

Master's thesis

Port cooperation for improving the hinterland accessibility
to Central- and Eastern Europe
Focus on the ports of Rotterdam and Antwerp



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Abstract

The Central- and Eastern European (CEE) region is a relatively new market that is showing rapid economic developments. Because of their geographical location, ports as Hamburg or Gdansk have a better location for serving this region concerning cargo originating from Asia. This is a threat for western ports such as Rotterdam and Antwerp, because they do not have this geographical advantage. In order for the western ports to play a role in serving this emerging CEE market, improvements must be made relating to their competitive position. As geographical position is a factual matter, the western ports must focus on factors that can be influenced, such as costs, speed, frequency and reliability of the transports into the CEE region. This can be achieved by improving their hinterland accessibility. The topic of this research is how cooperation between ports could improve the hinterland accessibility to the CEE region, with the focus on the ports of Rotterdam and Antwerp. It is likely that ports in cooperation could better improve the previously mentioned factors. Previous work addressed cooperation between ports in general, but a study on the benefits of a cooperation between the ports of Rotterdam and Antwerp has not been performed yet. This research does focus on the possibilities of a cooperation between the ports of Rotterdam and Antwerp.

In order to see how such a cooperation in relation to hinterland accessibility to the CEE region could be beneficial, the characteristics, position concerning the maritime, rail and road network, and competitive advantages of ports competing for serving the CEE region were compared to get to the promising area of cooperation. For this, a literature review has been performed, just as a case study on the ports of Rotterdam and Antwerp, a quantitative data analysis, and two interviews have been conducted.

The analysis of the development of the CEE region showed that there has been a significant economic development during the last decade. When looking at individual CEE countries, Slovakia, Poland and the Baltic States are the countries that relatively seen showed the steepest economic development. However, this development was influenced by the global economic crisis, which is clear because of the small economic developments during that period. After the recovery period from the economic crisis, wherein it is likely that there will only be a moderate economic growth, it is expected that this steep development will continue.

The results of the comparison of these factors are that the port of Gdansk has a competitive position for serving Poland and the Baltic States, but for serving the other CEE countries it cannot compete with the other ports, mainly because of the poor maritime accessibility and underdeveloped road and rail transport network. The port of Hamburg is the main competitor for the ports of Rotterdam and Antwerp, especially because of its fast, frequent and cheap railway connections into the CEE region. Because of the fast and frequent connections, the port of Hamburg enjoys the benefit of economies of scale and is able to provide for a sharply priced railway product. In order to be able to compete with that, the ports of Rotterdam and Antwerp must improve their hinterland accessibility in such a way that they facilitate actors to set prices lower than the port of Hamburg does.

Improving the railway hinterland connections appeared to be the promising area of cooperation, mainly because of the great potential it has in relation to frequency and efficiency for the ports of Rotterdam and Antwerp. These improvements to the railway hinterland connections can be made by investing in the development of a hinterland terminal, by bundling of cargo, and the integration of IT systems. These initiatives can among others contribute to improving the efficiency and increase the frequencies of connections into the CEE region. Previous individual initiatives of the ports of Rotterdam and Antwerp for improving the hinterland accessibility to the CEE region in the form of a hinterland terminal were unsuccessful, as they were unable to benefit from those initiatives to the extent that they were able to facilitate a better price setting than the port of Hamburg. Therefore, the majority of transports continued to be transported through the port of Hamburg.

Previous initiatives to cooperation between the ports of Rotterdam and Antwerp showed that the involvement of an independent third party is very important concerning the success of a cooperation. This is because barriers relating to trust and the division of costs and revenues play a large role within a possible cooperation between the ports of Rotterdam and Antwerp. The influence of such barriers can be decreased by the involvement of an independent third party that takes care of the operational activities and contributes to avoiding conflicts of interest.

Table of contents

Abstract	2
Table of contents	4
Chapter 1: Introduction	5
1.1 Background	5
1.2 Research question	6
Chapter 2: Methodology	7
Chapter 3: The characteristics of the forms of cooperation a port can realize	10
3.1 Port cooperation in general.....	10
3.2 Forms of cooperation in the functional field of port management	13
3.3 Characteristics of possible forms of cooperation	15
3.4 Potential barriers to the possible forms of cooperation.....	18
Chapter 4: Ports that are competing for serving the Central- and Eastern European region and their competitive advantages	20
4.1 The development of the Central- and Eastern European region	20
4.2 Position of the ports of Rotterdam and Antwerp	24
4.2.1 Port of Rotterdam	24
4.2.2 Port of Antwerp	30
4.3 Position of the ports of Hamburg and Gdansk	36
4.3.1 Port of Hamburg	36
4.3.2 Port of Gdansk	41
4.4 Competitive advantage overview for all four ports	46
Chapter 5: The form of cooperation through which it is most likely that Rotterdam and Antwerp gain advantages in the hinterland accessibility.....	48
5.1 Promising cooperation area.....	48
5.1.1 Hinterland railway terminal.....	53
5.1.2 Bundling of cargo	56
5.1.3 IT system.....	61
5.1.4 Previous cooperation initiatives by the ports of Rotterdam and Antwerp.....	63
5.2 Economic model effects	64
Chapter 6: Conclusion and discussion	67
References.....	70
Appendix.....	74

Chapter 1: Introduction

1.1 Background

The twenty-first century has just arrived, but it has presented some clear developments in economic markets worldwide, especially in Europe. Here, western Europe used to be the most active economic region. Academics and economists referred to this important economic region, which roughly stretches from London in the northwest to Milan in the south, as the blue banana (Hospers, 2003; Koski et al., 2002). In the present western Europe still is the dominant market in Europe, but another region is developing quickly and is thus becoming more important. The region referred to here is the Central- and Eastern European (CEE) region, which can be seen as the European economic zone to focus on in the nearby future because of its great potential. Academics and economists are already referring to this region as the yellow banana (Hospers, 2003). With the rise of this important economic region, new challenges rise for large western European seaports. These ports have proven their strength within the area of the blue banana, but within the yellow banana region their strength seems questionable. The geographical location of the western European ports is optimal for serving the blue banana region, as they are located close to the market. Obviously, this is not the case in the CEE region. From a maritime geographical point of view ports in for example Poland, Greece, and Romania are located closer to the markets, which gives them an advantage over the western ports. For the western European ports this clearly means new competition. The western European ports have to show why container transports from Asia with as destination the CEE region should choose the route through the western European ports.

One option that is likely to strengthen the position of the western European ports and that is getting increasingly more attention in literature and from the government is cooperation between ports within the same range (McLaughlin & Fearon, 2013; Wang et al., 2012; Wortelboer & Kolkman, 2010). Cooperation between ports within the same range is already taking place, but mainly on a national scale and between a large and a small port. An example of this is the cooperation between the port of Rotterdam and the port of Dordrecht ("Annual report port of Rotterdam", 2011). An international cooperation between two large seaports has however not been established yet, except for the merger between the ports of Malmö and Copenhagen, although it is possible that the use of such a cooperation can provide a better competitive position for serving areas in the contestable hinterland.

This research will focus on that issue, by looking at ports in the Hamburg – Le Havre range. The reason for the focus on cooperation is that the ports located close to the CEE market have a clear geographical advantage, which means that the western ports should provide advantages in the areas of for example costs, speed, frequency and reliability that clearly outweigh the geographical advantages of the CEE ports.

Papers have been written on the possibility of cooperation between ports, but a concrete study on cooperation between two specific ports within the Hamburg – Le Havre range has not been performed yet. The scientific relevance of this research is thus that this study makes cooperation between two ports in the Hamburg – Le Havre range concrete. A concrete study on cooperation between two ports for improving the

accessibility to the CEE market also has social and practical relevance, as such cooperation could strengthen the position of the ports and thereby the national economy of each port.

1.2 Research question

As this research will be about the possibility of cooperation between ports, with the goal of improving the accessibility to the CEE market, the following research question has been formulated:

“How can cooperation between ports improve the accessibility to the Central- and Eastern European hinterland?”

The research will focus on ports within the Hamburg – Le Havre range, more specifically the ports of Rotterdam and Antwerp. There are several reasons for this. Firstly, the port of Rotterdam still is the largest container port in Europe, with Antwerp as its biggest competitor (“Ranking European cargo traffic”, 2012). This means that from the western seaports, these ports now have a strong position and thus a competitive advantage over the other ports. Secondly, the ports of Rotterdam and Antwerp are competing fiercely for the same containers, which is likely to create negative effects for both ports. Thirdly, these ports are located geographically close to each other, which means they share the same hinterland and could share the use of the infrastructure. Fourthly, they both have a good maritime accessibility and hinterland connections, albeit that the port of Rotterdam is the largest port in Europe because of among others these characteristics, whereas the maritime accessibility and hinterland connections in Antwerp are slightly less developed. Finally, when the largest port of Europe and its biggest competitor can cooperate in order to achieve this improved accessibility, the probability of succeeding could be the highest. With use of the strengths of these ports, this research will investigate whether cooperation between the ports of Rotterdam and Antwerp can be a solution for improving the accessibility to the CEE market.

In order to make the research question researchable, in addition several sub questions were formulated:

What are the characteristics of each form of cooperation a port can realize?

Which ports are competing for serving the Central- and Eastern European region and what are their competitive advantages?

Through which form of cooperation is it most likely that Rotterdam and Antwerp gain advantages in the hinterland accessibility?

Chapter 2: Methodology

In this chapter, the methodology used in the research will be explained. From the research question it is clear that the focus will lie on ports within the Hamburg – Le Havre range, more specifically the ports of Rotterdam and Antwerp, and on how cooperation can improve the hinterland accessibility and strengthen their position.

There are three conditions that make clear which research strategy is most suitable: the form of the research question, control of behavioural events and the focus on contemporary events or not (Yin, 2014). Given the fact that the research question is the “how” form, there is no control over behavioural events and the focus is on contemporary events, the case study research strategy is most suitable for this research according to Yin (2014). Therefore the main method used in this research is a case study with a single-case embedded design, as defined by Yin (2014). This means the research will focus on one case, Rotterdam and Antwerp together, and how cooperation can improve their accessibility to the CEE region. The goal of the case study is to find the most suitable form of cooperation for Rotterdam and Antwerp, based on their respective competitive advantages and capabilities.

Yin (2014) states that a case study should fulfil some criteria. There are three principles that need to be taken into account when collecting data:

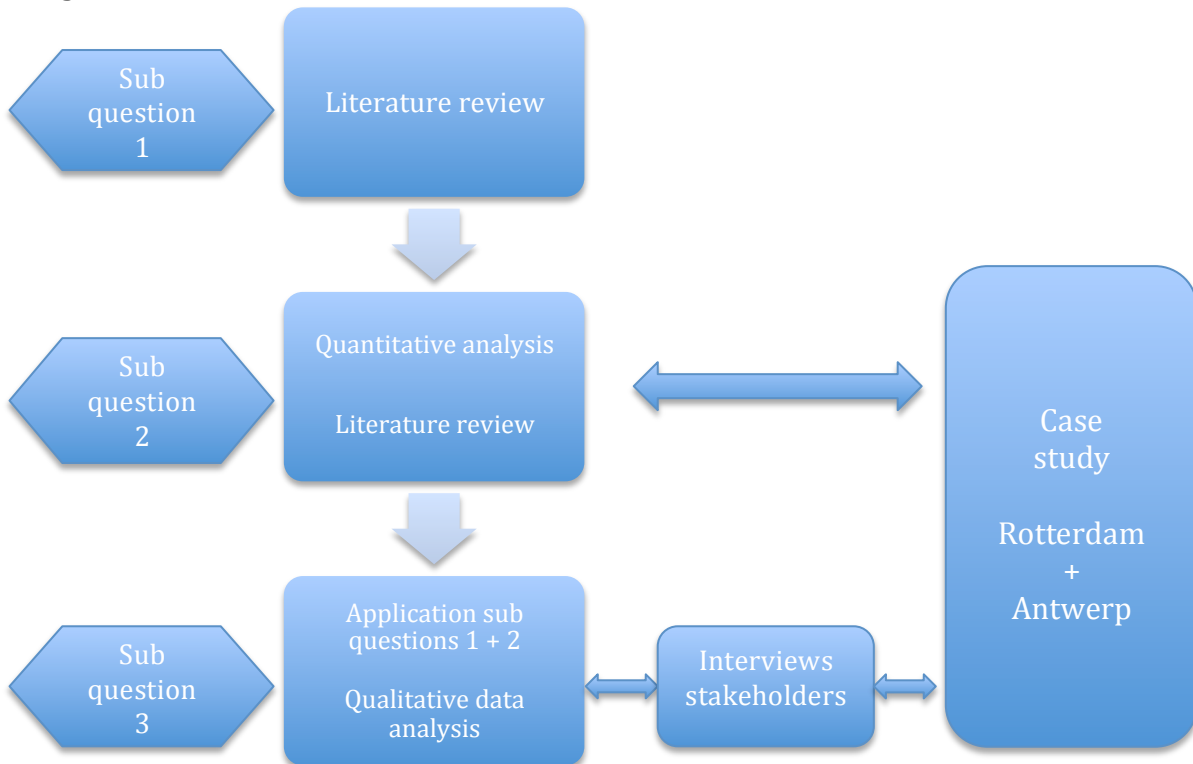
- Multiple sources of evidence should be used
- A chain of evidence should be maintained
- A case study database should be created

Concerning data, Yin (2014) does not make a separation between qualitative and quantitative case studies. It is stated that these data analysis can be in one case study together. That is also what this research will comprise: a quantitative and qualitative analysis of data. To be more precise, sub questions 1 and 3, which are about the forms of cooperation ports can realize and the form of cooperation that will gain advantages respectively will mainly be based on qualitative data. Sub question 2, which deals with the development of the region this research focuses on and the competitive advantages of the ports that are competing for serving that region, will be based on both quantitative and qualitative data.

The main sources of evidence that will be used in this research are documents and archival records, such as papers, newspaper articles and reports, interviews with stakeholders and quantitative data.

Below, in Figure 1 first an overview of the research structure will be presented in a scheme that visualizes all steps of the research. After that, the methods used for each sub question will be explained more precisely. This will provide a better insight, taking the case study database and thus the reliability of the research into account.

Figure 1: Research structure



The first sub question deals with port cooperation in general, the reasons why ports can gain from cooperating and with the forms of cooperation a port can realize. The characteristics of each of these cooperation forms will be discussed. Also, the relevant forms of cooperation will be placed in the functional field of port management. Next to that, the forms of cooperation are structured within a framework based on the degree of embeddedness and the short-term or long-term perspective. Finally, some barriers to a cooperation between ports in general is presented. For answering this sub question solely a literature review will be performed. This sub question can be seen as the theoretical background for the further analysis.

The second sub question deals with the question which ports are competing for serving the CEE region. To get an insight in the market multiple ports are competing for, an analysis of the development of this region is presented. This will be performed by collecting quantitative data, which will show the development in the region. These numbers will be derived from EUROSTAT and the OECD statistics database. In order to be able to also see the expected future development, forecasts will be performed for each category.

In the same sub question, the characteristics of the maritime and hinterland network of different ports will be discussed. The method used for this part of the second sub question is a literature review. The results need to make clear where the competitive advantages lie for the largest ports that are competing for serving the region and what their position is in the competitive field based on multiple factors.

The quantitative results and the results from the literature review are also part of the case study on the ports of Rotterdam and Antwerp, because these results will contribute to making clear what the competitive advantages and capabilities of the ports are.

The final sub question is about which area of cooperation can gain advantages for the ports of Rotterdam and Antwerp, which initiatives could contribute to that and the effects that these initiatives have on the business models of the ports. This sub question can be seen as an application of what has been found in the first two sub questions. For this application, the ports of Rotterdam and Antwerp are used as a case study. Next to the application of what has been found in the first two sub questions, qualitative data will be collected to support the research for this sub question. This data will be collected through interviews with stakeholders in the cooperation between the ports. The results of these interviews need to make clear whether the stakeholders see benefits of cooperation in general, and how they see the concrete possible initiatives for gaining advantages for both ports.

Limitations of the research set up

Clearly, every research has its own limitations. When reading this report, the following limitations of the research set up need to be taken into account:

- The only cooperation that is considered is cooperation between the ports of Rotterdam and Antwerp. No other combination of ports within the Hamburg – Le Havre range is considered. The reasons for this are explained in section 1.1, but can be seen as a limitation. Also, because of that the results cannot be generalized or applied to other ports.
- Within this research it has not been possible to collect qualitative data from a large amount of stakeholders that belong to each category (company, government, etc.). Also, the interviews have only been conducted with the focus on the ports of Rotterdam and Antwerp. An interview has been conducted at the Port of Rotterdam, just as there has been at the Port of Antwerp. For this reason, the outcomes could differ from outcomes when different stakeholders were interviewed, just as they can differ from the outcomes when different ports were focused on. Therefore, the results cannot be generalized.

Chapter 3: The characteristics of the forms of cooperation a port can realize

In this chapter, it will first of all be explained how cooperation with as goal improving the accessibility to the CEE region fits into the business model of a port. To show how the cooperation forms fit in the business model of a port, firstly the general options for an economic model will be discussed. Also, the reasons why cooperation between ports in general can be beneficial are addressed. After that, the cooperation/competitiveness framework by McLaughlin and Fearon (2013) will be used to give a clear overview of how the different forms of cooperation are related to each other and to show some primary characteristics. Fourthly, the functional field of port management wherein cooperation takes place is discussed, in order to show which forms of cooperation can possibly be used for which functional goals. After the discussion of the functional field of port management, the discussion of the characteristics of the actual forms of cooperation and concrete examples follows. Then, these forms of cooperation will be placed into a framework based on the embeddedness involved with the cooperation forms and whether they are executed on a short-term or long-term basis. Finally, some barriers to cooperating in general will be presented, to show that a cooperation cannot always be set up easily.

Every economic model starts with a value proposition. A value proposition includes the advantages a port can offer as opposed to its competitors and why the port is capable of bringing these advantages in the best way, in short their competitive advantage. There are two approaches for improving or maintaining this competitive advantage: through a revenue model or through a cost model. Obviously, these two approaches can also be combined. In this study the goal is to improve the accessibility to the CEE region in a way that the competition will be outperformed, and through which new markets could be served. The cooperation for this goal is a revenue model approach, as it is based on competition with as goal serving new markets. However, it could also be possible that the accessibility to that region will be improved by making cost improvements, so it could also be resulting in a combination of a revenue model and a cost model approach.

3.1 Port cooperation in general

Before discussing the general framework of port competition and before determining the actual forms of cooperation and some concrete examples, which addresses how port cooperation can be established, first of all the goals and directions of and motives for port cooperation are explained. This will make clear what ports can possibly gain from a cooperation.

Generally, it is assumed that port cooperation can cause cluster externalities to develop, because of which industrial economic effects or social effects can occur (Vanelslander et al., 2013). Specifically, what likely occurs because of cluster externalities is among others an increased efficiency, risk spreading, economies of scale and learning effects (Vanelslander et al., 2013). An increased efficiency can clearly positively influence the economic model of a port by using the cost model approach, just as risk spreading,

economies of scale and learning effects can have this influence. Historically, the motives for port cooperation are because of that mainly based on the cost model approach of the economic model of a port, and are more specifically focussed on an increased efficiency (Vanelslander et al., 2013). It is also likely that the effects that occur because of a cooperation between ports will also have a positive effect on their joint and separate competitiveness. An increased efficiency namely means that the ports will be able to lower their prices, which makes them more attractive for potential and current customers. Second, risk spreading is related to joint investments. When risks can be spread between two ports that are involved in the same investment, it is more likely that this investment will actually be done in comparison with the situation wherein only one port has to bear all the risks. Economies of scale is also an effect that can lower the prices within the ports. This is because economies of scale make it possible to spread the fixed costs over a larger amount of units, as the units of two ports are combined. Finally, learning effects can strengthen the position of both ports, because it among others stimulates innovation and knowledge development.

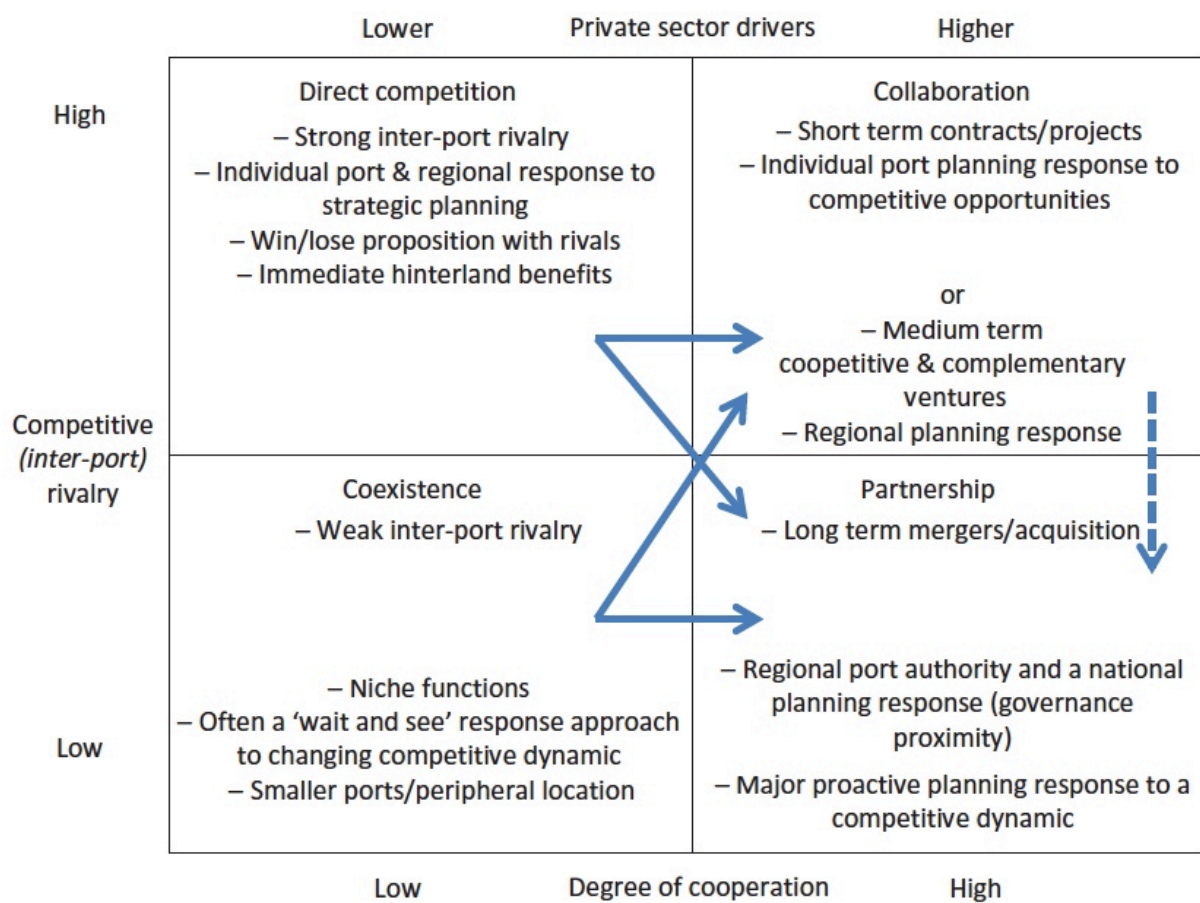
However, another goal where cooperations between ports are aiming at is improving the market position (Vanelslander et al., 2013). Improving the market position follows the revenue model approach within the economic model of a port. A cooperation aimed at improving the market position focuses more specifically among others on hinterland accessibility, information sharing, marketing and lobbying (Vanelslander et al., 2013). Thus, port cooperation can generally aim at an increased efficiency and/or improving the market position. In this research, all ports aim at serving the CEE region. Therefore, it seems obvious that the main goal of a port cooperation aimed at serving the CEE region is improving the market position. However, it could be possible that both general goals of port cooperation are aimed at. An increased efficiency can namely also contribute to an improved market position, because a port can be made cheaper for its customers. These lower costs can be established through for example a higher reliability, a higher frequency and faster services. When the costs for the customers of a port are lower, it is likely that the attractiveness of the port increases. However, also actions like improving the hinterland accessibility and information sharing can be necessary for making efficiency improvements. This is because such developments are also likely to lower the price for the customers of both ports, for example through faster services. Therefore, it is likely that both goals of port cooperation are aimed at simultaneously, especially when the goal of the ports is to improve their position for serving the CEE region, which can be achieved by improving the CEE hinterland accessibility. Improving the hinterland accessibility is part of the revenue model approach, but the cost model approach and especially efficiency improvements can also contribute.

Additionally, there are different directions in which ports can set up a cooperation. Generally, there are vertical and horizontal cooperations (Vanelslander et al., 2013). Vertical cooperations can be established by actors within the same supply chain, either forward or backward. For example, a vertical cooperation can be established between a port authority and a terminal operator or a forwarder. A horizontal cooperation on the other hand is between two actors who fulfil the same role within a supply chain. For example, this can be a cooperation between two port authorities. The direction of cooperation this research focuses on is horizontal cooperation. This is because a

cooperation between two ports is a cooperation between two actors that fulfil the same role within the supply chain.

In order to give an overview of how port cooperation in general can be established, cooperation/competitiveness framework by McLaughlin and Fearon (2013) is presented below. This framework does not evaluate the possible forms of cooperation at a detailed level. Because of that this framework is used to show the possible forms of cooperation at a somewhat abstract level, and to show how these forms of cooperation fit into the competitive or cooperation relation of ports. For example, in the right upper corner of the framework collaboration is situated, which can take place in the form of short-term contracts or projects.

Figure 2: Cooperation/competitiveness framework



Source: McLaughlin & Fearon, 2013

The framework should be read in the following way: the blue arrows moving from left to right in the framework show that according to McLaughling & Fearon (2013), it would be better for the competitive position of ports to move from direct competition or coexistence to collaboration or partnership. The blue arrow pointing down means that moving from a short- or medium-term perspective collaboration to a long-term perspective partnership requires some special actions from the ports involved. This is because a partnership with a long-term perspective is more difficult to established due to the commitment, trust and investments that are normally involved with such forms of cooperation. Next to the framework of McLaughlin and Fearon (2013), Wortelboer and Kolkman (2010) also add a form of cooperation at a somewhat abstract level. The form

of cooperation they add to the cooperation/competitiveness framework is network cooperation. These more abstract forms of cooperation all together form the basis, before evaluating cooperation forms in more detail.

3.2 Forms of cooperation in the functional field of port management

The general overview of port cooperation is presented, which provides the abstract basis. The next step is to make clear how the possible forms of cooperation fit into the functional field of port management. For the further analysis this is important, because the port management, which is executed by the port authority, should realize the actual cooperation. For that, it is necessary to determine which form of cooperation fits in each management activity and/or task. Also, by placing the possible forms of cooperation within the functional field of port management, it becomes clear which forms of cooperation could among others be used to achieve different functional goals within port management.

