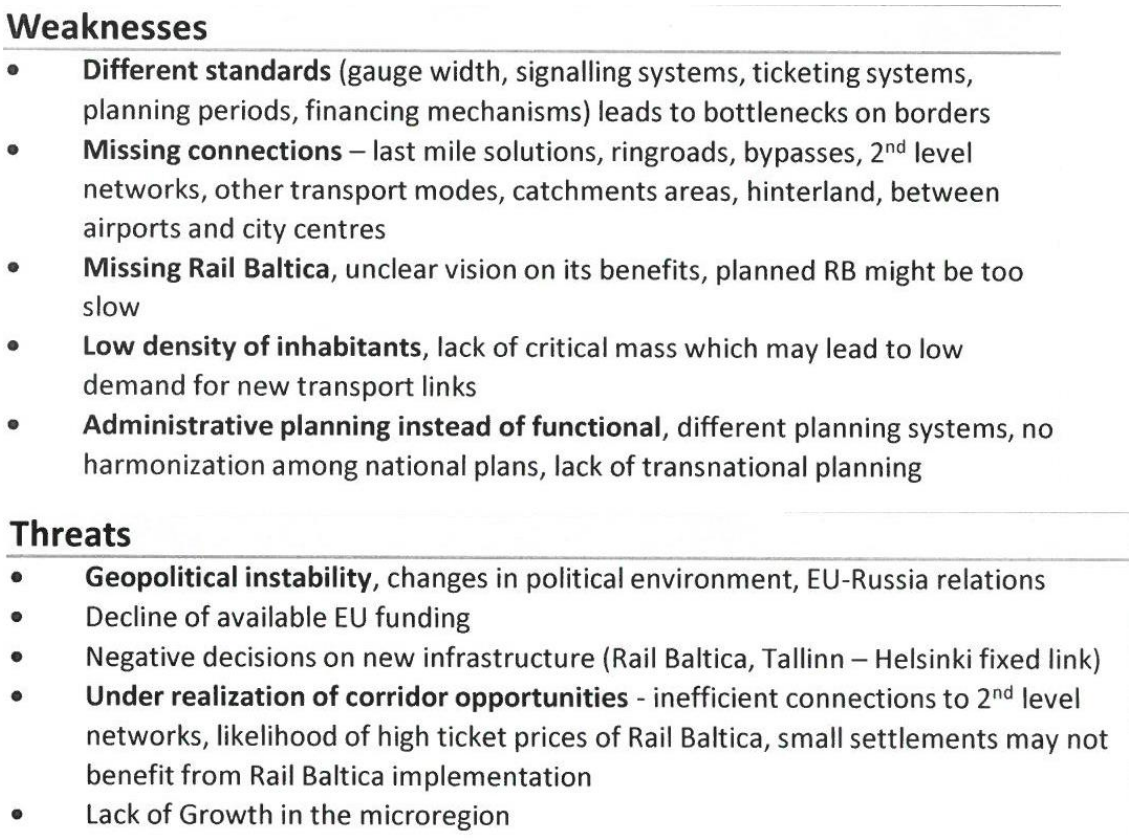


Figure 16: WT - Analysis – Summary discussed at EUSBSR Forum Berlin (VASAB, 2017)

Germany has a lot of potential in the intermodal sector and is already strong on some relations with its geographic location within Europe. The infrastructure is far-reaching and with its strong logistics sector also provides a wide terminal network. The sharing of the railway infrastructure makes the network utilisation complex and delays can be caused easily. There is the possibility to run longer trains, but only at certain times. Furthermore, the sidings often do not allow for longer trains and thus might need to be extended. In some areas the sidings may be missing at all.

The possibility to upgrade the infrastructure and the digitalisation of the infrastructure however bear potential. The Eurasian land bridge is a sector that sees continuous growth with trains coming via Poland to Germany. German intermodal transport chains could utilise Hamburg, Frankfurt (Oder) or Duisburg as a gateway to Poland for the Eurasian land bridge via Poznań and Małaszewicze. Hamburg, with 235 marketed departures per week and 27 destinations, is already strong in this area (Hafen Hamburg Marketing, 2018a). With the surging offerings by intermodal operators, this will potentially increase the amount of cargo transported by rail, rather than being transported across Europe to one of the seaports and then to Asia by ocean vessel.

A problem for the terminal landscape in Germany is the fact that some already operate at their limit and thus will face capacity issues in the long run when the volume continuously increases. Digitalisation, expansion or even new terminal infrastructure will need to be considered to solve this threat to intermodal transportation. Table 4 and Table 5 on the following two pages provides an overview of a SWOT for the intermodal landscape in Germany.

Table 4: SW analysis for intermodal landscape in Germany (own contribution)

Strength	Weakness
Geographic position in Europe with its extensive terminal network & infrastructure	Public- & transport sector share rail infrastructure
Government Master-, Action Plans & other initiatives focussing on efficient transport infrastructure with focus on rail	Passing sidings too short & more needed
Continuous cutting of administrative red-tape	Longer trains only possible at certain times
Logistics competence	Some terminal infrastructure operating at limit with current estimated growth rates
	Funding requirements too unattractive to enable increased intermodal transport share
	'Federal Transport Infrastructure Plan' measure implementations take too long
	Degrading infrastructure conditions
	Demographic changes & resulting lack of qualified personnel

Table 5: OT analysis for intermodal landscape in Germany (own contribution)

Opportunities	Threats
Global warming opportunity to bring railway transport mode forward	Global warming & Paris declaration resulting in more stringent EU environmental regulation
Digitalisation of infrastructure increasing efficiency of network	New funding period causing shift in funding & resulting in ceased funding opportunities
Upgrading of signalling, safety equipment & sidings allowing for 740 m trains to run at all times	Inequalities from renewable energy act, energy tax & CO2 certificate charge
Eurasian Land Bridge via Poland for certain cargo types	Gigaliner also potential threat to railway sector, if allowed on entire German road network outside combined-transport framework
Gigaliner offer capacity & efficiency advantages within combined transport framework	
Platooning in combination with combined transport & digitalisation opportunities	

Poland is crossed by two TEN-T corridors that provide economical and transport sector related potential. The upgraded road network also provides a good basis for the pre- and on-transport within intermodal transport chains. The terminal infrastructure is particularly strong in the ports, the industrial area in south-west Poland and the centre.

However, the terminal infrastructure is at the same time relatively weak in the eastern area of Poland. The time travelled on the road for equipment or the disposition of the ITU is unattractive. Therefore, there is an untapped economic- or cargo potential. With a better infrastructure, new services and cargo flows could be created.

The ‘Y’ line is an opportunity to further increase the capacity and at the same time reduce some of the bottlenecks. This is then also in line with the growing rail cargo transportation between Asia and the EU through Poland. An improved railway infrastructure could also further increase the trade with or transit cargo of the riparian non-EU states.

The railway infrastructure needs a lot of funding to reduce hindrances such as speed or train length. The government has stated its intention to increase the spending and funding, but it remains to be seen whether it is enough and fast enough to cope with the cargo growth prognosis. Potential funding from the European Union must be evaluated once the new funding programme beyond 2020 has been adopted. Table 6 below and table 7 on the following page provide an overview of the SWOT for the intermodal landscape in Poland.

Table 6: SW analysis for Polish intermodal landscape (own contribution; Ecorys Nederland BV, 2006; European Union, 2014; Kadlubek, 2010)

Strength	Weakness
Two TEN-T corridors crossing the country	Lacking terminal infrastructure on the eastern side of Poland
High density of terminals along 'North Sea – Baltic' corridor	Railway infrastructure bottlenecks (speed, train length, axle load, etc.)
Upgraded road network	Demographic changes and the lack of qualified personnel that comes with it
	Weak infrastructure in north-south direction

Table 7: OT analyis for Polish intermodal landscape – Opportunities and Threats (own contribution; Ecorys Nederland BV, 2006; European Union, 2014; Kadlubek, 2010)

Opportunities	Threats
'Y' – line	Railway infrastructure still sees comparably lower funding than road
Eurasian land bridge and proximity to non-EU states	Unutilised potential of E-20 route across Poland
Digitalisation of infrastructure increasing efficiency of network	Global warming and Paris declaration resulting in more stringent environmental regulation from European Union in Brussels
Upgrading of signalling, safety equipment and sidings allowing for 740 m trains to run at all times	New funding period causing a shift in funding and resulting in ceased funding opportunities
Gigaliner offer capacity and efficiency advantages within the combined transport regulatory framework	Gigaliner are also considered a potential threat to the railway sector, if they are allowed on the entire Polish road network, paired with the traditionally strong polish truck market
Platooning in combination with combined transport and digitalisation opportunities	
Expected growth in container transportation of more than 300 per cent by 2025	

5.1. Set of Assessment Indicator Criteria

Indicators are a representation of data, a relevant characteristic or aspect at a specified capacity (length, size, width, amount, etc.) and point in time or place. For the assessment of nodal point infrastructure, the EU's regulation and findings related to Combined Transport were chosen as point of reference. The indicators that are considered in the sub-activities of WP 2.2 are divided into qualitative- and quantitative indicators. They can be considered on a macro- or micro level scope – and can have different viewpoints. The indicators are used to measure the performance and / or compare infrastructure along the North Sea – Baltic Corridor under the consideration of latest developments and findings related to Combined Transport. It is important to consider policy and regulation, just as much as all parties involved in intermodal transportation. Within the framework of the NSB CoRe project, the following qualitative and quantitative indicators were considered:

Table 8: Qualitative Indicators (Rail Baltica Growth Corridor, 2013; Hafen Hamburg Marketing 2017b)

