Exploring Terminal Efficiency Along the Rhine-Alpine Corridor

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Exploring terminal efficiency along the Rhine-Alpine corridor

How the Connecting Europe Facility can contribute to terminal efficiency

Robert Wursten

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Master thesis Economic Geography

Radboud University Supervisor: dr. Rianne van Melik

Panteia Supervisor: Drs. Arnaud Burgess

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Preface

Approximately four and a half years ago, I enrolled for the Bachelors degree in Human Geography and Spatial Planning. At that moment with the thought that I would certainly become a spatial planner and took the introductory course on human geography only for the broadening of my scope. It is in the first half of the first semester that I realized that the main focus of a human geographer fitted me more than a spatial planner, and so I decided to switch the scope of my Bachelors degree more towards this end. Not a very big decision, because in the end it was a combined Bachelors degree, but still a decision that brought me to where I am now, and leaded me to the Masters degree in Economic Geography I eventually enrolled in, and for which this thesis is my ultimate aptitude test.

Where the choice between spatial planning and human geography was not as clear from the beginning as it was for other students, the same can not be said about my main interest point in geography. During the course of my study I have assessed different kinds of topics, varying from a regional vision for Zuid-Limburg to a qualitative analysis on why Google is interested in a new datacenter in Groningen. What is striking to see, is that the first ever scientific paper I wrote, for the course Academic Skills, has a lot of common ground with the last scientific paper I write, at least in the light of getting a degree, namely this Master thesis. This first paper I wrote about developments in the Port of Rotterdam. Now, four and a half years later and a lot of experiences and (academic) skills richer, my studentship comes to an end with the writing of this Master thesis, which also has to do with transport. Therefore, for me the circle is complete.

Transport fascinates me. In the summer, I see a lot of (container) vessels pass Nijmegen through the Waal. I find it interesting where these vessels come from and where they go. This interest point resulted in the writing of this thesis, which tries to answer some current questions about inland container transport. With the outcome of this research, but also the process in which it is conducted, I am very pleased. Still, I am sure that this thesis could not have been realized in this way without the help of several persons. First of all, I am very thankful towards Rianne van Melik, my supervisor from the Radboud University. Although transport theory is not her 'core business', she helped me in the process where she could, by posing critical questions and her availability when I needed it. Critical when needed and indulgent when possible, which was a combination in a supervisor that I found very helpful to have around at set times. Furthermore, the company where I did my internship, Panteia in Zoetermeer, proved to be a true asset for this research. Not only have they pointed me towards a more concrete direction for the subject of this research, being part of Panteia also made it easier for me to get in touch with respondents and different documents, for which I am very grateful. A special thanks goes out to Arnaud Burgess, who is manager of the freight transport team and helped me with specific questions during my internship, and Joshua van Buuren, who turned out to be a great critic and sparring partner.

Also, I have to thank all the respondents that were willing to sacrifice some of their time to help me to collect my data. First of all, the numerous actors that delivered quantitative data that can not be found on internet. Furthermore, a special thanks go out to all the persons that made time for me to do a interview. The outcomes of this thesis would not have been brought to surface without the help of Jarl Schoemaker, Frans van den Boom, Marnix Vos, Hanneke Bruinsma, Eric Nooijen, Rien Geurts and mister Wilms.

Last, I would like to say a special thanks to my family and friends who always supported me, not only during the writing of this Master thesis, but during the course of my entire study period. Here I also have to bring a thank you to my fellow interns at Panteia, Wouter, Marco, Tim, Mark, Bart and Michael, with who it was possible to discuss problems in the process of writing this thesis, but who also were always available to have thought opposing talks (Read: Football) during lunch and coffee breaks.

So, writing this means the end of my studentship is near. A time of my life that I would not have wanted to miss out on. On the other hand, a new period in my life dawns and I can not wait to start this period. The only thing left for me now, is to wish you a happy reading of this thesis, and do not hesitate to contact me if you have specific questions about topics regarding this research.