Table 1: Functional field of port management, specific goals and forms of cooperation

Functional field of port management	Specific goals	Institutional forms of cooperation
Port infrastructure	<ul style="list-style-type: none"> - Realizing additional infrastructure - Improve nautical access 	<ul style="list-style-type: none"> - Agreement/exchange of service on a non-commercial basis - Joint lobby - Strategic alliance - Joint venture/joint investment
Real estate	<ul style="list-style-type: none"> - Building warehouses - Building offices 	<ul style="list-style-type: none"> - Joint venture/joint investment - Cross participation
Waterfront development	<ul style="list-style-type: none"> - Exploit abandoned land areas - Sell/lease abandoned land areas 	<ul style="list-style-type: none"> - Joint venture/joint investment - Agreement/exchange of service on a commercial basis
Information services	<ul style="list-style-type: none"> - Develop/improve port community systems 	<ul style="list-style-type: none"> - Agreement/exchange of service on a non-commercial basis - Exchange of knowledge
Operational activities	<ul style="list-style-type: none"> - Vertical integration of transshipment - Vertical integration of inland shipping activities 	<ul style="list-style-type: none"> - Agreement/exchange of service on a commercial basis - Strategic alliance - Cross participation
Supporting services	<ul style="list-style-type: none"> - Marketing - Education - Innovation 	<ul style="list-style-type: none"> - Exchange of knowledge - Joint lobby - Joint venture/joint investment
Sustainability	<ul style="list-style-type: none"> - Improving environmental situation 	<ul style="list-style-type: none"> - Exchange of knowledge - Agreement/exchange of service on a non-commercial basis - Joint lobby

Source: De Langen et al., 2012

Table 1 shows which institutional forms of cooperation could be suitable for accomplishing the specific goals within different categories of the functional field of port management. It shows that each institutional form of cooperation can be used for multiple purposes within the functional field of port management. Next to that, it shows that not each institutional form of cooperation can be used within every area or for every specific goal within the functional field of port management. However, it should be clear that Table 1 aims at providing a list of forms of cooperation that are suitable for the achievement of the different functional goals within port management, but this list is not exhaustive. Within the functional field of port management, it is possible to distinguish between areas that can be seen as the basis of a port environment, the

benefits of which ports usually do not want to share with another port, and areas that are not the basis of a port environment, which likely makes it easier to set up a cooperation between ports within those areas. However, there is a thin line between these two categories. For example, port infrastructure that is realized within the boundaries of the port area is usually more or less for exclusive use of that port. However, port infrastructure that is being developed within the hinterland of a port is usually not for the exclusive use of one port. Therefore, a cooperation between ports could likely more easily be established in the latter situation, because it is more likely that there are joint interests in the development of such infrastructure. However, in general areas that can be seen as the basis of a port environment are waterfront development, operational activities, and real estate, for the reason that those normally concern activities exclusive to one port, executed within its own port area. The areas that in general cannot be seen as the basis of a port area are port infrastructure, information services, supporting services and sustainability, as these areas are related to activities that are normally not for the exclusive use of one port.

3.3 Characteristics of possible forms of cooperation

The characteristics of detailed institutional forms of cooperation are the relevant forms of cooperation in this analysis. This is because these forms of cooperation give an overview of the concrete possibilities ports have for cooperating. These detailed forms of cooperation in turn can all be placed in the abstract basis, which covers the whole range of general cooperation possibilities.

Van der Lugt and De Jong (2013) present an overview of these detailed institutional and thus relevant forms of cooperation in their report. The possible cooperation forms are the following: cross participation, strategic alliance, joint venture/joint investment, agreement/exchange of service, joint lobby and exchange of knowledge (Van der Lugt & De Jong, 2013). In the following sections the characteristics of each institutional form of cooperation are presented.

Cross participation

A cross participation is that one port takes a share in the second port, and vice versa. The main consequence of this is that the performance and results of the port in which a cross participation is held, becomes the interest of the first port as well. In other words, both ports will partly become dependent of the results of the other port. The bigger the participation is, the bigger the dependence on the result of that port is as well. Because of that, this form of cooperation can be effective when there is a desired cooperation between two competitors. This is because there will be no intention to compete when the result of the other port is important for the result of the first port.

Strategic alliance

In a strategic alliance, two ports agree upon a cooperation in which they share resources. An important characteristic of a strategic alliance is that both ports remain individual entities. Ports can agree upon sharing resources in order to achieve a common goal, making the strategic alliance finite. However, it is also possible that a strategic alliance is set up to create synergies for an infinite period of time.

Joint venture/joint investment

A joint venture is a form of cooperation that is a partnership, but mainly not with a long-term perspective. This is because in a joint venture a separate entity is set up because of a common project that needs to be finished within a limited period of time. Both ports that are involved in the joint venture will finance and invest in this separate entity. With this set up, the ports can be involved in a project together, without risking big losses within the ports itself.

With a joint investment both ports do not set up a separate entity to achieve a common goal, but they only combine resources or finances to jointly invest. This means that the risks will remain at the level of the individual ports.

Agreement/exchange of service

- On a commercial basis

An agreement or exchange of service on a commercial basis is set up to directly improve the efficiency of both ports involved. Such an agreement or exchange of service can take place within a wide range of activities a port is involved in.

- On a non-commercial basis

That it is on a non-commercial basis means that the agreement or exchange of service does not have the goal to create direct improvements of efficiency or a rise of profit for both ports. It could be that ports agree upon creating an IT system or improving the infrastructure.

Joint lobby

A joint lobby is a form of cooperation that can be used when two ports need an approval or permission from politicians, or when they want to bring a subject under the attention of politicians. A joint lobby for the same goal is most likely to be more powerful than two separate lobbies. When two ports share the same hinterland and they for example want to improve the infrastructure running through or connected to this hinterland, a joint lobby can be useful.

Exchange of knowledge

The exchange of knowledge is a form of cooperation that stimulates innovation and efficiency of both ports. Ports can for example decide to share a research & development centre or share the knowledge that results from their individual research & development centres. Because the exchange of knowledge stimulates innovation and efficiency, this form of cooperation will mainly be used between ports that are no direct competitors. This is because innovation and an improved efficiency will most likely improve the competitive position of a port.

This section showed the characteristics of all relevant forms of cooperation a port can realise and some concrete examples. The goal of Figure 3 below is to structure these forms of cooperation in a framework. The forms of cooperation are placed within this framework based on the short-term versus long-term perspective and on the embeddedness that is involved with each form of cooperation.

Figure 3: Institutional forms of cooperation within a structured framework

		Short-term	PERSPECTIVE	Long-term
E M B E D D E N E S S	Low	1: Collaboration Agreement/exchange of service - commercial Joint lobby		2: Ventures Cross participation Joint ventures/joint investments
	High	3: Network Exchange of knowledge Agreement/exchange of service – non-commercial		4: Partnership Strategic alliance

In Figure 3, a classification of the detailed institutional forms of cooperation within a structured framework is presented. This framework is based on the four categories that are used in section 3.1 on the general overview of port cooperation, within the McLaughlin and Fearon (2013) framework and the addition of Wortelboer and Kolkman (2010). These four categories are collaboration, ventures, network and partnership, which make it possible to place the institutional forms of cooperation in the framework within each of these categories, based on a division between short-term and long-term perspective and the degree of embeddedness.

The cross participation is placed in the lower part of the ventures block because when ports have shares in each other there will be a relatively high degree of embeddedness, and a mid-term perspective. This is because ports become dependent of their respective results, although they can decide to quit the participation.

Strategic alliances are placed in the right and lower corner of the partnership block, as such a cooperation will be realized with a long-term perspective and there will also be a high degree of embeddedness.

Joint ventures/joint investments are placed in the lower part of the ventures block, as they are normally realized for the mid-term to long-term perspective, and for the period of the joint venture there will be a high degree of embeddedness between the ports that are involved.

The agreement/exchange of service on a commercial basis is placed in the middle of the collaboration block. This is because such agreements normally are realized with a short-term perspective, and repeatedly executed within multiple different forms. Because of the temporary nature of such agreements, the degree of embeddedness is relatively low. Concerning the agreements/exchange of service on a non-commercial basis, this is different. This type of collaboration is placed in the network block. The reason for this is that such agreements mainly take place in the areas of communication, IT and infrastructure. These areas require a mid-term perspective, and a higher degree of embeddedness. The reason for the higher degree of embeddedness is the size of the projects that are normal for these areas, where trust and resources also become more important.

Joint lobby is placed in the mid right side of the collaboration block. This is because that form of cooperation does not require a high degree of embeddedness and is realized with a mid-term perspective. The low degree of embeddedness results from the fact that lobby agreements are normally not fixed projects dependent of contracts, but result from consensus in a deliberation.

Finally, the exchange of knowledge is placed in the mid right side of the network block. This is because the exchange of knowledge normally is realized with a mid-term perspective and a relatively low degree of embeddedness. The reason for this is that information is shared with another port, but such a collaboration can be stopped without problems and it does not make ports dependent of each other.

3.4 Potential barriers to the possible forms of cooperation

The previous sections showed that cooperations can take place in many different forms, and are realized with use of many different projects and initiatives within multiple ports. However, in order for almost every form of cooperation to be established, some barriers to that cooperation need to be overcome. Below some barriers to cooperation between ports are listed, which are presented by Vanelslander et al. (2013) and Stough (2005) in their work:

- Barrier of legislation and regulation. It could be that economically a cooperation between two ports in different countries is most likely to be beneficial for both ports. However, when the legislation and regulations differ too much between both countries, it could be that the cooperation will not be set up.
- Barrier of vision on the port. A cooperation might face difficulties when the ports that are aimed to be involved in the cooperation both have different opinions about the future development of the port. This could make an agreement about cooperation more difficult.
- Barrier of the need for funding. When a cooperation between two ports needs funding in order for it to be established and these funds are not present, then it could be that the cooperation will not be established because of that.
- Barrier of cultural differences. Cultural differences can make the negotiations about the cooperation impossible or very difficult.
- Barrier of trust. For a cooperation to be successful, ports need to have some level of trust in each other. When the level of trust is low, or there even exists mistrust between both ports, a cooperation is likely to be more difficult to establish.
- Barrier of customer and society interests. Especially when ports that are located in different countries are involved, this is an important barrier. The reason for that is that society sees the port as a driver of the national economy. It can be

very hard to explain that a cooperation with a port across the border will still benefit the national economy.

- Barrier of political conflict. In most countries worldwide, ports contribute significantly to the economic performance. Therefore, politics tend to influence the activities taking place at ports. When a cooperation between two international ports is suggested, national politicians in each country can be a barrier because they are afraid that the revenues of their respective ports will partly flow to other countries, and therefore they could try to block the establishment of a cooperation.
- Barrier of the division of costs and revenues within a cooperation. Ports that will be involved in the cooperation are not willing to run the risk of one of them making the cost, while the other port gets the revenues from the cooperation.

From this it is clear that different barriers to cooperate exist, but in practice there are concrete examples that show that almost each relevant form of cooperation for ports is already executed, and that these barriers thus do not always block the establishment of a cooperation between ports. However, under certain circumstances these barriers can block the establishment of a cooperation.

In conclusion, this chapter firstly presented the general overview of port cooperation and addressed the reasons why ports can gain from cooperating. This provided the basis for a further analysis of the institutional forms of cooperation. These institutional forms of cooperation were placed within the functional field of port management. After that, the characteristics of these institutional forms of cooperation were discussed. Then, these forms of cooperation were placed within a structured framework based on the general overview of port management, the short-term versus long-term perspective and the degree of embeddedness involved with the forms of cooperation. Finally, some general barriers to cooperation were presented.

Chapter 4: Ports that are competing for serving the Central- and Eastern European region and their competitive advantages

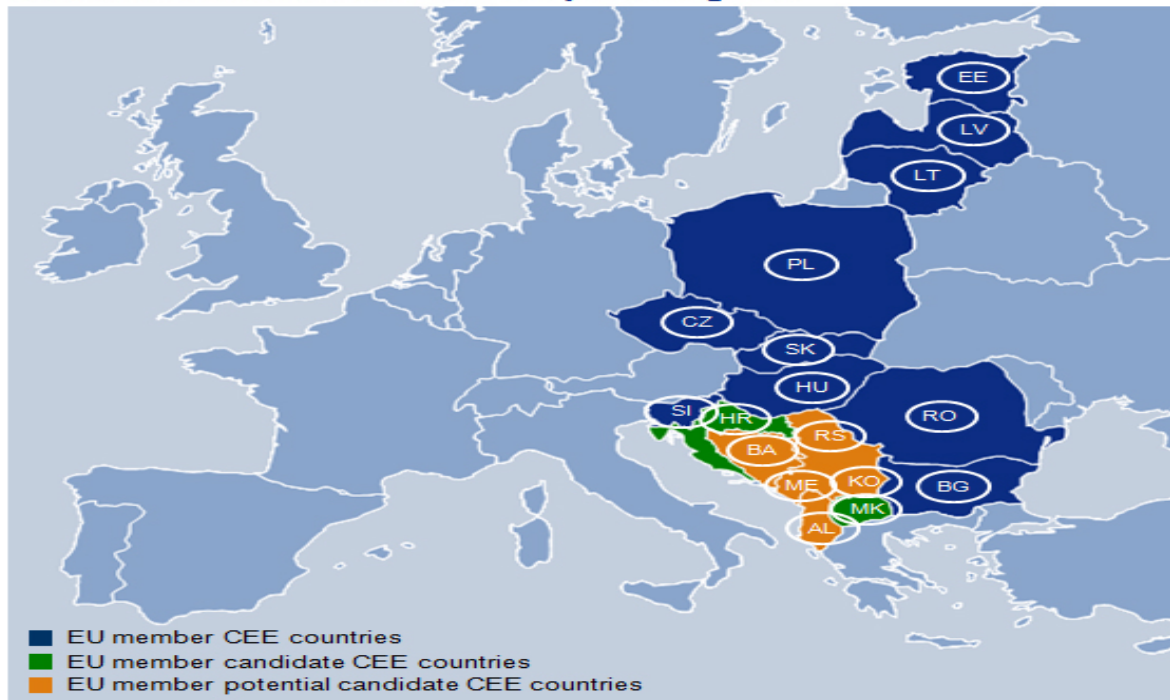
The possible forms of cooperation are discussed, but in order to come to the forms of cooperation that can gain advantages in the hinterland accessibility for the ports of Rotterdam and Antwerp together, it is required to review the development of the region where the cooperation should gain advantages. Also, it is important to get a view of the competitive positions of the ports that are competing for serving the CEE region. Therefore this chapter is divided into four sections, which discuss these topics.

4.1 The development of the Central- and Eastern European region

Before it is possible to review the development of the CEE region, first the countries that are included in this region needs to be determined. The countries that are included in the CEE region are: Albania, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovak Republic, Slovenia, and the Baltic states Estonia, Latvia and Lithuania (OECD). Figure 4 below shows the geographical position of each of the countries that belong to the CEE region. The ten blue countries in Figure 4 are CEE countries that are also EU member states. Albania and Croatia also are CEE countries according to the OECD, whose list of CEE countries will be followed in this research, but these countries are only potential EU member candidate state and EU member candidate state respectively.

Figure 4: CEE countries

The Central and Eastern European region



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There are multiple factors that have contributed and still contribute to the potential of the CEE region. Firstly, the fall of the Berlin wall in 1989, which opened up Europe, contributed to the potential of the CEE region because from then on the countries were free to develop themselves in the desired economic direction. Also, the process of globalisation contributes to the potential of the CEE region. Because of globalisation, it becomes easier for companies to produce where it is cheapest on a worldwide scale. As the economic development of the CEE region is relatively recent and therefore welfare is not at a high standard, wages are low and producing in this region is thus very attractive. This can also be seen when looking at the latest development that is influencing the potential of the CEE region, which is near shoring by western Europe. Because of among others the low wages, western Europe sees the potential of the CEE region and moves the production back from Asia to this region. However, the near shoring effect is not visible in every sector and it is not yet clear if this development is definite. In this research, the focus will lay on container transports from and to the CEE region, with as destination or origin Asia. This namely is the sector where the competition is highest and where the ports of Rotterdam and Antwerp can possibly gain from a cooperation. When looking at Figure 4, it becomes clear that the ports of Rotterdam and Antwerp are considering the geographical position and size of the ports the western European ports that could compete for serving the CEE region. In the north side of the CEE region, there are also two ports that could compete for serving the CEE region, also considering geographical position and size of the ports, Hamburg and Gdansk. Finally, there is the southern region where ports could also compete for serving the CEE region. However, it is clear that in this area no large seaports are located. Also, it

is well known that the road and rail infrastructure is in a bad condition or is not present at all. Therefore, this region is not taken into consideration. The ports that compete for serving the CEE region are Rotterdam and Antwerp in western Europe, and Hamburg and Gdansk in northern Europe.

In order to give a clear overview of the potential and development of the CEE region, some key economic indicators for economic development are used. The key economic indicators that will be used are: GDP, unemployment rate, price indices, interest rates, and international trade (OECD). The numbers of the recent past for each economic indicator are presented, and also forecasts of future numbers are included.

For each economic indicator, the numbers for 2002, 2007, and 2012 – 2017 are presented. In this way, the development of the last decade becomes clear, just as the development in the most recent past. Additionally, forecasts for the years 2014 – 2017 are included, in order to present the most likely development in the near future. In Appendix A, all the numbers for 2002 – 2017 are included. Unfortunately, the values of each economic indicator concerning Albania are missing in the databases. Therefore, the average numbers for the CEE region do not include the values for Albania.

Table 2: GDP of production of goods and services

Year	Actual numbers				Forecast			
	2002	2007	2012	2013	2014	2015	2016	2017
Average growth GDP (% volume growth)	4,69	6,84	0,95	1,21	-0,79	-1,39	-2,00	-2,60

Source: Eurostat

Table 3: Unemployment rate

Year	Actual numbers				Forecast			
	2002	2007	2012	2013	2014	2015	2016	2017
Average unemployment rate (% of labour force)	11,39	7,13	10,16	10,07	9,20	9,10	9,00	8,91

Source: Eurostat

Table 4: Price indices (HICP)

Year	Actual numbers				Forecast			
	2002	2007	2012	2013	2014	2015	2016	2017
Average HICP index (2005=100)	88,60	109,6	133,5	135,7	142,5	147,1	151,6	156,2

Source: Eurostat

Table 5: Interest rates

Year	Actual numbers				Forecast			
	2002	2007	2012	2013	2014	2015	2016	2017
Average interest rate (%)	8,00	5,29	2,13	1,31	1,34	0,86	0,38	-0,10

Source: Eurostat/OECD statistics

Table 6: International trade: import

Year	Actual numbers				Forecast			
	2002	2007	2012	2013	2014	2015	2016	2017
Average import growth volume (%)	9,1*	19,3	4,4	0,7	2,6	1,3	0,1	-1,2

* Number from 2003: 2002 not available

Source: Eurostat

Table 7: International trade: export

Year	Actual numbers				Forecast			
	2002	2007	2012	2013	2014	2015	2016	2017
Average export growth volume (%)	8,9*	15,8	5,3	2,3	4,2	3,1	1,9	0,8

* Number from 2003: 2002 not available

Source: Eurostat

From the Tables 2 – 7 two developments in the CEE region stand out. Firstly, the differences between the years 2002 and 2007 confirm the fast economic development of the region. The higher percentage of growth of GDP, a lower percentage of unemployment, a higher price index, lower interest rate, higher import volume growth and higher export volume growth, point at economic prosperity. The other development that is clear from the economic indicators is the economic crisis. The differences between 2007 and 2012 namely show a great downfall in the economic performance within the CEE region. Today, the world economy is still recovering from this economic crisis. This is also visible in the forecasts for the CEE region, which show lower growth percentages for each following year or even a decline. However, the consequences of the economic crisis are present in almost every national economy worldwide. Given the steep economic development between the years 2002 and 2007, it seems likely that this positive development will continue when the CEE region and the rest of the world have recovered from the economic crisis. Therefore, the expectation is that the CEE region will still need some period of time to recover from the economic crisis, but after that is likely to be able to exploit their great potential.

Also, when looking at the key economic indicators for individual countries within the CEE region, it becomes clear that some countries are performing better and developing faster relative to others. This can be seen in the Appendices A – F. In order to see which countries are developing faster and performing better relative to other countries in the CEE region, the focus is on the year 2007, which is the most recent year before the beginning of the worldwide economic crisis, and on the developments of the key economic indicators from 2002 to 2007. From this focus, it shows that Slovakia, Poland and all the Baltic States are performing relatively better on most in the key economic indicators compared to other countries in the CEE region. An exception is the unemployment rate in Slovakia, which was one of the highest in 2007 within the CEE region. Although the value of the unemployment rate for 2007 is not one of the best compared to other countries in the CEE region, it is one of the fastest relative declines in the unemployment rate from 2002 to 2007, namely 40 percent. Therefore, based on the development of the unemployment rate, Slovakia is relatively one of the best performing countries when compared to other countries in the CEE region. Figure 4 shows that Slovakia and Poland are centrally located within the CEE region, whereas the Baltic

States are located in the far north-eastern part of the region. The geographic locations of these countries might influence the relative competitiveness of the ports that want to serve the CEE region.

The evaluation of the key economic indicators for the CEE region showed that overall the countries located in this region experienced a steep development from 2002 to 2007, after which the economic crisis caused a downfall in the economic performance. Also, it showed that Slovakia, Poland and the Baltic States had a large contribution to this steep development.

4.2 Position of the ports of Rotterdam and Antwerp

Now that the development of the CEE region and its potential for further economic development is clear, it is important to see how the ports of Rotterdam and Antwerp in western Europe are positioned relative to this region. This positioning is related to among others the competitive position, geographical position and maritime position of both ports. In a division between the main characteristics related to serving the CEE region, the place in the road, rail and maritime network and the competitive advantages of each port, the overall position is explained.

4.2.1 Port of Rotterdam

The port of Rotterdam is the largest port in Europe (Port of Rotterdam Authority, 2014). In the past, it has even been the largest port in the world. The port is seen as the main European gateway port, because of its size and accessibility and because it offers good connections to the European hinterland. From that it is clear that the port of Rotterdam is very experienced in handling cargo, since it has been successful at it for a long period of time and still is. The experience of the port of Rotterdam seems to be an advantage, but other factors play an important role in the competition for serving the CEE region as well. Therefore, the main characteristics, competitive advantages and position of the port of Rotterdam in relation to serving the CEE region will be discussed in the following sections.

Main characteristics

The main characteristics of the port of Rotterdam will be shown by presenting the port area infrastructure, which will make clear what the possibilities of the port area are concerning size. Also, the characteristics and valuation of the port system will be presented, in order to among others show the efficiency of the port.

Table 8: Rotterdam port area infrastructure

Annual cargo throughput	450 million tons
Direct employment (2012)	92,108 jobs
Draft	20 m
Container terminals	26
-Deepsea	5
-Shortsea	3
-Empty depots	18

Source: Port of Rotterdam Authority (2014)

From Table 8 the size and scale of the port of Rotterdam is clear. One characteristic of the port area infrastructure stands out. This characteristic is the water depth. With a water depth of 20 meters, it is possible for the largest ships worldwide to moor in the port of Rotterdam 24 hours a day. Clearly, this enlarges the mooring options and with that the shipment possibilities when comparing it with the possibilities other ports in Europe have. In fact, this is an important reason why the port of Rotterdam often is the first port of call for transports from Asia to Europe (K. Cuypers, personal communication, January 13, 2015). Next to that, the focus on container transport becomes clear from Table 8. The total number of 26 container terminals clearly shows the capacity the port of Rotterdam has in this sector.

Table 9: Rotterdam container modal split

	2009	2010	2011	2012
Road	55.4%	56.6%	55.2%	54.0%
Barge	33.4%	32.8%	33.4%	35.3%
Rail	11.2%	10.5%	11.4%	10.7%

Source: Modal split containers (2013)

Table 9 shows that the largest part of the containers that depart from the port of Rotterdam are transported by road. Besides the road transport, barge transport is a modality that is used relatively much. It is likely that this is caused by the geographical location of the port of Rotterdam, which makes it possible to transport by barge through using the rivers Meuse and Rhine that run through the hinterland. Additionally, the focus of the port of Rotterdam on the Ruhr area in Germany can explain why barge transportation is used relatively often, as this area is located close to the Rhine River. The least used transportation mode is rail transport, which is only used to transport around 10% of the containers.

The valuation of the services of a port is very important, because it shows the satisfaction of the customers of the port. When a port has a high valuation of port services, it is likely that it will build a strong reputation that will contribute to its competitiveness. Table 10 will show the valuation of the port system by shippers and forwarders, which results from a survey that is conducted in the year 2004 (De Langen, 2007). De Langen (2007) researched the valuation of shippers and forwarders for ports that are competing for cargo in the contestable hinterland, in this particular case Austrian cargo. As the CEE region is also in the contestable hinterland as well as in the same region, this valuation is assumed to be comparable.

Table 10: Valuation of the port system

Valuation criterion	Score*
Location of the port	3.6
Efficiency of cargo handling	3.9
Quality terminal operating companies	3.7
Quality of equipment	3.9
Quality of shipping services (frequency, first port of call)	3.9
Information services in port	3.2
Good reputation related to damage and delays	3.6
Customer focus	3.3
Connection to hinterland modes	3.8
Personal contacts in port	3.3

* A higher score means a higher valuation. Scale: 0 – 5.

Note. From “Port competition and selection in contestable hinterlands” by De Langen, P., 2007, *European Journal of Transport and Infrastructure Research*, No. 1, p. 10

Table 10 shows that the efficiency of cargo handling, quality of equipment and quality of shipping services receive the highest valuation from shippers and forwarders. Also the connection to the hinterland modes receives a high valuation. That means that from the point of view of the potential users of the port of Rotterdam, these are the areas in which the port excels. Overall, the port of Rotterdam receives high valuations, but Table 10 also indicates that apart from the three or four areas that received the highest valuations, there is room for improvements in the other areas. The survey on which these outcomes are based is conducted in 2007, which means that in the meantime things could have changed. However, from the Key Performance Indicators (KPIs) for the year 2012 concerning the port of Rotterdam it appears that the factors that received the highest valuations in 2007 still are of such high quality. The numbers relating to transport efficiency, especially the Nautical Efficiency Index (NEI), show that the port of Rotterdam is performing better than the norm set for 2012 and relating to costs efficiency that the performance is on average according to the norm set for that year (“Key Performance Indicators”, 2012). Also, these numbers show that relating to customer focus clear improvements have been made, which was a weak characteristic in 2007 (“Key Performance Indicators”, 2012). Another criterion, which already scored high in 2007, is the quality of shipping services. It appeared that also in the present time the port of Rotterdam is often used as first port of call, especially relating to transports originating from Asia, which is the focus of this research (K. Cuyppers, personal communication, January 13, 2015). Therefore, even though such a port valuation survey has not been conducted recently, that it is likely that the criterions that received the highest valuations in 2007 remain to be important in the present time. Additionally, the port of Rotterdam is continuously improving itself, which can be seen from the improvements made in relation to customer focus.

Position: maritime, rail, and road network

In order to determine the position of the port of Rotterdam relative to the CEE region, first of all the distances from Rotterdam to the capital cities of each CEE country is presented, as well as the time it takes to reach these cities. The distance and required time will be presented for transportation by truck and by train. In this way, the geographical position relative to the CEE region can be put into perspective.

The distances will be calculated from city centre to city centre. Also, the transport is calculated when making use of a 40-ton container. The time it takes to transport will be calculated by using the average train and truck speed in Europe, which is based on a door-to-door delivery, so among others taking into account transit times and border crossing times. This results in an average speed of 15 km/h for international freight trains, and 26 km/h for trucks (Nelldal and Troche, 2000; Grue & Ludvigsen, 2005). Clearly, this is a large difference with the actual average running speeds of 60 km/h and 75 km/h respectively (Nelldal and Troche, 2000; routenet.nl).

Table 11: Distances Rotterdam – CEE region

Transportation mode	Truck		Train	
	Kilometres	Time*	Kilometres	Time*
Albania: Tirana	2176	3:11:41	2311	6:10:04
Bulgaria: Sofia	2119	3:09:30	2162	6:00:08
Croatia: Zagreb	1336	2:03:23	1407	3:21:48
Czech republic: Prague	915	1:11:11	970	2:16:40
Estonia: Tallinn	2030	3:06:05	2166	6:00:24
Hungary: Budapest	1405	2:06:02	1425	3:23:00
Latvia: Riga	1718	2:18:05	1816	5:01:04
Lithuania: Vilnius	1665	2:16:02	1663	4:14:52
Poland: Warsaw	1224	1:23:05	1242	3:10:48
Romania: Bucharest	2222	3:13:28	2250	6:06:00
Slovak republic: Bratislava	1242	1:23:46	1262	3:12:08
Slovenia: Ljubljana	1230	1:23:19	1263	3:12:12

* Time is in days : hours : minutes.

