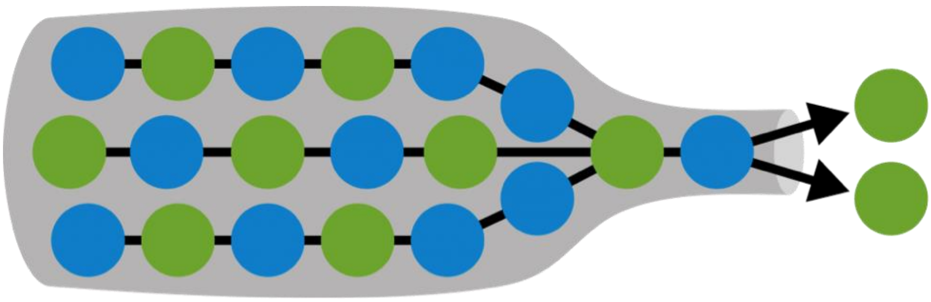
IDENTIFICATION OF REMOTER AREA'S BOTTLENECKS IN INTERMODAL NETWORK

Deliverable 3.1

WP3, Activity 1
Version: 2
Date: 21/12/2021



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Content

1 INTRODUCTION

The purpose of this document is to focus on the effort of **A 3.1 Bottlenecks in intermodal networks of NSR (report 1)**. This is the first report of a three-part report (Application form – pg. 17). The other two parts describe smart port solutions for remoter areas (report 2) and inland waterway regulations (report 3). In the **application form (AF)** of the European Project several aspects are mentioned that need to be incorporated in this report and will form the structure of this report. The focus in this report is laid on core and periphery harbours. It is known that each port type has its own bottlenecks that need to be studied.

The project investigates remoter transportation nodes (pg. 1):

- Also called the **comprehensive** network that is complementary with the core network (pg. 8).
- Also called the **peripheral transportation nodes** that contribute to raise the capacities of major nodes which mostly suffer from congestion (pg. 9).

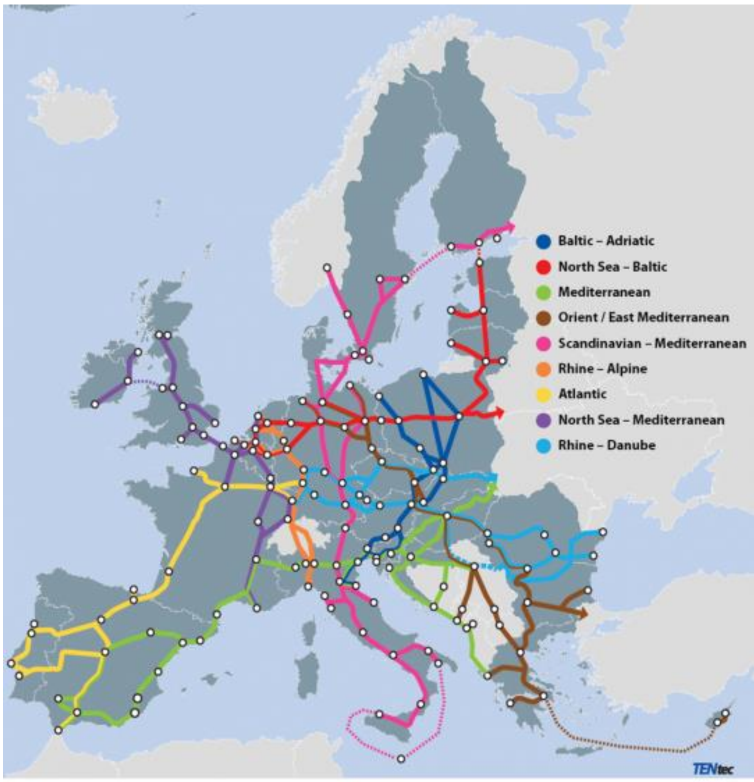
In this report several aspects are discussed which are structured as follows:

- A **glossary** with the key words important in this project and report (section 2);
- The **literature review** and (section 3);
- The **methodology** to identify the bottlenecks (section 4);
- A port passport;
- An interview and analysis;
- A conclusion on bottlenecks and barriers**.**

2 GLOSSARY

The project is of international nature and several aspects or keyword may be differently understood. Therefore, in this glossary, a few key words are described. By describing them, there is no misunderstanding and the reader can easily follow this report. These key words are as well mentioned in the application form.

Definition of TEN-T: Trans-European Transport Network. This was established by the European Commission to support the construction and upgrade of transport infrastructure across the European Commission. See also the figure below (https://ec.europa.eu/transport, 10/07/2021).



Note: the nine TEN-T core network corridors are based on the CEF and TEN-T Regulations (1316/2013 & 1315/2013); they have been created as a coordination instrument to facilitate the completion of major parts of the core network of strategic importance.
Source: European Commission, Directorate-General for Mobility and Transport, TENtec Information System

Figure 1: Ten-T core network corridors (Source: https://ec.europa.eu/transport, 10/07/2021)

<u>Definition of **North Sea Region**</u>: the countries and regions in EU that have access to the North Sea. These countries and regions are member of the North Sea Region Programme which facilitates transnational cooperation between 49 regions in seven countries (https://northsearegion.eu, 10/07/2021). These are as well part of the TEN-T network. See also the figure below of which countries or parts of it are included.

Figure 2:: North Sea Region (https://northsearegion.eu, 10/07/2021)

Definition of a pilot: A pilot is defined as a project partner that is introducing smart solutions for the NSR harbours. The 4 **pilots** in the project which are studied are the following ones:

1. Haven van Brussel (Belgium)
2. Haven Oostende (Belgium)
3. Port of Goteborg (Sweden)
4. Port of Vordingborg (Denmark)

These four pilot targets one of the following purposes as described in the application form:

- Pilot 1: Smart ITW cargo handling
- Pilot 2: Smart city port distribution
- Pilot 3: Smart remote nodes development
- Pilot 4: Smart remote nodes accessibility

3 LITERATURE STUDY: IDENTIFICATION OF BOTTLENECKS IN MULTIMODAL TRANSPORT

3.1 General literature: broad insights

During the first phase of the study a literature review has been conducted. Three categories of available literature have been used:

- Corridor Studies which mirror the scale and geographical scope of the current study.
- Multi-country transport and socio-economic research.
- National documents listing and describing infrastructure investments.

The literature study gives some broad insights into the barriers and bottlenecks encountered between and within different EU countries.

3.1.1 Multimodal transport: What? Technical bottlenecks?

Multimodal transport refers to the transportation of goods by two or more different modes of transport (such as road, rail, air or inland waterway, and short- or deep-sea shipping) as part of the contract where often a multimodal transport operator (MTO) is responsible for the performance of the entire haulage contract from shipping to destination (UN, 1980, Harris et al., 2014).

The movement of goods could be **within one country or international** with additional procedures such as goods clearance at customs. Figure 3 illustrates the whole international transport process where goods are moved from a country A to final destination in country B and the involvement of MTO during their journey. Its aim is to transfer goods in a continuous flow through the entire transport chain to make a transportation journey more efficient from a financial, environmental and time perspective (Beresford et al., 2006; Chao, 2011; Steadie Seifi et al., 2014). With the massive growth in containerisation and the great shift in thinking from a conventional unimodal to a system concept multimodal transport approach, multimodal is currently the main method used in the international transportation process as it enables the optimisation and organisation of all transport modes into an integrated continuous system in order to achieve operationally efficient and cost effective delivery of goods in the supply chain (Harris et al., 2014).

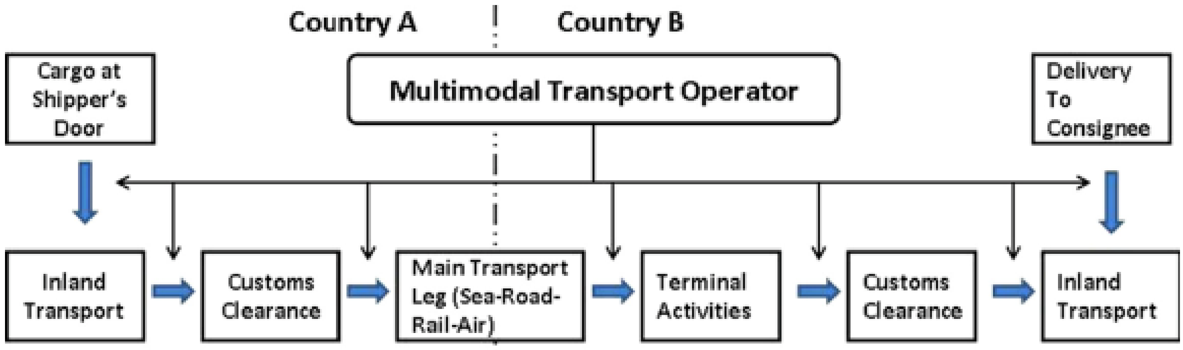


Figure 3: Goods flow in a typical international multimodal transport chain (Source: Chao, 2011)

A combination of different features of each transport mode could place additional constraints on goods during transportation such as packaging, transportation conditions and storage. On the other hand, multimodal **combines the specific advantages of each mode in one voyage**, such as the flexibility of road haulage, the relatively large capacity of railways and the lower costs of short/ deep-sea transport in the best possible way (Zaheer, 2008; Harris et al., 2014).