Opening Hours	Accessibility - Connection to roads of significance - Connection to railway lines of significance - Connection to sea-ports
Railway Undertaking Punctuality	Service Frequency (departures / week)
Lead-Time (transit time)	Electrified tracks (yes / no)
Length of tracks at terminal (fitting new desired 740 m train length? Yes / no?)	Length of siding tracks (fitting new desired 740 m train length? Yes / no?) on access railway lines
Safety and security standard (e.g. ISPS certified, damages p. a.)*1.6	Crane type and / or model
Value Added Services (e.g. EDI, Track and Trace, Cleaning, Customs)*2.3	Turnaround times for trucks
Turnaround times for trains*1.7	Proximity to market (catchment area of terminal, industry zones)
Possibility to expand terminal	Staff qualification / training (to be defined from NSB CoRe findings may be?)
Production system (direct or shuttle train etc.)	Quality Management (ISO9001)
Neutrality and openness of terminals for all operators and clients	

Table 9: Quantitative Indicators (Rail Baltica Growth Corridor, 2013; Hafen Hamburg Marketing 2017b)

Storage capacity (m^2 and or Twenty Foot Equivalent Unit (TEU)) - Available for reefer (yes / no or number of reefer plugs available) - Dangerous Goods (DG) cargo (yes / no, or number of possible TEUs to be stored)	Transhipment volume / throughput of Inter-modal Transport Units (ITUs) or TEUs
Number or rail tracks - Length of tracks in meter - Track gauge (EU-, wide-, small-standard)	Number of buffer tracks
Terminal productivity	Utilisation rate
Cranes - Number available - Crane load possible (weight in tons or kg) - Average crane rate (moves per hour) - Average movement time / distance between yards and crane	Transhipment cost per ITU
Total terminal cost per ITU	Truck area in meter or m^2 - For waiting - Gate-in / gate-out (Considering “Lang-LKW”, Euro- and Semi-trailer?)
Driving / waiting time ratio (minutes)	Emission per ITU
Energy use per ITU or tkm	Noise emission (acceptability of terminal / terminal expansion)

5.2. Benchmarking Analysis

There is an optimistic development potential of intermodal cargo transport for the eastern part of the North Sea-Baltic Corridor. This potential can be exploited, if infrastructure conditions provided are well organised and effective. The infrastructure project ‘Rail Baltica’ and intermodal terminals are the basis for this. Typically, the investments for terminals follow the cargo flow demands. Thus, there is a tendency of fragmentation and consolidation in terminal infrastructure in industrialised areas of Europe. The benchmarking analysis of container terminals was based on the assessment indicators discussed in the previous chapter 5.1. and the ‘as is analysis’ undertaken within the framework of WP 2 and as discussed at the beginning of chapter 5. The analysis also considered findings that are discussed in the following chapter, chapter 5.3. The analysis faced the limitation of availability- and provision of data related to the terminals. The data used in the analysis was that publicly available. Therefore, certain indicators could not be considered or underscored with the relevant data. Table 10 on the following page lists the terminals that were considered and analysed within the benchmarking analysis activity. There are six terminals in Germany, six in Poland, four in Finland, four in Lithuania, two in Latvia and two in Estonia that were analysed. For the benchmarking analysis there are some terminals that are of relevance for the analysis but are not part of the North Sea-Baltic corridor and therefore considered accordingly. These terminals are identified by a ‘no’ in the last column of the table.

From a qualitative indicator perspective, the benchmarking analysis looked at basic data such as the year of construction, scope of intermodality, or the working hours. The analysis considered other important qualitative aspects such as: the accessibility of terminals, electrification of tracks, the ability to expand the terminals or the production systems that were handled at the terminals. The latter refers to whether the terminals handled direct trains or shuttle trains, or both for that matter. From a quantitative indicator perspective, the analysis looked at data such as the storage and cargo holding capacity, the type of logistics unit supported by the terminal, the possibility to handle cooled- or dangerous cargo, or the track infrastructure. Further details on the analysis can be found in the NSB CoRe, WP 2, activity 2.2.4 report.

Table 10: List of analysed terminals (Institute of Logistics and Warehousing 2018)

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
	Hamburg	Hamburg Container Terminal Altenwerder CTA	YES
Poland	Gądki	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
Lithuania	Kaunas	Kaunas Intermodal Terminal	YES
	Vilnius	Vilnius Intermodal Terminal	YES
	Klaipeda	Klaipeda Container Terminal (KKT)	YES
	Klaipeda	Klaipedos Smelte (MSC)	YES
Latvia	Ventspils	Noord Natie Ventspils Terminals	YES
	Riga	SIA Baltic Container Terminal	YES
Estonia	Harju / Tallin	Muuga Container Terminal	YES
	Paldiski	Paldiski South Harbour - Esteve Terminal AS	NO
Finland	Kouvola	Cargo East Terminal (CET) Kouvola	NO
	Helsinki	Vuosaari Container Terminal	YES
	Kotka	Mussalo Container Terminal-Kotka	NO
	Turku	Turku Container Terminal	NO

Some of these terminals were built for the loading and unloading of intermodal units. Even though meeting European standards, many of them have shorter tracks and smaller-, poor-quality storage yards. Half of the analysed terminals have no access to a river or sea and their growth depends largely on the development of land infrastructure. Most terminals are available 24 hours a day or provide possibilities for 24-hour availability after pre-arrangements. Furthermore, most of them can expand. Access to electrified tracks is poor in most cases, but there are plans for increased electrification of railway tracks. The analysis further noted that there is a variety of value-added services provided by the various terminals. Most of the terminals offer

reefer (refrigerated cargo) and dangerous goods handling. The analysis also outlines that there is a need for an integrated and coordinated strategy for terminal development along the entire North Sea-Baltic corridor, not only on a local level. In other words, the terminals in the North Sea-Baltic transport corridor should be a coordination of cooperating intermodal terminals. The improvement of this situation and open access- and digitalisation of information and the exchange of this data between operators and stakeholders are key elements for intermodal transport development along the North Sea-Baltic corridor.

Globalisation and containerisation underline the potential of intermodality and the greening of transportation and supply chain. In order to be competitive with other modes of transport, the effectivity of intermodal transport chains must be improved. This can be underlaid by investments in rail and terminal infrastructure, but also in the expansion of terminals for a better handling ability of growing volumes. The expansion of terminals also enables terminal operators to offer value-added services that see more and more demand by their customers. Not being able to follow suit might get terminals upstaged by those that keep up with requirements and demands of customers and stakeholders. This also includes the terminal operator's ability to not just keep up in terms of infrastructure provided, but also with technology advancements, automation and Big Data for example. Thus, not only the infrastructure is important to keep up with demand, but also process- and information- and data exchange optimisation.

5.3. Best Practices

The Best Practices have been analysed within the NSB CoRe project under activity 2.2.2 of WP 2 ‘Nodal Point Best Practice’. The previously mentioned KPIs have been used to analyse intermodal nodal points from different perspectives. The following section will provide an overview of Best Practices from the perspectives of infrastructure and equipment, and operations and logistical services. Additionally, the Dry Port concept is considered, as this is a topic of interest in the industry and literature for years and offers potential to overcome capacity and bottleneck challenges in port hinterland connections. The efforts along the North Sea – Baltic Corridor to tackle those challenges along that corridor underline the inclusion of Dry Ports into Best Practice evaluations accordingly.

The aspect of infrastructure and equipment includes the considerations of accessibility, proximity to markets, terminal area, storage capacity, truck parking spaces, cranes and rail tracks available at nodal points. Accessibility refers to the connectivity of a nodal point to roads and railway lines of significance and to seaports. The proximity refers to the nodal point closeness to a market such as industry zones or catchment areas of terminals in general. It is like the loco quote of seaports. The other aspects are self-explanatory.

For the accessibility and proximity KPIs, the DUSS terminal Billwerder serves as a Best Practice example. It is well accessible and has a very good proximity to markets and seaport. It furthermore has a loco quote of about 30 per cent. The proximity to a market and in this example the high loco quote is also job creators or job savers, as the location bound cargo has regional effects due to the related value-added activities such as fabrication or processing of goods. Another good example for these two KPIs would be the CLIP terminal in Poland. It offers a Special Economic Zone and provides services to the car manufacturing industry in its catchment area. Table 11 on the next page will provide an overview of selected intermodal nodal points.

Table 11: Intermodal Terminals - Proximity to market (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Proximity to market
DUSS-terminal Hamburg Billwerder	Hamburg, connecting hub to Scandinavia and Southern Europe
DUSS-terminal Großbeeren	Port hinterland and Eastern Europe, City of Berlin
Metrans HUB terminal Poznań	car manufacturing, southern Poland, Hamburg
PKP Cargo terminal Poznań-Franowo	HUB dedicated for distribution of aerial trains with the North Sea ports
CLIP Container terminal Swarzędz	car industry, special economic zone
Spedcont container terminal Łódź	Central Poland
Metrans Intermodal terminal Pruszków	Mazowia region, Warsaw
Vilnius intermodal terminal	Scandinavia, Asia (OBOR), 'Rail Baltica', Eastern Europe
Kaunas intermodal terminal	Scandinavia, Asia (OBOR), 'Rail Baltica', Eastern Europe
Klaipeda container terminal	Baltic Sea Region, Hamburg, 'Rail Baltica', Asia (OBOR), Russia
Kuovola rail-road terminal	Helsinki

The area of a terminal is depending on its situation and role within a network. It is furthermore an indicator for the availability of the other previously mentioned indicators storage capacity and parking spaces. According to a study by the Deutsche GVZ Gesellschaft (DGG) (Nestler and Nobel, 2015), the average total area is about 180 hectare (ha) and the average developed area is about 140 ha. Furthermore, it can be said that many European freight villages can expand. The nodal point CLIP has about 100,000 m^2 terminal surface area and 400,000 m^2 warehouse space adjacent to it. A further 100,000 m^2 are currently in planning, or under construction. Table 12 on the next page will provide an overview of the area and ability to expand for selected intermodal nodal points.