Source: Routenet.nl/ecotransit.org

Table 11 shows the differences between transporting by truck and train. It is clear that for each destination, transportation by truck is faster. This obviously has to do with the higher average speed. Also, these times are based on a direct connection. With transportation by truck it is more common to have a direct connection, because a truck transports two containers at most. With transportation by train it is more common that there is an indirect connection with the destination in the CEE region, because a train transports multiple containers. An indirect connection means that the train stops one or more times on the route to the destination in the CEE region, where some of the containers have their destination. Obviously, this would increase the time involved with a transport by rail even more. However, transportation by truck has downsides as well. First of all, it has been determined that for distances up to 200 kilometres, transportation by truck is the superior way (Den Boer et al., 2011). However, above this distance, rail transportation can certainly compete with road transport. Next to that, a truck is only able to transport one 40 ft container to the destination, which is about 2 TEU, whereas a train can transport between 50 and 100 TEU, which is 25 to 50 containers (“Intermodal Freight Systems”, 2014). Also, there is the well-known problem of congestion on major highways in Europe, which is slowing down the transport by truck. Finally, transportation by truck is the most polluting way of transporting cargo, making it an increasingly more expensive modality. Therefore, although the train needs more time for the transportation to the CEE region, the potential of this mode of

transportation is clear. Especially when the average speed of trains can be increased by improving among others the terminal handling and border crossing problems, the advantages of transporting by train will be higher.

In Appendix B the railway terminal network for the port of Rotterdam is shown. This map makes clear that the port of Rotterdam has a strong railway connection with its direct hinterland, Germany. This is shown by the large connection from Rotterdam directly eastwards, which leads towards Poland in CEE. There are also multiple terminals located on that railway connection. This means that the port of Rotterdam may exploit its strong connection directly eastwards into Germany to expand its operations further eastwards, among others to Poland. Next to this connection, the port of Rotterdam has a connection that runs through Germany in a southeast direction. This connection may be used to connect to the CEE countries that are located there, such as the Czech Republic, Slovakia, Croatia, Hungary and Romania. This possible railway connection south-eastwards where also multiple terminals are located becomes clearer when looking at Appendix F, which shows the railway terminal network for the total region.

Also, when looking at the frequency of the transports from Rotterdam into the CEE region, it becomes clear what the quality of these connections is. In Table 12 a selection of CEE destinations is made, and the frequency of transports by rail with as origin the port of Rotterdam is listed. More specifically, the terminals in the port of Rotterdam are mentioned, just as the frequency of the transports in numbers weekly (P/W).

Table 12: Train frequencies of transports with as origin the port of Rotterdam

From - To Rotterdam	Czech Republic	Poland	Romania	Slovak Republic	Slovenia
ECT Delta/APM	- 3 trains: 1x P/W	- 3 trains: 3x P/W		- 2 trains: 1x P/W	- 1 train: 5x P/W
	- 1 train: 5x P/W	- 1 train: 5x P/W			
	- 1 train: 6x P/W				
RSC Waalhaven	- 1 train: 5x P/W	- 6 trains: 3x P/W	- 1 train: 1x P/W	- 1 train: 3x P/W	- 1 train: 3x P/W
	- 2 trains: 6x P/W	- 2 trains: 5x P/W	- 1 train: 5x P/W	- 1 train: 6x P/W	- 1 train: 5x P/W
P&O Ferries		- 1 train: 6x P/W			
CTT		- 3 trains: 3x P/W			

Source: railcargo.nl

The frequencies in Table 12 give an overview of the services from Rotterdam to the CEE region. For each destination included in this table, at least one train services at a frequency of 5 weekly. Some destinations even have a service by one or multiple trains

at a frequency of 6 weekly, such as the Czech Republic, Poland and the Slovak Republic. These three countries are also the most important countries in the CEE region for the port of Rotterdam (R. Van den Berg, personal communication, November 18, 2014). However, the Slovak Republic is still a relatively small market, which makes it difficult to further increase the frequencies (R. Van den Berg, personal communication, November 18, 2014). Still, with such service frequencies, it can be said that the existing rail transport connections and services are at a high quality level. The reason for that is mainly that delays resulting from waiting times in the port for the availability of trains are minimized because of the high frequency of services and availability of trains. However, there are still possibilities to improve these connections, as the port of Rotterdam now only has a market share of approximately 20% for the CEE market, which is mainly served by rail (R. Van den Berg, personal communication, November 18, 2014).

Additionally, Appendix C shows the TEN-T corridors as planned by the European Commission for the region where the port of Rotterdam is located. These corridors are planned to be the main corridors for that region. The North Sea – Baltic corridor, which is the red line, follows the same pattern as the main connection Rotterdam has directly eastwards, into Germany. Also, the southeast connection coincides with the Rhine – Alpine corridor, which is the yellow line. Linked to this Rhine – Alpine corridor is the Rhine – Danube corridor, which directly leads into the CEE region. With the support of the European commission of strengthening these connections to CEE and the contestable hinterland of the port of Rotterdam, the potential for train transport increases even further. Appendix G presents the TEN-T corridors for the total region, and makes clear how these corridors can support the railway transport from Rotterdam to the CEE region.

Figure 5: Maritime route Rotterdam - Shanghai



Source: searates.com

The maritime route of a container transport between Shanghai and Rotterdam is presented in Figure 5. The transport over a distance of 19416 kilometres can be

completed in 31 days and 4 hours. Because the port of Rotterdam has a good geographical position in the northwest of Europe, this transit time is relatively quick. Only the transport from Shanghai to the port of Antwerp is quicker than to the port of Rotterdam, which will only save one hour (see sections 4.2.2, 4.3.1 and 4.3.2). The fact that the maritime transport from Shanghai to Rotterdam is shorter concerning distance and transport time gives the port of Rotterdam a potential maritime advantage over the ports of Hamburg and Gdansk.

Competitive advantages

The evaluation of the main characteristics of the port of Rotterdam and the position of the port in the road, rail and maritime network together makes clear what its competitive advantages are.

First of all, the maritime accessibility is a clear competitive advantage for the port of Rotterdam. The relatively short transit time that is concerned with the transport from Shanghai to Rotterdam shows this, just as the impressive draft of about 20 metres irrespective of tides. This means that the largest containerships in the world can moor at the port of Rotterdam 24 hours a day, and there are no waiting times caused by low tide. Additionally, the railway connections to the hinterland are a competitive advantage of the port of Rotterdam. There are namely two strong connections running through Germany. One runs directly eastwards to the more northern located CEE countries such as Poland, Slovakia and the Baltic states, whereas the other one connects with the more southern located CEE countries such as the Czech Republic, Croatia, Hungary and Romania.

Finally, the quality of the port system is a competitive advantage of the port of Rotterdam. Among others the cargo handling efficiency, quality of equipment, the frequency of calls and the connections to hinterland modes are valued high by multiple actors.

4.2.2 Port of Antwerp

The port of Antwerp is the second largest port in Europe, after the port of Rotterdam (Port of Rotterdam Authority, 2014). However, the relative growth numbers show that the port of Antwerp is growing relatively faster than the port of Rotterdam (Port of Rotterdam Authority, 2014). This means that the port of Antwerp is growing to the position the port of Rotterdam is in concerning the handling of cargo and containers. Although it is not clear whether or not this development will become a trend in the nearby future, it does show that the port of Antwerp is a strong player in Europe. In the following sections, the main characteristics, the competitive advantages and position of this port will be discussed, in relation to serving the CEE region.

Main characteristics

This section will hold the same structure as for the port of Rotterdam. Firstly the port area infrastructure will be discussed, which will show the size and possibilities the port has. Next to that, a valuation of the port system will be presented.

Table 13: Antwerp port area infrastructure

Annual cargo throughput	190.8 million tonnes
Direct employment	60,873 jobs
Draft	15.2 m
Container terminals	18
-Deepsea	7
-Shortsea	11

Source: Port of Antwerp port authority (2014); portofantwerp.com

Table 13 shows that Antwerp has a large annual cargo throughput of almost 200 million tonnes in 2013. However, this annual cargo throughput is significantly smaller than the throughput in the port of Rotterdam, which is 450 million tonnes. This shows that Antwerp, as the biggest competitor of the port of Rotterdam within the Hamburg – Le Havre range, still is significantly smaller concerning total cargo throughput. What also stands out from Table 13 is the number of deepsea container terminals. The port of Antwerp has seven of them, whereas the port of Rotterdam has only five. This number of deepsea container terminals can be an advantage for serving the CEE region. However, the draft in the port of Antwerp can be a disadvantage, because the largest containerships in the world are not able to moor in the port 24 hours a day, which is possible in the port of Rotterdam.

Table 14: Antwerp container modal split

	2005	2008	2009
Road	60%	55%	52%
Barge	32%	32%	34%
Rail	8%	13%	14%

Source: Waardevol transport (2013)

The percentages in Table 14 show that the port of Antwerp has a similar modal split to the port of Rotterdam. Again, the main focus lies on road transport. After that, barge transportation is used to transport around one third of the containers. It is likely that the port of Antwerp also benefits from its geographical location close to the rivers Meuse and Rhine. Finally, also in Antwerp rail transport is not used often.

The valuation of the port system will show the satisfaction of the actors that are involved with the port of Antwerp. In 2009, Meersman et al. (2012) interviewed top managers of 35 port actors, such as terminal operators, logistic groups, European Logistic Centres (ELC's), and shipping companies. Among these shipping companies, there are 11 who exploit 45.7% of all containerships worldwide (Meersman et al., 2012). The top managers of all these actors were asked to value the port system of Antwerp, based on container transports to Poland.

Table 15: Valuation of the port system

Valuation criterion	Score*
Cost	4.4
Hinterland connections	4.5
Port capacity	4.6
Reliability	4.5
Port location	4.2
Cargo base	4.4
Flexibility	4.5
Customer service	4.2
Frequency	3.4
Risk of losses and damage	4.8
Customs services	3.0

* A higher score means a higher valuation. Scale: 0 – 5.

Note. Port valuation. Adapted from *Met have, goed & schip over de Schelde: vijftien jaar evolutie inzake havengebeuren, logistiek en scheepvaart in de Scheldemonding* (p.134), by Gonsaeles, G. & Coppens, J, (Eds.) 2012, Antwerpen/Apeldoorn: Maku.

Table 15 makes clear that the low risk of losses and damages, the port capacity, hinterland connections, and reliability and flexibility are valued highest by the port actors. This can be seen as the largest advantages of the port of Antwerp. Next to that, the cost and cargo base also receive high valuations. For serving the CEE region, it might be important to improve the advantages the port already has even further. The port actors do not really seem to be satisfied with the frequencies and customs services in the port. It is clear that these are the areas in which the port of Antwerp needs to make improvements, in order to bring the total port system to a higher quality level.

Position: maritime, rail, and road network

In order to determine the position of the port of Antwerp relative to the CEE region, the same structure as for the port of Rotterdam will be used. First of all the distances from Antwerp to the capital cities of each CEE country is presented, as well as the time it takes to reach these cities. The distance and required time will be presented for transportation by truck and by train. In this way, the geographical position relative to the CEE region can be put into perspective.

The calculations made in relation to distances, transport, time and speed are conducted in the same way as for the port of Rotterdam.

Table 16: Distances Antwerp – CEE region

Transportation mode	Truck		Train	
	Kilometres	Time*	Kilometres	Time*
Albania: Tirana	2120	3:09:32	2304	6:09:36
Bulgaria: Sofia	2063	3:07:21	2155	5:23:40
Croatia: Zagreb	1281	2:01:16	1400	3:21:20
Czech republic: Prague	897	1:10:30	1036	2:21:04
Estonia: Tallinn	2061	3:07:16	2241	6:05:24
Hungary: Budapest	1350	2:03:55	1419	3:22:36
Latvia: Riga	1749	2:19:16	1891	5:06:04
Lithuania: Vilnius	1689	2:16:58	1738	4:19:52
Poland: Warsaw	1255	2:00:16	1317	3:15:48
Romania: Bucharest	2166	3:11:19	2243	3:14:16
Slovak republic: Bratislava	1186	1:21:37	1256	3:11:44
Slovenia: Ljubljana	1175	1:21:11	1257	3:11:48

* Time is in days: hours : minutes.

Source: Routenet.nl/ecotransit.org

Table 16 presents results that are comparable with the results for the port of Rotterdam. This means that the transport by truck is faster than the transport by train, also taking into account that a transport by train often involves an indirect connection, which increases the time involved with the transport even further. The difference is that the total time it takes to transport the cargo and the distances over which the transport takes place are on average a bit shorter for the port of Antwerp. Also in this situation it is clear that the transportation by train has great potential, despite the time that is involved with the transport. This has to do with the capacity of the train, and the congestion and polluting costs that are involved with transportation by truck. Next to that, transportation by rail is becomes more attractive compared to road transportation when the transport is over a distance above 200 kilometres, which is true for every transport from Antwerp to the CEE region (Den Boer, 2011).

Appendix B shows the railway terminal network for the port of Antwerp. From that the connection Antwerp has in the direction of the southeast stands out and seems to be its most important connection. This connection may be used to connect with the southern CEE countries such as Croatia, Hungary, the Czech Republic and Romania, which is made clearer by looking at Appendix VI. On this connection multiple terminals are located as well. The port of Antwerp also has the possibility to use a connection that leads to the more northern located CEE countries like Poland and the Baltic States, but this connection runs through the port of Rotterdam. Because of that it is more likely that transports that have a destination in these countries will prefer an origin from the port of Rotterdam, when solely considering railway connections.

Also, when looking at the frequency of the transports from Antwerp into the CEE region, it becomes clear what the direction the transports are focused within the port of Antwerp. In Table 17 a selection of CEE destinations and other European destinations is made, and the frequency of transports by rail with as origin the port of Antwerp is listed. More specifically, the terminals in the port of Antwerp are mentioned, just as the frequency of the transports in numbers weekly (P/W).

Table 17: Train frequencies of transports with as origin the port of Antwerp

From – To Antwerp	Austria	Italy	Spain	France	Romania	Turkey
Zomerweg	- 1 train 3x P/W	- 3 trains 5x P/W - 1 train 3x P/W	-3 trains 3x P/W	- 1 train 5x P/W - 1 train 3x P/W		- 1 train 3x P/W
Combinant Terminal		- 1 train 5x P/W - 1 train 3x P/W	- 1 train 4x P/W			
Genk Euroterminal/ Haven Rail terminal		- 1 train 6x P/W - 1 train 3x P/W			- 1 train 4x P/W	

Source: railcargo.nl

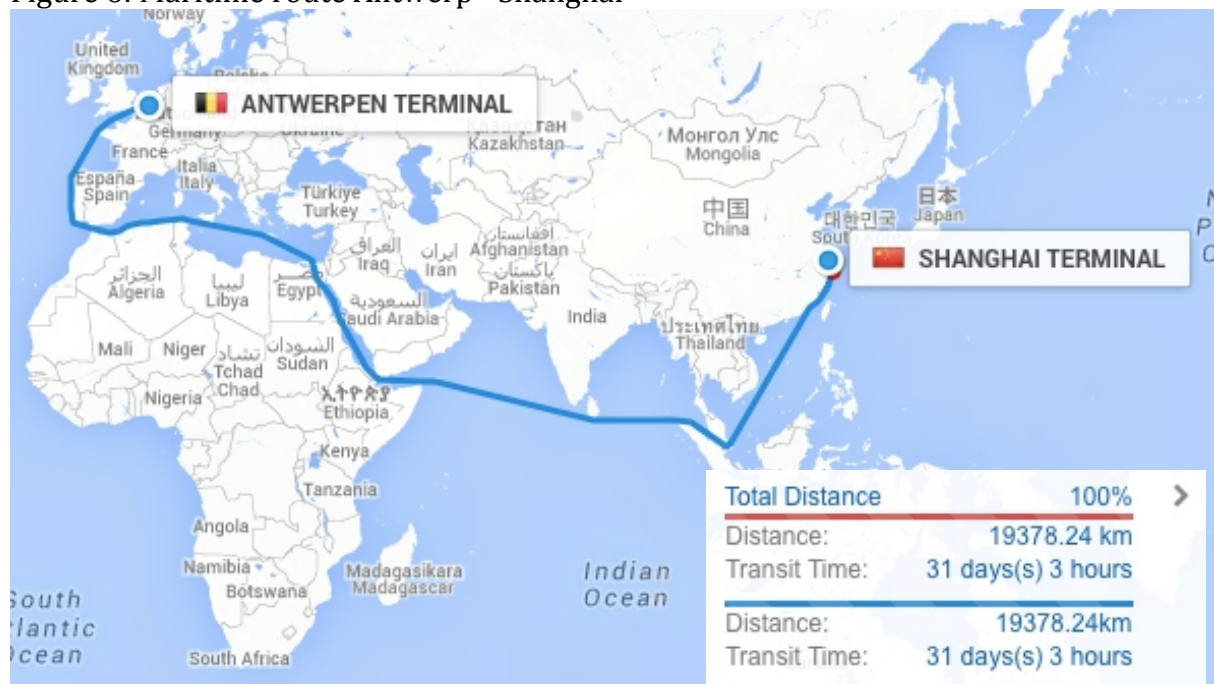
Table 17 shows that Antwerp is more focused on the south side of Europe. There are railway connections with Romania and Turkey, which are CEE countries that are located in the south of Europe. Also the port of Antwerp serves the countries Spain, France and Italy regularly, which are also located in the south west of Europe. From these frequencies the developed connections with the CEE countries in the south side of that region clearly show. However, these frequencies are not high compared with the connections the port of Rotterdam has with other CEE countries, given the average of only around 5 times weekly. Therefore, it can be stated that the port of Antwerp does have frequent connections with countries as Italy, France, and Spain, but do not have a real position in the CEE region (K. Cuypers, personal communication, January 13, 2015). However, it must be noted that the statistics concerning the frequencies only concern maritime containers that are transported to the CEE region, whereas a lot of cargo that is being transported through the port of Antwerp is continental cargo (bulk) (K. Cuypers, personal communication, January 13, 2015). Additionally, the port of Antwerp did not yet clearly notice the increased development in the CEE region fully (K. Cuypers, personal communication, January 13, 2015). However, the numbers presented in Tables 2-7 confirm the increased development, even though the economic crisis caused a fall back in the development.

Thus, during the global economic crisis and the recovery period from that there will probably not be a significant increase in container transport and frequencies, but it is also likely that after this recovery the development of the previous decade as visible from Tables 2-7 will continue, providing opportunities for increased frequencies for the port of Antwerp.

In Appendix C, the TEN-T corridors are presented for the Antwerp region. Especially the Rhine – Alpine corridor, which is the yellow line, can be an advantage for Antwerp in serving the southern part of the CEE region. The European Commission has namely planned to improve this connection and make it one of the core connections within Europe, and the most important one in the direction of the southern part of the CEE region. Another corridor, the light blue line that indicates the Rhine – Danube connection, is connected to the Rhine – Alpine corridor that has its origin in Antwerp. The Rhine – Danube corridor leads directly into the southern part of the CEE region.

Together with the support of the European Commission, the port of Antwerp has great potential for serving the southern part of the CEE region.

Figure 6: Maritime route Antwerp - Shanghai



Source: searates.com

The maritime route from Shanghai to Antwerp has relatively the fastest transit time, of 31 days and 3 hours. This means that solely based on the maritime network, the transport from Shanghai to the CEE region should run through the port of Antwerp. However, the draft of the port of Antwerp could negatively influence the transit time. Together with the fact that the transit time only is one hour shorter than the transit time to the port of Rotterdam, it can be said that the transit times to the port of Rotterdam and Antwerp are more or less the same. When comparing it to the transit times from Shanghai to Hamburg or Gdansk, the port of Antwerp clearly has an advantage (see sections 4.3.1 and 4.3.2). However, this advantage decreases because of the relative transport costs that are involved with transport over sea and over land. Namely, transport by road is on average 31% more expensive than transport over sea (Martinez-Zarzoso & Nowak-Lehmann, 2006). Therefore, the relatively short transport over sea and the relatively long transport over land give the port of Antwerp a cost disadvantage when compared to the ports of Hamburg and Gdansk. This is because the latter ports are located closer to the CEE region, which means that those transports involve a relatively long transport over sea and a relatively short transport over land. The advantage also decreases concerning the price of the maritime transport from Asia to Europe, because they are the same irrespective of which port is addressed (K. Cuyper, personal communication, January 13, 2015).

Competitive advantages

The discussion of the main characteristics and the position of the port of Antwerp within the road, rail and maritime network results in its competitive advantages for serving the CEE region.

Firstly, the location of the port is a competitive advantage. This is clear from the transit time for a transport from Shanghai to the port of Antwerp. Also, this is shown by the location of the port of Antwerp in relation to the railway hinterland connections. This railway connection leads directly to the southern part of the CEE region and shows great potential.

The quality of the port system is a competitive advantage for the port of Antwerp as well. This is shown by the high valuations the port receives for among others the port capacity, hinterland connections, reliability, flexibility, cost and cargo base.

4.3 Position of the ports of Hamburg and Gdansk

This section will show how the ports of Hamburg and Gdansk in northern Europe are positioned relative to the CEE region. This positioning is related to among others the competitive position, geographical position and maritime position of both ports, and follows the same structure as for the ports of Rotterdam and Antwerp. In a division between the main characteristics related to serving the CEE region, the place in the road, rail and maritime network and the competitive advantages of each port, the overall position is explained.

4.3.1 Port of Hamburg

The port of Hamburg is the third largest port in Europe, after the ports of Rotterdam and Antwerp (Port of Rotterdam Authority, 2014). The port is located on the Elbe River, and has a focus on container transport. In the following sections, the main characteristics, the competitive advantages and position of this port will be discussed, in relation to serving the CEE region.

Main characteristics

In order to keep the same structure as for the ports of Rotterdam and Antwerp, first of all the port area infrastructure will be discussed, after which the valuation of the port system will be presented.

Table 18: Hamburg port area infrastructure

Annual cargo throughput (2013)	139 million tonnes
Direct employment (2010)	79,000 jobs
Draft	12.8 m
Container terminals	16
-Deepsea	4
- Depots	12

Source: hafen-hamburg.de; hamburg-port-authority.de; Merk and Hesse (2012)

What stands out from Table 18 is that the port of Hamburg does not have clear advantages based on the port area infrastructure. The draft is quite low, meaning that large containerhips may not be able to moor at the port irrespective of tide. Also the number of deepsea container terminals is not that high. More deepsea container terminals are located in Antwerp and Rotterdam. Although these port infrastructure numbers do not show an advantage of the port of Hamburg, it is an advantage that from the direct employment and the annual cargo throughput the major part results from container handling and transport, because that is the main focus of the port of Hamburg.

Table 19: Hamburg container modal split

	2005	2009	2010
Road	66%	64%	62%
Barge	2%	2%	2%
Rail	32%	34%	36%

Source: Waardevol transport (2013)

The modal split of the port of Hamburg that is presented in Table 19 gives a very different view when compared to the modal splits of the ports of Rotterdam and Antwerp. In Hamburg, the main mode of transport is road, just as it is at the ports of Rotterdam and Antwerp. However, in these ports barge transportation takes a relatively large share concerning the transportation of containers. In Hamburg, barge transportation is barely used. This can be explained by the fact that Hamburg is not located geographically close to large rivers, which could be used to transport containers by barge. The rivers Meuse and Rhine make it a different situation for the ports of Rotterdam and Antwerp. What is also different from the ports of Rotterdam and Antwerp is the use of transportation by rail. The ports of Rotterdam and Antwerp use transportation by rail only for around 10% of the containers, whereas this percentage is around 33 for the port of Hamburg.

Another important aspect of the main characteristics of a port is the valuation of the port system. This namely shows the satisfaction of port actors. Also based on the port of Hamburg, Meersman et al. (2012) interviewed top managers of 35 port actors, such as terminal operators, logistic groups, European Logistic Centres (ELC's), and shipping companies. Among these shipping companies, there are 11 who exploit 45.7% of all containerships worldwide (Meersman et al., 2012). The top managers of all these actors were asked to value the port system of Antwerp, based on container transports to Poland. The interviews were conducted in 2009.

Table 20: Valuation of the port system

Valuation criterion	Score*
Cost	3.4
Hinterland connections	4.4
Port capacity	3.7
Reliability	4.1
Port location	4.4
Cargo base	4.2
Flexibility	3.8
Customer service	3.9
Frequency	4.8
Risk of losses and damage	4.6
Customs services	3.9

* A higher score means a higher valuation. Scale: 0 – 5.

Note. Port valuation. Adapted from *Met have, goed & schip over de Schelde: vijftien jaar evolutie inzake havengebeuren, logistiek en scheepvaart in de Scheldemonding* (p.134), by Gonsaeles, G. & Coppens, J, (Eds.) 2012, Antwerpen/Apeldoorn: Maku.

Table 20 shows that the port of Hamburg receives the highest valuation for frequencies and risk of losses and damages, which can thus be seen as the largest advantages. Also the port location and the hinterland connections can be seen as advantages of the port of Hamburg, because these criteria also receive high valuations. Overall, Hamburg receives high valuations. However, the port actors do not seem satisfied with the cost of the port and the port capacity. Apart from these criteria the port system of Hamburg is of high quality, which might explain the fact that the port of Hamburg is the third largest port in Europe.

Position: maritime, rail and road network

In order to determine the position of the port of Hamburg relative to the CEE region, the same structure as for the ports of Rotterdam and Antwerp will be used. This means that the distances from Hamburg to the capital cities of each CEE country is presented, as well as the time it takes to reach these cities. The distance and required time will be presented for transportation by truck and by train. In this way, the geographical position relative to the CEE region can be put into perspective.

The calculations made in relation to distances, transport, time and speed are conducted in the same way as for the port of Rotterdam.

Table 21: Distances Hamburg – CEE region

Transportation mode	Truck		Train	
	Kilometres	Time*	Kilometres	Time*
Albania: Tirana	2082	3:08:05	2094	5:19:36
Bulgaria: Sofia	1923	3:01:58	1945	5:09:40
Croatia: Zagreb	1274	2:01:00	1347	3:17:48
Czech republic: Prague	636	1:00:28	656	1:19:44
Estonia: Tallinn	1615	2:14:07	1779	4:22:36
Hungary: Budapest	1161	1:20:39	1208	3:08:32
Latvia: Riga	1303	2:02:07	1429	3:23:16
Lithuania: Vilnius	1284	2:01:23	1276	3:13:04
Poland: Warsaw	850	1:08:41	855	2:09:00
Romania: Bucharest	1977	3:04:02	2033	5:15:32
Slovak republic: Bratislava	965	1:13:07	1007	2:19:08
Slovenia: Ljubljana	1185	1:21:35	1204	3:08:16

* Time is in days : hours : minutes.

Source: Routenet.nl/ecotransit.org

The results that are presented in Table 21 show some differences with the results for the port of Rotterdam and Antwerp. For the majority of the destinations the distances and the time it takes to transport are significantly shorter when the origin of the transport is the port of Hamburg. This means that concerning road or railway transport, the port of Hamburg has an advantage over the ports of Rotterdam and Antwerp for the largest part of the CEE region. For the case of the port of Hamburg it is also true that transport by truck is faster, but transport by railway offers great potential because of the capacity of the train and congestion and pollutant costs that are concerned with transport by truck. Also in this situation, transport by rail becomes more attractive

compared to road transport with transports above a distance of 200 kilometres, which is the case for every potential destination (Den Boer, 2011).

Appendix D shows the railway terminal network for the Hamburg region. What stands out is that the port of Hamburg has high-speed connections in three directions, southwest, south and southeast. Although it is only a small part of the railway connection, it is likely to increase the average speed of the trains. Therefore, especially because of these parts of the railway, it is likely that trains run faster than 15 km/h. These high-speed railways contribute to the potential of transport by rail and increase the advantages over transport by truck. The connection that runs to the southwest is not important for serving the CEE region, as it connects to the west of Germany and to the Netherlands. The south connection and the southeast connection are important for serving the CEE region, which is clearer when looking at Appendix F. The south connection can be used to serve the southern countries in the CEE region, Croatia, the Czech Republic, Hungary and Romania. The southeast connection can be used to serve Poland and the Baltic States, but this connection also runs through the southern part of the CEE region. There are also multiple terminals located on this connection. Because of the variety of options that are available from the port of Hamburg, it can be said that the railway connectivity is well developed.

The frequency of the transports from Hamburg into the CEE region also shows how developed the network is. In Table 22 the frequencies for a selection of CEE destinations is presented. More specifically, the operators are mentioned, just as the frequency of the transports in numbers weekly (P/W), divided in an export and import transport.