As well as having multiple characteristics of each mode, an added complication is the **management of the whole seamless multimodal transportation process which is complex and involves different players** such as freight forwarders, third-party logistic service providers, couriers, carriers of different modes of transport, MTOs, rail, sea carriers, port and intermodal terminal operators (Marchet et al., 2009). The **communication** between these parties has to be accurate, timely and efficient to ensure the flawless and visible delivery process which could be challenging due to different technologies being deployed by different companies. The diverse nature of managing the multimodal transport chain is supported by a number of activities where each phase needs to be optimized and possibly integrated with other activities for effective and efficient business operations (Harris et al., 2014):

- transportation order handling (delivery schedule, forecasting);
- prepare the transportation chain (select and contract actor services);
- prepare transportation (loading, customs);
- perform transportation (reports on unloading, loading, damage);
- monitor transportation (track vehicles and drivers' behaviour);
- terminal operations (control loading/ unloading, manage stock terminal) (INFOLOG, 1999).

The range of activities varies from resource management and port operations to fleet and freight management processes that need to be supported by **appropriate ICT solutions** (Harris et al., 2014).

An **integrated multimodal transport network** is a critical factor for companies to successfully execute their supply chain processes both domestically and internationally. However, the complex nature of multimodal integration, for instance the involvement of a wide variety of operators can limit the growth of multimodality. One of the major constraints is the lack of **effective and efficient information connectivity** among and between various modes (water, air, road and rail) (Harris et al., 2014).

Despite the aforementioned benefits and strong government promotion, the uptake of recent **technological advances** for multimodal transport provisions in the UK and Europe has been slow (Huckridge et al., 2010, Perego et al., 2011, Marchet et al., 2012, Harris et al., 2014).

3.1.2 Synthesis framework as structural element to organize barriers and bottlenecks.

Based on different sources of scientific literature and reports, a framework was developed which organizes the different bottlenecks and barriers in a structured way, while keeping into account the different geographical scales and the main problems encountered.

Literature reports on barriers and bottlenecks is very extensive. Many research has been conducted already into this area and therefore is it a matter of structuring all this info into a way that helps us understand all the different issues.

As a lot of topics have been scrutinized, however the vast amount of them can be traced back to three main issues:

- Infrastructure issues
- Technical issues
- Operational and administrative issues.

These issues are also part of Indicative TEN-T investment action plan, prepared by the world bank (Indicative TEN-T investment action plan, 2018).

Under **infrastructure issues** we understand the port infrastructure as the base for port operations to serve the vessel, cargo and passengers which pass through ports. The development of port infrastructures requires capital-intensive investments, a long lead-time and therefore long-term planning. This means that the design of port infrastructures should anticipate the needs of the Waterborne, logistics and transport sector (https://www.waterborne.eu/vision/port-infrastructure)

Under **technical parameters** we understand parameters mainly related to infrastructure that can impede transnational multimodal transport. (Number of lanes, secure parking areas, accessible load, rail connection,..) (European Union, 2019).

Operational & administrative barriers are related to, one the one hand the operational processes of transnational multimodal transport, and on the other hand to the administrative barriers. Under administrative barriers, financial concerns (fee structures, investments, port charges, personnel costs), paper work concerns (some electronic, other with paper), Lack of qualified personnel, lack of working hours, Lack of national/EU guidance is seen.

Other barriers that are mentioned in the literature is very scattered and hard to put under one common denominator. Therefore we have chosen to put these barriers in the group **'other'** and describe them in detail.

The following sections discuss the three main issues identified

3.1.2.1 Infrastructure issues

Since the global economic crisis, the EU has been suffering from **low levels of investment in transport infrastructure.** This has held back modernization of the EU's transport system. Collective and coordinated efforts at European and national levels, recently boosted by the Investment Plan for Europe, need to reverse this downward trend (European Union, 2019, pg. 13).

In particular the **Trans-European Transport network (TEN-T) requires investment in new infrastructure**, refurbishment and modernization of the existing network. Better coordination is needed between EU countries on cross-border infrastructure projects European Union, 2019, pg. 13).

Road and rail infrastructure across the EU has been **degrading because of too little maintenance**. Maintenance budgets have often experienced cuts and have not evolved in line with the increasing length of infrastructure and the ageing of crucial links. This has led to a worsening of the state of roads in many EU countries and has generated higher risks of accidents, congestion, increased noise and a reduced service to society European Union, 2019, pg. 13).

The adaptation of infrastructure to **new mobility patterns** and the deployment of infrastructure for **clean, alternative fuels**, poses additional challenges that require new investments and a different approach to the design of networks and business models.

In Greece, Spain, France, Italy and Portugal, further **improvement of port services and port hinterland connections** by rail (and/or inland waterways) is crucial.

The upgrading and modernisation of infrastructures is needed in **the inland waterway network** of Belgium, Germany, France and the Netherlands (European Union, 2019, pg. 14). A number of other regulatory barriers exist in Europe for inland waterways. When inland transport crosses several national borders, paperwork may be complicated and time consuming (Pfoser et al., 2018). Implementing standardised IT systems in northern European ports has overcome this issue (Kotowska et al., 2018).

3.1.2.2 Technical issues

Building missing links at borders between EU countries and along key European routes, removing bottlenecks or interconnecting transport modes in terminals is vital for the Single Market and for connecting Europe with external markets and trade partners. The smooth functioning of the European network requires integration and interconnection of all modes of transport, including equipment for traffic management and innovative technologies European Union, 2019, pg. 13).

Cooperative intelligent transport systems (C-ITS) allow road users and traffic managers to share information and use it to coordinate their actions. C-ITS are based on technologies which allow vehicles to "talk" to each other and to the transport infrastructure. In addition to what drivers can immediately see around them, all parts of the transport system are able to share information (European Union, 2019, pg. 14).

Rail freight services suffer from low quality and reliability. This is due to the lack of coordination in cross-border capacity offer, traffic management and planning of infrastructure works (European Union, 2019, pg. 8).

- **Solution:** The creation of a Single European Rail Area.
- **Problem 1**: This requires major efforts to achieve technical interoperability and to ensure that rolling stock is able to run across national borders. In addition, standardization of systems and equipment in its broader sense is crucial to gain efficiency and reduce costs. Specific EU legislation, such as the Technical Pillar of the 4th Railway Package, aims at promoting interoperability. The rules are implemented with the assistance of the European Union Agency for Railways (ERA).

- **Problem 2**: The lack of effective competition may explain why in many EU countries rail transport has not developed customer-oriented services, innovative business models and costs/price reductions that can be witnessed after market opening in other transport modes. The degree of competition in the railway sector, measured as the total market share of all but the biggest railway companies, is low (see Figure 2). Although a low number of competitors may reflect the small size of a market, various barriers to entry still hamper the development of competition in rail.

3.1.2.4 Digital innovation

Under **digital innovation**, combinations of information, computing, communication, and connectivity technologies are considered (Bharadwaj et al., 2013). Three applications may be considered the key innovation domains in the port sector with respect to digital technology:

- electronic data interchange (EDI) innovation
- applications concerning monitoring of vehicles and cargo
- and those supporting the cargo flow.

In the article of Carlan et al. (2017), the term ‘‘digital innovation’’ refers to new ICT developments in the port sector and more specifically to communication platforms that facilitate the exchange and management of information, IT developments that help the cargo flow, and technological advancements that monitor the equipment or cargo.

These solutions are ICT applications that address the problems that arise in all transport modes. Literature shows that there are three main reasons behind the investment decision in transport ICT developments. Firstly, cost reduction and improvement of the service level are the most important elements in the ICT investment decision.[4] Secondly, the transport process control and monitoring enhancement is another important element in the adoption of ICT concepts.[5] Lastly, safety and security improvement is another reason why the transport sector also invested in digital innovation.

For **inland waterway transport**, studies in Sweden and Europe have revealed several key financial barriers to initiating IWT. The cost of pre/post-haulage (Konings, 2009; Vierth et al., 2012; Wiegmans & Konings 2015) makes the location of ports/quays important (Mommens & Macharis, 2014) as this determines the distance between ports and shippers.

Fee structures for other transport modes also affect the competitive situation (Vierth et al., 2012), for example the relatively low transport rates of the trucking industry (Konings 2009). Bloemhof et al. (2011) noted that financial institutions are only willing to invest in efficient large capacity barges. This poses a barrier to using smaller barges, which might be more suitable in certain use cases and can be easier to convert to renewable fuels and electric propulsion, enabling more sustainable waterway transport. A lack of qualified personnel may increase the cost of operations

In the light of a wave of **technological innovation and disruptive business models** (such as ride sharing), both the possibilities and demand for making transport safer, more efficient and sustainable have increased. Digital technologies help reduce human error. They can also create a truly multimodal transport system and spur social innovation. The market potential of **cooperative, connected and automated driving** is expected to lead to the creation of many new jobs (European Union, 2019, pg. 14).