Robert Wursten
March, 2015

Executive summary

This research is conducted in the framework of the TEN-T regulations. TEN-T is European policy focused on more efficient transport in Europe. To do so, the EU came up with nine different corridors, which cross the entire European continent. To finance this policy, there is the Connecting Europe Facility (CEF). In total, a budget of €26,2 billon has been allocated for TEN-T projects in member states of the European Union for the period 2014-2020. This is done on the basis of co-funding, where the EU finances up to 20% for works that need to be done. Different projects can be co-funded with the help of the EU. This research focusses on how CEF could contribute more to container terminal efficiency. Therefore, the aim of this research was to answer the following research question:

To what extent can the Connecting Europe Facility contribute more to the transport efficiency of terminals in Europe?

In order to do so, multiple steps were taken. First, it is important to have a theoretical overview of terminal efficiency and how this can be achieved. Terminal efficiency is best to be characterized as 'the speed of container handling and consequent vessel turnaround'. This can be accomplished through four dimensions, according to existing literature. These dimensions are accessibility (with the indicators rail length, quay length and waterway access), capacity (with the indicator handling capacity), on-port facilities (with the indicator entering facilities) and port services (with the indicators number of cranes and barge lines to a mainport). These dimensions determine terminal efficiency.

For one of the nine TEN-T corridors, the Rhine-Alpine corridor that runs from the seaports of Rotterdam and Antwerp through Germany and Switzerland to the port of Genoa, for all this indicators quantitative data is gathered. With the outcomes of this quantitative data, statistical tests were ran. It turns out that only a few terminals along the Rhine-Alpine corridor are optimized in terms of efficiency. Also, a few terminals score low on more than two indicators, but the most terminals only score low on one or two indicators. This is an indication that CEF can achieve an optimized container terminal efficiency with relatively little interventions.

Next to whether the terminals possess the needed characteristics, there is also checked if the indicators affect the maximum handling capacity of a container terminal. This was the case for all the indicators, except for entering facilities and waterway access. Therefore, in future research it must be well argued if these indicators get included in a research, because it does not seem to affect terminal efficiency according to this research. This also means that, in order to increase terminal efficiency, CEF subsidy should be allocated to the other five on-site projects, in order to improve the efficiency

of the terminal.

Next to quantitative data, qualitative data was also used. Different relevant actors were interviewed in order to get to know their experiences with (European) subsidies, but also to get to know what they find the most important projects a CEF subsidy should be spend on. This led to interesting findings. First of all, the application for a CEF subsidy is too complicated. Interested parties decide not to write an application for a CEF subsidy after seeing the guide for applicants, which should clarify demands and the process of application for them. In fact, it does the opposite, by making it too complicated and not being to the point. The way the Dutch government does this, can be stated as an example for the European Union. This applications are way less complicated and does therefore not scare interested parties. What also was striking was that some of the respondents did not even know about the TEN-T program, so also the possibilities should be elaborated more on, for instance by the European Union itself. The container terminals are hesitant to hire a specialized company to handle this kind of business for them, because they are afraid the benefits will not outweigh the cost.

Furthermore, the respondents are critical against the rate of co-funding for the CEF program. A rate of 20% means that they have to fund 80% themselves, which most of the time is too big of an investment for them. The reason for this is that the projects that improve terminal efficiency are very costly. There are multiple solutions for this problem. First of all, the rate of co-funding from the EU can get raised. Another option is that for a project other investors get involved, such as national governments. In organizing it like this, the co-funding part of the EU does not have to be raised and the part of the terminals themselves will be lower.

Last, the opinion of different terminal holders is asked regarding key projects of the subsidy. They think that on-site projects will have a smaller effect on terminal efficiency than off-site projects, as opposed to what the theoretical framework of this thesis claims. Therefore, the most important conclusion that can be drawn, as well from a social as from a scientific perspective, is to take the off-site aspect more into account. For scientific purposes this means that future research should look more into the impact of off-site projects. For social purposes this means that policy should be set to tackle off-site problems, such as a lack of efficiency in seaports and the remaining bottlenecks in infrastructure, instead of focusing on subsidies for container terminals. In the long run, this will have a bigger impact on terminal efficiency and is therefore the most adequate way CEF subsidies can be allocated.