Table 22: Train frequencies of transports with as origin the port of Hamburg

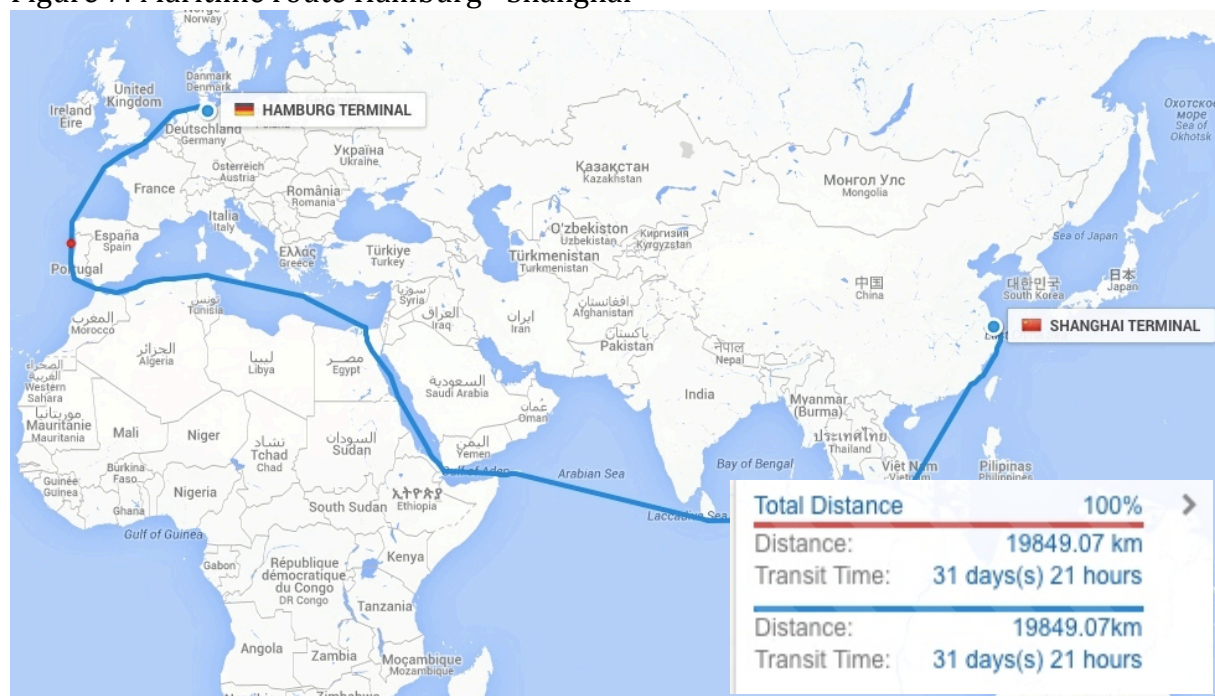
From – To Hamburg	Poland	Czech Republic	Austria	Hungary
Polzug	Export: 15x P/W Import: 15x P/W			
Metrans		Export: 48x P/W Import: 46x P/W		
IMS			Export: 16x P/W Import: 25x P/W	
I.C.E.				Export: 5x P/W Import: 5x P/W

Note. From “Bundling networks for intermodal freight flows to the European hinterland” by Bartosek, A. & Schönemann, R., 2012, No. 4, Vol. 7, p.13. Available at: http://pernerscontacts.upce.cz/28_2012/Bartosek.pdf

Table 22 presents an overview of railway service frequencies from the port of Hamburg to the CEE region. From this, it is clear that these frequencies are significantly higher than the frequencies observed from the port of Rotterdam. Especially the connection with the Czech Republic involves railway services with a high frequency. This shows that in the current situation, the port of Hamburg has the very high developed railway services into the CEE region.

The TEN-T corridors are likely to contribute even more to the railway connectivity from the port of Hamburg. Namely, the North Sea – Baltic corridor, which is the red line, will further improve the railway connection between the port of Hamburg and Poland and the Baltic States. Also, the Baltic – Adriatic corridor, which is the dark blue line, can be advantageous for the port of Hamburg. This corridor is connected to the North Sea – Baltic corridor and runs through the southern part of the CEE region, which is clearer when looking at Appendix G.

Figure 7: Maritime route Hamburg - Shanghai



Source: searates.com

The transit time from Shanghai to Hamburg is 31 days and 21 hours. This is a relatively long transit time, when compared with the transit times to Rotterdam and Antwerp. There is a difference of 18 and 17 hours respectively. However, the port of Hamburg is located closer to the largest part of the CEE region compared to Rotterdam and Antwerp, and also has faster rail and road connections. Thus the maritime connection from Shanghai to Hamburg is not optimal for serving the CEE region, but the containers are brought closer to the CEE region and together with the faster road and rail connections this could be an advantage. To make this advantage clearer, the relative transport costs per modality should be taken into account. Namely, on average transport by road is 31% more expensive than transport over sea (Martinez-Zarzoso & Nowak-Lehmann, 2006). The relatively long transport over sea and the relatively short transport over land would also give the port of Hamburg a cost advantage.

Competitive advantages

From the review of the main characteristics and position of the port of Hamburg, its competitive advantages for serving the CEE region can be determined.

The first competitive advantage of the port of Hamburg is the quality of the port system. Overall, the port receives very high valuations from the port actors. Especially the frequencies, risk of losses and damages, port location and hinterland connections receive a high valuation.

Another competitive advantage is the geographical position of the port in relation to the CEE region. The port is located close to a large part of the CEE region, for example Poland and the Baltic States.

Finally, the fast rail and road connections are a competitive advantage for the port of Hamburg. Compared to the port of Rotterdam and Antwerp, Hamburg is able to reach the major part of the CEE region considerably faster. Also the high-speed rail connections that run from the port of Hamburg in south and southeast direction contribute to these fast connections, and it is likely that the average European speed of 15 km/h for freight trains are a low estimate for transports from Hamburg to the CEE region.

4.3.2 Port of Gdansk

The port of Gdansk is not included in the top 20 of largest European ports (Port of Rotterdam Authority, 2014). However, this is the only reviewed port that is located within the CEE region, which seems to be a great advantage and offers great potential. Also, from a geographical point of view the port of Gdansk is located closest to the Baltic States, which showed a steep economic development during the last decade. The following sections will discuss the main characteristics, the competitive advantages and position of this port in relation to serving the CEE region.

Main characteristics

In order to keep the structure as applied to the ports in the former sections, first of all the port area infrastructure will be discussed, after which the valuation of the port system will be presented.

Table 23: Gdansk port area infrastructure

Annual cargo throughput (2013)	30.3 million tonnes
Direct employment (2003)	2,200 jobs
Draft	10.2 m
Container terminals	2
-Deepsea	1
-Shortsea	1

Source: portgdansk.pl

Overall, the port area infrastructure in Table 23 for the port of Gdansk shows that the port is relatively small. When the port area infrastructure is compared to that of the ports of Rotterdam, Antwerp and Hamburg the difference is clear. However, the comparison then is made with the three largest ports in Europe. The port of Gdansk does have a deepsea container terminal, which makes it possible to handle containers and transport them further. The draft, however, seems to be a problem. The draft of only

10.2 metres is not enough for large containerhips to moor at the port of Gdansk. As the containerhips from Asia normally are relatively large, the low draft could be a problem for serving the CEE region with transports from Asia. The annual cargo throughput shows that the port of Gdansk is not used to handle a large amount of cargo, which would be necessary when the port wants to serve the CEE region.

Table 24: Gdansk container modal split*

	2001	2011
Road	61.6%	79.4%
Barge	0.2%	0.1%
Rail	38.2%	20.5%

* Numbers for Poland, concerning all inland freight transport.

Source: Eurostat

The numbers in Table 24 give an approximation of the modal split for the port of Gdansk. The reason that it is only an approximation is caused by the fact that data concerning the container modal split for the port of Gdansk is not available. Instead of that, the numbers for Poland as a country are used, based on all inland freight. From these results it is clear that barge transportation is not of importance in the port of Gdansk. The main focus is on road transportation, which showed a large increase between 2001 and 2011. Obviously, this increase in the share of road transportation means a significant decrease in rail transportation for the port of Gdansk. Compared to the ports of Rotterdam and Antwerp the share of rail transportation is relatively large, but compared to the port of Hamburg this share is relatively low. The share of road transportation in the port of Gdansk is significantly larger than the share of road transportation in the ports of Rotterdam, Antwerp and Hamburg. The fact that the share of barge transportation is nearly zero might be a growth potential for the port of Gdansk. The reason for this is that when transportation by barge is introduced within the port of Gdansk, it will increase the handling capacity (Aronietis et al., 2011). However, transportation by barge can only be introduced when it is possible to improve the safety of the channels and barges drastically, in order for the safety to meet the European standards (Aronietis et al., 2011).

The valuation of the port system is another part of the main characteristics that is important, because it is about the satisfaction of the actors that are active in the port. For the port of Rotterdam a survey among shippers and forwarders by De Langen (2007) is used to show the valuation of the port system, whereas for the ports of Antwerp and Hamburg a study of Meersman et al. (2012) is used. Unfortunately, a survey for the port of Gdansk is not conducted. Therefore, in Table 25 indications of the valuation of the port system are included, derived from multiple sources. These indications of the valuation of the port system are aimed at serving the CEE region.

Table 25: Valuation of the port system

Valuation criterion	Score
Location of the port	high
Efficiency of cargo handling	low
Quality terminal operating companies	moderate
Quality of equipment	high
Quality of shipping services (frequency, first port of call)	moderate
Information services in port	moderate
Good reputation related to damage and delays	moderate
Customer focus	high
Connection to hinterland modes	moderate

Source: portgdansk.pl; dctgdansk.pl/en/; Clark, Dollar & Micco (2002)

Table 25 shows that the location of the port, the quality of equipment and the customer focus are the advantages of the port of Gdansk. Clearly, the location of the port is the largest advantage, because it is located in the CEE region and thus close to the market. The quality of equipment also receives a high valuation, which means that the port has a good technological basis to handle cargo. Customer focus is also important in the port of Gdansk, which might have to do with the small size of the port. The major disadvantage in the port of Gdansk is the efficiency of cargo handling. The low efficiency could be problematic when the port has the ambition to serve the large CEE region, but it might be explained by the lack of experience and the problems with the draft of the port.

Position: maritime, rail and road network

In order to determine the position of the port of Gdansk relative to the CEE region, the same structure as for the ports of Rotterdam, Antwerp and Hamburg will be used. The distances from Gdansk to the capital cities of each CEE country is presented, as well as the time it takes to reach these cities. The distance and required time will be presented for transportation by truck and by train. In this way, the geographical position relative to the CEE region can be put into perspective.

The calculations made in relation to distances, transport, time and speed are conducted in the same way as for the port of Rotterdam.

Table 26: Distances Gdansk – CEE region

Transportation mode	Truck		Train	
	Kilometres	Time*	Kilometres	Time*
Albania: Tirana	1890	3:00:41	1948	5:09:52
Bulgaria: Sofia	1713	2:17:53	1799	4:23:56
Croatia: Zagreb	1297	2:01:53	1357	3:18:28
Czech republic: Prague	734	1:04:14	778	2:03:52
Estonia: Tallinn	850	1:08:41	1099	3:01:16
Hungary: Budapest	949	1:12:30	1055	2:22:20
Latvia: Riga	538	0:20:41	750	2:02:00
Lithuania: Vilnius	488	0:18:46	722	2:00:08
Poland: Warsaw	340	0:13:05	330	0:22:00
Romania: Bucharest	1537	2:11:07	1864	5:04:16
Slovak republic: Bratislava	885	1:10:02	891	2:11:24
Slovenia: Ljubljana	1305	2:02:11	1343	3:17:32

* Time is in days : hours : minutes.

Source: Routenet.nl/ecotransit.org

What stands out from Table 26 are the relatively short transport times for the majority of the destinations in the CEE region. This means that the port of Gdansk has an advantage over the other ports concerning transport by road or rail for serving the CEE region. Also for this port, the transport times are significantly longer for railway transport when compared with road transport. With that, extra time resulting from often indirect connections should also be taken into account. However, keeping in mind the possibilities of the railway concerning capacity and the downsides of road transport in the form of congestion and taxes, clarifies the potential of railway transport. This potential is also supported by the relative attractiveness of rail transport concerning transports above 200 kilometres (Den Boer, 2011).

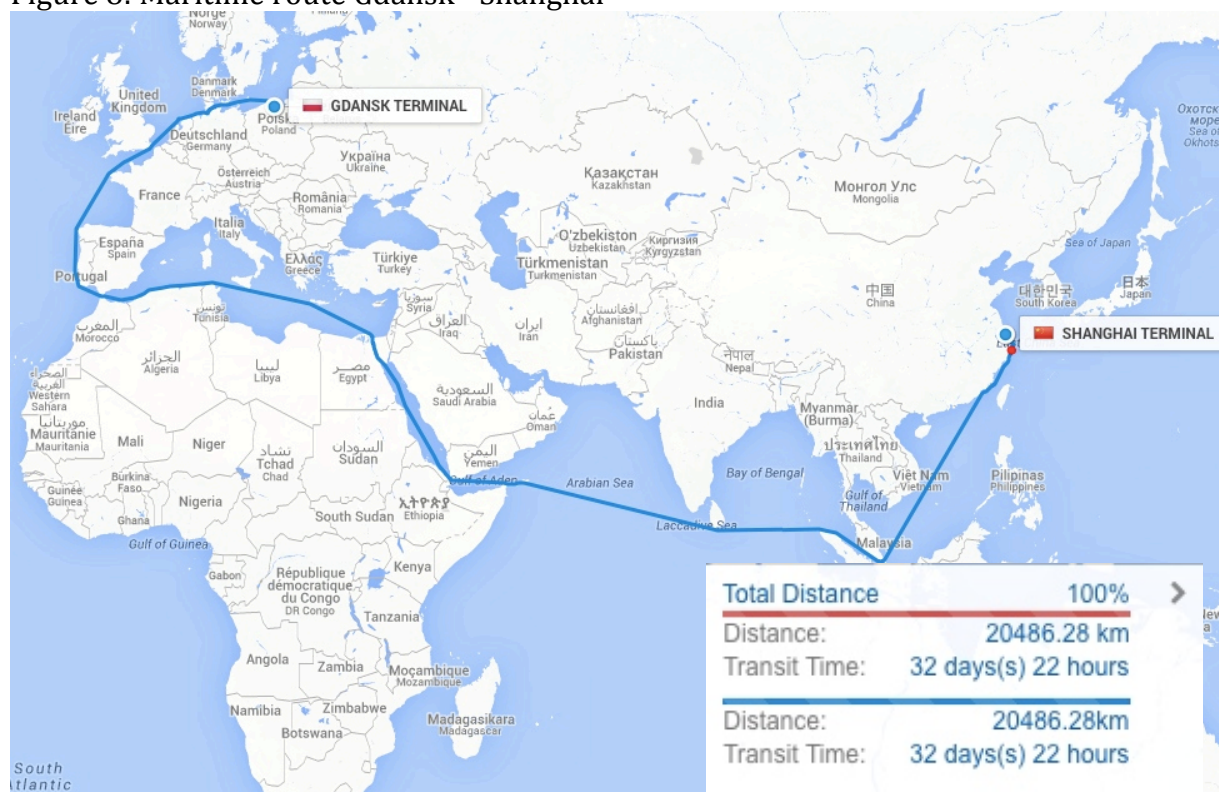
Appendix D shows the railway terminal network for the Gdansk region. The main connection runs in the direction of the southern CEE countries, which is clearer when looking at Appendix F. However, the railway connections from Gdansk into the CEE region need upgrades on the largest parts within the network. Originating from Gdansk, there is no railway connection that does not need an upgrade. This means that the potential for railway transport from Gdansk into the CEE region cannot be exploited yet, and that it is likely that the average speed of 15 km/h could not be met on the railway connections that have their origin in Gdansk. Also, there are just a few terminals located relatively close to the port of Gdansk. However, when the connection moves further southwards, there are considerably more terminals located on the railway connection.

In Appendix E, the TEN-T network for the Gdansk region is included. From that it is clear that the European Commission has plans to improve the railway connection originating from Gdansk, and running through the southern CEE countries, which is the dark blue line that is called the Baltic – Adriatic corridor. This corridor is linked with the North Sea – Baltic corridor, which is the red line, and the Rhine – Danube corridor, which is the light blue line. This linked network is clearer when looking at Appendix G. The improvements the European Commission has planned to make improves the potential of the railway connections that have their origin in Gdansk. The link with the North Sea –

Adriatic corridor namely provides an upgraded connection with the Baltic States, whereas the Rhine – Danube corridor makes it possible to reach all southern CEE countries.

There are not only problems concerned with the rail network. Also the road network, which connects the port of Gdansk with its hinterland, faces problems. Transportation by road is used with the largest part of the transports, but the network clearly does not meet the European standards. The network is underdeveloped, meaning that there are many unpaved roads, just as roads that cannot handle the heavy weight vehicles that are also used in the rest of Europe (Aronietis et al., 2011; Palmowski, 2001). Even though improvements are made concerning the road network, the construction and developments are realized at a slower pace than the freight transport is growing (Aronietis et al., 2011).

Figure 8: Maritime route Gdansk - Shanghai



Source: searates.com

The maritime route from Shanghai to the port of Gdansk shows that the transit time is the longest when compared with the other ports, because it takes 32 days and 22 hours to reach the port of Gdansk with containers originating from Shanghai. It takes 31 days and 3 or 4 hours to reach the ports of Antwerp and Rotterdam, which is a large difference with the transit times to Gdansk. Also, the draft in the port of Gdansk is a downside in this respect. The large containerships that are transporting the containers from Shanghai cannot moor at the port of Gdansk 24 hours a day, and thus need to take the tides into account, which could further delay the transport. Concerning the maritime route, the port of Gdansk because of that has a disadvantage when compared with the other ports, especially Rotterdam and Antwerp. However, the port of Gdansk does have an advantage based on transport cost. Given that transport over land is on average 31%

more expensive than transport over sea, the relatively short transport over land and the relatively long transport over sea are an advantage for the port of Gdansk (Martinez-Zarzoso & Nowak-Lehmann, 2006).

Competitive advantages

After the review of the port infrastructure, the valuation of the port system and the position of the port of Gdansk in relation to the CEE region, the competitive advantages of the port of Gdansk can be determined.

The biggest competitive advantage of the port of Gdansk is the geographical position relative to the CEE region. In fact, the port of Gdansk is already located in the CEE region. Especially the markets in Poland and the Baltic States are located close the port of Gdansk.

Related with the geographical position of the port, the short transport times via road or rail transport are a competitive advantage for the port of Gdansk. Despite the dated railway network, containers can move quickly to their destination from the port of Gdansk. Also, the TEN-T network program is likely to improve the railway connections between Gdansk and the rest of the CEE region, which shows the potential of railway transport.

Finally, the quality of equipment and the customer focus are competitive advantages within the port system of the port of Gdansk. This shows that Gdansk is able to handle containers with the right equipment, and can offer a customized service to their customers. When Gdansk is also able to further improve the efficiency of the cargo handling at the port, it is likely that the competitiveness of the port also increases further.

4.4 Competitive advantage overview for all four ports

This section will present an overview of the competitive advantages of all four ports that are competing for serving the CEE region. Based on this overview, it becomes easier to compare the ports.

Table 27: Competitive advantages

Rotterdam	Antwerp	Hamburg	Gdansk
Quality of the port system: - Cargo handling efficiency - Quality of equipment - Frequency of calls - Connections to hinterland modes	Quality of the port system: - Port capacity - Hinterland connections - Reliability - Flexibility - Cost - Cargo base	Quality of the port system: - Frequencies - Risk of losses and damages - Port location - Hinterland connections	Quality of the port system: - Quality of equipment - Customer focus
Maritime accessibility	Port location	Geographical position relative to CEE	Geographical position relative to CEE
Railway connections	Railway connections	Rail and road connections	Short transport times via rail/road

Table 27 gives an overview of the competitive advantages of all four ports. It shows that all ports have a competitive advantage based on the quality of the port system, but based on different topics. However, what the ports of Rotterdam, Antwerp and Hamburg do specifically have in common within the quality of the port system are the hinterland connections as a competitive advantage. The port of Rotterdam also has a competitive advantage based on its maritime accessibility, which is mainly because of the draft. The consequence of that is that Rotterdam often is the first port of call for transports from Asia to Europe (K. Cuypers, personal communication, January 13, 2015). Another competitive advantage of the port of Rotterdam is the railway connections, which are of high quality and focused eastwards into Germany. For Antwerp, the port location is a competitive advantage, because the port is located closest to Asia concerning maritime transport. Also for the port of Antwerp the railway connections are a competitive advantage, which are mainly focused on southern Europe. A competitive advantage of the port of Hamburg is the geographical position in relation to the CEE region, mainly for Poland, the Czech Republic, the Slovak Republic, and the Baltic States. The railway connections are also a competitive advantage for the port of Hamburg, because these connections are fast, of high frequency, and sharply priced (R. Van den Berg, personal communication, November 18, 2014; K. Cuypers, personal communication, January 13, 2015). For the port of Gdansk, a competitive advantage is the geographical position especially concerning Poland, the Czech Republic, the Slovak Republic and the Baltic States. Also, the short transit times via rail and road are a competitive advantage, especially concerning Poland and the Baltic States. Even though the railway connections appeared to be a competitive advantage for all ports, there are differences between the ports. The port of Hamburg clearly has the highest frequencies into the CEE region, and because of the economies of scale relating to that they are able to sharply price their railway product (K. Cuypers, personal communication, January 13, 2015). Especially in relation to the competing ports of Rotterdam and Antwerp, which also have high quality railway connections, this is an advantage, because these ports cannot benefit from economies of scale due to the lower frequencies, and thus cannot offer such low prices individually. Therefore, cooperation between the ports of Rotterdam and Antwerp could be an option (K. Cuypers, personal communication, January 13, 2015).

In conclusion, this chapter evaluated the ports of Rotterdam, Antwerp, Hamburg and Gdansk by first of all looking at their main characteristics. This included characteristics such as the direct employment, annual cargo throughput, draft, number of container terminals, modal split and the valuation of the port system by port actors. The evaluation also included the position all four ports have based on their rail, road and maritime network. This included the direct transport times by road and rail from the origin ports to destinations in the CEE region, just as the maritime transport times from the port of Shanghai to the respective ports. The evaluation resulted in competitive advantages of each port that is competing for serving the CEE region. Table 25 presents an integrated overview of these competitive advantages, in order to make a comparison between the ports easier.

Chapter 5: The form of cooperation through which it is most likely that Rotterdam and Antwerp gain advantages in the hinterland accessibility

This chapter will firstly discuss in which area of cooperation Rotterdam and Antwerp could most likely gain advantages in the hinterland accessibility. Additionally, the suitable forms of cooperation will be discussed. The results from the previous chapters, especially the competitive advantages for the ports of Rotterdam and Antwerp, will be used for both purposes. Then, previous initiatives of a cooperation between the ports of Rotterdam and Antwerp are discussed. Also, the business model effects of the joint initiatives to improve the hinterland accessibility are addressed.

5.1 Promising cooperation area

For determining in which area Rotterdam and Antwerp could set up a cooperation in order to improve the hinterland accessibility towards the CEE region, the competitive advantages of both ports are important. The review of the main characteristics and position within multiple networks showed that both ports more or less have similar competitive advantages. Namely, they both have a competitive advantage concerning the maritime route, maritime accessibility, the quality of the port system and the hinterland connections.

However, although these competitive advantages are a big plus for serving the CEE region, the ports of Hamburg and Gdansk still have the major advantage of being located close to the CEE region. The ports of Rotterdam and Antwerp should find a way in which they could serve the CEE region first of all in a faster way than the ports of Hamburg and Gdansk. The transit time is namely a factor that is very important in the competition between ports (R. Van den Berg, personal communication, November 18, 2014). In order to show the differences in transit times for all ports, and thus the speed of delivery, in Table 27 an example is presented. For this example the destination Prague, Czech Republic is chosen, because this country is located central in the CEE region. Also, the maritime transit times and the railway transit times are included, just as the total transit time. In general, it is assumed that with transports which involve more than 200 kilometres, transport by rail becomes more competitive (Den Boer et al., 2011).

However, Table 28 also shows the maritime transit times, the road transit times and the total transit times from Shanghai via each port that competes for serving the CEE region, with as example destination Prague in the Czech Republic. The example including road transit times is added in order to give a complete overview, and because road transport is still often used for container transports into the European hinterland.

Table 28: Transit times from Shanghai to Prague, Czech Republic

	Maritime transit time	Railway transit time	Total transit time
Rotterdam	31 days 4 hours	2 days 16 hours	33 days 20 hours
Antwerp	31 days 3 hours	2 days 21 hours	34 days
Hamburg	31 days 21 hours	1 day 19 hours	33 days 16 hours
Gdansk	32 days 22 hours	2 days 3 hours	35 days 1 hour

Table 29: Transit times from Shanghai to Prague, Czech Republic

	Maritime transit time	Road transit time	Total transit time
Rotterdam	31 days 4 hours	1 day 11 hours	32 days 15 hours
Antwerp	31 days 3 hours	1 day 10 hours	32 days 13 hours
Hamburg	31 days 21 hours	1 day	32 days 21 hours
Gdansk	32 days 22 hours	1 day 4 hours	34 days 2 hours

Table 28 shows that in this situation Hamburg would serve the Czech Republic fastest. With a delay of 4 hours, Rotterdam is also able to deliver the containers. Again 4 hours later, the delivery from Antwerp would be done. The port of Gdansk however would deliver with a significant delay as opposed to the other ports, with a delivery of 1 day and 1 hour after Antwerp could have delivered the containers.

Of course, speed is not the only consideration that is made concerning port selection. For example maritime accessibility, efficiency of cargo handling, frequency of call and hinterland connections are also important factors. In fact, these factors also influence the speed of delivery considerably. In Table 28 only the maritime transit time is included, which excludes among others port handling time, and railway transit time is included, which does include handling and waiting times in the speed per kilometre, but these numbers are European averages. Therefore, the railway transit times could in reality be shorter for ports that have well-developed railway hinterland connections, and could be longer for ports that do not have that. Appendices D and F showed that the railway network into the CEE region is not well-developed. This could be seen as another disadvantage for the port of Gdansk for serving the CEE region. For Hamburg, however, it is most likely that the railway transit times are shorter in reality because of the well-developed railway connections the port has, as well as high-speed connections on certain routes into the CEE region. Also, price is an important factor in this process of competition between ports for serving this CEE region (R. Van den Berg, personal communication, November 18, 2014; K. Cuypers, personal communication, January 13, 2015). For the sea transport from Asia to Rotterdam or Hamburg, the prices are the same (R. Van den Berg, personal communication, November 18, 2014; K. Cuypers, personal communication, January 13, 2015). Therefore, the hinterland connections are of great importance. From the port of Hamburg into the CEE region, these are of high quality and sharply priced. Based on the total transit times, the likeliness of an even shorter railway transit time for Hamburg, and the price of the hinterland transport, this port can be seen as the biggest competitor for serving the CEE region (R. Van den Berg, personal communication, November 18, 2014; K. Cuypers, personal communication, January 13, 2015).

In Table 29 the transit times for road transport are included. These results are the same as the rail transport results with respect to the competitiveness of the port of Gdansk.

Via the port of Gdansk it is namely possible to deliver a container in Prague with an average delay of more than a day compared to the other three ports. However, concerning via which port that it is possible to deliver a container fastest, there are differences with transport by rail. The transport by rail showed that via the port of Hamburg it is possible to deliver the container fastest, but with a transport by road Antwerp can deliver faster than it would be via the port of Hamburg. With a delay of 2 hours, a transport via the port of Rotterdam is also faster than via the port of Hamburg. A transport via the port of Hamburg takes 6 hours longer than a delivery via the port of Antwerp. When the results of Table 28 and 29 are compared it becomes clear that with transports via the ports of Rotterdam, Antwerp and Hamburg more than a day can be saved when the transport goes via road instead of rail. The difference between rail and road transport via the port of Gdansk is a bit less than a day in favour of road transport. However, given the fact that transportation via road realistically seen is not a competitive mode of transportation because among others the small capacity of a truck and the high costs that are involved with it, the focus will lie on transportations by rail.