3.1.2.5 Other issues

The TEN-T report tackle a number of horizontal challenges besides the aforementioned issues that need to be addressed to have reliable logistics in the European Union (European Union, 2019, pg. 7):

1. Sub-optimal market functioning
2. Negative externalities

Sub-optimal market functioning

The transport policies in the EU are characterised by divergent national priorities. **Fragmentation of the transport market** will continue to limit the quality of transport services in Europe and will leave growth potential untapped (European Union, 2019, pg. 7).

Maritime transport needs to overcome bottlenecks and act on administrative simplification, port capacity and efficiency, connection to the hinterland and access to financing. The lack of high-quality infrastructure or low-performing port services can result in significant extra costs for shippers, transport operators and consumers. For EU companies, port and terminal costs can represent up to 25% of the total door-to-door logistic cost. The "Ports Regulation" of 201718 introduces rules on transparent public funding to improve market access and make port investments and operations more efficient (European Union, 2019, pg. 11).

Inland water transport stands to lose its comparative advantage as an efficient, low external costs transport mode, unless long-term structural changes are made to improve the quality of its operating conditions. Suitable means include: investment in better infrastructure, skills, digitalisation and integration into the logistics chain. This requires both the definition of common standards at EU level and cross-border cooperation between EU countries, e.g. in the framework of the Danube Strategy (European Union, 2019, pg. 11).

The rail freight market has been fully open to competition since 2007. Between 2010 and 2016, the market shares of competitors continued to increase in most EU countries, most significantly in Belgium, Bulgaria, Czechia, Germany and Hungary. Exceptions to this growth trend were Estonia and France (European Union, 2019, pg. 8).

In the **road transport sector**, the market for international (intra-EU) freight and passenger services has been entirely opened to competition, but domestic transport remains largely protected. On the freight side, "cabotage", i.e. domestic transport performed by foreign hauliers, is subject to restrictions. As a consequence, operators face difficulties in optimising their operations and one in two vehicles operating domestic transport outside of its country of registration runs empty (European Union, 2019, pg. 9).

Another **common challenge of market functioning** is to create **conditions of fair competition** between the various transport operators in a market that is not distorted by illegal state aid or by abuses related to the control over infrastructure (European Union, 2019, pg. 11):

- State funding of regional **airports** is often needed to ensure territorial cohesion. However, undue distortion of competition in subsidising economically unviable airports must be avoided. Sustainable growth of airports and airlines requires full compliance with state aid rules. EU and non-EU air carriers benefit from equal access opportunities to the EU market. However, this is not always the case in non-EU countries.
- As for **maritime transport**, the "Ports Regulation" requires that financial relations between public authorities and the port managing body, or any other entity that provides port services or dredging and receives public funds, must be reflected transparently in the accounting system. Thus, the risk of undue cross-subsidisation is reduced.
- **In rail**, cases of (restructuring) aid and overcompensation of public service obligations are frequent. In addition, failure to separate infrastructure managers and service operators is not conducive to fair competition or efficient exploitation of the infrastructure.

Negative externalities

Congestion has to be dealt with urgently, considering the expected growth in transport demand. The indicator produced by the Joint Research Centre to evaluate the congestion level, measures hours spent by cars in road congestion. The countries with the highest congestion levels are Malta, the United Kingdom, Belgium, Italy and Luxembourg (European Union, 2019, pg. 17).

3.2 Overview of barriers in the North Sea Region countries

In this sections an overview barriers and bottlenecks is given specifically for each country that is involved in the CONNECT project: Belgium, Denmark, Germany, Netherlands, Sweden and United Kingdom.

3.2.1 Belgium

3.2.1.1 Issue 1: Efficient infrastructure management to reduce congestion

Transport infrastructures are well developed, but growing traffic commuter and freight volumes are putting them under increasing pressure, leading to congestion and declining air quality in inner cities. Investments to address bottlenecks would benefit from more systematic cost-benefit analysis, which is currently under used. Investment choices would also benefit from better coordination between the federal government, in charge of railways, and regions, in charge of roads, ports and inland waterways.

Increasing the size of infrastructure, however, could be only part of the answer. Traffic volumes are boosted by large commuting subsidies and a cost-efficient policy would be to develop congestion pricing in both road and railway transport to reduce congestion and address negative externalities in terms of environmental impact and cost to the economy.

Another approach to alleviate pressure on the transport system would be to target investments in bottlenecks and alternative transport modes. While the average use of the road network is relatively low, transport tends to be concentrated around Brussels and Antwerp.

Investments in inland waterway infrastructures have aimed at shifting freight transport from roads and rail. Nevertheless, road freight transport is contributing to congestion and an ambitious road-pricing scheme for trucks seems necessary (European Union, 2019, pg. 27).

3.2.1.2 Modal split for freight transport

Freight transport seems to rely predominantly on road, rather than railways. However, in Belgium inland waterways account for an important share of the modal split for freight transport (15,1%) (European Union, 2019, pg. 28).

Table 1: Modal split for freight transport in 2018. Source: EU transport in figures, statistical pocketbook 2020

Modal split for freight transport (shares based on tonne-kilometres)				
	Inland			
	Road	Railways	Waterways	Pipeline
Belgium	71,5%	10,2%	16%	2,3%
EU-28	73,1%	17,2%	5,3%	4,4%

3.2.1.3 Completion of TEN-T Core network

Belgium is globally very advanced in completing its share in the TEN-T Core network. Yet gaps persist, mainly in the conventional rail part.

Table 2: Completion of TEN-T Core network in Belgium. Source: DG MOVE TENTec

Completion of TEN-T Core network 2016			
Road	Conventional Rail	High speed Rail	Inland waterways
99%	71%	100%	87%

3.2.2 Denmark

3.2.2.1 Issue 1: Road congestion

Denmark has high-quality roads, but congestion is increasingly a problem. In terms of road quality, Denmark ranks high in the Global Competitiveness Report (World Economic Forum, 2018) with its well-developed road network. Since 2008, the investment rate in road infrastructure has gradually increased to a level comparable with the EU average. Road congestion is, however, increasing, particularly around the large cities. Projections from the Ministry of Transport, Building and Housing (2018) suggest that in ten years' time car commuters will spend 150 % more time each year in congestion than they did in 2018.

3.2.2.2 Modal split freight transport

Freight transport in Denmark relies to a larger extent on road transport than the EU average. Correspondingly, the share of railways is lower. Inland waterways do not play any role for freight transport in Denmark.

Table 3: Modal split for freight transport in 2018. Source: EU transport in figures, statistical pocketbook 2020

Modal split for freight transport (shares based on tonne-kilometres)				
	Inland			
	Road	Railways	Waterways	Pipeline
Denmark	80,8%	10,9%	/	8,4%
EU-28	73,1%	17,2%	5,3%	4,4%

3.2.2.3 Completion of TEN-T Core Network in Denmark

The completion of the TEN-T Core Network in Denmark is relatively advanced for the road part, but on the rail part there is still room for further development

Table 4: Completion of TEN-T Core network in Denmark. Source: DG MOVE TENTec

Completion of TEN-T Core network 2016			
Road	Conventional Rail	High speed Rail	Inland waterways
83%	50%	0%	Not applicable

3.2.3 Germany

3.2.3.1 Issue1: Transport infrastructure

The quality of the German transport infrastructure is generally high and above EU average. However, investment levels in the past have been insufficient and led to an investment backlog especially in rail infrastructure, bridges and in municipalities in general. Investment in transport infrastructure over the last years has only increased nominally but in real terms investment as a share of GDP has stayed constant below 0.6% and thus even below pre-crisis levels.80 Consequently, the increases might be insufficient to address the investment backlog and improve the infrastructure according to future needs at the same time.

Policy measures taken at national level to relieve municipalities financially are only able to address the investment backlog in transport infrastructure to a limited extent.

A recent estimate by Germany assumes the between 2021 and 2030 EUR 115 billion would be needed on the German sections of the TEN-T Core and Comprehensive Networks. The German Infrastructure Plan 2030, which provides the basis for transport infrastructure investment planning in Germany for the next 15 years, fully reflects the requirements set in the TEN-T regulation. However long term political and financial commitment at national and regional level is often lacking to complete important cross-border infrastructure, mainly in the railway sector. As Germany is a mayor transit country, this is not only detrimental to the functioning of the internal market but also contradicts the modal shift and climate targets set at European as well as at national level.

3.2.3.2 Modal split

For land freight transport, the road transport covers the largest share of freight transport activity, about 70% of all tonne-kilometres driven. In addition, Germany has a higher share of rail and inland waterway transport than the EU average.

Table 5: Modal split for freight transport in 2018. Source: EU transport in figures, statistical pocketbook 2020

Modal split for freight transport (shares based on tonne-kilometres)				
	Inland			
	Road	Railways	Waterways	Pipeline
Germany	70,8%	19,3%	7,2%	2,7%
EU-28	73,1%	17,2%	5,3%	4,4%

Completion of TEN-T Core Network in Germany

Table 6: Completion of TEN-T Core network in Germany. Source: DG MOVE TENTec

Completion of TEN-T Core network 2016			
Road	Conventional Rail	High speed Rail	Inland waterways
59%	94%	58%	100%

3.2.4 Netherlands

3.2.4.1 Issue 1: Congestion

Congestion remains a specific challenge in a dense and well equipped country that is a key player in EU logistics with the biggest EU port in Rotterdam and one of the biggest airports in

Schiphol. The issue has been alleviated with additional infrastructure works but it still remains an issue with high social costs and hours wasted stuck in traffic.