Table 12: Intermodal Terminals - Terminal area and possibility to expand terminal (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Terminal area	Possibility to expand terminal
DUSS-terminal Hamburg Billwerder	30 ha	expanded 2012 by 4 x 585 m tracks
DUSS-terminal Großbeeren	8 ha	Yes, and expanded in 2005. Part of GVZ Großbeeren
Metrans Polonia HUB Poznań	40,5 ha	YES ('next level')
PKP Cargo terminal Poznań-Franowo	2,8 ha	n/a
CLIP Container terminal Swarzędz	10 ha	Yes
Spedcont container terminal Łódź	14,6 ha	Yes
Metrans Polonia terminal Pruszków	14 ha	No
Vilnius intermodal terminal	54 ha	Yes
Kaunas intermodal terminal	40 ha	Yes
Klaipeda container terminal	n/a	NO (Baltmax Outerport)
Kuovola rail-road terminal	170 ha	Yes – approx. 270 ha and 500 000 m2

The storage capacity can be depicted in parameters such as ha, TEU, Loading Unit (LU), Trailer, the availability of reefer plugs for reefer storage, or dangerous goods storage. The DGG states an average storage capacity of 26 ha for European freight villages. In terms of storage capacity, the terminal Zaragoza Plaza excels and ranks first with a total of 427 ha capacity. The nodal points along the North Sea – Baltic Corridor are surely smaller than the European average mentioned in the DGG study. The following table provides an overview of storage capacity for selected intermodal nodal points.

Table 13: Intermodal Terminals - Storage capacity (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Storage capacity			
	in ha	in TEU	Available for reefer	Dangerous goods
DUSS-terminal Hamburg Billwerder	n/a	1700 TEU	yes	yes
DUSS-terminal Großbeeren	n/a	430 TEU	on request	yes
Metrans Polonia HUB Poznań	16 ha	2600 TEU	yes	yes
PKP Cargo terminal Poznań-Franowo	2.8 ha	1800 TEU	yes	yes
CLIP Container terminal Swarzędz	8 ha	4500 TEU	30	yes
Spedcont container terminal Łódź	6,1 ha	8000 TEU	yes	n/a
Metrans Polonia terminal Pruszków	13 ha	1800 TEU	yes	yes
Vilnius intermodal terminal	9 ha	1400 TEU	164	yes (incl. DG leakage area)
Kaunas intermodal terminal	7 ha	1120 TEU	16	yes (incl. DG leakage area)
Klaipeda container terminal	n/a	n/a	n/a	n/a
Kuovola rail-road terminal	16 ha indoor, 6 ha terminal	10,000 TEU	on request	on request

Truck parking spaces are essential for a smooth operation of an intermodal nodal point and the external effects it has on the catchment area. In the proximity of the Großbeeren intermodal node - the region constructed a 3,600 m^2, 24/7 guarded, publicly available parking space to ease the situation at the freight village and nodal point. It is the first of its kind in the wider area of Berlin. A similar approach was chosen for the situation around the various terminals in Hamburg. The Hamburg Port Authority launched the so-called ‘pre-gate parking’ project that helps controlling approaching traffic at an early stage to create additional capacity for destination traffic. This was done through the suggestion of pre-gate parking facilities outside the port area, when drivers were approaching the port. This furthermore enabled the drivers to better plan their breaks. The table on the following page provides an overview of selected intermodal nodal points and the available truck parking spaces.

Table 14: Intermodal Terminals - truck area (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Truck parking spaces
DUSS-terminal Hamburg Billwerder	120
DUSS-terminal Großbeeren	5 + 24h secure parking near GVZ Großbeeren
Metrans Polonia terminal Poznań	16
PKP Cargo terminal Poznań-Franowo	5
CLIP Container terminal Swarzędz	40
Spedcont container terminal Łódź	0
Metrans Polonia terminal Pruszków	10
Vilnius intermodal terminal	37
Kaunas intermodal terminal	17
Klaipeda container terminal	7
Kuovola rail-road terminal	100

Cranes as indicator can also provide a quick overview of the size of a nodal point. Larger terminals usually make use of gantry cranes and/or reach stackers to lift cargo. Smaller terminals on the other hand are often equipped with mobile cranes and/or reach stackers. The equipment at hand naturally then influences the operational aspect. It defines the speed at which it can operate and handle cargo regarding trucks and trains at the terminal, but also influences operational costs and efficiency. The following table gives an overview of selected intermodal nodal points and the equipment- and the lifting capability available.

Table 15: Intermodal Terminals – Cranes (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Cranes	
	Number	Crane load possible (t)
DUSS-terminal Hamburg Billwerder	7	41
DUSS-terminal Großbeeren	2	41
Metrans Polonia HUB Poznań	none, 6 reach stackers	45
PKP Cargo terminal Poznań-Franowo	none, 3 reach stackers	45
CLIP Container terminal Swarzędz	none, 3 reach stackers	45
Spedcont container terminal Łódź	2 + 3 reach stackers	45
Metrans Polonia terminal Pruszków	none, 3 reach stackers	45
Vilnius intermodal terminal	1	40
Kaunas intermodal terminal	1	40
Klaipeda container terminal	2	40
Kuovola rail-road terminal	None, 5 reach stackers Kalmar	41

The rail track indicator is also very important and a good indicator of the size and future readiness of a nodal point. The indicator can be measured in total length, length on terminal premises, number of tracks, the gauge, the number of buffer tracks available, and whether the tracks are electrified. The table below provides an overview of rail tracks of selected intermodal nodal points.

Table 16: Intermodal Terminals – rail tracks (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Rail tracks					
	Number	Length (in m)	Length of tracks at terminal	Track gauge	Number of buffer tracks	Electrified tracks
DUSS-terminal Hamburg Billwerder	12	7660	4 x 720 m 4 x 680 m 4 x 585 m	1435	4	one sided
DUSS-terminal Großbeeren	4	2100	2 x 700 m 2 x 350 m	1435	1	one sided
Metrans Polonia HUB Poznań	5	3050	4 x 610 m	1435	1	no
PKP Cargo terminal Poznań-Franowo	3	1419	2 x 610 m	1435	1	1
CLIP Container terminal Swarzędz	2	4067	1527 m	1435	1	no
Spedcont container terminal Łódź	2	1400	2 x 400 m	1435	2	no
Metrans Polonia terminal Pruszków	2	1550	1 x 600 m 1 x 350 m	1435	1	no
Vilnius intermodal terminal	3	1811	n/a	1520	1	no
Kaunas intermodal terminal	4	1360	2 x 880 m 2 x 799 m	1435 & 1520	1	yes
Klaipeda container terminal	4	1700	88 waggons capacity	1520	4	no (electrification by 2027)
Kuovola rail-road terminal	2	10,000	4x 500 m	1524	n/a	no

The operational aspect of nodal points can be distinguished into indicators such as emissions, opening hours, utilisation rate, terminal capacity, service frequency and production system used, and other KPIs for terminal operations.

In terms of emission per LU – noise emission and energy use per LU/tkm are the most commonly used KPIs. Terminals across Europe applied a variety of other measures to improve climate protection. The DGG have categorised these measures into building oriented-, vehicle oriented-, resource-oriented measures and energy consumption and Intermodality. Unfortunately, data regarding emissions per LU, noise emission and energy use per Intermodal Transport Unit or tkm are not accessible for the NSB CoRe terminals. No comparison was possible at this stage.

To be able to handle high volumes daily, avoidance of waiting times and 24/7 opening hours are necessary. Not all the intermodal nodal points illustrated below offer a 24/7 service. The table below provides an overview of opening hours of selected intermodal nodal points.

Table 17: Intermodal Terminals – opening hours (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Opening hours
DUSS-terminal Hamburg Billwerder	24 h
DUSS-terminal Großbeeren	24 h
Metrans Polonia HUB Poznań	24 h
PKP Cargo terminal Poznań-Franowo	0700 to 1900 hrs Mon to Sat
CLIP Container terminal Swarzędz	Sun 2200 to Sat 1400 hrs
Spedcont container terminal Łódź	Sunday 22:00 Saturday 14:00
Metrans Polonia terminal Pruszków	Mon to Fri 0700 to 2100 hrs, Sat 0800 to 1600 hrs
Vilnius intermodal terminal	24 h
Kaunas intermodal terminal	Mon to Thu 0700 to 1600, Fri from 0700 to 1445 hrs
Klaipeda container terminal	24 h
Kuovola rail-road terminal	Mon-Fri 7.00-23.00; Warehouse 7.00-17.00

The European freight villages have an average utilisation rate of 75,000 LU. Quadrante Europa in Italy with 700,000 LU excels here in comparison to the rest of Europe. The DGG study found that on average the utilisation rate of European freight villages is only a bit over 50 per cent. There are of course other examples, where the utilisation rate has reached approximately 100 per cent. The table on the following page provides an overview of selected intermodal nodal points and their utilisation rates.

Table 18: Intermodal Terminals – utilisation rate (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Utilisation rate
DUSS-terminal Hamburg Billwerder	75 %
DUSS-terminal Großbeeren	50 %
Metrans Polonia HUB Poznań	90 %
PKP Cargo terminal Poznań-Franowo	n/a
CLIP Container terminal Swarzędz	n/a
Spedcont container terminal Łódź	n/a
Metrans Polonia terminal Pruszków	94 % (figure relates to area in 2017 i.e. 10 ha, today it is 14,6 ha)
Vilnius intermodal terminal	60-70 %
Kaunas intermodal terminal	20 %
Klaipeda container terminal	n/a
Kuovola rail-road terminal	n/a

The DGG study furthermore found that European terminals have an average capacity of 150,000 LU per annum. Whereby the LU includes containers, swap bodies and semitrailers for example. Interporto Quandrante Europa is outstanding here with a capacity of 1,400,000 LU. An overview of intermodal nodal points and their capacity can be found in the table below.

Table 19: Intermodal Terminals – terminal capacity (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Handling capacity (loading units p.a.)
DUSS-terminal Hamburg Billwerder	370,000
DUSS-terminal Großbeeren	75,000
Metrans Polonia HUB Poznań	385,400
PKP Cargo terminal Poznań-Franowo	117,000
CLIP Container terminal Swarzędz	75,000
Spedcont container terminal Łódź	80,000
Metrans Polonia terminal Pruszków	96,000
Vilnius intermodal terminal	100,000
Kaunas intermodal terminal	55,000
Klaipeda container terminal	450,000
Kuovola rail-road terminal	55,000 TEU, 250,000 TEU after 2020

Another important indicator for intermodal nodal points, and whether an example can serve as a Best Practice in this regard, is the service frequency and production system. In the case of selected intermodal nodal points, the DUSS terminal Billwerder excels with its 154 train departures a week and 20 direct trains. Hereby the nodal point utilises its proximity to the Port of Hamburg and its international links. Up to 220 freight trains with up to 5,900 railcars run to and from the Port of Hamburg daily. Around 11 per cent of the rail traffic in Germany begins or ends in the Port of Hamburg. This is also reflected in the approximately 2000 services offered per week from and to Hamburg and with destinations in the DACH-region and major parts of Eastern Europe and China. The table below provides an overview of service frequencies and the production system of selected intermodal nodal points.