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1. Introduction

For the Dutch government it is important to keep the Netherlands competitive and accessible (Dutch Government, 2013). The infrastructure in the country plays an important role in this goal. Every year, the government issues the MIRT, or Multiannual program for Infrastructure, Space and Transport. In this book all the spatial projects within the border of the Netherlands are named and the progress of these projects is explained. All together, in 2014, about 7,7 billion euros was available for infrastructure (Groot & Suiskind, 2013). For example, 131 million Euros are reserved for the project 'Toekomstvisie Waal' (Dutch Government, 2013). The goal of this project is to broaden and deepen the river Waal on crucial parts, to make the river better accessible for vessels on the route. Projects like this are realized throughout the entire country, to keep the Netherlands competitive and accessible.

It is necessary to keep the hinterland of main ports accessible, or perhaps make them even more accessible. Since the appearance of containerized transport in the 1960's, it had improved its performance at an impressive pace (Roso, Woxenius & Lumsden, 2009). Containerized transport is the backbone of global trade and is accounted for 13% trade in volume and 49% by value (Cullinane & Khanna, 2000). To benefit from this development, the main ports should be kept connected at a reasonable level to the hinterland.

The goal of the Dutch government of a connected hinterland, shown in the example of the river Waal, is related to European regulations. In 2011, the European Commission (EC) stated that the establishment of efficient networks of transport is one of twelve of the core tasks in The single market act. The Single Market Act – Twelve levers to boost growth and strengthen confidence: 'Working together to create new growth', is a document written by the EC (2011) in which this twelve levers are presented which should stimulate European economy. Next to, amongst other levers, a unified digital market, social cohesion and a regulatory framework for businesses, one of the core projects is realizing a better transport network. This will be done by implementing the so-called TEN-T regulations and the Connecting Europe Facility (CEF), which is the funding program for the TEN-T (PNO, 2014). This means that the CEF is the subsidy in the framework of the TEN-T policy. Therefore, the terms CEF and TEN-T subsidy are used throughout this research and mean the same. When TEN-T is mentioned, the underlying European policy is meant. The TEN-T initiative aims for a better connected Europe, through a better connection of water, road and rail. This research will take into account this TEN-T regulations. Throughout this research, different properties of container terminals in Europe are examined. This properties will be compared to scientific definitions of efficient terminals. Further on, there will be examined how CEF and TEN-T can contribute to more efficient transport in Europe.

1.1 What is TEN-T?

The European Union tries to regulate policy about transport within its borders. Therefore, they set up the so-called Trans-European Network (TEN). These networks have been established in the fields of energy, telecommunication and transportation (European Union, 2014c). On the basis of the TEN policy, national networks need to be transformed to one European network, without disrupting the environment (Panteia, 2014a). This research is affiliated with the transport section of the TEN regulations, or the TEN-T. The TEN-T policy dates from the beginning of the 1990's. At that time, the 12 member states decided to set up a joint policy for transport to strengthen the internal market.

With the advent of inland terminals, hinterlands of main ports are bigger than before (Wilmsmeier, Monios & Lambert, 2011). Where the hinterland of a main port used to be physically captive, they have grown bigger as the inland terminals grew, as well in size as in number. The result of this is that parts of land have to be better connected in order to feed this development. To do so, the EU launched an ambitious project. The Trans-European Network of Transportation (TEN-T) sets the goal to realize one border crossing leading network in terms of transportation. In January 2014, the EU renewed these TEN-T regulations. This policy aims to close the gaps between Member States' transport networks. TEN-T is a network which comprises roads, railway lines, inland waterways, inland and maritime ports, airports and container terminals