3.2.4.2 Modal split

For freight, the dominant transport modes in the Netherlands are road and inland waterways

Table 7: Modal split for freight transport in 2018. Source: EU transport in figures, statistical pocketbook 2020

Modal split for freight transport (shares based on tonne-kilometres)				
	Inland			
	Road	Railways	Waterways	Pipeline
The Netherlands	48%	6,1%	41,1%	4,8%
EU-28	73,1%	17,2%	5,3%	4,4%

3.2.4.3 Completion of the TEN-T Core Network in the Netherlands

The completion of the TEN-T Core Network in the Netherlands appears to be well on thrack and for high speed it is even completed

Table 8: Completion of TEN-T Core network in the Netherlands. Source: DG MOVE TENTec

Completion of TEN-T Core network 2016			
Road	Conventional Rail	High speed Rail	Inland waterways
96%	84%	100%	97%

3.2.5 Sweden

3.2.5.1 Issue 1: Investment in transport infrastructure

Despite a good overall macroeconomic performance, Sweden's infrastructure investment situation appears unfavourable, particularly concerning the railway system.

The quality of Swedish transport infrastructure ranks 22nd worldwide in the Global Competitiveness Report (World Economic Forum, 2018). However, railroad infrastructure scores much lower than road infrastructure. It is also relatively low in the context of Sweden's strong performance on most other competitiveness indicators considered in the Report.

The railway system could benefit from increased investment in network maintenance and connections for cross-border traffic.

3.2.5.2 Modal split

Overall, the Swedish domestic transport system seems to rely almost entirely on land transport, with Sweden imposing a tax on travelling by air in order to encourage citizens to use less polluting means of transport.

Table 9: Modal split for freight transport in 2018. Source: EU transport in figures, statistical pocketbook 2020

Modal split for freight transport (shares based on tonne-kilometres)				
	Inland			
	Road	Railways	Waterways	Pipeline
Sweden	69,3%	30,7%	0%	0%
EU-28	73,1%	17,2%	5,3%	4,4%

3.2.5.3 Completion of TEN-T Core Network in Sweden

The completiong of the TEN-T Core Network in Sweden seems to be making good progress. However, high speed rail infrastructure is still missing in Sweden.

Table 10: Completion of TEN-T Core network in Sweden. Source: DG MOVE TENTec

Completion of TEN-T Core network 2016			
Road	Conventional Rail	High speed Rail	Inland waterways
77%	51%	0%	100%

3.2.6 United Kingdom

3.2.6.1 Issue 1: Road congestion

Road congestion levels are significantly above the EU average. According to data from the Commission's Joint Research Centre, car occupants in the United Kingdom were second only to Maltese car users in terms of hours spent in road congestion in 2015.

3.2.6.2 Issue 2: quality of transport infrastructure

Despite high investments in transport infrastructure in the United Kingdom, the perceived quality of the infrastructure shows a declining trend. This is particularly the case for road and railway infrastructure, but also in the field of aviation.

3.2.6.3 Modal split

For land freight transport, road transport covers the largest share of freight transport activity, about 87% of all ton-kilometres drive. The United Kingdom has a considerable lower share of rail and inland waterway transport than the EU average.

Table 11:Modal split for freight transport in 2018. Source: EU transport in figures, statistical pocketbook 2020

Modal split for freight transport (shares based on tonne-kilometres)				
	Inland			
	Road	Railways	Waterways	Pipeline
United Kingdom	85,8%	8,9%	0,0%	5,2%
EU-28	73,1%	17,2%	5,3%	4,4%

3.2.6.4 Completion of TEN-T Core Network in the United Kingdom

Table 12: Completion of TEN-T Core network in the United Kingdom. Source: DG MOVE TENTec

Completion of TEN-T Core network 2016			
Road	Conventional Rail	High speed Rail	Inland waterways
100%	100%	81%	Not applicable

3.2.7 Summary project partner countries

Table 13 gives an overview of the different bottlenecks and barriers encountered by partners in the North Sea Region based on de Move TENTec reports.

Table 13: Overview of bottlenecks by project partner countries

	Congestion	*Infrastructure*	*Modal split*
Belgium	X	X	
Denmark			X
Germany		X	
Netherlands	X		X
Sweden		X	X
United kingdom	X	X	

3.2.8 Conclusion

The literature review gives an oversight of the bottlenecks encountered by the north sea region countries. The review is split up into two different sections. In the first section a broad overview is given of the bottlenecks found in the TEN-T reports. Here the structural framework was developed were bottlenecks have been grouped into 3 different themes: **“Infrastructure**”, “**Technical**” and “**Operational and administrative**”. Severe other themes were mentioned in literature which couldn’t be placed under one common denominator and therefore were grouped under the theme “other’. This framework will later be used as structure for the pilot interviews;

In the second part of the review, an overview of bottlenecks per country was given based on the TENTec reports. These reports highlight three common bottlenecks in these countries: “Congestion”, ‘infrastructure” and “modal split”.

4 METHODOLOGY

As the focus of this project is on hinterland nodes, next to the literature study (section 3), a more into depth study has been conducted to the barriers and bottlenecks our project partners encounter. Therefore, following steps have been taken to gain more insight into this matter:

1. Creation of port passport per pilot (section 5).
2. Pilot interviews with the analysis of the interviews (section 6)

4.1 Port Passports

The port passport is the identification of the pilot ports in the project. This passport gives more insights into the type of pilots within the project whereby information was collected about:

- Contact details (pilot name, pilot manager, pilot manager function, etc.)
- Pilot type (port size, connections with hinterland, cargo, market share, pilot project etc.)

This information on the passport has been collected by organising an online questionnaire (software Limesurvey). In the first phase, the predetermined content of the draft questionnaire was discussed with project partners (SESTRAN) and was adapted according to these discussions. In a second phase, the final questionnaire has been distributed to the project partners with a pilot in the project via e-mail. The final version of this questionnaire can be found in Appendix 1 (port passport). Afterwards, answers where than discussed in the third phase during the stakeholder interview together with the pilot managers.

4.2 Stakeholder interviews

4.2.1 Set-up of the interviews

In the stakeholder interview, an in depth interview has been conducted with each of the pilot project partners (four in total). The questions in the interview were based on the outcome of the two previous methods: the port passport and the literature review. Following on this, the stakeholder interview could be divided into two parts which handles different questions.

In the **port passport** a brief explanation on the pilot type was given by each pilot partner. In order to gain a deeper understanding of the pilot, this questionnaire of the port passport was supplemented with questions in the stakeholder interview. This created the first part of the stakeholder interview.

Out of the **literature review** (section 3), a framework was established which reflected the synthesis of the literature review. This framework helped to organize the different bottlenecks and barriers in a structured way, while keeping into account the different geographical scales and the main problems encountered in literature. This framework contains questions on each problem and on each scale which formed the base of the interview. This created the second part of the stakeholder interview. The overview of the complete stakeholder interview can be found in Appendix 2: Stakeholder interview.

The stakeholder interviews per pilot were online organised via MS Teams:

- Pilot Oostende: 27/09/2021 with Jan Allaert;
- Pilot Vordingborg: 01/07/2021 with Benjamin Aijida;
- Pilot Brussels: 18/06/2021 with Désiréé Simonetti;
- Pilot Gotenborgh: 15/06/2021 with Stefan Jacobsson.

During and after performing the stakeholder interviews, the transcripts of the interviews were made.

4.2.2 Analysis of the interviews

Once all the interviews were conducted, transcripts were made as a basis for a qualitative analysis. This study takes the ‘grounded-theory approach’. The idea of the method is that the researcher arrives at theory formation on the basis of empirical material. This is done by working cyclically towards the data. This is often called the 'constant-comparative-method' (Mortelmans, 2007) and is applied when processing the interviews. Initially, the data, or transcripts, are broken down and then rebuilt. When rebuilt, themes or categories are built up. Afterwards, relationships are sought in the themes or categories.

In practice, in the first step, labels have been giving to different sections within the transcripts. These labels vary in a broad range of themes and are given to remarkable, repetitive and themed expressions. Once all the transcripts were read several times and coded, an overview of the themes was made and compared in between the transcripts to see it there were connections and overlaps. The outcome of this exercise provided info on several bottlenecks encountered by our pilot partners.

5 PORT PASSPORTS

In preparation of the stakeholder interviews, questionnaires have been send out to the four pilot managers. These questionnaires give more insights into the type of pilots within the project and is also called the 'port passport'.

In this section, an overview of the four pilot projects is given. This is based literature , project documents and results of the questionnaire.

5.1 Port of Oostende

5.1.1 Introduction

The port of Ostend is situated along the coast of Belgium. It is a maritime port which handles only bulk. The port of Ostend handles 1.5 million tons of cargo per year (https://www.nt.nl/havens/2020/04/21/haven-oostende-laat-stijging-zien-van-aantal-invaarten-en-tonnage/?gdpr=accept). It is located next to the city centre which influences some negative externalities towards the city (pollution, noise,…). The port focuses on offshore activities and renewable energies. This mainly concerns construction and maintenance of wind parks (https://www.vlaanderen.be/vlaamse-havens). The ports vision is to excel in niche markets with water related activities (https://www.portofoostende.be/en/about-us).