Table 20: Intermodal Terminals – train departures per week and production system (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Train departures per week	Direct or shuttle trains
DUSS-terminal Hamburg Billwerder	154	direct and shuttle trains
DUSS-terminal Großbeeren	7	direct and shuttle trains
Metrans Polonia HUB Poznań	14	direct and shuttle trains
PKP Cargo terminal Poznań-Franowo	5	direct and shuttle trains
CLIP Container terminal Swarzędz	6	direct and shuttle trains
Spedcont container terminal Łódź	2	direct and shuttle trains
Metrans Polonia terminal Pruszków	13	direct and shuttle trains
Vilnius intermodal terminal	7	direct and shuttle trains
Kaunas intermodal terminal	1	direct
Klaipeda container terminal	10	direct and shuttle trains
Kuovola rail-road terminal	1-2	direct and shuttle trains

The turnaround time for trucks and trains is a further important KPI and varies between 60 to 180 minutes at the Kuovola rail-road terminal, up to 60 minutes at Metrans Polonia HUB terminal in Poznań and Metrans Polonia terminal Pruszków. DUSS Billwerder and Spedcont container terminal in Łódź have an average turnaround time of about 30 minutes, whilst it is only 15 minutes at DUSS Großbeeren.

Trains have an average turnaround time of 600 minutes / slot at DUSS Billwerder and Großbeeren, 240 minutes at Metrans Polonia Poznań and about 360 minutes at the Metrans Polonia terminal Pruszków.

A last point regarding indicators that needs to be made is that there are of course more KPIs that define the performance of a terminal operation. However, the actual data is often not publicly available. Examples of such indicators are: railway undertaking punctuality, terminal costs per ITU or waiting times at terminals. They should however be considered when benchmarking businesses.

One other Best Practice analysis viewpoint is the logistics services- and quality offered. The DGG study outlined furthermore that the intermodal nodal points mostly offered value-added services such as a customs office, truck repair or social and catering service offerings. It was furthermore noted in the study that trucking, depot, container repair and packing, container cleaning and the storage of hazardous containers are the most important value-added services. On average, four out of six services mentioned are offered by European freight villages. 'The Terminal Intermodale Nola' excels in this, offering services such as storage and logistics, maintenance and repair, customs, weighting, container stripping and stuffing, door deliveries and container leasing. The table below illustrates value-added services of selected intermodal nodal points.

Table 21: Intermodal Terminals – value added services (Hafen Hamburg Marketing, 2018b)

Intermodal Terminal	Value-added services (selection)
DUSS-terminal Hamburg Billwerder	customs 2.5 km radius
DUSS-terminal Großbeeren	Repair and storage, customs 8 km Ludwigsfelde, next to empty container storage
Metrans Polonia HUB Poznań	customs, EDI, cleaning, repair, survey
PKP Cargo terminal Poznań-Franowo	warehouse, aerial trains, 'Cargo Connect' first/last mile services, storage
CLIP Container terminal Swarzędz	cleaning, repair, removal of old stickers and security elements such as hooks and nails, container forming
Spedcont container terminal Łódź	Weighing of containers, customs, warehouse
Metrans Polonia terminal Pruszków	Customs Mon to Fri 0800 to 1600 hrs
Vilnius intermodal terminal	repair, customs, packing station
Kaunas intermodal terminal	warehousing, stuffing, repair, customs
Klaipeda container terminal	reefer inspection, stuffing, stripping, weighting, EDI, palletizing, transhipment of liquid cargo to tank containers
Kuovola rail-road terminal	Container inspection, sealing, stuffing, loading, railway bills, customs clearance

Staff qualification is also a sign of quality for an intermodal nodal point. Terminals can, for example, train employees according to ISO standards in quality management and environmental management systems. The Metrans Polonia terminals use these trainings.

A Best Practice for a training centre that ensures a high qualification of staff for the logistics sector, and available to a whole region, is the ‘maco-maritimes competenzcentrum GmbH’. The shareholders are various associations and unions from logistics that are situated in Lower Saxony, Bremen, Berlin and Hamburg. The company provides courses in port operations, cargo handling, logistics, maritime shipping, dangerous goods, and safety among other things. Attendees can certify to become a highly qualified specialist for port logistics, a ‘ConTrucker’, or the ‘Hansa logistics expert’. The flexible training concept is adaptable to distinct requirements of companies and considers previous qualifications of participants.

Dry Ports can also serve as Best Practice as they generally offer to shift cargo flows from road to rail and increase the throughput of seaports without having to expand the terminal area. It is essentially a transhipment point from origin to seaport and vice versa. Furthermore, the Dry Port can also provide value added services to shippers and transport operators, such as those discussed above. The transhipment can be realised in the form of a local distribution centre, or as a hub within a network. The transport thus can essentially be shifted from road to higher capacity capable transport modes such as railway or inland navigation. The cargo can then furthermore be shifted to seaport-, or terminal dedicated transports. This will reduce the necessity for shunting or inner-port distribution traffic.

As a result of these highly utilised transport modes, the traffic density and related external effects in seaports and catchment area of nodal points is reduced. The necessity for coupling and sorting of trains with various groups of waggons for varying terminals would be reduced or eliminated and increase the performance and capacity of the port infrastructure and superstructure on the one hand and reduce the dwell time of trains in the port on the other hand. Naturally there is some railway cargo that already runs on container trains and where direct trains are utilised. In that case, these containers of course are not suitable for such Dry Port traffic.

It must be noted that all references to the DGG study and mentioned indicators underlie relative ratings. The rating depends on the region, context and time. Thus, it might appear that the terminals along the North Sea – Baltic Corridor rank comparatively low and more specialised

than the average, but they server their regions well. They even can expand the capacity and cope with increasing volumes. They furthermore are located close to seaports and/or capital regions and catchment areas. All discussed nodal points have good connectivity between the North range ports and the Baltics, but also to the Eurasian land bridge – the 'new Silk Road', often referred to as 'Belt and Road Initiative', to China. Whilst this offers great opportunities in the future, the nodal points must assure that they stay up-to-date with developments and thus with terminal infrastructure, technology and equipment. Further benchmarking with other terminals might reveal untapped potential. Naturally, the density of the network is much higher in the Western European area compared to the Baltic Sea region. A further development of the network as well as nodal points in the Baltic Sea Region thus might enable an increase in intermodal transport and contribute to the greening and implementation of a sustainable transport corridor system.

6. Conclusions

The transport sector is a key contributor to the economy in the European Union and with 11 million jobs in Europe a key sector that adds a gross overall value of 4.8 per cent, or € 548 billion, for the 28 EU countries. The sector is furthermore essential for the integration process and for the achievement of an internal market, providing economic growth and jobs. The 'Roadmap to a Single European Transport Area' outlines the goals for a competitive and resource efficient transport system. This is on the one hand even more important in the light of the United Nations Climate Change Conference in Katowice at the end of 2018 and the effort to halt climate change. On the other hand, the transport sector is responsible for almost 25 per cent of Europe's GHG emissions and having increased the emissions – rather than reduced them in comparison to 1990. Naturally this is also due to the increased demand for transportation. This development, on the contrary, underlines the importance of a sustainable transport mode modal shift and the necessity for the greening of transportation.

The European Union has provided instruments for the fostering of - and increase in the utilisation of sustainable transports such as rail or inland waterway transports. On a legislative perspective the 'Combined Transport Directive' has been a pillar for the promotion of multimodal transportation. The Directive is further supported by other European Policies such as the 'Weights and Dimensions Directive' (Directive 2015/719/EU) and a study (European Commission, 2015) on the European combined transport market that was undertaken in 2014. After 25 years, the 'Combined Transport Directive' therefore, is currently undergoing a revision. This is one of the puzzle pieces for the greater use of multimodal solutions. Other very important aspects are the internalisation of external costs of all modes of transport, more targeted investments into physical infrastructure and the better use of information. The European Union has therefore put in place various financial instruments to support measures to boost intermodal or multimodal transport. The 'Connecting Europe Facility' is one such instrument, but also the European Fund for Strategic Investment, the European Structural and Investment Fund, but also the research programme Horizon 2020.

To further underline the importance of multimodality and sustainable transport, EU Transport Commissioner Violeta Bulc made 2018 the 'Year of Multimodality' during which such key thematic areas as the digitalisation, economic incentives, supporting multimodal infrastructure and innovation were discussed and promoted. The topics were integral parts of events such as the 'TEN-T Days', the 'European Mobility week', 'Conference on Sustainable Urban Mobility Plans', the 'Transport Research Arena', the 'High-level Conference on European Multimodal Freight Transport' and many more. Some of these key thematic areas were recaptured in the previous chapters in one way or another. The digitalisation aspect is mostly covered within the work undertaken in WP 2.3 and its three sub-activities. Therefore, this aspect will be discussed only with direct correlation to the intermodal nodal point infrastructure aspect. The findings and discussion regarding the digitalisation in intermodal or multimodal transportation can be found in the corresponding reports to the sub-activities 2.3.1 to 2.3.3. Alternatively, the report of 2.4.3 is an information consolidation of the digitalisation aspect that feeds into the final output for WP 2.