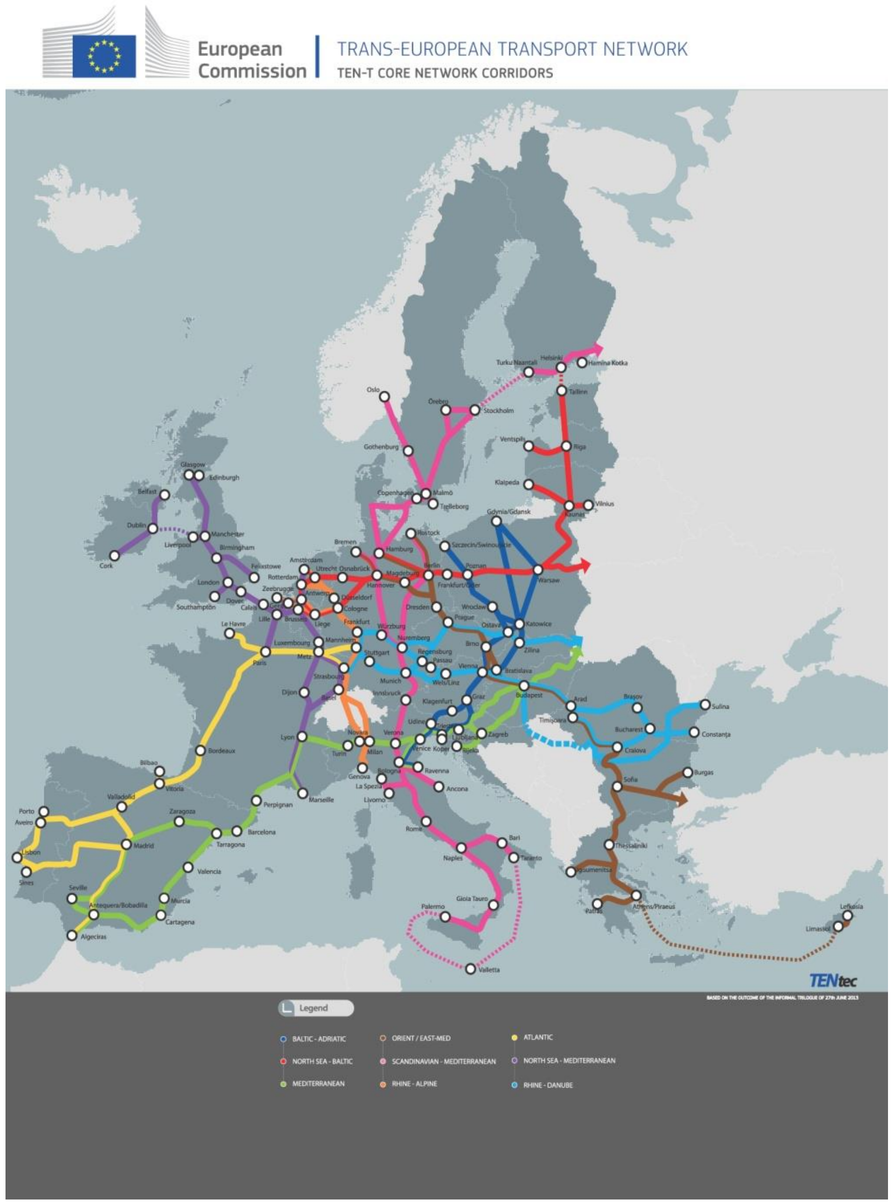

Figure 1.1 TEN-T Corridors (Source: European Commission, 2013a)

throughout the 28 Member States. The TEN-T consists of two different layers. First of all, there is the *comprehensive network*. This is a multi-modal network of a relatively high density which provides all European regions with an accessibility that supports their development in terms of economic social and territorial progression (European Union, 2014d). The comprehensive network is planned to be in place by December 31st 2050 at the latest. It will ensure full coverage of the EU and accessibility of all regions in the Union, including remote and the outermost regions (Rozmarynowska & Ołdakowski, 2012). In total, the comprehensive network contains 138.072 km of railway lines, 136.706 km of roads and 23.506 km of inland waterways (European Union, 2014d).

The second layer that has been established, and what this research focuses on, is the *core network*. This core network is part of the comprehensive network, and consists of the strategically most important parts of the TEN-T network. This is translated into the nine different core corridors that are displayed in figure 1.1 and Appendix I. The core network constitutes the backbone of the European multimodal transport network. Core network corridors involve at least three shipment modes and run through at least three Member states of the European Union. If possible, a core corridor should be connected to a maritime port (Rozmarynowska & Ołdakowski, 2012). The core network is planned to be in place by December 31st 2030 at the latest.