5.1.2 Problem in the pilot

The port of Ostend is limited in size and in infrastructure. Expansion of the port is nearly impossible due to it's location within the city of Ostend. In order to valorise the position of the port within their niche logistic operations in a sustainable way and to get full connection to the North Sea Mediterranean and the North Sea Baltic TEN-T corridors it is indicated on the TEN-T maps that investment is needed in the further development of the sea-river vessels and the use of the inland waterways.

5.1.3 Solution in the pilot

Instead of going for increasing in volumes. One example here is autonomous vehicles. The port of Ostend has several projects running involving autonomous vehicles. With the Connect project they try to gain even more insight in the usage, advantages, disadvantages of autonomous vehicles. The possibility to handle goods from ship to quay and vice versa are scrutinized by making a digital twin of the quay and implementing modals to imitate this movement.

5.2 Port of Vordingborg

5.2.1 Introduction

The port of Vordingborg is situated in Denmark, southwest of the city Copenhagen. It is located in the Southern part of Zealand and close to the Great Belt and Baltic Sea on the island of Masnedoe. With this location the port has a good connection with cities. It is a maritime port which handles mainly bulk such as grain, sand and stone (www.bpoports.com, 28/09/2021). The port has a connection with the roads and waterways in the hinterland but not with railways or the airport. The port handles yearly a cargo of 1 million tons/ year and has a marketshare that is increasing (www.bpoports.com, 28/09/2021).

5.2.2 Problem in the pilot

At the moment, the port of Vordingborg can be seen as a remote note in a peripheral region in the TEN-T network.

5.2.3 Solution in the pilot

By the emerging Fehmarn belt the port of Vordingborg is investigating the possibilities to integrate into the TEN-T systemin and European inland water system.

5.3 Port of Gothenburg

5.3.1 Introduction

The port of Gothenburg is a maritime port located in the west coast of Sweden. It is the largest port in Scandinavia and has container, ro-ro, passenger and oil and energy terminals (https://www.portofgothenburg.com/about-the-port/the-port-of-gothenburg/). The port has links with rail, road and waterway. The port handles 800.000 TEU/year and transfers up to 1.7 million passengers yearly (numbers from 2016, https://www.portofgothenburg.com/about-the-port/the-port-of-gothenburg/) The market share of the port is stable

5.3.2 Problem in the pilot

The port of Gothenburg is scrutinizing the possibility to implement smart remote nodes accessibility. At the moment of writing, poor information exchanges in today's intermodal transport system means long queues and waiting times when truck and trains arrive at seaport terminals, preventing them from accessing the right containers at the right times.

5.3.3 Solution in the pilot

The purpose of the project is to investigate how effective access management can reduce turnaround times for trucks and trains in seaport terminals through an automated exchange of relevant information. Effective access management can be achieved when transport resources (e.g. trucks and truck drivers) can be managed together with terminal resources (e.g. straddle carriers and straddle carrier drivers). Namely, with effective access management the right information can be exchanged at the right time towards ensuring the actors to be able to grant or receive access to the right resources at terminals at the right time. The users of the results are hauliers, train operators and terminals, which can automatically exchange information one week, one day and two hours before the trucks and trains arrive at the seaport terminals, can reduce turnaround times, costs and environmental impact.

5.4 Port of Brussels

5.4.1 Introduction

The port of Brussels crosses from the North side of the city over 14 km to the South side. The canal serves a port area of 107 hectares. The port has connection with inland waterways, road and rail. The port handles 6.6 million tons of cargo per year. In 2020 building materials were traditionally at the top of the list of goods. Oil products come second, with containers in third place (https://port.brussels/en).

5.4.2 Problem in the pilot

Brussels is a major consumption centre for the construction sector. More than 75% of the 2.5 million transhipped tons of building materials in the Port of Brussels come from the Netherlands or Antwerp. It is estimated that only 5 to 10 % of Brussels' construction flows are currently transported by waterway. Traditional transport to construction sites via road is often uncoordinated, with many separate deliveries and various peaks of congestion at the site. The vehicle utilization is poor with vehicles often travelling half-empty to site and empty from site, leading to excessive traffic flow and carbon emissions out of proportion to tonnage handled. Congestion problems around Sea Ports and in Brussels are partly due to missing links between Sea Ports and their hinterland. Waterway transport is a solution to (re)create these links and reduce the extensive use of trucks for the transport of goods.

5.4.3 Solution in the pilot

Taking the abovementioned challenges into account, this pilot has two aims:

- Reinforce links between North sea ports with their hinterland connections through the Antwerp-Brussels-Charleroi Canal;
- Optimize global supply chain and city distribution for construction sites.

Concretely, this pilot project aims to test the possible extension of the Construction Consolidation Center for building materials (CCC) in the North (Vergote Dock) to the South of Brussels (Biestebroek Dock), in order to further develop the use of waterway for unitized building material supply (pallets, big bags, mobile boxes, etc.) with a special focus on the organization of the last mile and the whole supply chain from building material producers to the end consumer (construction sites).

A CCC is a smart and innovative logistic concept that aims to improve the logistic chain of building materials in city centres. It is an intermodal distribution facility through which the delivery of building materials are channelled to construction sites. The flow of building materials is bundled and consolidated in order to reduce externalities of the construction sector (congestion, noise ,pollution, carbon emissions and improved reverse logistics).

This will contribute to intramodality growth as it directly fosters the hinterland connection with Dutch and Flemish sea ports and indirectly the connections on the TEN-T corridors North Sea-Mediterranean and Rhine-Alpine.

5.5 Overview pilot ports in the project

In the table below, an summary of the four pilot ports in the project is given

Table 14: Summary of port passport

Port	*Business case*	*Location port*	*Connection Rail*	*Connection inland waterway*	*Main goods transported*
Ostend	Smart ITW cargo handling	Maritime	No	Yes	Building materials
Vordingborg	Smart remote nodes accessibility	Maritime	No	Yes	Agricultural material
Gothenburg	Smart remote nodes development	Maritime	Yes	Yes	Container
Brussels	Smart city port distribution	River	Yes	Yes	Building material

6 PILOT INTERVIEWS

6.1 Background

To gain more insights into the bottlenecks and barriers encountered by the pilots, an in depth interview was conducted with the four pilot managers. The interview consisted of two parts: (i) gaining more info on the pilot from each partner and (ii) gaining more insight on the local bottlenecks and barriers in each pilot.

The first part of the interview was based on the questionnaire that had been send out a couple of days before the interview. The second part of the interview was based on the synthesis framework coming out of the literature study. This was adapted so information on different geographical scales could be captured (Transnational – national – local). The figure below show the basis of the framework with the different bottleneck types and the geographical scales:

Table 15:Structural framework

Bottlenecks/barriers	Infrastructure	Technical	Operational/administrative	Other
Transnational level				
National level				
Port specific/local				

Finally, questions were added based on the information found in literature. The transnational questions remained the same in all four interviews, however, the national and port specific questions were adapted based on the information found in the literature.

The stakeholder interviewed by each pilot project had different backgrounds. Following stakeholders have been interviewed in each pilot area:

- Ostend: Port authority
- Vordingborg: Vordingborg business association + feedback from port authority
- Gothenburg: Consultation research centre
- Brussels: Port authority

6.2 Results

Once all the interviews were conducted, transcripts were made. Based on these transcripts a coding method was applied, meaning that labels have been giving to different sections within the transcripts. Following sections elaborate on the results from the coding process

Drivers of the pilot project

Despite the fact that the four pilot projects have a very different background and differ in local sceneries, it does seem that the driver of the pilots can be grouped under one term which we refer to as **"reduce externalities and enhance efficiency"**.

The improvement of efficiency and reduction of externalities have a broad range. For the Brussels pilot this is **bundling of material flows and reducing congestion** by implementing a construction consolidation centre. The reduction of the congestion externality is also part of the drivers for the Goteborg pilot, were they want to implement an efficient access management system to **reduce waiting time and cut back costs**. The driver for the pilot from the port of Ostend is also to **reduce the cost of handling goods** by scrutinizing the possibility of autonomous vehicles to load and onload vessels. Finally, the Vordingborg pilot wants to **reduce greenhouse gas emissions and explore the possibility for specialized freight for food consumption**.

In the next step, the drivers of the pilot are linked to the structural framework that came out of the literature review. This gives insights on which domain of the types of bottlenecks the pilots pursue. Following links have been found:

- Ostend: Smart ITW cargo handling => Operational & Administrative
- Vordingborg: Smart remote nodes accessibility => Operational & Administrative
- Gothenburg: Smart remote nodes development => Operational & Administrative
- Brussels: Smart city port distribution => Operational & Administrative

It is clearly noticeable that all pilots in the Connect project are related to the operational and administrative bottleneck. This confirms the fact that the driver of these pilots is to enhance efficiency as this can be achieved primarily through operational improvements.