The European Commission has paved the way towards a 'Single European Railway Area'. With the legislative measures of 'railway packages', the creation of 'Rail Freight Corridors' that are corresponding to the TEN-T network, and the provision of various funding sources things have come a long way. However, there is still room for improvement to further the competitiveness and development of more efficient and up-to-date solutions to promote the railway sector and with that the intermodal transport sector. The alignment of these rail freight corridors to the TEN-T network ought to establish interconnectivity and interoperability. This can only be reached through the expansion of capacity through the removal of bottlenecks and bridging the still missing infrastructure links. The objective to complete the Core Network by 2030 and the Comprehensive Network by 2050 is complex, both financially and organisationally wise.

Even with the segmentation into several corridors, the investment needs far outweigh the available funding. The establishment of the 'Connecting Europe Facility' and 'Horizon 2020' are good examples how the European Commission is trying to leverage the available funds with public-private cooperation. This cooperation is further assisted through the provision of the 'European Fund for Strategic Investment' for example. The 'European Structural Investment Fund' on the other hand is a common designation for several European funds, of which the 'Cohesion Fund' and 'European Regional Development Fund' have been mentioned in this report before in more detail. These funds are important for the support of various thematic

objectives (European Commission, 2016l) relevant to intermodal transportation such as Information and Communication Technology or sustainable transport and network bottlenecks for example. While the strategic investment fund is thought to allow for more high-risk investments and to mobilise private capital, the structural investments fund focuses more on the contribution to achieving the objectives of the investment plan.

The activities undertaken in the 'NSB CoRe' project are co-financed through one of the Interregional Programme arms of the 'European Territorial Cooperation', which in turn is funded by the 'European Regional Development Fund' and part of the European Union Cohesion Policy. The project partners stress the importance of such funds and the cross-border cooperation to further the necessary progress in intermodality, interoperability and sustainable transport and mobility as such in Europe. There is no doubt that there is still some work to be done and where these kinds of projects have great added-value to help the European Commission and the Member States to fulfil their endeavour to reach the goals set by 2050. However, the current multiannual financial framework period is coming to an end and the United Kingdom's departure from the European Union is imminent. This provides the opportunity to modernise a framework that has been in place since 1998 (European Commission, 2018a) on the one hand, but also leaves a 'hole' in the budget due to less funds available from now 27 instead of the previous 28 Member States. The discussion is still ongoing as the proposal also differs in the structure compared to the current multiannual financial framework. A decision is intended to be made during 2019 due to the upcoming elections. If that will be the case, remains to be seen.

The new proposal also illustrates a shift from the current 'EU2020' terminology and its goals, towards other European Union priorities such as the digital economy. Most budget cuts have fallen on the cohesion policy and instruments outside the multiannual financial framework have been boosted at the same time (Parry and Sapała, 2018). For the 'European Regional Development Fund' and the 'Cohesion Fund' there is a budget reduction of around 10 per cent in the new financial framework period 2021 to 2027. The European Parliamentary Research Service underlines three different scenario options and a budget of € 273 billion. The first scenario would propose a cut across all thematic areas, option two considers geographic concentration of funding and option three proposes a proportionate cut in funding in all regions, combined with a preeminent thematic concentration on innovation, the environment, broadband and small and medium sized enterprises. The last option is currently preferred and as such also

outlined in a flyer on the 'EU Budget for the Future' (European Commission, 2018b). European Territorial Cooperation is a great way to drive change. The TEN-T Core Network is estimated to need € 750 billion in investments with the largest shares coming from the budgets of the Member States. Even with the provision of funds through funds such as the 'Connecting Europe Facility' or the 'Horizon 2020' fund, there will not be enough at hand. It is therefore inevitable to leverage funds and resources to continue the progress in a decarbonisation in transport and mobility.

The dissemination to the relevant stakeholders of the progress in intermodal transport and on the existing gaps remaining, is important. Persuasive efforts and lobbying are necessary in various areas in intermodal transportation. One of the most important areas for a single European railway network is that of data sharing. The 'chicken and egg' problem has been discussed for quite some time, but still hinders investments and cooperation between stakeholders. It furthermore also hinders the efficiency of intermodal logistics chains, as the tracing of cargo is not possible throughout the entire logistics chain within the customers' supply chain. A one-stop-shop offer development, which is currently offered in a fragmented manner for the differing transport modes at best, is also curbed through this. Another area of importance is the need to raise awareness of railway infrastructure undertakings. The long-term added-value to the general public and a region is often not well known and on the business side a potential may not be the focus of businesses is in the present, whilst the focus of major infrastructure projects is in the future.

'Rail Baltica' is a great example. There is a huge potential for cargo flows, however the works are not expected to be finished before the end of the next decade. 2030 is too far away for businesses. They focus on now and what business development they can drive in what direction. It is therefore important to foster the discussion, awareness and open-mindedness of all stakeholders involved and those who might use the infrastructure in the future. Bigger flexibility through an updated 'Combined Transport Directive' and more dissemination will be one element for a more sustainable transport sector. Another element will be progress made by the rail freight corridors, their cooperation and research and innovation coming from cooperation projects such as Shift2Rail and its examples of innovation that drive the competitiveness of intermodal / multimodal transportation compared to other modes of transport. The Shift2Rail 'playground' involves areas that can also be used for intermodal transportation. 'Cooperative-Intelligent Transport Systems', 'Internet of Things' and 'Big Data' are topics that are applicable

to all modes of transport and can unfold even more potential when utilised in intermodal or multimodal transport. One other digitalisation potential that is transport mode overarching is the utilisation of e-documents in transportation.

The ability to utilise 740 m trains on the European railway infrastructure will provide railway operators with a better load factor, cost per unit and thus increase competitiveness over other modes of transports. There is yet a lot to be done, but first steps have been made. Germany's Transport Ministry has reaffirmed the importance and has included many projects in the federal transport infrastructure plan. The utilisation of the lines will increase, more cargo can be transported with the same amount of trains and with that not only help reduce the capacity bottleneck, but also reduce energy consumption and noise- and CO^2 emissions. Germany, for example, intends to implement 85 per cent of 75 measures by 2026. Positive effects on TEN-T corridors are expected from 2023 (Railway Gazette, 2018; DB Netz AG, 2018).

The implementation of the 'Rail Baltica' will then ensure this advancement in rail infrastructure to be taken along the North Sea-Baltic Corridor up to the northern end of North Sea – Baltic Corridor. Furthermore, this infrastructure project will also ensure the interoperability of the railway network with the TEN-T and 'Rail Freight Corridors' and the utilisation of the 1435 mm railway gauge. Whilst most intermodal terminals will have to split these longer trains to handle them or extend the terminal rail infrastructure. The new terminals within the 'Rail Baltica' however, are constructed under the consideration of such longer trains and the Kaunas terminal even offers the connection of the European gauge with the Russian gauge. This will have the positive effect of being able to build upon the efforts between the European Union and China to foster the cooperation and implementation of the Eurasian land bridge and the 'Belt and Road Initiative'. As a result, additional routings of the cargo, aside from the currently mostly used Małaszewicze routing will be added. The 'Rail Baltica' will also create the infrastructure under the consideration of the 'European Railway Traffic Management System' and with that backing onto the efforts by Belgium, the Netherlands, Germany and Poland to provide ERTMS operation within the 'North Sea – Baltic Corridor (European Commission, 2018c).

7. Bibliography

Auito, D., 2018, European Union, Committee on Transport and Tourism, PE619.311v04-00, COM(2017)0648-C8-0391/2017 – 2017/0290(COD), http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+REPORT+A8-2018-0259+0+DOC+PDF+V0//EN (Accessed: 8 February 2019).

Berg, C. N.; Deichmann, U. K.; Liu, Y.; Selod, H. (2015) Transport policies and development (English). P. 4. Policy Research working paper: no. WPS 7366. Paper is funded by the Knowledge for Change Program (KCP). Paper is funded by the Strategic Research Program (SRP). Washington, D.C. : World Bank Group. Available at: http://documents.worldbank.org/curated/en/893851468188672137/Transport-policies-and-development (Accessed: 7 February 2019).

Berlin Brandenburg (2017) Joint future concept for the German-Polish catchment area 2030. Available at: http://gl.berlin-brandenburg.de/en/spatial-development/european-level/artikel.503865.en.php (Accessed: 8 February 2019).

Bramans, G. (2017) 'Rail Baltica - Project of the Century', p. 5, Presentation held at NSB Connector of Regions Project Dissemination Event, Tallink Hotel, Riga 4 April, unpublished

Bulc, V. (2017) Speech to the TRAN Committee on 2017 and 2018 Work Programmes. Brussels: European Commission. Available online: https://ec.europa.eu/commission/commissioners/2014-2019/bulc/announcements/speech-commissioner-bulc-tran-committee-2017-and-2018-work-programmes_en (Accessed: 8 February 2019).

Citizens Information (2014) The European Union Explained: Connecting Europe's citizens and businesses: Transport. Luxembourg: Publication office of the European Union. DOI: 10.2775/13082. Available at: https://europa.eu/european-union/file/1232/download_en?token=xCql9RmY (Accessed: 7 February 2019).

Community of European Railway and Infrastructure Companies (2015) Broad-gauge infrastructure in northern & eastern Europe. Brussels: CER. Available at: http://www.cer.be/sites/default/files/publication/CER%20FactSheet%20Broad-gauge%20infrastructure%20in%20northern%20eastern%20Europe.pdf

Cross-Sectoral Coordination Centre (2010) Sustainable Development Strategy of Latvia until 2030. Available at: http://www.pkc.gov.lv/sites/default/files/images-legacy/LV2030/LIAS_2030_en.pdf (Accessed: 7 February 2019).

DB Netz AG (2018) Stand 740m-Netz [PDF]. Available at: https://www.netzwerk-bahnen.de/assets/files/downloads/2018_juni-planungsstand-db-740-meter-netz.pdf (Accessed: 8 February 2019).

Deutsches Zentrum für Luft- und Raumfahrt e.V. (2016) Verkehrsverlagerungspotenzial auf den Schienengüterverkehr [German – 'Potential freight transportation shift to rail freight']. Berlin: Germany. Available at: http://www.bmvi.de/SharedDocs/DE/Anlage/MKS/studie-verkehrsverlagerungspotenzial-schienen-gueterverkehr.pdf?__blob=publicationFile (Accessed: 8 February 2019).