The result that the port of Gdansk cannot compete with the ports of Rotterdam, Antwerp and Hamburg to serve the CEE region, is based on the destination Prague, Czech Republic. This destination is located centrally in the CEE region. Among others because of this reason, it does not mean that the port of Gdansk is not in a competitive position for serving any of the CEE countries. The port of Gdansk namely is in the best position to serve the Baltic States, which is in the northeast area of the CEE region. This competitive position is mainly based on the geographical location of the port of Gdansk, because it is closely located to the Baltic States. This is especially true in comparison with the ports of Rotterdam, Antwerp and Hamburg. However, even though this geographical location provides the port of Gdansk with an advantage, there are still problems related to serving the Baltic States. These problems are mainly concentrated on the rail and road networks in Poland. Especially the road network is an area of the economy that is clearly underdeveloped, even though the largest share of freight is transported through this mode (Aronietis et al., 2011; Palmowski, 2001). More specifically, the roads are often unpaved and cannot handle the increasing weight of the vehicles, which causes serious safety issues (Palmowski, 2001). As mentioned, Poland does put effort into developing the road network, but these construction improvements are made at a lower pace than the growth of the freight traffic (Aronietis et al., 2011). Next to the road network, there are also problems with the rail connections from Poland to its hinterland. This is because the Baltic States have been influenced by the Soviets in the past, causing the rail network to be of low quality, and not fitting the European standards (Palmowski, 2001). Also, there are problems concerning low maintenance (Palmowski, 2001). This can cause problems with the transportation of containers from Gdansk to the Baltic States. Therefore, even though the geographical location of the port of Gdansk in relation to the Baltic States is an advantage over the other ports that are competing for serving the CEE region, there still need to be made strong improvements concerning the road and rail network connecting Poland with the Baltic States. It is likely that the port of Gdansk will only be able to secure the Baltic States market when these improvements are realised. Otherwise, it is likely that especially the port of Hamburg will also be able to serve the Baltic States.

However, it still seems to be a credible strategy for the port of Gdansk to focus on the Baltic States, and combined with that develop their railway system in order to be able to serve other parts of the CEE region as well. This is mainly because with serving the

Baltic States, the port of Gdansk will be able to exploit its geographical location. Additionally, Gdansk has been turned into a hub port because Maersk, one of the largest container operators worldwide, started a constant transport from Shanghai via the port of Gdansk (Aronietis et al., 2011). It is likely that this will also contribute to infrastructure and other hinterland developments within the port of Gdansk. Besides, the port of Gdansk could invest in their port handling systems, which appeared to be important for port actors as well.

Based on the previous results, the competition focuses on the ports of Rotterdam and Antwerp, against the port of Hamburg. The competitive advantages of all three ports show where the ports of Rotterdam and Antwerp should focus on for improving the service into the CEE region, and thus indicate in which area a cooperation could be beneficial.

Table 30: Competitive advantages Rotterdam, Antwerp and Hamburg

Rotterdam and Antwerp	Hamburg
<ul style="list-style-type: none"> - Quality port system (R+A) - Railway hinterland connections (R+A) - Maritime accessibility (R) - Location: maritime route (A) 	<ul style="list-style-type: none"> - Quality port system - Railway hinterland connections - Geographical position

Table 30 lists the competitive advantages for all three ports. From these competitive advantages, some cannot be influenced or changed. For the port of Hamburg, the geographical position towards the CEE region will remain and cannot be influenced. For the port of Rotterdam the same accounts for the maritime accessibility, whereas for the port of Antwerp it accounts in the same way for the location concerning the maritime route from Asia. What remains are 2 competitive advantages for both the port of Rotterdam and the port of Antwerp. For the port of Hamburg 2 competitive advantages remain as well. What stands out is that the remaining competitive advantages for the ports of Rotterdam and Antwerp together and the port of Hamburg are the same. The railway hinterland connection advantage of the ports of Rotterdam, Antwerp and Hamburg is mainly based on the high quality of the connections into the CEE region. However, there are also some differences between the advantages of the railway hinterland connections of the ports of Rotterdam and Antwerp as opposed to the advantage of the port of Hamburg. The advantage of the ports of Rotterdam and Antwerp is namely besides the high quality of the connections also based on the fact that they cover the largest part of the CEE region with a strong connection eastwards from Rotterdam and a strong connection south-eastwards from Antwerp. The port of Hamburg only connects their railway network southwards with the CEE region, which makes it difficult to also cover the countries that are located more in the bottom south side of the region. On the contrary, the speed and quality of the railway hinterland network of the port of Hamburg is really unique in Europe, making this their strong advantage. The directions of the railway hinterland connections can be seen from the Appendices B, D and F. The quality of the port system is for the ports of Rotterdam and Antwerp based on cargo handling, quality of shipping services and quality of equipment, whereas for the port of Hamburg it is based on location, cargo handling and connection to hinterland modes.

Relating this information with the promising area of cooperation, it is likely that a cooperation will be based on the railway networks of the ports of Rotterdam and Antwerp. Namely, Appendices B and F show that the port of Rotterdam has the best eastward connection that runs through Germany into Poland and potentially to the Baltic States, whereas the port of Antwerp has the best south eastward connection that runs through the southern CEE countries such as Croatia, Hungary and Romania. Because they jointly cover the largest part of the CEE region, it is likely that both ports can benefit from a cooperation within this area. Additionally, it is necessary to optimize the hinterland connections, because the port has little influence on among others the price setting of operational actors, which is an important factor for determining which port to transport through (K. Cuypers, personal communication, January 13, 2015). By optimizing the hinterland connections the port can facilitate operational actors, and make it possible for them to change their price setting as a result of that. Also, railway transport in general has great potential, mainly because of the large capacity of trains and because of that the relatively low transport costs per container. Next to that, as a railway connection into the hinterland is mainly infrastructure that is not exclusively build for one specific port, it is also not something that is the basis of a port environment in the sense that ports do not prefer to keep it for themselves. Therefore, jointly developing or improving such a connection could be a promising area of cooperation. Another reason for this is the support from the European Commission in the form of the planned TEN-T network, which can be seen in the Appendices C, E and G. Especially Appendix C shows that the main railway hinterland connections from Rotterdam to the east and from Antwerp to the south-east are connections the European Commission is focusing on with its plans. Therefore, the initiative of Rotterdam and Antwerp for setting up a cooperation in order to improve both railway hinterland connections that run through the CEE region is likely to receive support from the European Commission. Additionally, national governments and ports are setting goals for achieving a different modal split in favour of railway transport for the near future. Also, a reason why the railway connections to the CEE region are the promising areas for setting up a cooperation is that there is a lot of room for improvement. The fact that the average speed of freight trains is only 15 km/h in Europe, which is among others caused by waiting times and border crossing times, clearly shows that.

Although it is determined that railway hinterland connections is the promising area for cooperation, the question remains how these connections could be improved and which forms of cooperation are suitable for achieving this. It is an option to create additional infrastructure into the hinterland, in the form of railway tracks (Van den Berg & De Langen, 2011; De Langen, 2008). However, it is confirmed in both the port of Rotterdam as the port of Antwerp that the railway capacity is not an issue, because the tracks are sufficiently developed and can handle a substantial increase in container flows into the CEE region (R. Van den Berg, personal communication, November 18, 2014; K. Cuypers, personal communication, January 13, 2015). Also, a cooperation based on infrastructure is normally not for the exclusive use of the ports that will be involved in the development, which possibly creates difficulties in relation to competitors that could also benefit from it. Also, according to the port of Rotterdam there are large risks with developing a new connection, and they confirm that the capacity on the current connections is sufficient to improve the frequencies (R. Van den Berg, personal communication, November 18, 2014). Only for the south of Germany, Austria and the Slovak Republic the port of Rotterdam is currently establishing new connections, in

order to improve the service level and market share. This is an investment executed jointly with several private parties, in order to mitigate the risks involved (R. Van den Berg, personal communication, November 18, 2014). Next to that, it is an option to increase the capacity of the ports, in order to be able to handle the increase in container flows (Van den Berg & De Langen, 2011). However, especially with the creation of the Second Maasvlakte in the port of Rotterdam and the large land areas available in the port of Antwerp this is not necessary. Additionally, it is a possibility to engage in joint marketing activities in the hinterland, in order to find out where in the hinterland customers experience problems, and to solve them (Van den Berg & De Langen, 2011). However, concerning the customers in the CEE region this will have a minor impact, as both ports do not have frequent connections into the region caused by the relatively little individual market shares. The following three suggestions could improve the railway hinterland connections into the CEE region solely for the ports involved in the cooperation and could exclusively improve the service quality of Rotterdam and Antwerp towards the CEE region: investing in the development of a shared hinterland railway terminal, bundling of cargo, and the integration of IT systems (Van den Berg & De Langen, 2011; Roso et al., 2009; Bartosek & Schönemann, 2012; Almotairi et al., 2011). As these initiatives would solely involve the interests of the ports of Rotterdam and Antwerp and only those ports will benefit from it, it is likely that the competitive position of these ports for the CEE will improve in relation to the port of Hamburg. Also, these initiatives are likely to have an influence on the efficiency of the transport, which will influence the price and transit time of the transport. As those are factors that are of great importance for attracting cargo with as destination the CEE region, it is likely that it will benefit the position of the ports of Rotterdam and Antwerp in the CEE market (R. Van den Berg, personal communication, November 18, 2014; K. Cuypers, personal communication, January 13, 2015). The following sections will further explain why and how these actions could improve the railway hinterland connections and thereby the hinterland accessibility, and will explain which forms of cooperation are most suitable for achieving this.

5.1.1 Hinterland railway terminal

One option to consider when the aim is to improve the railway connections and with that the hinterland accessibility is a hinterland railway terminal. There are multiple reasons why a hinterland railway terminal could improve this hinterland accessibility, but the dry port concept explains the potential of improvement from such a terminal for the ports that are involved with developing it (Roso et al., 2009). When the ports can benefit from such a hinterland railway terminal, it is likely that the customers of a port or port services benefit as well. This in turn would make the ports that are involved with this development more competitive.

The dry port concept is concerned with multimodal inland terminals that are connected with seaports, such as Rotterdam or Antwerp (Roso et al., 2009). There are several advantages of having a direct link between seaports and a multimodal inland terminal. In this situation, it will likely involve an inland terminal that is relatively far away from the seaports, because the destinations are far away as well with respect to transport over land within Europe. One advantage of such a distant dry port is that the hinterland of the seaports will expand because of that (Roso et al., 2009). Next to that, making use of a dry port decreases the problem of containers waiting in the port area until operators plan to transport them, because then they can directly be transported to a

hinterland terminal (K. Cuypers, personal communication, January 13, 2015). Also an advantage of a dry port is that it is likely that congestion will decrease in the seaport area, because the handling and further transport of a part of the containers is shifted from road to rail, and is shifted to the distant inland terminal (Roso et al., 2009). This decrease in congestion is likely to have positive externalities for the ports of Rotterdam and Antwerp, and especially for the cities of Rotterdam and Antwerp in general. These positive externalities could be related to environmental improvements. Additionally, a dry port can improve the efficiency of the seaports because they will be able to transfer some activities to the dry port, such as customs clearance, security checks and information handling (Roso et al., 2009). Because of that, the port is able to focus on other port handling activities and improve the efficiency of those activities. Another advantage is that the ports of Rotterdam and Antwerp will be able to handle the increased throughput caused by serving the CEE region without having to physically expand the capacity of the seaport in the direct region of Rotterdam and Antwerp (Roso et al., 2009). This is an important advantage, because it is becoming more difficult to expand, because of the lack of land capacity or environmental issues (Rodrigue & Notteboom, 2009). For this reason, it could be that investing in the development of such a dry port is a necessary action in order to be able to handle the significantly increased amount of containers caused by the transports to the CEE region. Also, the realization of a dry port is likely to avoid delays that could result from the increased amount of containers that the ports should handle for serving the CEE region.

All these advantages are important for improving the hinterland accessibility, the hinterland range and the railway connections. The main reasons for that are that customers of a port give a high value to among others hinterland connections, frequency of inland transport services, and speed and reliability of these services (Roso et al., 2009; Van der Horst & Van der Lugt 2009). This means that when ports are able to improve these valuation criteria, it is likely to improve their competitiveness. Clearly, investing in the realization of an inland terminal can improve these criteria. The reliability is improved by avoiding delays and decreasing congestion in the port area, the frequency can be improved because there will be more capacity, the speed can be improved because the realization of an inland terminal will improve the efficiency, and the hinterland connections are likely to improve because of the increased size of the hinterland that can be served.

A cooperation between ports can make such a dry port feasible, because it is clear that investing in the realization of a dry port is an expensive action. With a cooperation between ports, the fixed costs of the development of a dry port can be shared (Roso et al., 2009). When the fixed costs of the realization of the dry port are shared, this also means that both ports share the risks that are involved with the dry port. These risks also involve whether such a hinterland terminal can be profitable (R. Van den Berg, personal communication, November 18, 2014). A cooperation can provide more security concerning the profitability of a hinterland terminal, because investing in the development of a hinterland terminal for the use of one port only normally is too expensive, because it cannot be made profitable (R. Van den Berg, personal communication, November 18, 2014). The funds for the realization of the dry port should also be generated. As in this situation the largest port in Europe and its biggest direct competitor are involved, it is likely that these ports are able to generate these funds. Even concerning only the port of Rotterdam, funds for investing in the

development of a hinterland terminal can be made available (R. Van den Berg, personal communication, November 18, 2014).

Besides that, port authorities are seen as intermediaries between port actors, initiators of projects, and managers of initiatives with collective benefits (De Langen & Chouly, 2004). From this it also appears that investing in a dry port fits the role of a port authority. Concerning solely the port of Rotterdam, a cooperation with private parties for the development of a hinterland terminal even is normal practice, as was also the case for the development of terminals in the Czech Republic and Slovak Republic (R. Van den Berg, personal communication, November 18, 2014).

Additionally, for a dry port to be successful, there must be sufficient container flows (Roso et al., 2009). In that way, the railway operations can be executed at an efficient speed and with an efficient frequency. Although both the port Rotterdam and Antwerp handle a large amount of containers annually, it would provide the ports with less risks if they know the flows from both ports will be handled at the dry port in their joint hinterland.

Next to the realization of a dry port, the ownership of the ports of Rotterdam and Antwerp can contribute to the operations. Through the ownership of the dry port both ports can coordinate between the parties involved in the dry port, in order to improve for example the rail transport planning and to avoid delays (Van der Horst & Van der Lugt 2009; R. Van den Berg, personal communication, November 18, 2014). This is also true for the investment in for example a communication system within the dry port. The investment in such a system appears to be difficult among private parties because of among others a lack of resources, or distrust (Van der Horst & Van der Lugt 2009). Also in this situation, the ports of Rotterdam and Antwerp can jointly invest in such a system and with that improve the operations within the dry port. However, the port of Rotterdam normally never involves itself in the operations of a hinterland terminal it develops (R. Van den Berg, personal communication, November 18, 2014). Therefore, when the goal of the cooperation would be setting up a hinterland terminal together with the port of Antwerp, where both ports are involved in the operations of this terminal, will be a challenge for the port of Rotterdam. This has everything to do with the fact that the port of Rotterdam has a landlord role (De Langen, 2008). This means that the port will mainly facilitate the port actors with for example investing in the development of infrastructure, and in the development of sites or land areas where actors can operate within the port area or the hinterland (De Langen, 2008). There is normally no involvement in the actual operation of in this case a hinterland terminal. Also the port of Antwerp has such a landlord role, because of which operational activities in a hinterland terminal would also be a challenge. The ports of Rotterdam and Antwerp are usually only able to facilitate, promote or invest in the operational activities of other, often private, parties. This accounts for the operational activities taking place within the port area, but also in the hinterland. The power of the ports of Rotterdam and Antwerp namely does extent to that the landlord role that is executed within the port area can also be executed in the hinterland. Therefore, a cooperation in relation to a hinterland terminal will relate to investing in the development, in order for customers to be able to make use of it when realized.

Suitable forms of cooperation

After making clear what the advantages of the development of a hinterland terminal will be for the ports of Rotterdam and Antwerp, it should also be clear which forms of

cooperation are suitable to realize this. For developing a hinterland terminal, joint lobby and joint investment/joint venture could be suitable forms of cooperation (Van der Lugt & De Jong, 2013).

- Joint lobby

Before it is possible to build a terminal, there should be permission to build and thus support from local entities is required. Therefore, a joint lobby is a form of cooperation that is suitable or making the build of a hinterland terminal possible. This joint lobby is likely to be powerful, because the two largest ports in Europe will execute it. Additionally, it is likely that the joint lobby will receive support from the European Commission, as they have plans to improve these railway connections as well. The lobby should make clear what the necessity of a terminal is and how the local community could also benefit from it.

- Joint investment/joint venture

In the situation where there is permission to build a terminal and there is support from the local entities, there should be made an investment in the actual build of a hinterland terminal. For that, a joint investment or joint venture is a suitable form of cooperation. When the ports choose to set up a separate entity for the build of a terminal, in order to completely separate the building of the terminal from the individual ports, a joint venture is the most suitable form of cooperation. If this form is used, the risks of the investment are for the new established entity.

When the ports choose to run the risks of the investment in a hinterland terminal within the individual ports, a joint investment is the most suitable form of cooperation. In this way, only resources and finances are invested jointly, the risks remain at the level of the individual ports.

5.1.2 Bundling of cargo

Bundling of cargo is another way to improve the hinterland connections and with that hinterland accessibility. There are several improvements that can be realized through the bundling of cargo. Firstly, the utilization of trains can be improved (Bartosek & Schönemann, 2012). The biggest advantage that is concerned with a higher utilization is the costs savings that are associated with that (Jourquin et al., 1999). The costs of the transport per container will namely be lower with a fully utilized train. Another improvement can be the increased frequency of train services (Bartosek & Schönemann, 2012). A high frequency service makes it possible that the port customers do not have to take into account the rail service possibilities when planning the transport from origin to destination. This is because long waiting times can be avoided because of this high frequency service, meaning that there will be no cost increase because of that (Bartosek & Schönemann, 2012). This high frequency service is necessary in the situation of cargo bundling, because the advantages of bundling the cargo in terms of efficiency should outweigh the increased costs of waiting for a departure (Janic et al., 1999). With a high frequency service these waiting times are relatively low, and therefore it is likely that the benefits of bundling cargo will outweigh the costs of delay (Notteboom, 2008). Another improvement is that overall the bundling of cargo is assumed to increase efficiency of the total transport system (Janic et al., 1999). This can for example be realized by forcing a shift from road to rail and thereby decreasing congestion (Janic et al., 1999). For the port of Rotterdam bundling of cargo becomes interesting concerning

efficiency improvements when containers from the two ports for one destination can be bundled in the port area or through a hinterland terminal (R. Van den Berg, personal communication, November 18, 2014). Also, an advantage of the bundling of cargo is an increase in destinations that can be served from a terminal, as a consequence of the increased amount of containers that are transported (Bartosek & Schönemann, 2012; R. Van den Berg, personal communication, November 18, 2014).

The increase in frequency can be realized if the containers, which are transported through the ports of Rotterdam and Antwerp with as destination the CEE region, are bundled. This can be seen from Figure 9 below, which shows the amount of containers in TEU that are handled by the ports of Rotterdam and Antwerp, just as for among others its competitor the port of Hamburg. These containers all have a destination in the CEE region, and originate from East Asia.

Figure 9: Amounts of TEU transported through European ports



Note. From “Bundling networks for intermodal freight flows to the European hinterland” by Bartosek, A. & Schönemann, R., 2012, No. 4, Vol. 7, p.11. Available at: http://pernerscontacts.upce.cz/28_2012/Bartosek.pdf

Figure 9 shows that a large share of these containers has Poland or the Czech Republic as its destination. From Figure 9 it is also clear that the ports of Rotterdam and Antwerp separately already transport a large amount of containers into the CEE region, namely 8 and 6 million TEU respectively. As from this figure it becomes clear that around 80 million TEU was transported in and out of the CEE region in 2011, the ports of Rotterdam and Antwerp take a respectable share of 17.5%. Currently, from research at the Port of Rotterdam it showed that Rotterdam has a share of approximately 20% (R. Van den Berg, personal communication, November 18, 2014). The same accounts for the port of Hamburg, which with 6 million TEU also covers a significant share of the total volume in TEU. However, comparing the rail services between the ports of Rotterdam and Antwerp versus the port of Hamburg shows a big difference in frequency. Namely, Table 22 shows that the port of Hamburg on average has frequencies of around 15 weekly per destination and a maximum of 48 weekly, whereas Table 12 and 17 show that the ports of Rotterdam and Antwerp have an average frequency of around 10 weekly per destination and a maximum of 25 weekly. These numbers show that the rail services connecting the port of Hamburg and the CEE region are developed and utilized in a better way than the rail services are developed and used by the ports of Rotterdam and Antwerp. The joint amount of containers that is handled by the ports of Rotterdam and Antwerp compared with the amount handled by the port of Hamburg clearly indicates that the amount of containers is large enough to increase the frequency of rail services between the ports of Rotterdam and Antwerp and the CEE region. This amount in TEU that the ports of Rotterdam and Antwerp would jointly handle is namely more than twice the amount the port of Hamburg would handle. Because of this large amount of containers that need to be handled jointly, it seems to be possible and even necessary to increase the frequency minimally to the frequencies the port of Hamburg uses. The main reason for the necessity of a significant increase in frequency is that the ports of Rotterdam and Antwerp are then jointly able to benefit from economies of scale and because of that provide for a sharply priced product, in the same way the port of Hamburg is currently able to (K. Cuypers, personal communication, January 13, 2015). Another reason why such an increase in frequency is necessary is because the port of Hamburg, next to a sharply priced railway product also has very fast connections compared to the ports of Rotterdam and Antwerp, with speeds that most likely are significantly above the European average of 15 km/h (K. Cuypers, personal communication, January 13, 2015). Also, given the development of the CEE region during the last decade (see Tables 2-7), it is likely that container volumes will remain to increase significantly, at least after the recovery period from the economic crisis. Therefore, an increase in frequency should also be realized in order to be able to handle the increased volumes with as final destination the CEE region in the nearby future. An overview of the railway service frequencies from the port of Rotterdam and Antwerp in different situations compared with the frequencies from the port of Hamburg is presented in Table 31 below.

Table 31: Railway service frequencies

Port	Frequency	Weekly average	Increase in percentage*	Weekly maximum	Increase in percentage*
Hamburg		20	-	48	-
Rotterdam + Antwerp (1)		10	-	25	-
Rotterdam + Antwerp (2)		20	100	48	92
Rotterdam + Antwerp (3)		35	170	60	140

* Increase compared with Rotterdam + Antwerp in the current situation (1)

Table 31 presents the railway service frequencies from Hamburg to the CEE region, compared with the railway services from Rotterdam and Antwerp. The railway services from Rotterdam and Antwerp are based on three situations. The first one is based on the frequencies the ports individually offer in the current situation. The second situation brings the frequencies to the levels they are at the port of Hamburg, where the column describing the increase in percentage shows what the increase in percentage must be compared to the current situation of the ports of Rotterdam and Antwerp. The third situation is based on an increase in frequencies that higher than they are in the port of Hamburg, based on the fact that the combined amount of containers exceeds the amount that is transported through the port of Hamburg, and because of the necessity in relation to economies of scale and price setting. Again, the increase in percentage column shows what the increase in percentage is compared to the current situation of the ports of Rotterdam and Antwerp (which is situation 1). If the ports of Rotterdam and Antwerp aim to increase the frequencies to the levels they currently are at the port of Hamburg, a 100% increase in average weekly services is necessary, just as an increase of 92% in the maximum weekly service frequency. This means that the ports of Rotterdam and Antwerp must more or less double their frequencies, in order to provide the same frequencies as the port of Hamburg. When both ports aim at an increase to a level of frequencies that exceed the level within the port of Hamburg, an increase of 170% and 140% respectively is needed. This means that the ports of Rotterdam and Antwerp must more than double the average and maximum frequencies as opposed to the frequencies the port of Hamburg offers. Although these percentages seem to be high, it has to be said that the frequencies of the ports of Rotterdam and Antwerp are based on the situation wherein they do not cooperate. This means that both ports individually on average offer these services. Because of that, it might become easier to increase the frequencies when a cooperation is established. An example of a destination in the CEE region where such a cooperation is likely to be beneficial is the Slovak Republic. This is because that market currently is too small for the port of Rotterdam to further increase the frequencies and improve the service, which is likely to be different when there is a possibility to bundle with cargo from Antwerp (R. Van den Berg, personal communication, November 18, 2014). Also, because the frequency is based on a joint service with among others the aim to improve the train utilization, situation 3 is a realistic aim. The combined amount of containers that is handled by the ports of Rotterdam and Antwerp is more than twice as large as the amount that is handled by the port of Hamburg, whereas the frequencies are increased with around 75% compared to the port of Hamburg (35 as opposed to 20, see Table 31). By using the amount of containers in TEU as presented in Figure 9, it means that the current 6 million that the port of Hamburg is able to handle then also can be served by the ports of Rotterdam and Antwerp jointly, plus this extra 75% caused by the increase in frequency, which is 4.5 million (75% of 6 million). Together, this is 10.5,

which is 75% of the combined amount of containers the ports of Rotterdam and Antwerp would handle (see Figure 9, 10.5 million on a total of 14 million TEU). This means that with the current train utilization rates, it should be possible to transport 75% of the combined amount of containers in TEU that are transported through the ports of Rotterdam and Antwerp. However, a benefit of bundling cargo is that because of that utilization rates increase as well. Therefore, the aim is to fill the gap of 25% by increasing the utilization rate of the trains. Given the fact that container trains normally have an average utilization rate of 75%, this should be possible (Bowuza et al., 2011; Stive, 2008; “Keyrail facts and figures”, 2014). Additionally, it should be possible to transport this increased amount of containers mainly on the existing railway connections, given that the ports of Rotterdam and Antwerp share the high-developed connections eastwards and south eastwards, and there is sufficient capacity (R. Van den Berg, personal communication, November 18, 2014; K. Cuypers, personal communication, January 13, 2015).

In an ideal situation, the frequencies would increase to situation 3. The realization of that might be easier when a hinterland dry port and the in section 5.1.3 to be discussed IT system can support this development. The support of these other initiatives is very important, because it is not possible to just simply increase the frequency of railway services without taking other measures. For that it is important to have a node in the immediate hinterland that can support the bundling process (Bartosek & Schönemann, 2012). Also, it appeared that initiatives to start new direct shuttle train services are mostly terminated within half a year after the start, mainly because of problems with container availability and a fluctuating container supply (Bartosek & Schönemann, 2012). Such an increase in frequency will also be beneficial for customers, mainly because of the decreased waiting times within the port, but also because there will be less necessity to keep a large safety stock. Lowering the safety stock will also lower the costs for the port customer.

Additionally, a consequence of the increased frequency because of the bundling of containers by the ports of Rotterdam and Antwerp can cause that, together with the development of the hinterland dry port, it will be possible to serve more destinations. A potential consequence of this development can be that the ports of Rotterdam and Antwerp have improved their competitiveness in such a way that containers that were transported through the port of Hamburg or through one of the ports that transport small amounts to the CEE region will then be transported through the railway hinterland channels of the ports of Rotterdam and Antwerp. This would increase the amount of containers to be handled and the market share for the CEE region even further.

Notteboom (2008) states in his work that the feasibility of the bundling of cargo depends on the level of cargo concentration in the port area and the concentration of cargo in the hinterland. In this situation, the level of cargo concentration in the port area is high, because the amount of containers that are handled by the ports of Rotterdam and Antwerp together is by far the largest in Europe. On the contrary, for serving the CEE region the concentration of cargo is low, as the CEE region covers a large part of Europe. Notteboom (2008) states that in this situation, an inland terminal can be beneficial when bundling of cargo is realized. Also from this perspective, the options that are discussed so far should best be executed simultaneously.

There are criterions that can measure the performance of a cargo bundling system. These criterions are among others: size of terminals and routes, capacity of transport unit, frequency, schedule delay, average transport speed, costs, externalities, safety and reliability (Janic et al., 1999). It is likely that a cooperation between the ports of Rotterdam and Antwerp can increase the quality of these criterions significantly. This is because when these ports work together, terminals and routes can be shared, transports will be combined on trains that have a large capacity, and it showed that the frequency of the transports could be increased because of the combined amount of containers (Bartosek & Schönemann, 2012). Schedule delay and the average transport speed can be improved by the higher efficiency, and costs can also be lower due to efficiency improvements. This is mainly because of the increased frequency that is possible when the ports bundle containers, which causes less delays and waiting times. Also, the hinterland dry port will contribute to this by making the transshipment process more efficient, which improves the average transport speed (Konings, 2007). Together, these improvements can lower costs. Additionally, positive externalities in terms of the environment are likely to result from the decreased congestion problems, and safety and reliability can be improved by the increased efficiency and frequencies.