Pilot bottlenecks and barriers

In each of the interviews multiple bottlenecks and barriers were mentioned. In order to structure these bottlenecks, an overview is given on the amount of times each bottlenecks was mentioned an which geographical scales the applied to. The reasoning behind this is that this gives us an idea on which types of bottlenecks and barriers are most common in each pilot and on which scales do they apply.

Some of the bottlenecks discussed during the interviews have effects on multiple geographical scales. Therefore, the effect on each geographical scale of each bottleneck was assessed. If a bottleneck appeared to have effect on multiple scales, it was counted to each of these scales. An example is the Seine-Scheldt Canal. At the moment this an transnational infrastructural bottleneck (between France and Belgium) however, this bottleneck also has effect on national and local scales. Therefore this bottleneck was counted in each of the geographical scales.

The results for the pilots can be found in figures below

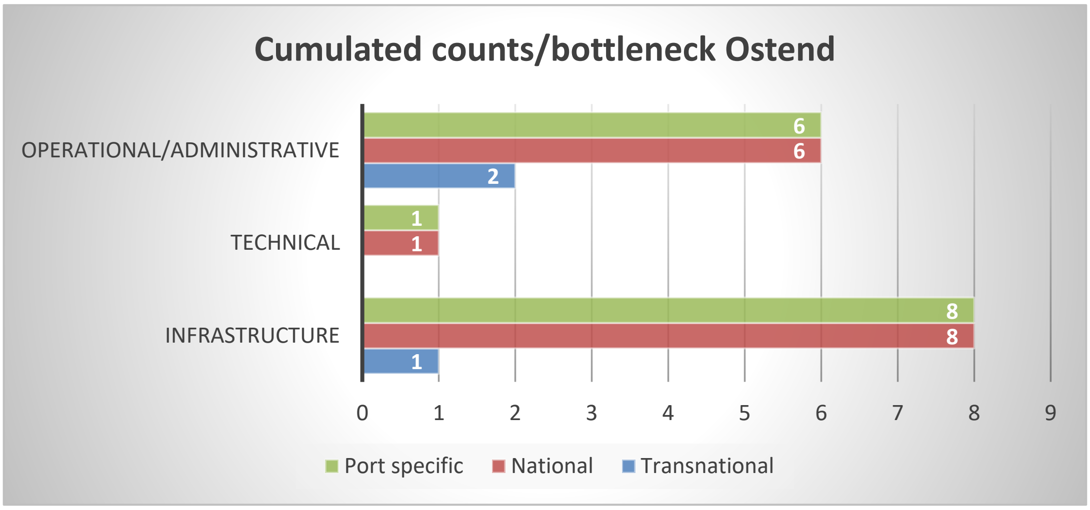


Figure 4: Cumulated counts/bottleneck Ostend

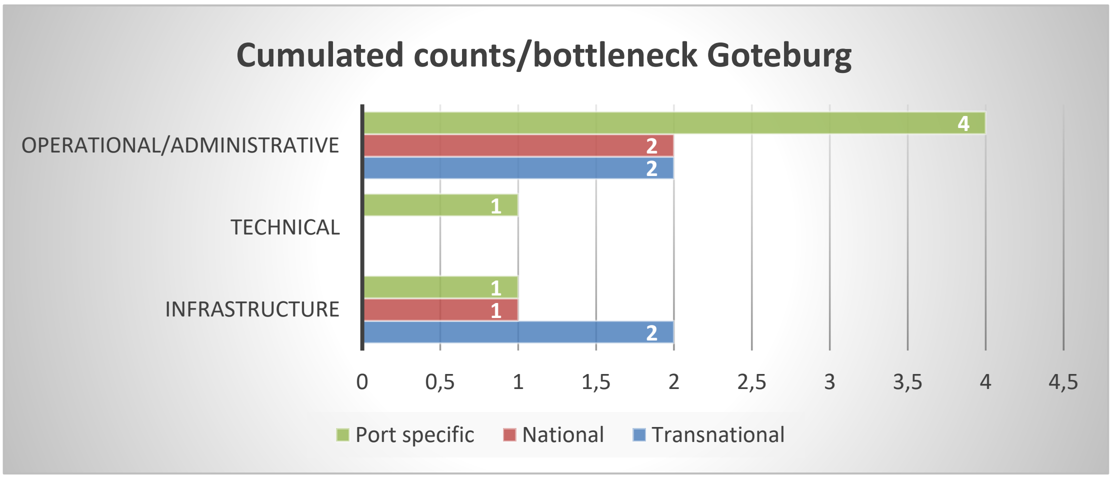


Figure 5: Cumulated counts/bottleneck Goteburg

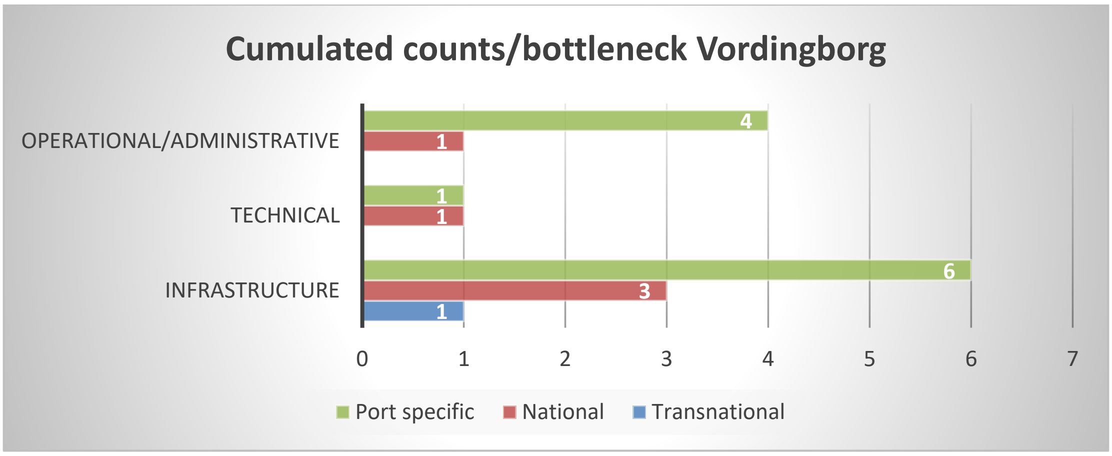


Figure 6:Cumulated counts/bottleneck Vordingborg

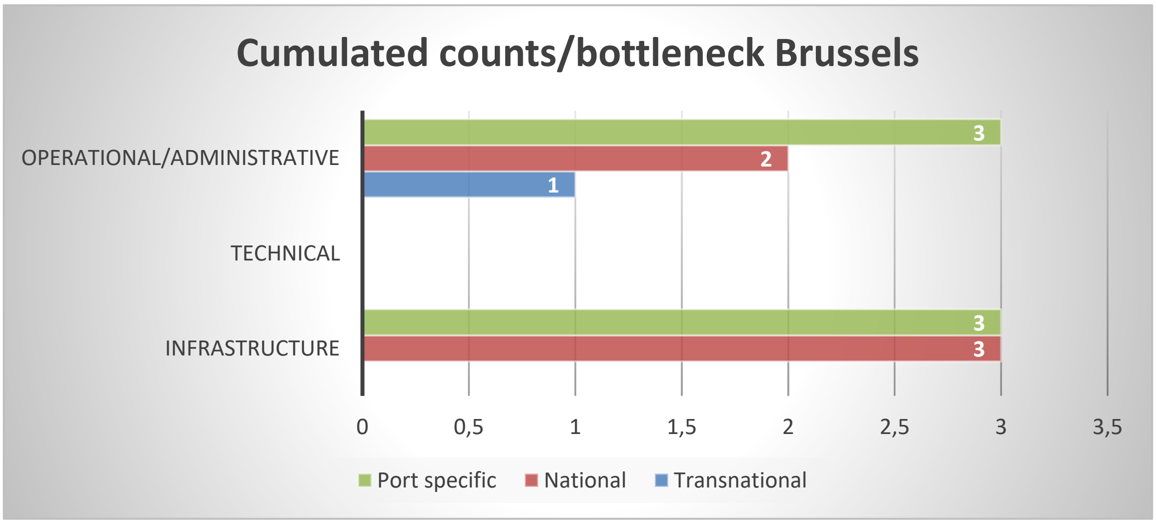


Figure 7: Cumulated counts/bottleneck Vordingborg

The graphics above show that operational/administrative and infrastructure bottlenecks were mentioned most during the interviews. When we combine all the info of the different pilots in one graphic we get following image below.