Ecorys Nederland BV (2006) Country Report Poland: Study on Strategic Evaluation on Transport Investment Priorities under Structural and Cohesion funds for the Programming Period 2007 – 2013. p. 31.For DG-Regio. No 2005.CE.16.0.AT.014. Available at: http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/evasltrat_tran/poland.pdf (Accessed: 8 February 2019).

Estonian EU Secretariat (2017) Priorities of the Estonian Presidency. Available at: https://www.eu2017.ee/priorities-estonian-presidency (Accessed: 8 February 2019).

"Estonian Government (2012) National Planning Estonia 2030+. Tallinn: Estonia. Available at

(Estonian): https://www.valitsus.ee/sites/default/files/content-editors/arenguka-vad/eesti_2030.pdf (Accessed: 7 February 2019)."

Eurokombi (2017) Eurokombi Terminal Hamburg -Technical Data Intermodal Station. Available at: http://www.eurokombi.de/eurokombi_en/EUROKOMBI/About-us/Technical-Data (Accessed: 8 February 2019).

European Commission (1992) European Commission (1992) Directive 92/106/EEC on the establishment of common rules for certain types of combined transport of goods between Member States. European Commission. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01992L0106-20130701&from=EN (Accessed: 7 February 2019).

European Commission (1996) A strategy for revitalising the community's railways. COM(96)421 final. Brussels: European Commission. Available at: http://europa.eu/documents/comm/white_papers/pdf/com96_421_en.pdf (Accessed: 7 February 2019).

European Commission (2011) Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. COM(2011) 144 final. Brussels: European Commission. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0144&from=EN (Accessed: 7 February 2019).

European Commission (2012) Directive 2012/34/EU: establishing a single European railway area. OJ 343/32 recast. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012L0034 (Accessed: 7 February 2019).

European Commission (2013a) TEN-T Core Network Corridors [Map]. Available at: http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/site/maps_upload/SchematicA0_EUcorridor_map.pdf (Accessed: 7 February 2019).

European Commission (2013b) Establishing the Connecting Europe Facility. OJ L348/129. Document 32013R1316. Brussels: European Union. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R1316&from=EN (Accessed: 8 February 2019).

European Commission (2014a) The planning methodology for the trans-European transport network (TEN-T). SWD(2013) 542 final. Brussels: European Commission. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013SC0542&from=bg (Accessed: 7 February 2019).

European Commission (2014b) Core Network Corridors: Progress Report of the European Coordinators. Brussels: European Commission. Available at: https://ec.europa.eu/transport/sites/transport/files/infrastructure/tentec/tentec-portal/site/brochures_images/CorridorsProgrReport_version1_2014.pdf (Accessed: 7 February 2019).

European Commission (2014c) Directive 2012/34/EU: Development of a single railway area. Brussels. European Commission. Available at: http://eur-lex.europa.eu/legal-content/HU/TXT/?uri=URISERV:tr0041 (Accessed: 7 February 2019).

European Commission (2015) Analysis of the EU Combined Transport. Frankfurt: European Commission (FV355/2012/MOVE/D1/ETU/SI2.659386). Available at: https://ec.europa.eu/transport/sites/transport/files/themes/strategies/studies/doc/2015-01-freight-logistics-lot2-combined-transport.pdf

European Commission (2016a) A European Strategy for Low-Emission Mobility. Staff Working Document. SWD(2016) 244 final. Brussels: Belgium. European Commission. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1485969133041&uri=CELEX:52016DC0501 (Accessed: 7 February 2019).

European Commission (2016b) Infrastructure – TEN-T – Connecting Europe: Corridors. Brussels: European Commission. Available at: https://ec.europa.eu/transport/themes/infrastructure/about-ten-t_en (Accessed: 7 February 2019).

European Commission (2016c) Second Work Plan of the European Coordinator Catherine Trautmann: North Sea Baltic. Belgium: European Commission. Available at: http://www.europarl.europa.eu/cmsdata/117304/tent-coordinators-2nd-workplan-nsb_en.pdf (Accessed: 7 February 2019).

European Commission (2016e) First Railway Package of 2001. Brussels: European Commission. Available at: https://ec.europa.eu/transport/modes/rail/packages/2001_en (Accessed: 7 February 2019).

European Commission (2016f) Rail: Fourth Railway Package of 2016. Brussels: European Commission. Available at: https://ec.europa.eu/transport/modes/rail/packages/2013_en (Accessed: 7 February 2019).

European Commission (2016g) Directive 2016/2370/EU: amending Directive 2012/34/EU as regards to opening of the market for domestic passenger transport services by rail and the governance of the railway infrastructure. OJ L352/1. Document 32016L2370. Brussels: European Commission. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016L2370 (Accessed: 7 February 2019).

European Commission (2016h) Commission Staff Document: REFIT ex-post evaluation of Combined Transport Directive 92/106/EEC - executive summary. (SWD(2016) 141 final). Available at: https://ec.europa.eu/transport/sites/transport/files/facts-fundings/evaluations/doc/swd(2016)141-exec-summary_en.pdf (Accessed: 7 February 2019).

European Commission (2016i) Connecting Europe Facility (CEF) Transport Calls for Proposals: Country Factsheet Germany. Available at: https://ec.europa.eu/transport/sites/transport/files/2016-cef-call/2016-cef-country-fiche-de.pdf (Accessed: 7 February 2019).

European Commission (2016j) Country Report Poland 2016. (SWD(2016)89 final). Brussels: European Commission. Available at: https://ec.europa.eu/info/sites/info/files/cr_poland_2016_en.pdf (Accessed: 7 February 2019)

European Commission (2016k) Second Work Plan of the European Coordinator Kurt Bodewig: Baltic Adriatic. Brussels: European Commission. Available at: https://ec.europa.eu/transport/sites/transport/files/tent-coordinators-2nd-workplan-bac.pdf (Accessed: 8 February 2019).

European Commission (2016l) European Structural and Investment Funds and European Fund for Strategic Investments complementarities: Ensuring Coordination, Synergies and Complementarities. P. 8 ff. Brussels: European Union. Available at: https://ec.europa.eu/regional_policy/sources/thefunds/fin_inst/pdf/efsi_esif_compl_en.pdf (Accessed: 8 February 2019).

European Commission (2017a) European Union Strategy for the Baltic Sea Region: Action Plan {COM(2009) 248}. Staff Working Document. SWD(2017) 118 final. Brussels: Belgium. European Commission. Available at: https://www.balticsea-region-strategy.eu/action-plan?task=document.viewdoc&id=17

European Commission (2017b) EU Funding for TEN-T: Connecting Europe Facility. Brussels: European Commission. Available at: https://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/project-funding/cef_en (Accessed: 7 February 2019).

European Commission (2017c) Directive 92/106/EEC: Amendment of the Combined Transport Directive. Brussels: European Commission. Available at: https://ec.europa.eu/transport/themes/urban/consultations/2017-CTD_en (Accessed: 7 February 2019).

European Commission (2017d) Inception Impact Assessment. European Commission. Available at: http://ec.europa.eu/smart-regulation/roadmaps/docs/2017_move_006_combined_tranport_en.pdf (Accessed: 7 February 2019).

European Commission (2017e) Statement by Catherine Trautmann, North-Sea Baltic TEN-T Corridor Coordinator. 26 June. Brussels: European Commission. Available at: https://ec.europa.eu/transport/themes/infrastructure/news/2017-06-26-statement-catherine-trautmann-north-sea-baltic-ten-t-corridor_en (Accessed: 7 February 2019).

European Commission (2017f) EU Funding for TEN-T. Brussels: European Commission. Available at: https://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/project-funding_en (Accessed: 8 February 2019).

European Commission (2017g) Work programmes. Brussels: European Commission. Available at: https://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/project-funding/work-programmes_en (accessed: 8 February 2019).

European Commission (2017h) Implementing CEF Transport 2014-2016: Connecting Europe Today. p. 10. [Presentation]. Available at: https://ec.europa.eu/inea/sites/inea/files/2017_cef_transport_stat_web_final.pdf (Accessed: 8 February 2019).

European Commission (2017i) Investments in EU Transport: Commission proposes €2.7 billion for 152 projects. Brussels: European Commission. Available at: https://ec.europa.eu/transport/themes/infrastructure/news/2017-06-23-2016-cef-call_en (Accessed: 8 February 2019).

European Commission (2017j) Horizon 2020: Funding areas. Brussels: Innovations and Networks Executive Agency (INEA). Available at: https://ec.europa.eu/inea/en/horizon-2020 (Accessed: 8 February 2019).

European Commission (2017k) European Structural and Investment Funds. Brussels: European Commission. Available at: https://ec.europa.eu/info/funding-tenders/european-structural-and-investment-funds_en (Accessed: 8 February 2019).

European Commission (2017l) Cohesion Fund. Brussels: European Commission. Available at: http://ec.europa.eu/regional_policy/en/funding/cohesion-fund/ (Accessed: 8 February 2019).

European Commission (2017m) Priority Project 27: Rail Baltica Axis: Warsaw-Kaunas-Riga-Tallinn-Helsinki. Brussels: Innovation and Networks Executive Agency. Available at: https://ec.europa.eu/inea/en/ten-t/ten-t-projects/projects-by-priority-project/priority-project-27 (Accessed: 8 February 2019).

European Commission (2017n) European Regional Development Fund. Brussels: European Commission. Available at: http://ec.europa.eu/regional_policy/en/funding/erdf/ (Accessed: 8 February 2019).

European Commission (2018a) Council Decision on the system of Own Resources of the European Union. SWD(2018) 172 final. 2018/0135 (CNS). P. 2. Available at: https://ec.europa.eu/commission/sites/beta-political/files/system-own-resources-may2018_en.pdf (Accessed: 8 February 2019).

European Commission (2018b) Regional Development and Cohesion Beyond 2020: The New Framework at a Glance. EU Budget for the future. Brussels: European Commission. Available at: https://ec.europa.eu/commission/sites/beta-political/files/budget-may2018-new-framework-glance_en.pdf (Accessed: 8 February 2019).