Suitable forms of cooperation

Concerning the bundling of cargo by the ports of Rotterdam and Antwerp, there are forms of cooperation that can possibly be used. The forms of cooperation that could be suitable in such a situation are an agreement/exchange of service on a commercial basis and a joint investment/joint venture (Van der Lugt & De Jong, 2013).

- Agreement/exchange of service on a commercial basis

For the bundling of cargo, an agreement on a commercial basis is a suitable form of cooperation. Because it is about the actual handling of the containers, which is one of the main operational activities in the port, it is on a commercial basis. The ports of Rotterdam and Antwerp can agree to fully exploit the capacity of trains, for example by bundling cargo with the goal of reducing the frequency of the trains. The ports can also agree to increase the frequency of the trains, in order to be able to improve the service to a 24/7 delivery schedule.

- Joint investment/joint venture

A joint investment also is a suitable form of cooperation, in addition to an agreement on a commercial basis. This is because the bundling of cargo can only be successful when there are physical facilities that can contribute to the actual process of cargo bundling. For building these facilities, a joint investment can be used. Also a joint venture is a possibility, especially when both ports want to externalize the risks of building these facilities.

5.1.3 IT system

The third option for improving the hinterland accessibility is the integration of IT systems. This option should be seen in relation to the other options, because it is likely to contribute to the success of these hinterland accessibility improvements.

The main contribution of an integrated IT system will be the improvement of efficiency. The main goal of an IT system is namely to decrease the administrative workload

(Almotairi et al., 2011). An IT system can improve the efficiency because it is able to create visibility within the combined supply chain of the ports of Rotterdam and Antwerp (Almotairi et al., 2011). From this it will be possible to coordinate the frequency of trains with multiple destinations, in order to realize the optimal utilization. An example of such an IT system is an EDI system, which stands for Electronic Data Exchange system (Almotairi et al., 2011). With the possibility to exchange real time data between ports it is likely that the efficiency of combined transports through bundling of cargo and through inland terminals will improve. Also, an IT system can improve the efficiency because it will make more effective decision-making possible (Almotairi et al., 2011). In a situation without an IT system it is likely that the decision makers do not possess all relevant information, which will result in inefficient decision-making.

Almotairi et al. (2011) state in their work that an IT system is necessary when a large amount of containers will be handled and transported through several terminals. This is because the transport of a large amount of containers is a complex process. The use of an IT system can structure a transport by sharing data between ports, but also between actors within the total transport supply chain. The use of an integrated IT system will thus somewhat simplify the situation (K. Cuypers, personal communication, January 13, 2015). Such a system can contribute to the cargo bundling process as well. The delays and waiting times are namely likely to decrease when the ports of Rotterdam and Antwerp decide to integrate their IT systems (Konings, 2007). Next to that, the use of an IT system can be realized at relatively low cost (Almotairi et al., 2011). When the ports of Rotterdam and Antwerp decide to cooperate by jointly developing a dry port and by bundling cargo, it appears to be necessary to use an integrated IT system for sharing all relevant information among actors. This is likely to have a positive effect on the efficiency of the transports, and with that contributes to the improvement of the hinterland accessibility. The hinterland accessibility can be improved by an increase of efficiency because it creates new possibilities such as increased frequencies, optimal utilization of trains and faster handling of administrative work that causes fewer delays. The integration of the IT systems can thus help improve a process, but a requirement for an IT system to be of additional value is that all parties involved in the use of the system cooperate and accept the system (R. Van den Berg, personal communication, November 18, 2014). For this acceptance a cooperation between the ports of Rotterdam and Antwerp can be beneficial, because such a large-scale application of an IT system will make it difficult for parties not to cooperate if they still want to transport through the ports of Rotterdam or Antwerp.

Suitable forms of cooperation

There are some forms of cooperation that could be suitable for the integration of IT systems. These forms of cooperation are the exchange of knowledge, joint lobby, an agreement/exchange of service on a non-commercial basis, and a joint investment/joint venture (Van der Lugt & De Jong, 2013).

- Exchange of knowledge

First of all, exchange of knowledge on existing IT systems is a suitable form of cooperation. With that, both ports might improve their individual IT systems based on the handling and transport of containers through the railway network into the hinterland.

- Joint lobby

Also, a joint lobby is a suitable form of cooperation. When ports want to introduce an IT system that is capable of tracking and tracing the containers on the railway connection into the hinterland, it would be beneficial to get cooperation from the local entities in each country the railway connection is located. With this joint lobby, the ports should make clear how the local entities could benefit from such a system; for example the increased frequency of trains that will be possible because of the improved efficiency of transporting the containers on the railway connection and through hinterland terminals, which then should be caused by the IT system.

- Agreement/exchange of service on a non-commercial basis

An agreement/exchange of service on a non-commercial basis also is a suitable form of cooperation. Both ports can for example agree upon the integration of IT systems for improving the railway connections to the CEE region, agree to jointly develop their individual systems, or agree to develop an improved, new system.

- Joint investment/joint venture

Related to the agreement/exchange of service on a non-commercial basis, a joint investment/joint venture is also a suitable form of cooperation when the goal is to improve the hinterland accessibility by the integration of IT systems. Especially concerning the development of a joint IT system, this form of cooperation is suitable. A joint investment can be made to develop an IT system that fits the needs of both ports for improving the hinterland accessibility. When both ports want to externalize the risks involved with the investment in an IT system, the suitable form of cooperation is a joint venture.

5.1.4 Previous cooperation initiatives by the ports of Rotterdam and Antwerp

The discussion of the initiatives that can be realized showed how the hinterland connections and with that the competitiveness of the ports of Rotterdam and Antwerp can be improved. There have also been previous initiatives between the ports of Rotterdam and Antwerp to cooperation, and by the ports individually to improve their competitiveness in the CEE market.

There has been attempts in the past to establish a cooperation between the ports of Rotterdam and Antwerp for setting up a hinterland terminal (R. Van den Berg, personal communication, November 18, 2014). However, it appeared that the cooperation could not be established. Explanations for that are that the ideas both ports had differed too much, and there is a different culture and way of working in both ports (R. Van den Berg, personal communication, November 18, 2014). Additionally, even when a cooperation between the ports of Rotterdam and Antwerp can be established, the port of Antwerp sees Rotterdam as a giant because it is the largest port of Europe, and thus as the party that will decide on the important matters and will decide on the direction of the cooperation (R. Van den Berg, personal communication, November 18, 2014). Even though the port of Rotterdam states this is clearly not true in practice, this can clearly be a bottleneck in establishing a cooperation, just as it will be a disadvantage when a cooperation will be established (R. Van den Berg, personal communication, November 18, 2014). This means that the trust barrier mentioned in section 3.4 applied to this situation. Also, another barrier or disadvantage often plays a role in potential

cooperations between the ports of Rotterdam and Antwerp. This is the barrier of the division between costs and revenues within a cooperation. Usually, a cooperation is beneficial for both ports involved. However, for example in relation to bundling of cargo, it can be that one port gains more from the cooperation than the other (K. Cuypers, personal communication, January 13, 2015). Then, there is the risk that this one port eventually sets up the same connection individually, leaving the other port with no cargo and no revenues for a connection that does still involve costs. In that case, the other port only helped the other port setting up the connection (K. Cuypers, personal communication, January 13, 2015). Therefore, there must be a strict and clear agreement on the division of costs and revenues between the ports involved in the cooperation. A barrier concerning the division of costs and revenues also relates to the barrier of trust, because it involves the factor of trusting (or mistrusting) the other port for complying with the agreement in relation to the division of costs and revenues. Barriers to cooperation thus in fact do in some cases block the establishment of a cooperation. However, a solution to this problem could be that a cooperation is set up in a different way, namely when an independent third party is involved (K. Cuypers, personal communication, January 13, 2015). Currently, there is a project in Nordrhein Westfalen, Germany, where the ports of Rotterdam and Antwerp are jointly involved (K. Cuypers, personal communication, January 13, 2015). This project already runs for several years, and the aim is to develop the site into a logistic zone. In this situation the local governments in Nordrhein Westfalen asked for the participation of the ports of Rotterdam and Antwerp, mainly in the forms of funding, expertise and marketing. These are areas in which both ports do not have conflicts of interest, which could make it a potentially long lasting cooperation. Participation in the form of funding, expertise and marketing namely has nothing to do with gaining advantages in relation to cargo being transported, in which case conflicts of interest can easily arise, and with that the creation of disadvantages to a cooperation or even barriers. Although there are no direct benefits of participating in this form concerning cargo, both ports do benefit from the fact that a logistic zone is developed, which will likely indirectly cause the cargo transported through the ports of Rotterdam and Antwerp to increase.

Individually, the port of Rotterdam has in the past invested in setting up a hinterland terminal in the Czech Republic and the Slovak Republic (R. Van den Berg, personal communication, November 18, 2014; K. Cuypers, personal communication, January 13, 2015). However, this was not successful. It appeared that the majority of the cargo was still transported through the port of Hamburg. An explanation for that could be that even though the realization of a hinterland terminal in both CEE countries facilitated efficient cargo handling, still the frequencies and the sharp prices the port of Hamburg offered could not be met only by facilitating this. As prices are very important for shippers, that could explain why solely investing in a hinterland terminal in the CEE region has not been successful in the past.

5.2 Economic model effects

After the discussion of the actions that can improve the hinterland accessibility to the CEE region, and showing how a cooperation between the ports of Rotterdam and Antwerp could significantly support the realization and the effect of these initiatives, in this section the effects on the economic models of both ports will be addressed. As this research focuses on the aim for the ports of Rotterdam and Antwerp to improve their

competitiveness for serving the CEE market by improving their joint hinterland accessibility, the focus was firstly on the revenue model approach within the economic model. However, as previously discussed, initiatives based on the revenue model are also likely to have an impact on the cost model within the economic model. Therefore, Figure 10 will present an overview of the effects of the initiatives for improving the hinterland accessibility on their economic models.

Figure 10: Effects on the economic model of the ports

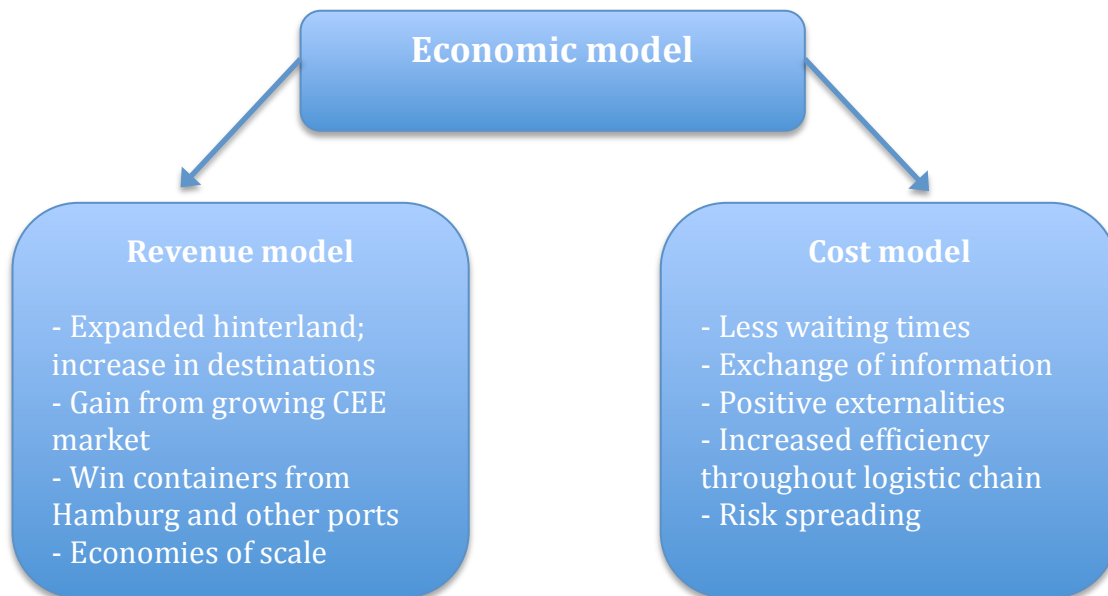


Figure 10 shows which effects the joint initiatives of the ports of Rotterdam and Antwerp can have on their economic models. The research focuses on the revenue model approach, which also shows improvements. The first effect is that because of the initiatives, the ports of Rotterdam and Antwerp will be able to expand their hinterland. Because of that, it will be possible to serve an increased amount of destinations. This will likely have an effect on the revenues of both ports. Additionally, the ports of Rotterdam and Antwerp will likely benefit from the improved hinterland accessibility because through that both ports will be able to benefit from the transport growth in that developing region. This is because when the ports are able to involve themselves more in that market through improved hinterland accessibility, they will automatically benefit from the development of the region, without for example attracting cargo that is normally transported through another port (K. Cuypers, personal communication, January 13, 2015). Also, with the improvements caused by the initiatives, it might be possible to win a share of the containers that are currently transported to the CEE region through the port of Hamburg or through other, perhaps smaller ports. This would also involve an increase in revenues for the ports of Rotterdam and Antwerp. Next to that, the ports will be able to benefit from economies of scale, especially because of the increase in frequencies and the bundling of cargo, which will make it possible to set sharp prices, and because of that it is likely that additional cargo can be attracted.

Although the initiatives were aimed at improving the hinterland accessibility in order to serve the CEE market, which focuses on a new source of revenues, there are also cost

effects within the economic model of the ports. Firstly, higher frequencies that can be realized because of a hinterland dry port, the bundling of containers and an integrated IT system, will cause less waiting times within the port and will likely decrease the size of safety stocks that port customers keep. Waiting times caused by rail operators will also likely decrease within the port area, as containers will be transported directly to a dry port in the hinterland (K. Cuypers, personal communication, January 13, 2015). Secondly, the exchange of information through an integrated IT system will likely increase the efficiency of operations, which will lower the costs. Also, positive externalities are likely to result from establishing a hinterland dry port. This would namely move some port activities to the hinterland, which will decrease congestion and pollution in the direct port area. Given that environmental damages and congestion cause increased costs for ports, for example because of fines, moving activities to a hinterland dry port will likely lower costs within the direct port area. Additionally, in case all three initiatives will be realized, the port can benefit from an overall increase in efficiency throughout the logistic chains, which will likely result in a decrease in transit times and lower costs. Next to that, the ports will be able to spread the risk in investments relating to the initiatives, which also decreases the possible loss to be incurred when the initiative appears to be unsuccessful.

Because of a cooperation between the ports with the aim of increasing the hinterland accessibility to the CEE region, it is also likely that there will be effects on the business model of the respective port authorities, especially on the revenue model. Namely, because of investing in the development of a hinterland terminal and gaining ownership of it, the port authorities will also be able to gain additional revenues. Additionally, improved hinterland accessibility and with that the attraction of cargo with as final destination the CEE region, will likely increase the port dues the respective port authorities can collect. Next to that, it might be that actors with as main focus serving the CEE region will locate in the one or both of the ports, which will also generate more revenues from land rent for the port authorities.

In conclusion, this chapter discussed the promising area of port cooperation. It appeared that a cooperation could best be established within the area of railway connections. Next to that, it showed which initiatives within this area could improve the hinterland accessibility. These initiatives are investing in the development of a hinterland dry port, bundling of cargo, and the development or improvement of an integrated IT system. Also, the potential bottlenecks and disadvantages of a cooperation between the ports of Rotterdam and Antwerp are briefly discussed. Finally, the economic- and business model effects of these initiatives were addressed. From that, it showed that there are effects on the revenue model, but also on the cost model within the economic model for both ports, and mainly on the revenue model within the business model of the port authorities.

Chapter 6: Conclusion and discussion

In this section the conclusion is presented. An overview of the main findings will be provided for, and these findings will briefly be discussed. Additionally, some recommendations for further research are included.

In order to see how cooperation could be applied to ports, it was determined how cooperation could fit into the economic model of a port. It appeared that improving the hinterland accessibility mainly fits into the revenue model approach because its aim is to serve new markets, but it will also have consequences for the cost side of the economic model. The benefits of port cooperation mainly relate to cluster externalities such as risk spreading, increased efficiency and economies of scale. Cooperation can also be beneficial in relation to hinterland accessibility, information sharing and lobbying. Some forms of cooperation are more suitable for application to a specific functional field within port management than other forms of cooperation. A joint venture/joint investment has a broad application, whereas a cross participation is usually only applied in limited occasions. Also, there is a difference based on the short-term versus long-term perspective and the degree of embeddedness for each form of cooperation. A strategic alliance is usually based on a long-term perspective just as it involves high embeddedness, whereas an agreement/exchange of service on a commercial basis normally is based on a more short-term perspective and low embeddedness. There also appear to be potential barriers to all forms of cooperation, such as the trust barrier and the barrier concerning the division of costs and revenues in a cooperation.

The analysis of the development of the CEE region showed by making use of key economic indicators that there has been a steep economic development during the previous decade. However, this development was clearly influenced by the worldwide economic crisis. Because of that, there were only small economic developments during that period. There will probably again be a moderate increase in the development of the CEE region during the recovery period from the economic crisis, and it is likely that the steep development will continue after this recovery period. When looking at individual countries in the CEE region, Slovakia, Poland and the Baltic States are the countries that showed the relatively steepest economic development.

The ports that are competing for serving this region and where the research has focused on are the ports of Rotterdam, Antwerp, Hamburg and Gdansk. The port of Rotterdam is the largest port of Europe, and has the important characteristic that the largest containerships in the world are able to moor 24 hours per day. The analysis of the port of Rotterdam resulted in the maritime accessibility, the railway connections to the hinterland and the quality of the port system being the competitive advantages for serving the CEE region. The port of Antwerp has the most beneficial geographic position in relation to the maritime transport, but it appeared that this advantage is only important concerning transit time, as the prices for maritime transports from Asia to Europe are the same irrespective of the port that is used. The competitive advantages of the port of Antwerp are the maritime location, railway hinterland connections, and the quality of the port system. The port of Hamburg is well known for its fast and sharply

priced railway connections into the CEE region. Also, the high frequencies via rail into the CEE region are beneficial for its position. The competitive advantages of the port of Hamburg for serving the CEE region are the quality of the port system, the geographical position in relation to the CEE region and the fast rail and road connections. The port of Gdansk has the advantage of being located within the CEE region, but the poor maritime accessibility makes it difficult to transport through that port. For the port of Gdansk the competitive advantages are the geographical position in relation to the CEE region, the short transport times via road and rail, and the quality of equipment and customer focus within the port system.

In order to be able to determine the promising cooperation area for improving the hinterland accessibility, the transit times from Shanghai to a centrally located destination in the CEE region, Prague in the Czech Republic were compared. From among others this comparison of transit times between the ports that are competing for serving the CEE region, it appeared that the port of Gdansk is most competitive for serving the Baltic States, but cannot compete with the other ports for serving the rest of the CEE region. This is mainly because of the significantly longer transit times involved with transports through that port. Therefore, the competition would be between Rotterdam and Antwerp against Hamburg. Further, the comparison between the competitive advantages of the ports of Rotterdam and Antwerp on the one hand as opposed to the port of Hamburg on the other hand resulted in the improvement of the railway hinterland connections as the promising cooperation area. This is mainly because the other competitive advantages could hardly be influenced, and because in the railway connections a lot of improvements are possible for the ports of Rotterdam and Antwerp.

Within the cooperation area of improving the railway connections, three different actions are proposed that can contribute to this. These actions are: investing in the development of a hinterland railway terminal, bundling of cargo, and the integration of IT systems. Investing in the development of a hinterland terminal could among others contribute to an increase in efficiency, a decrease in congestion and waiting times, and can be realized by using a joint investment/joint venture. Bundling of cargo can increase the frequency of the connections to the CEE region, and provide for economies of scale. In that way the ports of Rotterdam and Antwerp will be better able to compete with the sharply priced railway product of the port of Hamburg. Bundling of cargo can among others be realized through an agreement/exchange of service on a commercial basis. The integration of IT systems could improve efficiency, and can among others be realized through an agreement/exchange of services on a non-commercial basis.

Previous initiatives undertaken by the ports of Rotterdam and Antwerp jointly or individually showed that solely and individually investing in the development of a hinterland terminal in the CEE region has been unsuccessful. Namely, the majority of the cargo remained to be transported through the port of Hamburg. What has been successful is the participation of both ports in a project in Nordrhein Westfalen, where an independent third party is involved in the actual development of a logistic zone, and both ports participate in the form of funding, expertise and marketing. When an independent third party is involved in the operations, the risk of conflicts of interests between the ports decreases significantly, which conflicts are likely to be there when a cooperation directly involves cargo. In the case of such conflicts of interests, there can be

disadvantages or even barriers relating to trust or the division of costs and revenues within a cooperation. The main risk is that one port in fact only helps setting up a new connection for the other port, because in the end the other port decides to run the connection individually.

The effects on the economic model of both ports showed that on the revenue side there are benefits relating to an expanded hinterland, the growth of the CEE region on itself, winning containers from Hamburg and other ports, and economies of scale. On the cost side there are benefits relating to less waiting times, exchange of information, positive externalities, and risk spreading. There are also effects on the business model of port authorities, especially on the revenue side. There, advantages can be gained through the attraction of cargo, as incomes from port dues will then rise. Also, the likelihood that actors involved in transports to the CEE region will locate in the port area causes the creation of extra revenues for port authorities through land rents.

In conclusion it can be stated that in order for ports to improve the accessibility to the Central- and Eastern European hinterland through cooperation, it is necessary to jointly optimize the railway hinterland connections. If the proposed initiatives will be used in order to achieve that, it is important that an independent third party is involved, as that will likely avoid conflicts of interests. Because of the optimization of the hinterland connections, the ports of Rotterdam and Antwerp could among others jointly increase the efficiency, facilitate actors with an environment in which sharper prices are possible, and increase the frequencies to the CEE region. These are things that both ports individually were unable to establish. With the realization of among others those things, both ports could in cooperation be able to compete with its biggest competitor the port of Hamburg, which has many, fast and cheap connections into the CEE region.

Recommendations for further research

The results of the analysis of different ports that can serve the CEE region can always be further improved. In this section, some recommendations for further research are presented.

Firstly, further research could help to determine whether or not a cooperation between the ports of Rotterdam and Antwerp is feasible. There can be many reasons why a cooperation between two ports is not feasible, even though in theory it would be beneficial for both ports.

Second, collecting more qualitative data through interviews with multiple stakeholders of a cooperation between the ports of Rotterdam and Antwerp with the aim of improving the hinterland accessibility to the CEE region could contribute to providing a more complete overview of the different perspectives of looking at such a cooperation. Additionally, a further investigation of the railway development plans of the European Commission could contribute to the analysis of two ports that want to improve their competitiveness for serving the CEE region by improving the hinterland accessibility. Also, the focus of the analysis could be changed in order to present a more complete overview. Namely, in this research the focus was only on transports from Asia to the CEE region. A possible contribution to the analysis would be to expand the origins of the transports with as destination the CEE region to areas outside Asia.

Next to that, further research can focus on what the exact optimal location for a hinterland dry port is for the ports of Rotterdam and Antwerp, because the location of a dry port is important for the success of it.

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Appendix

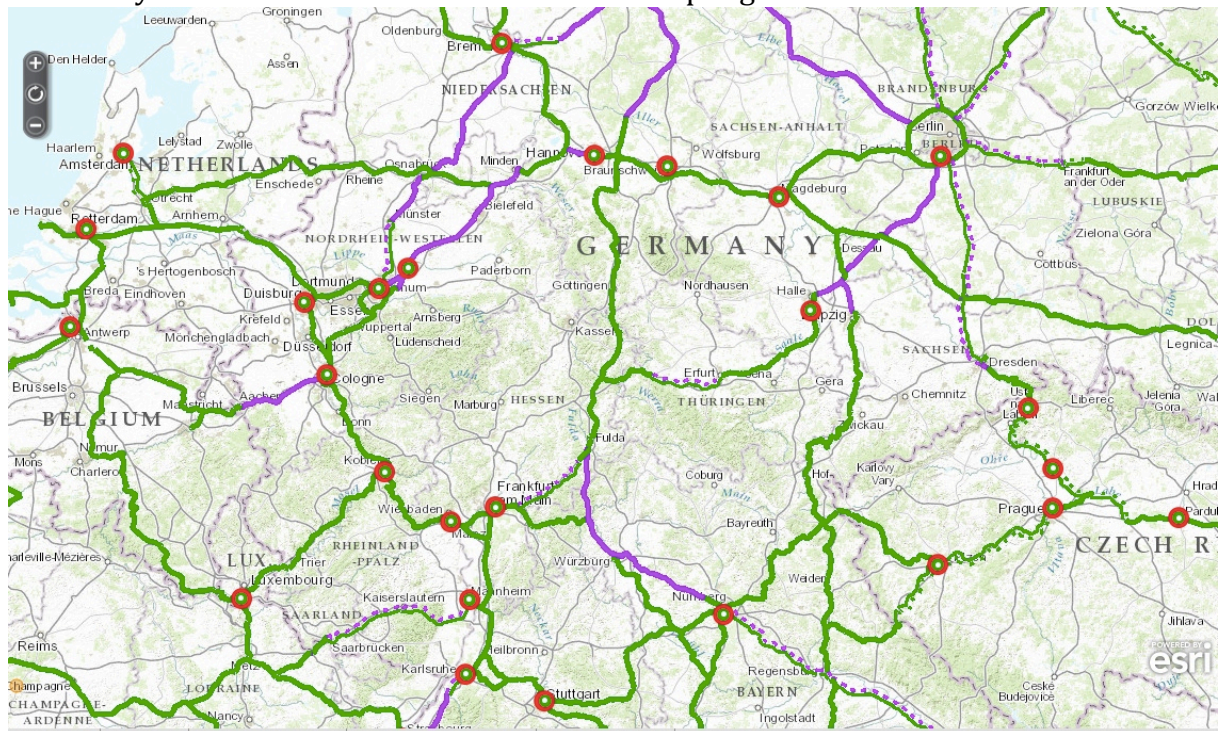
A. Average numbers key economic indicators CEE region*

Average CEE	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Export	-	8,9	21	18,8	21,2	15,8	11,9	-29,8	25,9	20,8	2,3	5,3	4,227	3,082	1,936	0,791
Import	-	9,1	18,5	16,1	23,2	19,3	9,8	-28,6	21,4	19,2	0,7	4,4	2,613	1,335	0,056	-1,222
GDP	4,691	5,564	6,009	6,073	7,218	6,836	2,709	-8,009	1,191	3,309	0,945	1,209	-0,786	-1,391	-1,996	-2,6
HICP	88,593	91,739	96,172	100	104,214	109,634	118,592	121,679	124,361	129,062	133,53	135,657	142,479	147,049	151,62	156,191
Interest rate	8	5,98	6,02	3,99	4,25	5,29	6,49	5,18	2,35	2,49	2,13	1,31	1,339	0,860	0,380	-0,099
Unemployment rate	11,386	11,258	11,248	10,565	8,931	7,128	6,485	9,444	11,079	10,248	10,157	10,072	9,199	9,102	9,004	8,907