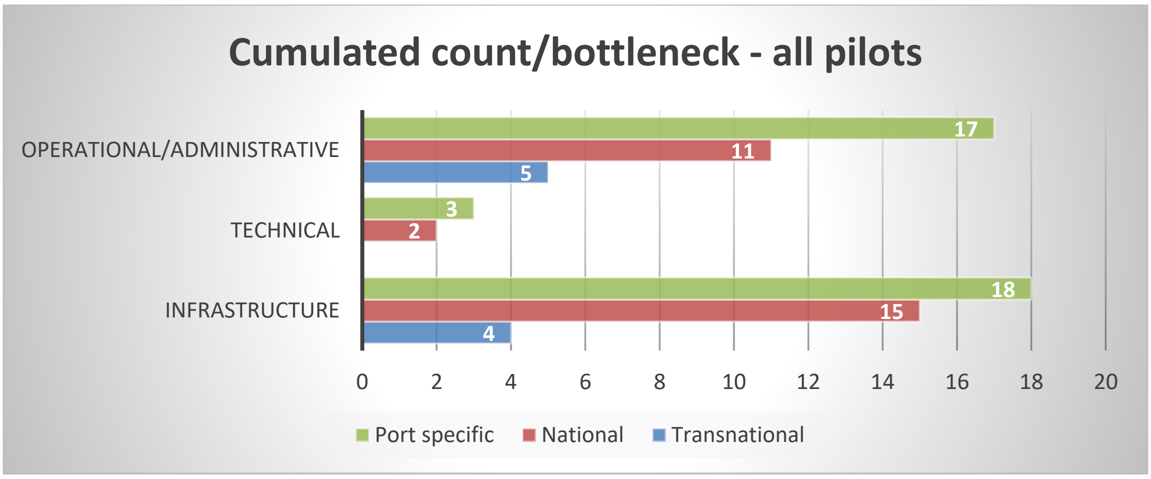


Figure 8: Cumulated count/bottleneck sum of all pilots

Both operational/administrative and infrastructure bottlenecks are way ahead in relation to the technical bottlenecks on all geographical scales. Moreover, due to the fact that the interviews happened with local stakeholders, we can clearly see that most of the bottlenecks and barriers encountered are related to the port specific scale, something that also was noticed during the interviews. Pilot managers were less bothered by bottlenecks on transnational level but are mainly concerned on bottlenecks on local and national level.

Other bottlenecks

Next to the operational/administrative, technical and infrastructural bottlenecks from the structural framework, several other bottlenecks were mentioned during the interviews. Some of these bottlenecks were mentioned in multiple interviews with pilot partners and could be related to each other.

For the port of Ostend, Goteborg and Brussels **spatial issues** were mentioned in that way that all three of these ports are located in/next to the city center, resulting in several issues such as a lack of space to expand activities, nuisance for local residents (noise, odor,…), shared access for public,…

Congestion problems were mentioned by Goteborg and Brussels. These bottlenecks also contribute to the pilot project of both ports (smart remote nodes development and smart city port distribution). Both of the projects intention is to reduce congestion by either managing the process by which actors access resources at terminals resulting in decreased turnaround times and increased access precision. Or by bundling streams of construction materials resulting in less transport movements and utilizing reverse logistics.

Finally, a **mindset/ mind shift** bottleneck was mentioned by Goteborg, Vordingborg and Brussels. For Brussels this was mentioned in relation to the construction sector, were traditionally most of the construction materials are transported to the construction site by road transport in scattered parcels. Here a different mindset is needed by this sector were they can optimize these transports by using the construction consolidation center. Also the Goteborg pilot mentioned this mindshift but in relation to the transport sector. Availability of detailed information on when to pick up containers for transport companies doesn't automatically mean that they will use this information as they are unfamiliar with this new technology. In Vordingborg a general mindshift to use cleaner energy and using digital tools by SME's in the Vordingborg region were mentioned.

The table below show which other groups of bottlenecks were mentioned and to which pilot they are related:

Table 16: Overview of other bottlenecks encountered

Other bottlenecks	*Spatial issue*	*Congestion*	*Mindset/Mind shift*
Ostend	X		
Goteborg	X	X	X
Vordingborg			X
Brussels	X	X	X

Interview conclusions

The interviews with the pilot managers gave more insights in how hinterland ports are affected by bottlenecks and barriers. Not only on transnational level but also on national and local level. The findings are following:

- Local ports are more effected by local and national bottlenecks than with transnational bottlenecks
- Bottlenecks most encountered by the pilots are administrative/operational and infrastructure bottlenecks.
- Three other bottlenecks were mentioned by the pilot partners: Spatial issues, congestion and mindset/ mind shift.

As these findings gain more insight into the port specific issues. It must be noted that this research is very limited in the number of ports interviewed. As this is a small scale research, results may not be representative for other regions.

7. CONCLUSIONS

7.1 General findings

The report on transnational bottlenecks and barriers exists out of three main sections: the literature review, the port passport and the pilot interviews.

In the **literature study** an overview was made of the most encountered bottlenecks and barriers encountered by scientific literature, European reports and other studies. The literature was structured and four thematic groups of bottlenecks were created: **"Infrastructure**", "**Technical**", "**Operational and administrative**" and **"Other".** This structure formed the bases for the pilot interviews. In the second part of the literature review, an overview of bottlenecks per country was given based on the TENTec reports. These reports highlight three common bottlenecks in these countries: **"Congestion", 'infrastructure"** and **"modal split".**

To gain more insight into bottlenecks and barriers encountered by hinterland pilots, interviews were conducted with the pilot managers. These questionnaires give more insights into the type of pilots within the project and is called the '**port passport'**. Based on the information from both the literature review and the post passport, questions were prepared and structured in the 'structural framework' to ensure we reached al the facets of bottlenecks encountered by the pilot managers.

The interviews with the pilot managers gave more insights in how hinterland ports are affected by bottlenecks and barriers. Not only on transnational level but also on national and local level. The findings are following:

- Local ports are more effected by local and national bottlenecks than with transnational bottlenecks
- Bottlenecks most encountered by the pilots are administrative/operational and infrastructure bottlenecks.
- Three other bottlenecks were mentioned by the pilot partners: Spatial issues, congestion and mindset/ mind shift.

As these findings gain more insight into the port specific issues. It must be noted that this research is very limited in the number of ports interviewed. As this is a small scale research, results may not be representative for other regions.

7.2 Next steps

In this report a qualitative analysis was performed. In the next step, a quantitative analysis can be carried out. For this, additional information must be collected. In practice, this means that the results found must be checked against those already interviewed during the pilot interviews. For example, they can be asked to give scores to the bottlenecks found and reported in this study. In this way, the researchers of this study will be able to carry out a quantitative analysis that will find out how heavily a particular bottleneck weighs in a specific port area. These weights can be defined and measured by a Qualitative Comparative Analysis (QCA). A QCA is a qualitative analysis tool that allows the cause-effect analysis of case studies. The QCA is particularly useful to establish and understand the combination of certain factors, called conditions, from case studies (or pilots) that could lead to a specific outcome.

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8.2 The list of literature and sources

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9 APPENDICES

9.1 Appendix 1: port passport

Section A: Contact details

A1. **Pilot name**

A2. **Pilot manager name**

A3. **Pilot manager function**

A4. **Are there any other relevant colleagues we can contact for this project? If yes, can you please indicate a name and e-mail address?**

Section B: Pilot type

B1. Port size

- Small size: cargo volume of less than 150 million tonnes ☐
- Medium size: cargo volume of 150-300 million tonnes ☐
- Large size: cargo volume of over 300 million tonnes ☐

B2. Type of location

- Maritime ☐
- River ☐
- Lake ☐

B3. Connections with hinterland

- Train ☐
- Road ☐
- Waterway ☐
- Airport ☐

B4. Cargo

- Bulk ☐
- Container ☐

B5. Market share

Increasing ☐

Stable ☐

Decreasing ☐

B6. Port-city connection

Less correlated ☐

Correlated ☐

B7. Which smart port solution will you implement?

Smart ITW cargo handling ☐

Smart city port distribution ☐

Smart remote nodes development ☐

Smart remote nodes accessibility ☐

B8. Can you briefly explain this smart solution?

9.2 Appendix 2: stakeholder interviews

Brussel Pilot:

	Infrastructure	Technical	Operational & administrative	Other
Definition	The port infrastructure is the base for port operations to serve the vessel, cargo and passengers which pass through ports. The development of port infrastructures requires capital-intensive investments, a long lead-time and therefore long-term planning. This means that the design of port infrastructures should anticipate the needs of the Waterborne, logistics and transport sector (Source: https://www.waterborne.eu/vision/port-infrastructure)	Technical parameters of infrastructure (Number of lanes, train lenght, accessible load, secure parking areas, rail connection, ...) (Source: Ten-T european corridor studies)	e.g. unloading/loading = het echte uitvoeren van acties in je haven. "Administrative: Financial concerns (fee structures, investments, port charges, personnel costs), Paper work concerns (some electronic, other with paper), Lack of qualified personnel, lack of working hours, Lack of national/EU guidance "	Not related to infrastructure/technical/operational/administrative
Possible questions transnational barriers and bottlenecks & TEN-T	In your opinion, do you encounter **transnational** barriers in effective and efficient connectivity between the various modes (water, air, road and rail)?	In your opinion, are there technical parameters that cause	In your opinion, do you encounter transnational barriers in digital innovation? (Under digital innovation we understand combinations of	Do you encounter any other barriers?

core/comprehensive network		transantional barriers? (modernisation of railways, train lenghts, loading gauge, speed limits,)	informations, computing, communication and connectivity technologies)	
			In your opinion, do you encounter transnational adminstrative/legaslative barriers? (country specific regulatory and operational requirements for international trade and transport)	
			In your opinion, do you encounter transnational financial concerns? (fee structures, investments, port charges, personnel costs,),	