European Commission (2018c) CEF support to North Sea - Baltic Corridor. Innovation and Networks Executive Agency. Available at: https://ec.europa.eu/inea/sites/inea/files/201803_corridor_report_northseabaltic_withcover_0.pdf (Accessed: 29 January 2019).

European Investment Bank (2017) What is the European Fund for Strategic investments (EFSI)? Luxembourg: European Investment Bank. Available at: http://www.eib.org/efsi/what-is-efsi/index.htm (Accessed: 8 February 2019).

"European Parliament (2016a) The fourth railway package. Brussels: European Parliamentary Research Service. Available at: http://www.europarl.europa.eu/RegData/etudes/IDAN/2016/579088/EPRS_IDA(2016)579088_EN.pdf (Accessed: 7 February 2019)."

"European Parliament (2017) Towards low-emission EU mobility. Brussels: European Parliamentary Research Service. Available at: http://www.europarl.europa.eu/RegData/etudes/BRIE/2017/599356/EPRS_BRI(2017)599356_EN.pdf (Accessed: 7 February 2019)."

European Parliament (2019) Cohesion Fund Fact Sheet. Brussels: European Parliament. Available at: http://www.europarl.europa.eu/factsheets/en/sheet/96/cohesion-fund (Accessed: 8 February 2019).

European Structural and Investment (2016a) Country Factsheet Germany. Brussels: European Commission. Available at: http://ec.europa.eu/regional_policy/sources/policy/what/investment-policy/esif-country-factsheet/esi_funds_country_factsheet_de_en.pdf (Accessed: 8 February 2019).

European Structural and Investment (2016b) Country Factsheet Poland. Brussels: European Commission. Available at: http://ec.europa.eu/regional_policy/sources/policy/what/investment-policy/esif-country-factsheet/esi_funds_country_factsheet_pl_en.pdf (Accessed: 8 February 2019).

European Structural and Investment (2016c) Country Factsheet Estonia. Brussels: European Commission. Available at: http://ec.europa.eu/regional_policy/sources/policy/what/investment-policy/esif-country-factsheet/esi_funds_country_factsheet_ee_en.pdf (Accessed: 8 February 2019).

European Structural and Investment (2016d) Country Factsheet Latvia. Brussels: European Commission. Available at: http://ec.europa.eu/regional_policy/sources/policy/what/investment-policy/esif-country-factsheet/esi_funds_country_factsheet_lv_en.pdf (Accessed: 8 February 2019).

European Structural and Investment (2016e) Country Factsheet Lithuania. Brussels: European Commission. Available at: http://ec.europa.eu/regional_policy/sources/policy/what/investment-policy/esif-country-factsheet/esi_funds_country_factsheet_lt_en.pdf (Accessed: 8 February 2019).

European Union (2014) The Study of the North Sea – Baltic Core Network Corridor. Brussels: Proximare. European Commission. Available at: https://baltirail.files.wordpress.com/2015/01/north-sea-baltic-core-network-corridor-study-proximare-2014.pdf (Accessed: 7 February 2019).

European Union (2016a) Trans-European transport network guidelines - Germany. Brussels: European Commission. Available at: https://ec.europa.eu/transport/sites/transport/files/ten-t-country-fiches/ten-t-country-fiches-de_en.pdf (Accessed: 7 February 2019).

European Union (2016b) EU by Topic: Transport policy. Brussels. Available at: https://europa.eu/european-union/topics/transport_en (Accessed; 7 February 2019).

EuroStat (2017) Climate change - driving forces. Luxembourg: European Commission (statistics explained). ISSN 2443-8219. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Climate_change_-_driving_forces#Transport-related_emissions.2C_including_emissions_from_international_aviation (Accessed: 7 February 2019).

Federal Ministry of Finance (2017) Abschlussbericht: Förderung von Umschlaganlagen des Kombinierten Verkehrs nichtbundeseigener Unternehmen [German – 'Final report on the promotion of combined transport handling facilities of non-governmental companies']. Spending Review 2015/2016. Available at: http://www.bundesfinanzministerium.de/Content/DE/Standardartikel/Themen/Oeffentliche_Finanzen/Spending_Reviews/2017-04-04-spending-review-abschlussbericht-kombinierter-verkehr.pdf?__blob=publicationFile&v=2 (Accessed: 7 February 2019).

Federal Ministry of Transport and Digital Infrastructure (2008) Freight Transport and Logistics Masterplan. Berlin: Federal Ministry of Transport and Digital Infrastructure. Available at: https://www.bmvi.de/SharedDocs/EN/Documents/masterplan-freight-transport-and-logistics-publication.pdf?__blob=publicationFile (Accessed: 7 February 2019).

Federal Ministry of Transport and Digital Infrastructure (2014) Policies for mobility and modernity. Berlin: Federal Ministry of Transport and Digital Infrastructure. Available at: https://www.bmvi.de/SharedDocs/EN/publications/policies-for-mobility-and-modernity.pdf?__blob=publicationFile (Accessed: 7 February 2019).

Federal Ministry of Transport and Digital Infrastructure (2016) The 2030 Federal Transport Infrastructure Plan. Berlin: Federal Ministry of Transport and Digital Infrastructure. Available at: http://www.bmvi.de/SharedDocs/EN/Documents/G/ftip-2030.pdf?__blob=publicationFile (Accessed: 7 February 2019).

Federal Ministry of Transport and Digital Infrastructure (2017a) Transport Infrastructure. Available at: https://www.bmvi.de/EN/Topics/Mobility/Transport-Planning-Investment/Federal-Transport-Infrastructure-Plan/federal-transport-infrastructure-plan.html (Accessed: 7 February 2019).

Federal Ministry of Transport and Digital Infrastructure (2017b) Federal Ministry of Transport and Digital Infrastructure Richtlinie zur Förderung von Umschlaganlagen des Kombinierten Verkehrs nicht bundeseigener Unternehmen [German – 'Directive on the promotion of combined transport handling facilities of non-governmental companies']. G 22 /3141.4/1. Available at: https://www.bmvi.de/SharedDocs/DE/Anlage/VerkehrUndMobilitaet/Schiene/foerderrichtlinie-von-umschlaganlagen-des-kombinierten-verkehrs.pdf?__blob=publicationFile (Accessed: 7 February 2019).

Fichert (2017) Transport policy planning in Germany - An analysis of political programs and investment masterplans. European Transport Research Review, 9(28), pp. 1 - 12. doi: 10.1007/s12544-017-0247-7. Available at: https://link.springer.com/content/pdf/10.1007%2Fs12544-017-0247-7.pdf (Accessed: 7 February 2019).

Finger and Holvad (2013) Regulating Transport in Europe. London: Edward Elgar Publishing Limited. ISBN 978 1 78100 482 1

Goujard, A. (2016) Improving transport and energy infrastructure investment in Poland. OECD Economics Department Working Papers, No. 1302. Paris: OECD Publishing. Available at: http://dx.doi.org/10.1787/5jlwz8jrf89r-en (Accessed: 7 February 2019).

Hafen Hamburg Marketing (2017a) The Port of Hamburg: Facts and Figures [Pdf]. Available at: https://www.hafen-hamburg.de/downloads/media/dokumente/hhm_d-f_2017_en_final.pdf (Accessed: 8 February 2019).

Hafen Hamburg Marketing (2017b) KPI Comparison Intermodal Terminals [Tables]. Preparatory Data Collection for Report in Activity 2 of 'North Sea - Baltic Connector of Regions' project. Hamburg. Unpublished.

Hafen Hamburg Marketing (2017c) Nodal Point Infrastructure KPIs. WP 2.2.3 Report. Unpublished.

Hafen Hamburg Marketing (2018a) Hamburg - Gateway to the New Silk Road. Hamburg: Port of Hamburg. Available at: https://www.hafen-hamburg.de/downloads/media/dokumente/RZ_Folder_Seidenstra%C3%9Fe_WEB.pdf (Accessed: 8 February 2019).

Hafen Hamburg Marketing (2018b) Best Practices of Intermodal Nodal Points. WP 2.2.2 Report. Unpublished.

Hamburg Port Authority (2015) smartPORT. P. 15. Available at: https://www.hamburg-port-authority.de/fileadmin/user_upload/150422_tl_messe_lowres.pdf (Accessed: 8 February 2019).

Hamburger Hafen und Logistik AG (2017) Obligatory pre-announcement for truck visits. Available at: https://hhla.de/en/truck-info/pre-announcement.html (Accessed: 8 February 2019).

Hansen, J. (2017) Herausforderungen durch neue Allianzen, Digitalisierung und Marktveränderungen aus Sicht eines Terminal Betreibers [German – Challenges posed by new alliances, digitisation and market changes from the point of view of a terminal operator]. Paper Presented for Hamburger Hafen und Logistik AG (HHLA) at: Erste Bahnkonferenz Schienengüterverkehr und Häfen [‚First railway conference on rail freight and ports'], Hotel Baseler Hof, Hamburg 26 June. Available at: https://www.hamburg-logistik.net/index.php?eID=tx_nawse-curedl&u=0&g=0&t=1549712438&hash=e773396916ddd2c2c1cc5583a8686a8c8ad143c4&file=fileadmin/user_upload/PDF-Datein/Veranstaltungen/Bahnkonferenz/2_Lars_Neumann_HHLA.pdf (Accessed: 8 February 2019).

Institute of Logistics and Warehousing (2017) 'WP2 status report and next steps'. Presentation held at NSB Connector of Regions Project Meeting, Riga 5 April 2017, unpublished.

Institute of Logistics and Warehousing (2018) Nodal Points Benchmarking. WP 2.2.4 Report. unpublished.

Jaworski, M. (2016) The location of intermodal terminals used in Poland in 2015. 'Rynek kolejowych przewozów intermodalnych' [Polish: Railway Intermodal Transport Market]. Intermodal Freight Transport Forum February 2016. Warsaw, p. 7. Available at: https://utk.gov.pl/download/1/11648/Analizakolejowychprzewozowintermodalnychw-Polsce.pdf (Accessed: 8 February 2019).