Source: Eurostat/OECD statistics

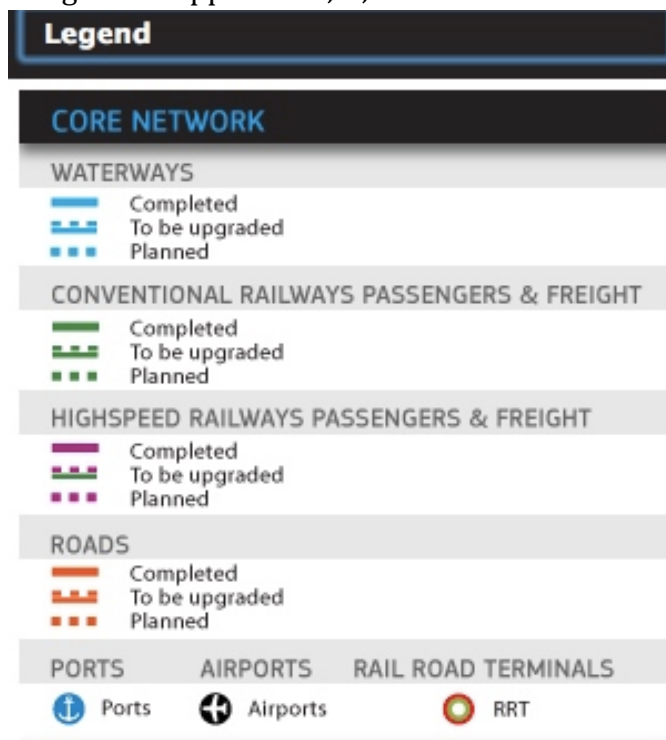
*No numbers for Albania are included

B. Railway terminal network Rotterdam – Antwerp region*



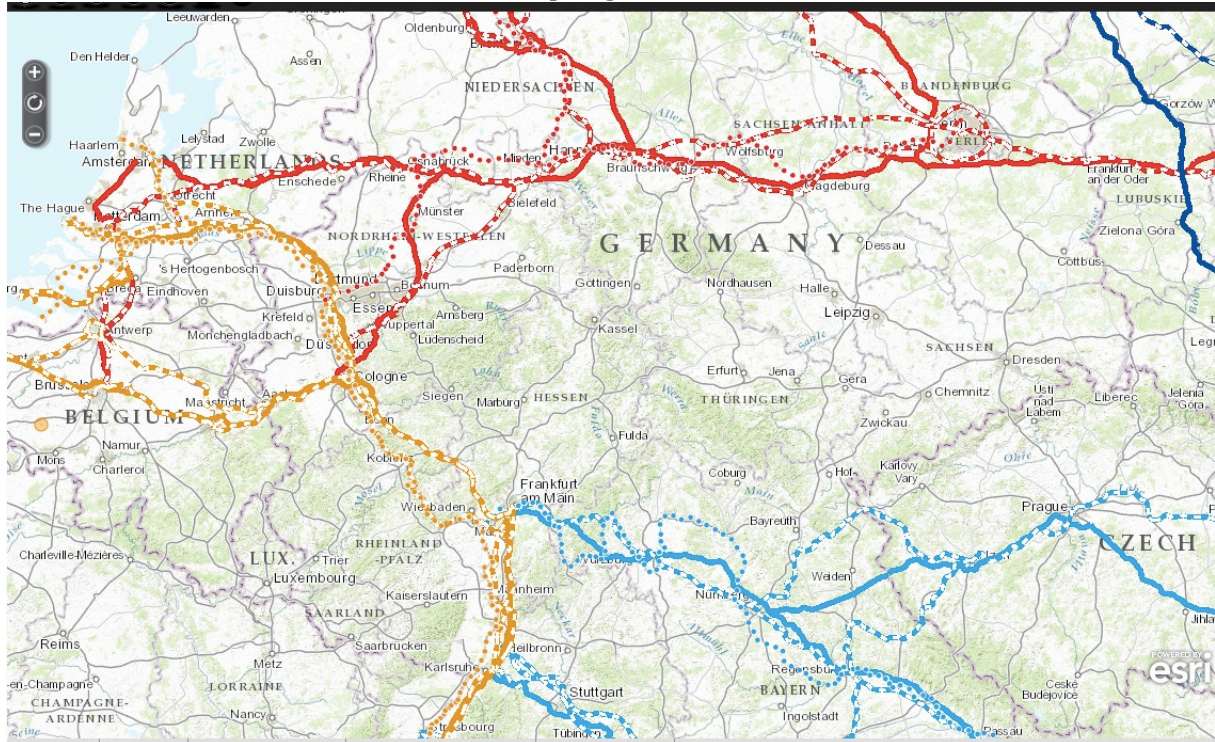
Adapted from European Commission Mobility and Transport, in Trans European Transportation Network TENtec, n.d., Retrieved August 2014, from <http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/main.jsp>

* Legend of Appendix B, D, F



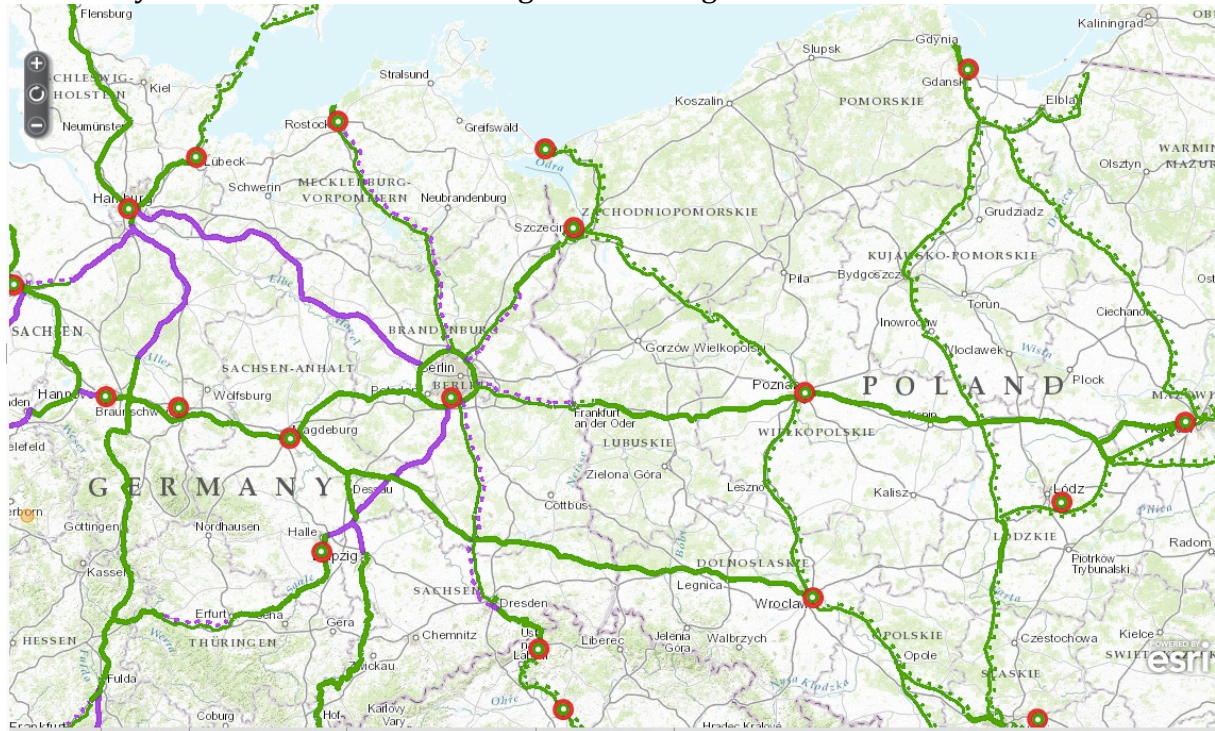
Adapted from European Commission Mobility and Transport, in Trans European Transportation Network TENtec, n.d., Retrieved August 2014, from <http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/main.jsp>

C. TEN-T corridors Rotterdam – Antwerp region



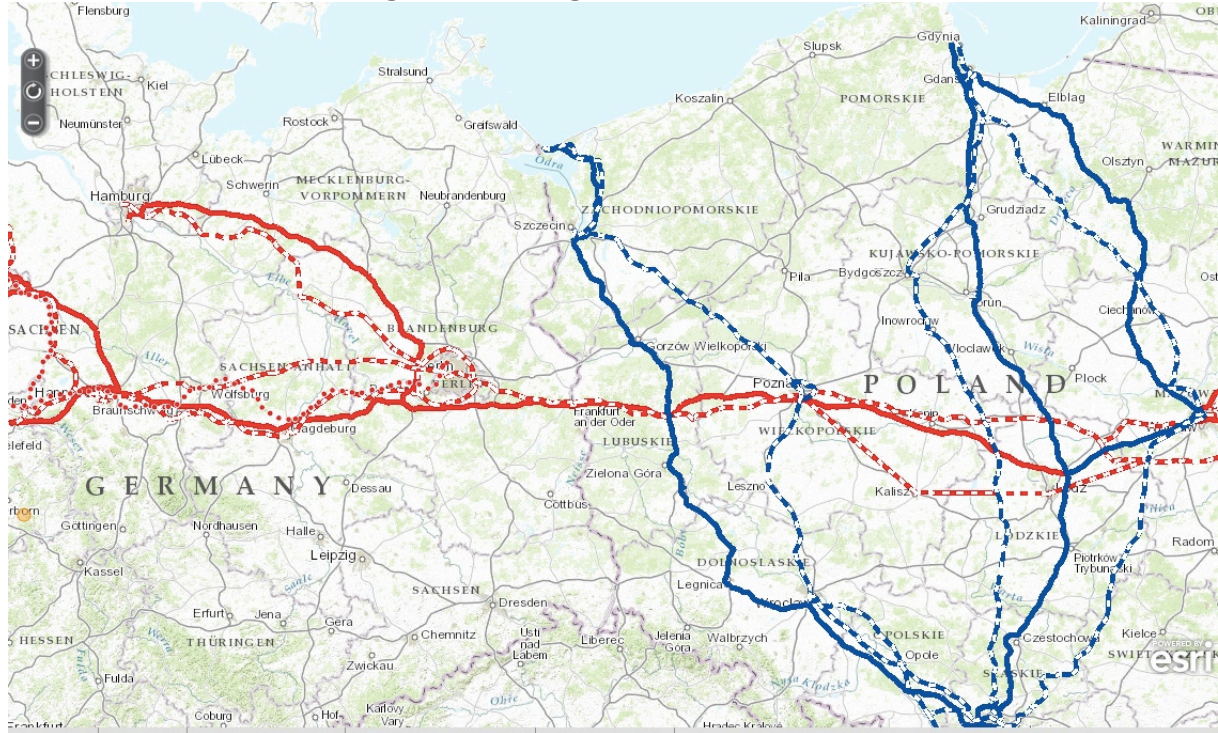
Adapted from European Commission Mobility and Transport, in Trans European Transportation Network TENtec, n.d., Retrieved August 2014, from <http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/main.jsp>

D. Railway terminal network Hamburg – Gdansk region*



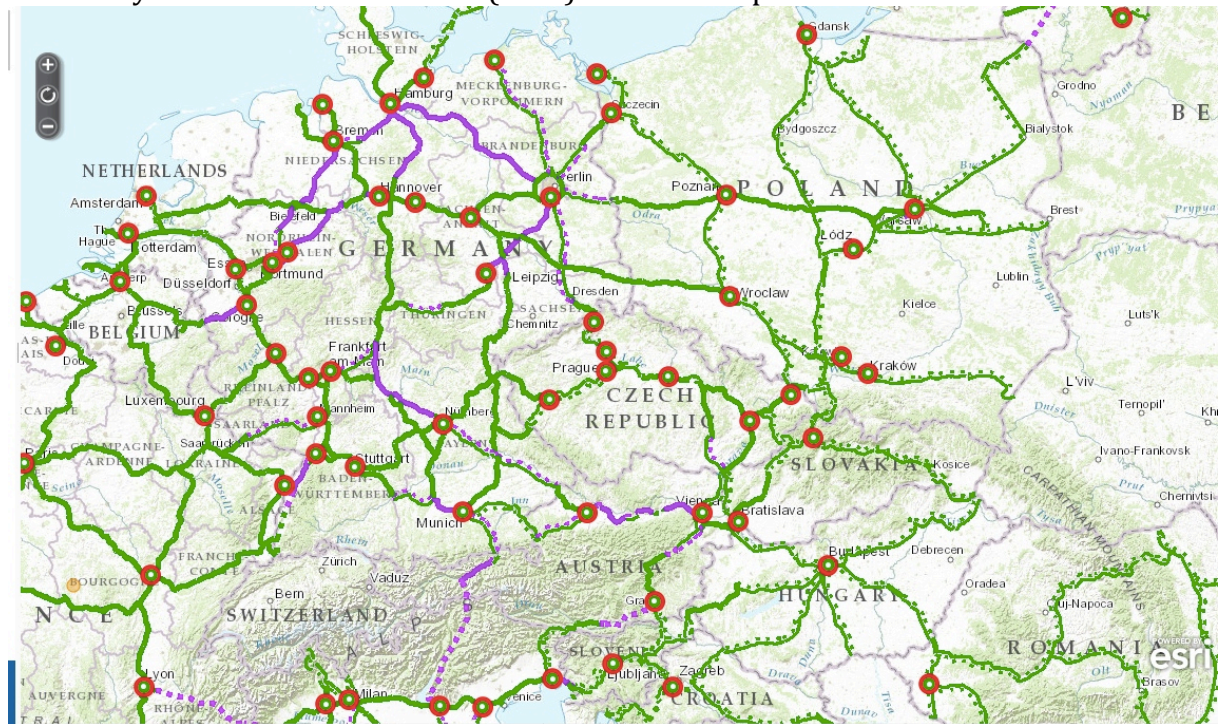
Adapted from European Commission Mobility and Transport, in Trans European Transportation Network TENtec, n.d., Retrieved August 2014, from <http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/main.jsp>

E. TEN-T corridors Hamburg – Gdansk region



Adapted from European Commission Mobility and Transport, in Trans European Transportation Network TENtec, n.d., Retrieved August 2014, from <http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/main.jsp>

F. Railway terminal network north (west) and CE Europe*



Adapted from European Commission Mobility and Transport, in Trans European Transportation Network TENtec, n.d., Retrieved August 2014, from <http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/main.jsp>

G. TEN-T corridors north (west) and CE Europe



Adapted from European Commission Mobility and Transport, in Trans European Transportation Network TENtec, n.d., Retrieved August 2014, from <http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/main.jsp>

H. Interview with Roy van den Berg, Business Manager Logistics – Intermodal Transport & Hinterland Development
Port of Rotterdam

Q: What is the market share of Rotterdam in serving CEE in the container market?

A: It appeared from research conducted by the Port of Rotterdam that there is not a large market share. This research was based on connections and volumes. A precise number is not known, but it is somewhere around 20%.

Q: What is the modal split in serving the CEE region?

A: It is a possibility concerning capacity to transport via road, but it is too expensive. Especially when compared to transports via Hamburg and Gdansk, who also transport via rail. Therefore, it is not competitive to transport via road to the CEE region. The transports into the CEE region are mainly performed via rail. The further away from the Netherlands, the larger the share of intermodal transport. Only around 5% of the road transport coming through the port of Rotterdam leaves the Netherlands. There is not much to win in the area of road transport. Maybe there are a lot of road transports into that region, but not via the port of Rotterdam.

Q: What are the top 3 destinations in CEE for Rotterdam?

A: The Czech Republic is an interesting market for the port of Rotterdam. But, because the distance between Rotterdam and Czech Republic is a lot further than when compared to Hamburg/Gdansk, competition with these ports is difficult. Also the south area of Poland is an important market, where ERS has established a position. And the Slovak Republic, but that is not a really large market. It is interesting, but the current volumes are not that large yet.

Q: In what areas do ports that aim to serve the CEE region compete?

A: Price is important, but transit time as well. It is a trade off. This mainly depends on the value of the cargo that is being transported. The lower the value of the cargo, the less important is the transit time. Also the volume needs to be considered, because a large volume of low value cargo can still represent a high value. The transit time is more and more included in the price of the transport. So that it takes more time (maybe 3 days more) to transport the goods via Hamburg does not really matter, as long as there is a substantive cost reduction because of that.

Comparing Rotterdam and Hamburg: the price of sea transport is the same. In this respect, it does not matter which port you choose. So only transit time will be longer, and if you can arrange that with lower hinterland transport cost, the choice is easy made. Next to that, hinterland connections are crucial for the transport of containers into the hinterland, because when those are not there the transport becomes difficult. Reliability and frequency are also important.

Q: Which port is the biggest competitor for serving CEE for Rotterdam?

A: Hamburg is the biggest competitor, because they have a lot of connections into that region. That makes it difficult for Rotterdam to get a position there. Next to that, their prices are set very sharply.

Q: What will be needed in the area of hinterland connections to improve the competitiveness for serving the CEE market?

A: In the past Rotterdam has looked into hinterland positions. This focused on an investment in a hinterland terminal. This has actually been done in the past for the Czech Republic and Slovak Republic, but they were sold because of various reasons. But in general, when the aim is to invest in land for the development of a terminal, it is difficult in the Netherlands, but even harder in foreign countries. So for that, also a long time scale is necessary, because it will take a long time to realize it. Next to that, also suitable locations are difficult to find. So also, next to money, time is needed. It is not possible to develop a hinterland terminal within 6 months.

Besides, the question is whether it can be profitable. Because when you develop such a terminal in for example Prague, it will also be open to use for Hamburg, because a terminal only for Rotterdam will be too expensive. This is because most likely there are not enough connections to make it profitable. Therefore, the open terminal will most likely also be used by Hamburg, Antwerp and Gdansk. And then what is the point in developing it. However, there are chances concerning a hinterland terminal, because it will make it easier to coordinate and promote caused by the fact that you are closer to the market.

Q: What do you need to realize the improvement in competitiveness?

A: Currently the capacity is sufficient, the biggest problem is that when the aim is to start a new rail connection in order to be able to handle future increases in container volumes, a utilization rate of around 80% on the train is necessary to run break even. Assume that with a 5 times weekly frequency, around 30.000/35.000 containers are needed to make it profitable. Around 5 times a week, 1 time per day, is a reasonable frequency, which makes it competitive. Thus, a competitive connection can only be profitable when such large volumes are available. When then the costs of running the train back and forth are also around 30.000/35.000 euros, then there is a large risk, because when the utilization rate decreases to an insufficiently low level, you would lose 150.000 euros in a week when there is nothing on the train. This is because you have to run it as people expect that they can book the train, which means a loss of more than 1 million within 2 months. Also, parties do not easily switch, which makes it difficult to develop something like that. Therefore, the risk is very large. So, on the capacity side there currently is not really a problem, although some improvements can be made there concerning for example transit times. It is more the risks that are concerned with starting something new like that.

Q: What is the port of Rotterdam undertaking in the area of hinterland connections to improve their competitiveness for serving the CEE region?

A: When looking at the region in the south of Germany, and also Slovak Republic, Austria, then those are regions where Rotterdam does not have a large market share. So, in these areas Rotterdam wants to establish new connections. But again, the risk is very large, so the aim is to invest together with other parties, in order to decrease the risk for the private party. Because of that, they are more likely to develop these connections. Also, Rotterdam is able to contribute to the promotion and marketing of such a connection, because the reach is very large for Rotterdam. So with investing and supporting private parties with promotion and marketing, the aim is to stimulate the faster development. Currently, there are some examples concerning new connections and increases in the frequencies. With these initiatives you see that there are always some start-up losses, which all parties aim to reduce. By investing with the parties the port of Rotterdam will also take these losses, but in the end also benefit from the profits

resulting from that. These profits in turn will be used to come back to the break-even level, in order to be able to invest again. The aim is not to make a high profit, but to make it possible to invest again in new connections.

Q: How can cooperation relating to ownership bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: When Rotterdam is setting up a terminal, this is always a cooperation with a private party. It is possible to set up a cooperation with Antwerp to do that, but then you have to look into how to do that. For example whether it will be a 50-50 investment. However, it will always be the development of the land for the terminal, not the development of the terminal itself. It is also possible to set up additional infrastructure, which will be included in the rent. Renting land is a main part of the business model of the Port of Rotterdam: income from rent of land, and port fees. The division of that is about 50-50. The core business is developing land and renting it to companies.

Q: How can cooperation in coordination relating to a hinterland terminal bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: Again, the question is: who is the owner? Is it the Port of Rotterdam, because we are not involved in the process. Then it is better, like it is at ECT, which is providing extended gateway services. ECT is owner of a number of inland terminals, so they can optimize the process between their terminal and the hinterland terminal, because they will have a direct influence on it. So there this effect is present, where they can play such a role. The Port of Rotterdam is not capable of doing something like that, because we are not involved in the operations. It is possible to coordinate, but real involvement in the operations is not happening.

Q: So, then it will not be beneficial, because Port of Rotterdam does not have a lot of influence on the process?

A: It is possible to identify the things that need to be improved, like infrastructure, IT, agreements on quality. So it is possible to control things like that, but in the end it is about how the operational actors will handle this for themselves.

Q: How can cooperation relating to an IT system bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: There have been initiatives concerning barge connections, mainly concerning the coordination in the port area. Currently, there is also a large project in this area. The Port of Rotterdam is also involved in this project. But it is important that all parties who have an interest in the system will also cooperate. It has been the case that only the barge operators or the inland terminals were developing such a system, but when the deepsea terminals are not involved, it does not work. This is mainly because it is important to have a clear agreement. So IT is a means to improve a process, but in order for it to work out, every actor has to use it. The same accounts for the Port of Rotterdam's CRM (Customer Relations Management) system, which is very useful. However, if it is not used in the proper way, then it is of no use at all. So it is important to use it, the same with an IT system. When every actor uses it, it is useful. But when every actor uses it in a different way, it will become a mess and will have no additional value. Thus IT on its own is not a problematic factor, everything can be build. But it is more about acceptance and the use of this system.

Q: How can cooperation relating to sharing costs bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: Considering Antwerp, it is possible to cooperate alongside the river Rhine in developing a terminal, which will create profits for both ports, which makes it a logical move to do that jointly. It is also a possibility to think that a train runs in a triangle (for example Prague, Antwerp, Rotterdam), which can also be interesting considering the bundling of cargo. So that is also an option. However, it will increase the transit time, and then you have to determine whether it is interesting enough.

Concerning the cost of improving hinterland connections, the Port of Rotterdam invests in land, sometimes a little of the infrastructure, and then rent it to the terminal operator. For doing this, the finances are not a problem. This is because these actions are executed a lot within the port area, and it is the core business of the Port of Rotterdam. This means that the funds are there, and thus that sharing costs with Antwerp will not be necessary.

Q: How can cooperation relating to lobbying bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: Concerning certain infrastructure it can be beneficial to do it together, because it is important for both ports. But when for example looking at the Betuweroute connecting the Netherlands with Germany, Antwerp did not lobby for that, and obviously the Port of Rotterdam did. So, a lobby can be stronger when two ports are executing it jointly, but that will only happen when there are interests for both ports.

Q: How can cooperation relating to efficiency bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: Bundling of cargo is a possibility when it is organized in a good way. In fact, when there is a connection between a port and a hinterland terminal then there already is some bundling on a train. But when there are containers from both ports for one destination, which will be bundled in the port or somewhere in the direct hinterland and then transported through the hinterland terminal (or via a circle/triangle construction), it becomes interesting concerning efficiency improvements.

Q: How can cooperation relating to container flows bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: Maybe there are sufficient container flows, but we do not have a clear picture of that. We do not have precise knowledge of where every container goes. When we would know that, it would have been easier to show the precise container flows, because then you can plot it and then look at where you possibly need to develop further. Thus, first you have to identify these container flows before you can develop something new. For example in the area of Prague, you have to look at which companies are located there, and to which ports they transport, or from which port they import, and then you have to look whether there is a potential to do that through rail to Rotterdam, or you have to convince parties to transport via Rotterdam. In that situation the connection can be a bottleneck, when that is not present or of bad quality they will not go via Rotterdam. Additionally, it can also be a possibility that they use a shipping company that does not transport via Rotterdam. Although most shipping companies do transport via Rotterdam, it can be that this party uses a shipping company that does not. When that is the case it can be a bottleneck, because then another shipping company must be chosen,

and that shipping company will also have to transport via rail to Rotterdam. Thus, it is usually not the case that it is only concerned with the piece of actually bundling cargo, but you have to see the wider context. That all these factors must be considered makes it clear that it is a difficult process.

For most countries the Port of Rotterdam does have a clue where the containers are going, but not precisely. There is a possibility that there is a country where volumes are too low or too wide-spread, which makes it not interesting to set up a connection for that. Thus, a cooperation with Antwerp for the connections with these countries could be an advantage, making it possible to reach a wider market when bundling containers.

Q: How can cooperation relating to sharing routes bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: There are mainly direct connections from Rotterdam into the CEE region. An example is the connection with Stuttgart, which departs from Rotterdam, then goes to Duisburg, Stuttgart, and back to Rotterdam. A cooperation based on direct connections can be possible, dependent on the type of cargo. However, this is again a difficult process, because the infrastructure within the port area normally is more complex than it is in the area of the hinterland terminal. This will make it more difficult to implement.

Q: Where can cooperation bring disadvantages in this process of increasing the competitiveness by improving the hinterland connections?

A: There have been contacts with Antwerp concerning a cooperation for setting up a hinterland terminal, but it is difficult to organize that in a good way. There has been contact with Antwerp to jointly invest in a terminal in Germany, or in the port, but it appeared to be difficult, because the ideas differ between the parties, and there is also a different culture and way of working, which further complicates matters. Also, Rotterdam is being seen as a giant, so on the one hand it is nice to be the largest port in Europe, but on the other hand other ports within Europe feel very small compared to Rotterdam. They are afraid that Rotterdam will determine everything in a cooperation. However, this is not the case, because the ports will decide together.

I. Interview with Koen Cuypers, Senior Advisor Intermodality & Hinterland – rail Port of Antwerp

Q: What are the top 3 destinations in CEE for Antwerp?

A: Poland is not so important for Antwerp, there are things happening, but that is very limited continental industrial cargo. But for that it is hard to specify the relation; is it production – consumption, which is included in that chain, or is there interaction between the local industrial sites in the Antwerp region and logistic sites in Poland. So that is very limited. We have to move more southwards to get better relations. Globally said we are working on it, but at this moment especially concerning maritime containers that are directly being transported into that region there are limited volumes handled in Antwerp. The Czech Republic and Slovak Republic are areas where we are actively involved to set up things, but it is not significant yet. The Slovak Republic is one of those markets that is functioning on its own, which still has little interaction with other countries, especially in western Europe. There is a lot of economic activity, mainly based on heavy industry, and on its own national consumption. Therefore, there is automatically less interaction. And if there is interaction, if a heavy industry company needs supplies, then it runs through a warehouse that is not located there. Of course, it is said that the logistic chain will develop there, but why would you want to locate a large warehouse in the Slovak Republic for goods that are probably consumed in our regions and imported by a large seaport? The land and labour prices might be cheaper, but that can partly be covered by automating processes, the problem is that the transport costs will be extremely high. It is only possible to develop that market when the national consumption will grow much faster. Also when that happens, it is still so that Antwerp and Rotterdam must compete with the German ports, which is difficult.

Q: Which port is the biggest competitor for serving CEE for Antwerp?

A: The first remark that must be made is whether the development of a new market is a threat. It is a possibility that CEE (Central and Eastern Europe) will further develop within multiple sectors, for example in logistics. The question then is whether this will negatively influence the logistics sector in the Benelux and Nordrhein Westfalen in Germany. When this is not the case, you can work from the perspective that your own market, wherein the two ports (Antwerp and Rotterdam) are powerful, will not be threatened by this development. On the contrary, if these markets in Eastern Europe will further develop and the consumption and logistic chains are growing, there will possibly be a larger number of interactions between your own regional logistic markets and these regions, which might benefit your own turnover. A general finding is that those markets (CEE region), even though it is said for 15 to 20 years now, did not develop as much as analysts and others have predicted. That development, which is announced for years now for multiple sectors, is concerning international chains that are not at the level that was predicted. So, that this development is coming is clear, but that these developments move slower than everyone predicted is also a fact. I do not see these developments directly as a threat, but as an opportunity that must jointly be handled or individually, to see in the case these developments in CEE start moving faster how we can benefit from that.