In total, the EC distinguishes 2 'north-south' corridors, 3 'east-west' corridors and 4 'diagonal' corridors. This corridors partly consist of existing infrastructure, but also new infrastructure and improved infrastructure are part of the plans. The aim of the TEN-T project is to make transport more durable and efficient. The infrastructure should be adapted to the corridors. This could be done by adaptation of existing routes, but also by creating new routes. Also, a upgrade for multimodal nodes is planned, as well for goods as passengers.

The TEN-T does not just focus on transport by road, but makes use of all the possible modes of transport. This means that also the use of water, railroad and plane should be used effectively. By shifting between these modalities, it should be easier to establish durable and efficient transport between the corridors (Quispel & Roest Crollius, 2014).

This TEN-T policy for the core network aims at the three different components with the highest added value (Rozmarynowska & Ołdakowski, 2012). First of all it focuses on cross border missing links. This contains discrepancies between different countries, for instance on the width of the railroad track. Second of all, it focuses on key bottlenecks in infrastructure, such as congesting nodes in traffic or rivers with a small width. Third of all, the multimodal nodes within the core networks of the TEN-T are being examined. In this part, the focus lays on different container terminals along the core network and what kind of service they can offer. The focus in this research will lay on this last component.

Financing the TEN-T

To finance this European transport network, the European commission came up with the Connecting Europe Facility (CEF). This CEF is a financing tool that supports the new TEN-T governance. The main objective of CEF transport is to help complete the TEN-T core network and its corridors by the end of 2030. In this way, the CEF will work as a successor for TEN-T (Innovation and Networks Executive Agency [INEA], 2014a). A total budget of €26,2 billon has been allocated to co-fund TEN-T projects in member states of the European Union for the period 2014-2020, of which €750 million is allocated to optimizing the integration and interconnection of transport modes (INEA,2014b; RVO, 2014).

Organizations that are interested in this CEF facility, can submit a proposal to the European Commission, which will judge this proposal on the basis of *equal treatment* and *transparency* (INEA, 2014b). It is assumed that co-funding rates for TEN-T projects on the core network will be up to 50 percent of EU co-funding for studies regarding the subject and up to 20 percent EU co-funding for works related to the subject. The other amount has to be paid by the body itself (Rozmarynowska & Ołdakowski, 2012). The height of the part that the European Union funds, depends on the phase of the project, plan or implementation and the type of project (ERAC, 2013).

1.2 Research goals

This thesis will be written within the frameworks of the so-called TEN-T regulations as set by the European Union. The terminals in one corridor will be looked at from the TEN-T perspective. This will be done for one of the nine established corridors, the Rhine – Alpine corridor, which leads from the west of the Netherlands and Belgium, through Germany and Switzerland, to Genoa in Italy. A more in-depth analysis of this specific corridor will be given in Chapter 4 of this thesis. Why this corridor has been picked, has multiple reasons. First of all, this corridor is particularly interesting because of the outstanding position, located in the Blue Banana. The Blue Banana is a highly industrialized area in the European Union and is a banana shaped metropolitan axis that runs from Manchester to Milan, and have been Europe's breading place for innovation and growth for a long time (Hospers, 2003). A overview of where this banana is located and how the Rhine-Alpine corridor fits into this can be found in figure 4.1. Together with the resulting fact that this corridor carries by far the greatest transport volume in Europe, this makes it the pioneer for international rail freight transport in Europe (EEIG Corridor Rhine-Alpine, 2014).

Second of all, there is a practical element involved in choosing the Rhine-Alpine corridor as the case for this research. As being the shortest corridor, it is the only corridor that can be examined as a whole in the quantitative part of this research, due to the given time that is available for the thesis. When another corridor would have been chosen, only a part of the corridor could be examined. Therefore, the choice has been made to pick the smallest corridor to have a more in-depth and complete look at this corridor.