Nationale statements (uit literatuur)	issue 1: Efficient infrastructure management to reduce congestion			
Port specific (corridor study north sea mediterranean)	Do you encounter barriers due to limited volumes handled?			
	In Belgium, there are a few short stretches of waterway in the corridor which limit vessel size below CEMT IV. The Brussels-Charleroi canal is listed as a Class IV waterway but its current profile is less than optimal for shipping with Class IV ships (pg. 51).			
	The Ring of Antwerp and the Ring of Brussels face severe congestion issues leading to loss of reliability and decreases in productivity (pg 53).			
	The North-South Junction in Brussels constitutes the main bottleneck on the Belgian railway network. Around 1,200 trains of different types (HSL, IC, IR, L) use this section every working day. This situation leads the North-South Junction close to saturation. It has a negative EU cross-border impact on many high speed train services operated by railway undertakings from several member states (eg. UK, DE,FR, NL) (pg. 55)			

	The Belgian railway network currently encompasses 1,857 level crossings, 670 of which cross lines that are included within the TEN-T network. These level crossings generate problems linked to safety, capacity and punctuality (pg 55).
	The Brussels canal between Charleroi and Vilvoorde has to be improved in several sections, as the height of the bridges in Brussels are too low (below 5.25m) and the section between Lembeek and Halle needs to be modernised (pg. 64)
Port specific (corridor study Rhine-Alps)	Further physical bottlenecks are identified between Brussels - Denderleeuw, as one of the most utilised lines in Belgium, and at the Brussels North-South junction (used by multiple countries' trains, such as ICE for Germany and TGV for France).

	The Belgian Walloon motorway needs rehabilitation in order to avoid reduction of speed, accidents and a local decrease of capacity due to renovation of infrastructure. The ring roads of Antwerpen as well as Ghent (west R4) and Brussels have capacity bottlenecks. At the moment the hinterland road connections to the port of Zeebrugge proves as a bottleneck.
	The waterway network around Brussels is also restricted by bridge height constraints; currently five bridges in the Brussels regions do not provide 5.25m clearance.

Goteborg Pilot:

Intro question	Have there been any project to improve barriers or bottlenecks in the past, or are there any projects planned in the future?			
	Infrastructure	**Technical**	**Operational & administrative**	**Other**

Definition	The port infrastructure is the base for port operations to serve the vessel, cargo and passengers which pass through ports. The development of port infrastructures requires capital-intensive investments, a long lead-time and therefore long-term planning. This means that the design of port infrastructures should anticipate the needs of the Waterborne, logistics and transport sector (Source: https://www.waterborne.eu/vision/port-infrastructure)	Technical parameters of infrastructure (Number of lanes, train lenght, accessible load, secure parking areas, rail connection, ...) (Source: Ten-T european corridor studies)	e.g. unloading/loading = het echte uitvoeren van acties in je haven. "Administrative: Financial concerns (fee structures, investments, port charges, personnel costs), Paper work concerns (some electronic, other with paper), Lack of qualified personnel, lack of working hours, Lack of national/EU guidance "	Not related to infrastructure/technical/operational/administrative
Possible questions transnational barriers and bottlenecks & TEN-T core/comprehensive network	In your opinion, do you encounter **transnational** barriers in effective and efficient connectivity between the various modes (water, air, road and rail)?	In your opinion, are there technical parameters that cause transantional barriers? (modernisation of railways, train	In your opinion, do you encounter transnational barriers in digital innovation? (Under digital innovation we understand combinations of informations, computing, communication and connectivity technologies)	Do you encounter any other barriers?

		lenghts, loading gauge, speed limits,)		
			In your opinion, do you encounter transnational adminstrative/legaslative barriers? (country specific regulatory and operational requirements for international trade and transport)	
			In your opinion, do you encounter transnational financial concerns? (fee structures, investments, port charges, personnel costs,),	
Nationale statements (uit literatuur/corridor study scandinavian-mediterranean)	Issue 1: Road congestion			Do you encounter barriers due to limited volumes handled?

Port specific	Do you encounter barriers due to limited volumes handled?
	"8 million city" Norwegian, Swedish and Danisch regions => high speed treians and new tracks (pg275) Does this has an impact on your connections?
	Provide additional capacity or reduce travel time for passengers and freight: Goteborg: city tunnel pg275)
	Fullfillement of he required freight train lenght of 740m? Already ok now? Does this affect you if not? (275)
	"Is road safety an issue around the goteborg area? (pg 288)"
	How is the connection to rail and road for gotheburg port? See pg308 ScanMed: works multimodal platforms and port hinterland connections. Has this been done? And what are their implications?
	Pg309: Rail and port: Goteborg port line (upgrade to double track) and new Marieholm bridge project => which impact does this have, is this better than before?

Vordingborg pilot:

Intro question: Have there been any project to improve barriers or bottlenecks in the past, or are there any projects planned in the future?

	Infrastructure	Technical	Operational & administrative	Other
Definition	The port infrastructure is the base for port operations to serve the vessel, cargo and passengers which pass through ports. The development of port infrastructures requires capital-intensive investments, a long lead-time and therefore long-term planning. This means that the design of port infrastructures should anticipate the needs of the Waterborne, logistics and transport sector (Source: https://www.waterborne.eu/vision/port-infrastructure)	Technical parameters of infrastructure (Number of lanes, train lenght, accessible load, secure parking areas, rail connection, ...) (Source: Ten-T european corridor studies)	e.g. unloading/loading = het echte uitvoeren van acties in je haven. "Administrative: Financial concerns (fee structures, investments, port charges, personnel costs), Paper work concerns (some electronic, other with paper), Lack of qualified personnel, lack of working hours, Lack of national/EU guidance "	Not related to infrastructure/technical/operational/administrative
Possible questions transnational barriers and bottlenecks & TEN-T core/comprehensive network	In your opinion, do you encounter **transnational** barriers in effective and efficient connectivity between the various modes (water, air, road and rail)?	In your opinion, are there technical parameters that cause transantional	In your opinion, do you encounter transnational barriers in digital innovation? (Under digital innovation we understand combinations of informations, computing,	Do you encounter any other barriers?

		barriers? (modernisation of railways, train lenghts, loading gauge, speed limits,)	communication and connectivity technologies)	
			In your opinion, do you encounter transnational adminstrative/legaslative barriers? (country specific regulatory and operational requirements for international trade and transport)	
			In your opinion, do you encounter transnational financial concerns? (fee structures, investments, port charges, personnel costs,),	
Nationale statements	issue 1: investment in transport infrastructure			

Port specific	Do you encounter barriers due to limited volumes handled?
	Bottleneck on the railway section around Vordingborg (will be removed after construction of the Storstrom Bridge latest 2021) (pg259) Subquestion: Vordingborg is not connected to the rail network, are there plans in the future or do you consider this as a barrier?
	Concern on current and even more ambitious passenger and freight volumes that shall be transporte by rail on the corridor. Do you experience this? (pg276)
	Will the Fehmarn tunnel have an impact on your port activities?
	Are their issues with the lacking of alternative fuels and filling stations in your area?

Ostend pilot:

Intro question	Have there been any project to improve barriers or bottlenecks in the past, or are there any projects planned in the future?			
	Infrastructure	**Technical**	**Operational & administrative**	**Other**

Definition	The port infrastructure is the base for port operations to serve the vessel, cargo and passengers which pass through ports. The development of port infrastructures requires capital-intensive investments, a long lead-time and therefore long-term planning. This means that the design of port infrastructures should anticipate the needs of the Waterborne, logistics and transport sector (Source: https://www.waterborne.eu/vision/port-infrastructure)	Technical parameters of infrastructure (Number of lanes, train lenght, accessible load, secure parking areas, rail connection, ...) (Source: Ten-T european corridor studies)	e.g. unloading/loading = het echte uitvoeren van acties in je haven. "Administrative: Financial concerns (fee structures, investments, port charges, personnel costs), Paper work concerns (some electronic, other with paper), Lack of qualified personnel, lack of working hours, Lack of national/EU guidance "	Not related to infrastructure/technical/operational/administrative
Possible questions transnational barriers and bottlenecks & TEN-T core/comprehensive network	In your opinion, do you encounter **transnational** barriers in effective and efficient connectivity between the various modes (water, air, road and rail)?	In your opinion, are there technical parameters that cause transantional barriers? (modernisation of railways, train	In your opinion, do you encounter transnational barriers in digital innovation? (Under digital innovation we understand combinations of informations, computing, communication and connectivity technologies)	Do you encounter any other barriers?

		lenghts, loading gauge, speed limits,)		
			In your opinion, do you encounter transnational adminstrative/legaslative barriers? (country specific regulatory and operational requirements for international trade and transport)	
			In your opinion, do you encounter transnational financial concerns? (fee structures, investments, port charges, personnel costs,),	
Nationale statements (uit literatuur)	issue 1: Efficient infrastructure management to reduce congestion			
	Do you encounter barriers due to limited volumes handled?			

Port specific (corridor study)	The Ghent-Ostend Canal, downstream from Schipdonk, represents a bottleneck as it is Class IV, unlike the rest of the network which is class Va (pg. 64)