Of course, the geographic position is an important element that you cannot control, if ports as Hamburg and Gdansk are more beneficially located than Antwerp or Rotterdam, this is a fact. However, even from a less beneficial geographic position, there still are some possibilities. But a first step that must be conquered, and something where ports

certainly must fight against, is that patterns develop which are not fully explainable by economics. The two ports, Rotterdam and Antwerp, are already working for years to gain market share in the region of Bavaria and Munich in Germany, where there also are a lot of activities, and it became clear that it remains extremely difficult to gain a significant market share in that region. Even though the transport distances geographically seen are the same for the German ports and for Rotterdam and Antwerp. But still, this market is almost monopolized by the German ports. The reason for this is probably related to historical relations, and also the fact that national borders are still, even in the EU internal market, barriers to rail transport. But purely from a geographical perspective, there is nothing that can explain the dominance of the German ports. Then it indeed really is about culture and historical matters, the fact that the trains so to speak already run 10 times per day, which provides for economies of scale, making it very difficult for a third party to gain a significant market share. If you look at the Czech Republic, the Slovak Republic region, you also see historical matters that have developed there, which makes it a comparable situation with the German region. The market is dominated by a number of large ports, who are able to put decent products in the market, which thus makes it difficult for a third party to gain significant market share.

Q: So if you would have to say which port is the largest competitor then that would be Hamburg, because Gdansk is not of importance?

A: Gdansk can also be a competitor. To get there, normally goes via feeder or transshipment. So, it concerns cargo that is transhipped via Hamburg, Rotterdam or Antwerp with a feeder ship to Gdansk. If the port of Gdansk grows and the attractiveness of the market grows, then there will be more direct calls from large shipping companies. And then the threat to your port is that you could lose some cargo based on the transshipment feeders. But there is nothing you can do about that, because it is normal practice. Do you have to look at it as a threat? Yes, but still there is nothing you can do about it.

Poland, if that really develops then their ports will become more important as well. On the other side, there will establish industrial intermodal relationships of which Antwerp can benefit as well. You can say we have our own industrial logistic system wherein relationships are established, those relationships will develop and that means automatically that the relationships between seaports and that region are going to develop, and that the turnover in your own port can develop based on that region. So we have to make sure that this transport relationship exists, and then it can be an opportunity.

Q: How important is the maritime difference between Antwerp and Hamburg concerning costs/time?

A: Between shipping companies there will be differences, but to the customer there will not be. People sometimes overestimate the power of seaports in attracting shipping companies; that power is in your cargo basis. As port authority you must make sure that the hinterland connections are as attractive as possible.

Q: What will be needed in the area of hinterland connections to improve the competitiveness for serving the CEE market?

A: Capacity is necessary, but given. From the position of your customer this is not important. It is not by the creation of capacity that you will establish railway

connections. It is not that you establish a railway connection and that then everybody will use it. Why do you use the rail as transport mode? Mainly because of the price, reliability, and transit times, but the last one must not be overestimated, because often the trains run at night, whereas truck drivers are obliged to follow rest times more than trains, so in the end it often results in the same transit time. The train runs for this many hours, the truck runs less hours, but the truck does not always run directly to its destination. There is said a lot about this, but in the end, it is questionable whether that is the factor that determines the choice for a transport mode.

Another example, a container is discharged at a container terminal in Antwerp, then you can talk about transit times and speed, but the container normally stays in the port for 5 days, which has nothing to do with procedures or other things (customs), because these are normally fully ended before the container is discharged, but with the transport planner on the other side who starts planning when the container is discharged and then sees that if he will pick up the container now he will not have enough capacity in his warehouse. There often are already a lot of trucks planned on that day to discharge, which means he will need extra personnel, and consequently he will then look when the next slot will be. When that is in 3 days it is normally okay for him, and he will just leave the container in the port. Also, there is always free time (dwell time) in Rotterdam and Antwerp, which means that the container can stay for free at the container terminal for a certain period, which is a cheap storage deal for the shipper and transport planner. So he will plan when it fits his interests. So, a lot of people state that the transit times for barges are long, but in the other case the container remains at the terminal for 5 days. So if you had really needed it, then there is a choice of how it could be transported in the fastest way. But that normally only happens with perishables, and those are often transported by air. When it does not concern such goods it is just planned in the interests of the planner. Therefore, transit time is a wrongly understood concept. We see that certain companies that have their logistic chain organized in the good way, normally logistics then plays a crucial role in their business, for example Nike. It is much cheaper that when a container arrives, to put it immediately on a barge, and transport it at night to a terminal that is located close to the company site, because if you then need this container, you know through ICT systems that the container can be at the company site within 15 minutes. If you have to get the container in the port of Rotterdam or Antwerp it will take multiple hours. So these companies control that, the transport costs might be a bit higher, but a lot can be saved in inventory costs and planning in their own warehouse.

Also rail can be given such a function, by looking at how you can organize the chain in such a way that a lot of cargo is moved quickly to a site closer to the final customer, from where the final customer can be served better. That is the main idea concerning extended gateways, so can you move some functions of the port a bit. With such concepts you can look in relation to CEE if you together with some parties can find some companies and flows that can be organized in a better way.

Q: Is the difference in distance an obstacle for Antwerp as opposed to Hamburg?

A: The geographic position plays a determining role in many cases, but in some cases, especially when you are in a region where multiple ports can have a position, you see certain relationships have developed which are not determined by the geographic position. Thus in cases where the geographic position does not play a role, certain matters establish which are otherwise unexplainable. You could say that if everything is determined by the geographic position, within a level playing field, that market players

would have similar market shares, corrected for the size of the ports. In practice this is not the case, so other interests play a role. And those are things that must extensively be looked at.

When there is a location in Poland where you are 200 kilometres away from Gdansk, then the western ports must work from the perspective that it is not possible to gain a dominant market share there. Maybe it is possible to play a role within certain logistic chains, but certain other matters are important as well. So if that is the ambition, then you must look at it from a certain distance, but the more southwards you move, the bigger the role could be for Antwerp.

Q: What are the cost differences for rail transport between Antwerp and Hamburg (also considering the differences in distance into the CEE region)?

A: It would be very difficult to compete with the sharply priced railway transport. Hamburg is currently capable of providing for such high frequencies, that economies of scale are also relevant there. That is of course a problematic situation for Antwerp and Rotterdam, because you are confronted with prices that are extremely low. And that is main challenge, how can you act against that. That also is the big problem with the connection from Nuremberg to Munich, if you want to compete with that you will have to produce at such low prices that it becomes extremely difficult. Or you must be willing to invest millions, at least if you are allowed to do that, because Europe does not easily approve that you will subsidize on such scale. That has in the past been the case for Hamburg, which was stated as unfair competition. It is also not sufficient to offer the same price in order to persuade people to switch of logistic chain, you have to offer lower prices to do that. The possibility does exist to look at that region jointly, Rotterdam is now individually involved in a connection with Nuremberg, but I heard that is not the most profitable connection. So they are willing to invest there. But we are also looking, especially at how the logistic chains are organized. For example cargo that is being transported to Nuremberg is mainly industrial cargo, then you can wonder whether it is possible to transport that directly.

Q: What is the market share of Antwerp in serving CEE in the container market?

A: What we see for example, there is a lot of rail traffic with northern Italy (from Antwerp), but the cargo that is for that destination is transported in continental containers, which is a part of a truck or a truck that has been put on a train. Not in a classic, maritime container. The cargo is mainly industrial, or first processed in a logistic centre the Antwerp region and then in that way transported. In northern France, for which Antwerp is a very important port, something similar happens. Sometimes people wonder why it is said that Antwerp is such an important port for northern France, because it does not show from the statistics concerning container transport, wherein the container transport to northern France is very little. So where does this idea that Antwerp is important for France come from and why are there so little containers transported to that region? The answer is in fact very simple. The containers are not going to France. The total logistic chain for France is being handled in Flanders. So many cargo from and to industrial companies in France is transported via a warehouse in the Antwerp region. Thus, what happens is that the container arrives in the port, and the cargo is processed and divided for further transport to the final destination in the same region. Therefore, it looks like the transport ends in Antwerp. The same thing also happens in Rotterdam. What happens after that is a totally different process, which nobody sees or registers. I think something like that also happens in relation to Eastern

Europe. There namely are multiple intermodal relations, also given the number of Eastern European truck drivers and other trucking companies that drive back and forth into that region. Therefore, I think that this cargo follows the same process as the cargo for France. So, as long as the logistic chain in that region is not developed to a sufficient level, will there also be a different transport chain. Of course we also have to mind that we do not let our opportunities be taken away by the German ports who in the meantime by having connections with Metrans and other large railway companies that are active in that region are strongly trying to gain a share in this developing market.

Q: So when you look at the market share that is being published based on containers does not show the real transport volumes into that region?

A: Indeed, then you miss a large part. When you look at Hamburg, there is only the city centre, outside that region there is nothing. In fact, you have to move further into Germany to find large, regional logistic centres. Germany in fact does not have a local hinterland. In that way, the situation in Hamburg is different from that in Antwerp and Rotterdam. In Antwerp a little more than in Rotterdam there are very local logistic clusters. So, then it is hard to compare such different hinterlands.

Q: What do you need to realize the improvement in competitiveness?

A: Large shippers and logistic companies behave to that extent rational in that they do not distinguish between ports. When you talk to large German logistic companies or retailers, I have had a discussion with someone who has a large shoe company in Germany, with 100 stores so to speak and a large central warehouse, for him it is irrelevant which port will be used. The only thing that is important is how the goods reach his warehouse, especially concerning transit time and price. The final shipping company, that comes from Asia, will provide the same prices for Hamburg, Rotterdam and Antwerp. From their perspective, Europe is one entity.

So assume you are in Germany, as a large importer, and you will ask for prices at different shipping companies. These shipping companies will compete among each other with their prices. This is irrespective of which port will be used, because they can be on more or less the same distance from the final destination. So the way in which the cargo will be taken to the final destination is important. So as a port, you have very little to say against these importers on the basis of your own price setting. Therefore, you must ascertain that your hinterland connections are optimal, and because of that hinterland customers will get connected to that, just as shipping companies. It is namely the shipping company that follows the cargo and not the other way around. This means that no port takes the decision on such matters. In Flanders there is a discussion concerning Zeebrugge and Antwerp, that must be one port according to some people, but it is not true that in that case the port can decide for itself, as port authority or government, which ships will be send to Zeebrugge and which to Antwerp. That is clearly not normal practice.

So the hinterland connections determine whether it is possible to connect with new customers and gain cargo. Then also the geographic position can be important, when there is a certain port nearby, this port will get more or less a natural hinterland. But there is also a second element that plays a role, which is sometimes overlooked. Flanders, the Netherlands and Nordrhein Westfalen perform within the highest quality levels concerning logistic systems. A lot of cargo that is destined for the rest of Europe or the other way around is processed within these former-mentioned regions. It may be produced somewhere else, but is stored, divided, etc. here. Of course, this chain will

partly determine the transport mode. What happens in Antwerp and in Rotterdam, is that the transport distances are relatively short. This geographic frame is thus very small. That is related to the function in our own hinterland. The strict character of the ports, from a transport-politics perspective is a weak characteristic. The container, as long as the cargo is inside it, is easily transported by barge or train to a certain point. When it is discharged there, and it will be processed and transformed into a final product, then the perspective on this market is very different.

Q: What is the port of Antwerp undertaking in the area of hinterland connections to improve their competitiveness for serving the CEE region?

A: There is a project in Nordrhein Westfalen. That is a process that runs for years now, and I do not know exactly what the current status is. I think the place is called Reinholt, close to Dusseldorf. It is an old industrial site, located along the Rhine, which is being developed into a logistic zone and where local governments have asked for the participation of both ports, for both the financial power and the expertise, marketing, etc. Those are matters in which Antwerp and Rotterdam match very well, because the interests of both ports are similar. It is not that there will only be cargo from and to Rotterdam or the other way around, it is clear that when the region develops there will be cargo for both Antwerp and Rotterdam. Also, both ports have an interest in the further development of that region. So based on this joint interest you can look further into Europe to see whether it is possible to do business together, but it will become more difficult because then there will be competition from German ports and there will be other interests, which you cannot control.

Q: Are there other initiatives that Antwerp undertakes to improve the competitiveness in or the hinterland connections to Eastern Europe?

A: There is a cooperation with Duisburg because we already have some connections there, an intensive cooperation based on multiple relations. From the perspective of rail some options are being considered, but it is a continuous process. In the past there were clear segments in railway transport, intermodal container transport, block trains with bulk, and spread railway transport which concerns individual wagons. These were three separate components, which means there were also three different commercial and operational models. Then you can consider whether it is possible to combine these three components and look at a more complex process. Concerning spread railway transport the system was focused on centralization, which was a clear point-to-point network. It is not easy, but the ideas are there, and concepts are being explored and developed. An example is Austria, which is served by such combined railway transport. From Linz, Austria there also are connections further to Hungary and Romania, for which cargo can also be combined. So you can work at it one step at a time.

Q: Is that region also more beneficially located for Antwerp as opposed to Rotterdam, because it is located more in the south of Europe?

A: If the transport is 200 kilometres, then 80 kilometres is a big difference. But if you transport over 1500 kilometres, then 80 kilometres difference is nothing.

Q: But I also mean when you look at the connections, Rotterdam has more connections directly eastwards into Germany, whereas Antwerp focuses more southwards to France, Italy, etc. Is that region then more beneficially located for Antwerp?

A: That has also to do with the industry. There is a lot of intermodal transport to Italy, but that is almost fully continental cargo. I often get the question why Antwerp has so

much intermodal connections to south Italy, because the ports of Genua and Koper are located nearby. We cannot say that this concerns maritime cargo, it often is cargo that is included within an industrial logistic chain. Between those chains there is a lot of interaction. So the question is whether we really are competitors there. You could better ask yourself when looking at south Germany why Hamburg has such a strong position there, because if you look at the other side of Europe Koper, Slovenia is located closer to that region. So there are greater challengers than on our side. The Alps are obviously a very large obstacle, concerning tunnels etc. This normally makes it cheaper to import the cargo via the northern ports. This also has to do with maritime patterns. So it is a complex situation. But in the direction of Austria it does not make much of a difference if Hamburg or Rotterdam or Antwerp is used for transport. Concerning geographic locations the differences are so small. Poland is of course a different situation. The geographic proximity for Hamburg and the Polish ports are an advantage, and you must look at what those Polish ports will do.

Q: How can cooperation in coordination relating to bundling of cargo bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: There you can certainly look at combinations between, which is not obvious, maritime containers and continental cargo. Because of several reasons there are little combinations between the two different cargos. That has to do with the commercial system, such as operational aspects concerning wagons. Often people use the concept 'container', but there are a lot of factors involved that are not necessarily compatible. However, it can be a driving force when you look at continental relations, if you also next to that transport maritime containers back and forth. But especially when considering combining cargo between ports there is another problem between Rotterdam and Antwerp. When focusing on maritime containers, you can see that via Rotterdam there are a lot of imports, and via Antwerp a lot of exports. In the loops of the maritime shipping companies, you often see that Rotterdam often is the first port of call, then the ship moves to Hamburg, Felixstowe, Antwerp, and then it goes back to Asia. So for a shipper it is beneficial to discharge the cargo in Rotterdam, because then you can win a couple of days. But when the cargo is exported, it is beneficial to transport it through Antwerp, because also in that case the transit time is shorter. It is interesting, but it means that when looking at the hinterland transport chains, there will be huge imbalances. And the problematic part of railway transport is that the train must have a utilization rate of at least 80% back and forth. There have already been too many situations wherein the train in one direction could be utilized for more than 100%, but in the other direction is only utilized for 20%. In such a case it is not possible to have a profitable product. There has a lot been said about how such imbalances could be solved between two ports. It is an option to let trains run in a triangle pattern, but that is easier said than done. Operational wise this is not easy, some technical issues must then be solved. But also, there is the problem that there is the more psychological commercial and competitive aspect. If one of the ports start to move in the direction of a balance, then it is easy to pull this train entirely to that port. Or, assume that you have that system, and the other says that in the meantime I established such an amount of cargo that I can offer a balanced train utilization. In that case the concept collapses as well. How do you handle such systems that in practice only have a limited life cycle? Maybe it should be in the form that setting up a concept is done with the aim that the two ports

eventually are able to run shuttle trains individually. Because this is an emergency solution.

Q: How can cooperation in coordination relating to a hinterland terminal bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: There are of course different forms of such concepts. It could be beneficial to select a location somewhere in Germany, could be in Duisburg, and from there set up one strong connection. Duisburg also has the ambition to get involved in such matters. The downside of such concepts is that there is an additional handling moment in Duisburg, and from there you set up feeder lines into for example Poland and the Czech Republic. The downside is that when someone puts a direct connection next to that, that connection will be much cheaper. This sort of cannibalism is the main problem of such concepts. A hub and spoke system develops something, but when someone develops something besides that, the system collapses.

Q: But for which port is such a connection feasible?

A: You could say that we do not have sufficient cargo volumes to individually set up connections into that region. The two ports together do have these volumes, maybe also together with Zeebrugge, Flushing, Amsterdam and Moerdijk, and we then combine everything in Duisburg. It is in Duisburg maybe also possible to combine the cargo with local cargo that must be transported into the hinterland. So the system functions because cargo from different locations will be combined, and then a direct connection can be established. The downside is that there is an extra handling moment in Duisburg, which is a time penalty, meaning that it is a sub optimal system. There also is the risk that one port sets up a direct connection individually because it generated more cargo due to the cooperation. Then cargo that should be transported through the hub and spoke system moves to the direct train connection. So the biggest threat is that you are confronted with too little volumes in the hub and spoke system for letting the train run optimally. In that case the costs will move to the remaining ports in the cooperation.

Q: Could it be a solution for containers that are normally waiting in the port to be transported further?

A: That is the main purpose of such systems. For cargo of which you know the transit times to be shorter when you combine them, and thus to make them move faster. Dry ports and similar initiatives, these are systems where you will look at the combination of intermodal terminals and large logistic centres, who have a cargo basis, and the larger the cargo basis is, the more you will get the development of intermodal products. The largest bottleneck for setting up a new intermodal rail connection is the large fixed start up costs. You almost need a cargo basis to set up something like that. The second problem is that when something has been started up, it takes a long time before companies or people are willing to quit their normal habit and make a change. There is some conservatism in the system; people are not willing or capable of making a change, which can be due to contracts. People will review the new system for a couple of months or a year, and reconsider this system during the negotiations for a new contract. In the meantime, the railway connection is not utilized at a sufficient level, which leads to great financial losses. There is not one rail operator in Europe that is capable of bearing such losses. Also, the investment in this new connection must return in the form of profits, which is difficult due to low profit rates. So, the losses can only be during a short period of time, because otherwise the profits will not within a reasonable time make up for the losses that had to be incurred. The requirement of setting up such a connection quickly, implies a cooperation between multiple large companies that are willing to invest. You

can look at a dry port in the form of a community. Within the port area some logistic zones are being prepared for development, which must take place in an environmental friendly way. If you want to develop such a thing, you must think of which sort of companies you want to attract. We have said that for the area close to an intermodal terminal we are going to specifically select companies that would want to make use of intermodal rail transport. Then you must be without doubts because you will refuse other companies to locate there, even though the companies could be interesting for the port.

Q: How can cooperation relating to an IT system bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: We have recently discussed this with the members of the Vlaams Nederlandse Delta, so wherein the large ports are involved. Then I also mentioned that this is a domain where cooperation is possible, also relating to Portbase and the system in Antwerp, which are similar systems. For the largest part these systems are based on standards, but certainly in railway transport there are large improvement possibilities in order to get integrated systems. It would indeed be stupid to work with competing systems, because then everybody also must compare these systems between the ports, which would further increase the complexity of the situation. Whether you can create an advantage for Rotterdam and Antwerp as opposed to the German ports remains the question, because Hamburg also has a system. They have far-developed systems, but at least you can take away the barriers for your own ports in order to be able to really compete with the German ports. Because if you do not do that, you can be sure it will never succeed. You can say we both have an advantage when an integrated system exists, but again, the development of infrastructure is not an absolute requirement to set up a connection. First of all you must look at which terminals are already there, and there are multiple. Then it will not work to put another terminal next to the existing one, because you will not attract the cargo with that. You must look in which region there are no terminals yet, and also look whether there is sufficient economic activity there, which is a basic requirement. But you can also jointly look at hub regions, and whether it is possible to set up intermodal railway connections. Maybe that must be done with an open mind, from the perspective that we both have nothing in that region, the Germans have or are developing, in order to be able to act against the Germans. And if that works out, then there is a win, even though one port will possibly benefit more than the other.

Q: How can cooperation relating to sharing costs/risks bring advantages in this process of increasing the competitiveness by improving the hinterland connections?

A: There is a concrete project, not in Eastern Europe but in Germany, where the two ports are jointly involved. That is also explicitly on request of the local market, located somewhere along the Rhine, a new port zone. They were looking for some large institutional partners, the ports, who together wanted develop this zone. You could say we involve the two largest, because they will balance each other, which could also be seen from a discussion dating from some years ago concerning the participation in Duisport, which the Germans prevented from happening. That was a joint undertaking, which was also given in by the fact that Duisburg is important for both ports, and locally they did not want to make a choice between the ports. It is a possibility that such developments are undertaken jointly, but you must look extensively into how to approach that. I know from colleagues in Rotterdam that in the past they have invested

or participated in the development of a terminal in the Czech Republic. In practice it appeared that all the cargo destined for that region was transported via Hamburg. It is not that when you are involved in that region, that you can monopolize the transport market. Also, it is not possible to say that you build a terminal for the exclusive use of Antwerp and Rotterdam, because the authorities will not approve that. The aim must be to look at it from the perspective of how benefits can be generated from it. It is simpler to invest in your own natural hinterland, we are involved in Beverdonk, to help out the local market because you know that a large part of the cargo will come back to the port due to the geographic position. Even Beverdonk is an open access terminal, so it services both Rotterdam and Antwerp, and Antwerp has always said that it does not have the ambition to monopolize that market and this is also not possible because we are only a minority shareholder. But we know that this terminal will also benefit us, at least from the truck transport that goes to Rotterdam, which also passes the Antwerp region. Also, it will strengthen the region where this terminal is located, because companies and warehouses will also locate there, and the cargo that is transported to and from there will likely go via Antwerp, due to the proximity. So it is more beneficial to invest locally, because you will benefit almost automatically. A region like the Czech Republic is much more difficult. It involves much more factors than just building a terminal.

Q: Where can cooperation bring disadvantages in this process of increasing the competitiveness by improving the hinterland connections?

A: There are multiple factors that must extensively be monitored. First of all there must be a reasonable division between costs and benefits. That often is a crucial factor. And that is sometimes pushed to the limit, I know from projects between competing private companies, for example concerning the exchange of empty containers between terminals that have more import and export respectively, which creates an imbalance. In practice, instead of saying we are short on the containers and the other says we have too much containers, there is bad management, because of which you get patterns that show containers are not sent to the other terminal, but moved back and forth between the one terminal and the shipping companies. That is strange, but is it easier to manage than a triangle pattern. Because if you set up a triangle connection, it is not sure who will pay the costs and the management of the transport to the other terminal, whereas the costs of sending the container back will be incurred by the shipping company. The system is good, but it collapsed, because certain terminals for several reasons benefited much more from it than other terminals. Nobody had a disadvantage, but some had a larger benefit than others. Also, one terminal could strengthen its long-term position, which could bring disadvantages for the other terminal. So it is not that when everybody has a win, that everybody is happy as well. Something like that is very difficult to manage. A second problem is that a clear exit strategy must be present, because it is an emergency solution. The system and the cooperation must be robust enough, or there must be very clear agreements to make sure that when the system works and the volumes are increasing and one port transports between 80-90%, of course you will never get a perfect division, that it becomes interesting to set up your own connection. Then the one port can say thank you for the help to develop the connection, I will exclude myself from the agreement and then the other port is in huge trouble because he will not be able to let the trains run anymore without incurring great losses. This is because he loses the advantage of the bundling, and then the only option will be to transfer the remaining cargo to the other port as well. In that case you really helped develop the connection for the other port. The question is how you must deal with such

a pattern. In Antwerp we have experienced this in practice, and also in Rotterdam it happened, but in Antwerp we had a terminal that functioned as a turning table. There were multiple maritime terminals and trains, the revolution that is currently also happening in Rotterdam, and the cargo had to be transported between all these terminals. How should you solve that? There are multiple trains, but too little cargo to get one train per terminal. Only one train leaves, and for that multiple terminals must be addressed. There were trains arriving in very short time periods after each other, and the operator firstly started moving the wagons instead of the trains. So containers were switched. Then there were homogeneous trains at the terminals, and the system was optimized, so there were as little handlings as possible. The system is good, but there are significantly higher costs involved, mainly because of the handling which costs around 40-50 euros per container, so the profit range is very small. And the system functioned mainly based on subsidies. After some time the government stated they were not able anymore to further provide for these subsidies on a long term, and the system collapsed. It is not affordable anymore, also not for the operator. Obviously, many actors panicked, until we started looking at the volumes. It appeared that a large part of the cargo that was pushed into that system could perfectly be transferred onto direct trains. But this did not happen, because the operator needed the cargo to make the system work. That is the problem of the hub-and-spoke system. The goal is to keep the system running, because of the system. So the system must be able to function as an incubator, and must be at least robust enough to handle continuous questioning of the working of the system. So questioning whether this is still the optimal way to do it.

Q: So you must constantly evaluate the hub-and-spoke system?

A: You must evaluate, and continuously question the system. That is a fact, but when you are with two competing parties, how do you deal with that? You build up a system, and you must constantly question it, and at the same time also take into account the interests of the other party. Otherwise you will get mistrust. If you cannot get such trust elements in the system, the system will not function. That is why it is easier to participate jointly in for example the Reinholt project, where you say we will do the real estate development, and in fact you base your business plans on the expected profits you can gain from the real estate development. In that way, every party has the same interests, and you look at the project purely from such a real estate perspective. The parties will not involve themselves in the actual development of the region. However, expertise concerning port development can be involved, and sometimes you will go further into the region, but the main focus remains the profits to be gained from the real estate development. That is also how we evaluate such participations.

So, in conclusion, cooperation is an option, but it is not obvious that it will happen. Especially the willingness is not obvious between Antwerp and Rotterdam. Maybe between Zeebrugge and Antwerp, but how will you control that? Who will or will not get the benefits from it? How will you balance the interests, which strategy will be used to defend the interests on the long term? How will you deal with exit strategies? Which models will be used to make clear what is possible and how will you deal with the continuously changing circumstances?

Q: There is not a clear answer, but something must happen if you want to play a role in that region.

A: Yes, I think there are multiple domains where we can cooperate. There are some clear domains, for example concerning pipelines between Rotterdam and Antwerp where there are common interests. It also concerns the joint developments of sites located in

Germany where there also is a common interests apart from all other motives, because if a region develops then this is for the benefit of both ports irrespective of how this results, because that is a question we cannot really ask ourselves. But where we can gain advantages related to the project itself and within a more global context are obvious matters, but as you move outside that comfort zone it will become a lot more difficult to have common interests. There are common interests, but how will you defend these on the long term? In the end you need someone that can function as an intermediary, who will say we have a clear view on how we should develop this, and we need the support of both parties.

Q: Is it necessary to involve an independent party?

A: Yes. There is another project running for a couple of years now, the Twinhub project, in Antwerp we also had the Mainhub but that is shut down because there are no subsidies anymore. In Rotterdam you might also need something like that, a sort of turning table terminal, and state that both ports will use this terminal for Eastern Europe. Everything from Antwerp will be send to Rotterdam by train and will move further from there, and then from Antwerp there could be the transports to our natural hinterland, France and southern Europe. However, there is always a but. Antwerp also has interests in Germany, and because of the cooperation Rotterdam will then gain a good position where they now have a weak position. This is a conflict of interests. So if you look at Germany it might be much more obvious to look at a terminal there, for example Duisburg, because in that case both ports are equals. Then you can say Duisburg will do the development, and we will support them, in order to develop the Eastern European market, and we will both participate with cargo via our direct connections with Duisburg. In that way we will also cooperate, but living apart together, in the way that the other party will do the actual development. Maybe that will give a larger chance of success. Because it is also an advantage if a party is interested in a direct connection that party does not have to choose between Rotterdam and Antwerp, and we will both benefit without the creation of an imbalance. And such a party might be less attracted to focus on a specific connection, but more on the global network. It also has often been said that the initiative should come from the market to the seaports. Or, if we agreed to jointly look at the region, that we will jointly put something in the market, but then say to the market that we created something, but that we are looking for another party to actually perform it. Then we will bear the risks, and play for referee, but let the third party do the development because otherwise we will only look at each other concerning who does what.