Kadlubek, J. M. (2010) 'SWOT analysis of the road cargo transport companies in Poland', Archives of Transport Systems Telematics, 3(3), pp. 4-8. Available at: http://atst.pl/pdf/ATST_3_10.pdf (Accessed: 8 February 2019).

Kellermann (2008) The German Masterplan for Freight Transport and Logistics [Presentation]. p.4. Available at: https://www.unece.org/fileadmin/DAM/trans/wp24/wp24-presentations/documents/pres08-06.pdf (Accessed: 7 February 2019).

Lithuanian Government (2013) Lithuania: National Reform Programme 2013. Available at: https://ec.europa.eu/info/sites/info/files/file_import/nrp2013_lithuania_en_0.pdf (Accessed: 7 February 2019).

Lithuanian Railway (2015c) Freight Transportation: Kaunas Intermodal Terminal. Vilnius: JSC „Lietuvos geležinkeliai". Available at: http://cargo.litrail.lt/en/kauno-vlc (Accessed: 8 February 2019).

Ministry of Economic Affairs and Communication (2013) Transport Development. Available at (Estonian): https://www.mkm.ee/sites/default/files/transpordi_arengukava.pdf (Accessed: 7 February 2019).

Ministry of Infrastructure and Development (2014) PROGRAM OPERACYJNY INFRASTRUKTURA I ŚRODOWISKO 2014 – 2020 [Polish – 'Operational Programme for Infrastructure and Development 2014 – 2020']. Warsaw: Ministry of Infrastructure and Development. Available at: https://www.pois.gov.pl/media/10900/POIiS_2014-2020_04112015.pdf (Accessed: 8 February 2019).

Ministry of Infrastructure and Development (2016) KRAJOWY PROGRAM KOLEJOWY DO 2023 ROKU [Polish – 'National Rail Plan up to the year 2023']. Available at: http://mib.bip.gov.pl/fobjects/download/194387/rm_111_147_16-pdf (Accessed: 8 February 2019).

Ministry of Transport and Communication (2017) National Transport Development Programme 2014-2022 (summary). Vilnius: Ministry of Transport and Communications. Available at: https://sumin.lrv.lt/en/administrative-information/national-transport-development-programme-2014-2022-summary (Accessed: 7 February 2019).

Nestler, S. and Nobel, T. (2016) Freight Villages (FV) in Europe: Results of the second European Ranking 2015. pp. 80. Deutsche GVZ-Gesellschaft mbH. Berlin: Wissenschaftlicher Verlag Berlin. ISBN: 978-3-86573-940-7

OECD (1998) Report on the current state of combined transport in Europe. P. 14. Paris: OECD Publications Services. ISBN 92-821-1238-1. Available at: https://www.itf-oecd.org/sites/default/files/docs/98comb_0.pdf (Accessed: 7 February 2019).

Pape, M., 2018, European Union, European Parliamentary Research Services, PE 623.553, http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/623553/EPRS_BRI(2018)623553_EN.pdf (Accessed: 8 February 2019).

Parry, M. and Sapała, M. (2018) 2021 - 2027 multiannual financial framework and new own resources: Analysis of the Commission's proposal. P. 3. PE625.148. ISBN: 978-92-846-3827-7. DOI:10.2861/663213. Brussels: European Parliamentary Research Service. Available at: http://www.europarl.europa.eu/RegData/etudes/IDAN/2018/625148/EPRS_IDA(2018)625148_EN.pdf (Accessed: 8 February 2019).

Posaner, J. (2017) 'Juncker's promise to truckers (in the West)'. Politico. Brussels. 31 May. Available at: http://www.politico.eu/article/junckers-social-promise-to-truckers-in-the-west/ (Accessed: 8 February 2019).

Publication Office (2013) Regulation (EU) No. 1315/2013: on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU. OJ 348/1. Document 32013R1315. Brussels: European Commission. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013R1315 (Accessed: 7 February 2019).

"Rah (2016) 'Hamburg - Policy Challenges in an Urban Node' [PowerPoint presentation]. Available at: http://ec.europa.eu/regional_policy/sources/conferences/udn_brussels_2016/6.3%20Sicco%20Rah_Hamburg.pdf (accessed: 7 February 2019).

Rail Baltica (2017a) Rail Baltica - Project of the Century. Available at: http://www.rail-baltica.org/about-rail-baltica/ (Accessed: 8 February 2019).

Rail Baltica (2017b) Agreement between the government of the Republic of Latvia, the Government of the Republic of Estonia, and the Government of the Republic of Lithuania on the development of the Rail Baltic / Rail Baltica Railway Connection. Available at: http://www.railbaltica.org/wp-content/uploads/2017/05/Intergovernmental_Agreement_2017.pdf (Accessed: 8 February 2019).

"Rail Baltica (2017c) Joint Declaration between the minister of transport of the Republic of Finland, the minister of Economic Affairs and Infrastructure of the Republic of Estonia, the minister of transport of the Republic of Latvia, the minister of transport and communications

of the Republic of Lithuania, the minister of infrastructure and construction of the Republic of Poland on the enhanced cooperation for the implementation of the Rail Baltic / Rail Baltica Project. Rotterdam. Available at: http://www.railbaltica.org/wp-content/uploads/2017/05/Joint-Declaration-Rotterdam-2016.pdf (Accessed: 7 February 2019)."

Rail Baltica (2017d) Rail Baltica - North Sea Baltic Network [Illustration]. Available at: http://www.railbaltica.org/wp-content/uploads/2017/04/Rail_Baltica_North_Sea_Baltic_Network.png (accessed: 8 February 2019).

Rail Baltica (2017e) Rail Baltica Global Project Cost-Benefit-Analysis: Executive Summary. Ernst Young and RB Rail. Available at: http://www.railbaltica.org/wp-content/uploads/2017/04/RB_CBA_EXECUTIVE_SUMMARY_0405.pdf (Accessed: 8 February 2019).

Rail Baltica Growth Corridor (2013) Expert Group Final Report. WP6 - Logistics Pilot. Pp. 6. Available at: http://www.rbgc.eu/media/articles/expert-group-wp6-final-report.pdf (Accessed: 8 February 2019).

Rail Freight Corridor 8 (2016) Rail Freight Corridor North Sea – Baltic. Available at: http://rfc8.eu (Accessed: 7 February 2019).

Railway Gazette (2018) 'German rail projects added to implementation list', Railway Gazette, Sutton, 6 November 2018.

Schulz, A. (2017) 'Hinterlandterminalstrategie' [German – 'Hinterland terminal strategy']. Paper Presented for DB Netze (DB Network) at the Erste Bahnkonferenz Schienengüterverkehr und Häfen ['First railway conference rail freight and ports'], Hotel Baseler Hof, Hamburg 26 June. Available at: https://www.hamburg-logistik.net/index.php?eID=tx_nawse-curedl&u=0&g=0&t=1549721358&hash=5f4952403e42db8ff6260941416e3fa6fd9cf9ff&file=fileadmin/user_upload/PDF-Datein/Veranstaltungen/Bahnkonferenz/8_Andreas_Schulz_DUSS.pdf (Accessed: 8 February 2019).

Scordamaglia, D. and Katsarova, I. (2016b) 'The Fourth Railway Package: Another Step Towards A Single European Railway Area'. European Parliamentary Research Service Blog. 15 March. Available at: https://epthinktank.eu/2016/03/15/the-fourth-railway-package-another-step-towards-a-single-european-railway-area/ (Accessed: 7 February 2019).

Scribble Maps (2017) Scribble Maps. Available at: https://www.scribblemaps.com/ (Accessed: 8 February 2019).

Shift2Rail (2014) Factsheet Shift2Rail: driving innovation on railways. Brussels: European Commission. Available at: https://ec.europa.eu/research/press/jti/factsheet_s2r-web.pdf (Accessed: 8 February 2019).

Shift2Rail (2016) Annual Work Plan 2017 & Budget Figures. P. 22. Brussels: European Commission. Available at: http://ec.europa.eu/research/participants/data/ref/h2020/other/wp/jtis/h2020-wp17-shift2rail_en.pdf (Accessed: 8 February 2019).

Shift2Rail (2017a) Master Plan. Brussels: European Commission. PP.16. Available at: https://ec.europa.eu/transport/sites/transport/files/modes/rail/doc/2015-03-31-decisionn4-2015-adoption-s2r-masterplan.pdf (Accessed: 8 February 2019).

Shift2Rail (2017b) Mission and Objectives. Brussels: Shift2Rail. Available at: https://shift2rail.org/about-shift2rail/mission-and-objectives/ (Accessed: 8 February 2019).

Shift2Rail (2017c) S2R Lighthouse Projects Mid-Term Public Event. Brussels: Shift2Rail. Available at: https://shift2rail.org/events/s2r-lighthouse-projects-mid-term-public-event/ (Accessed: 8 February 2019).

Transport Policy Guidelines (2013) Transport Policy Guidelines 2014-2020. Riga. Provided by e-mail from Riga Planning Region ('NSB CoRe' project partner). 3 August 2017. Unpublished.

Union Internationale Pour Le Transport Combine Rail-Route (2017) Position Paper on e-Communication and Digitalisation in Logistics. Industry Alliance for Multimodal. International Union For Road-Rail Combined Transport. Available at: http://www.uirr.com/de/component/downloads/downloads/1230.html (Access: 8 February 2019).

VASAB (2017) SWOT Analysis NSB CoRe. Information material during presentation at European Strategy for the Baltic Sea Region Forum, Berlin 14 June 2017, unpublished.

Wiśniewski, S. (2017) 'The accessibility of Poland's Space to the Trans-European Transport Network', Miscellanea Geographica – Regional Studies on Development, 21(3), pp. 1 – 11, DOI: 10.1515/mgrsd-2016-0030. Available at: https://www.degruyter.com/downloadpdf/j/mgrsd.2017.21.issue-3/mgrsd-2016-0030/mgrsd-2016-0030.pdf (Accessed: 8 February 2019).

World Bank (2017) Logistics Performance Index. World Bank Group. Available at: https://lpi.worldbank.org/ (Accessed: 8 February 2019).