The fact that this corridor possesses this mentioned attributes, does not make the corridor unique. The other eight corridors also have to do with the TEN-T and CEF subsidies and the possibilities for a subsidy. This legislation works the same for every corridor. Therefore, by examining this one corridor, it will be possible to contribute to the knowledge for the other corridors as well.

The goal of this thesis is to reflect how CEF can contribute to the transport efficiency of the terminals in the Rhine-Alpine corridor, in the light of the TEN-T developments and to find out whether or not the CEF subsidies are the right tool to stimulate efficiency in container terminals. All the terminals along the corridor should meet certain standards to be able to cope with big amounts of transport flows. Data will be gathered to see whether these terminals do meet modern requirements. Furthermore, CEF will be examined to frame where these two elements could match better, with the goal to improve CEF. This will be researched by using mixed methods, so as well qualitative as quantitative data is used. How this is done, is described in Chapter 3.

1.3 Research Questions

In order to meet this research goal, this research is structured in a main research question and sub questions. The main research question of this thesis will be the following:

To what extent can the Connecting Europe Facility contribute more to the transport efficiency of terminals in Europe?

In order to answer this main question, the following sub questions will be answered throughout this thesis:

-How can a container terminal be efficient?
-Where is the Rhine-Alpine corridor and how many terminals can be located?
-To what extent are the existing terminals in the Rhine-Alpine corridor efficient?
-How is the CEF subsidy perceived by relevant actors?

This sub questions will be the thread throughout the thesis. In every chapter, one of these questions will be tried to answer. In the end, the main question will be answered.

1.4 Relevance

The European Commission stated a better transport network as a core lever. This means that the transport network within Europe needs to be improved and, when this is done, maintained. Increasing the mobility on the corridors, is one of the 12 boosts for the European economy. The fact that the entire European Union gets better connected, not just by road, but also by water and rail, is a situation the entire Union could benefit from. This more connected Europe opens many doors in the transport sector. Efficient transport means a decline in costs and this could lead up to lower prices for goods which have been transported through Europe. This is also named by market players in maritime transport, who consider inland logistics as one of the most important areas still to improve economic indicators, to add value, and to increase profitability (Bartosek & Schönemann, 2012). This means that there is social relevance to take a closer look into the subject of TEN-T corridors within Europe. Next to inhabitants of various countries in the European Union, this topic is also highly interesting for companies in the field of transport. Transport companies will have a more efficient way of moving their goods, both in terms of costs and time. This opens up a bigger market for them within the European Union, which of course they benefit from. Also, many container terminals along the corridors might profit from the TEN-T regulations. Container terminals serve as pivots in the corridors, from where different transport modalities can be changed. The portion of inland costs in the total costs of container shipping range from 40 to 80 percent (Rodrigue & Notteboom, 2005). This indicates that the inland terminals are playing a big role in container transport and that the port’s role has changed from a monopoly to a dynamic interlinkage and a subsystem in the logistics chain (Robinson, 2002). These container terminals have to have a certain standard to be efficient.

On the basis of the new TEN-T regulations, these terminals could be improved. In this way, also the companies that lead these container terminals can profit from a better transport network. This is where this research comes in. The aim of the research is to make insightful whether or not the coming CEF subsidies are useful for implementation, or need improvement somehow. Up to now, a lot of research has been conducted on transport, but this research tries to critically reflect CEF subsidies and the view of stakeholders regarding TEN-T regulations. By doing this, the current CEF subsidies can be improved. This will most likely mean that the process of doing an application for subsidies goes easier and that the available funds are spend better.

This research can open up some new questions in the field of transport policy and TEN-T legislation. Outcomes of this research can be used directly to improve existing policy about the transport corridors. It could give insights in reachability and usefulness of the TEN-T regulations. Also it will contribute to the scientific debate on the use of a transport corridor in general and whether or not this concept of transport corridors is a useful addition. Monitoring and comparing different inland ports in terms of overall efficiency should be well researched, in order to advantage as much as possible (Tongzon, 2001).

Next to the social relevance, this research also has a scientific relevance. By doing a in-depth analysis of a corridor, the bottlenecks of transport terminals can be mapped, so goods can be transported more efficient in the future. This has not been done in this order up to now. There has been an exploration of properties of terminals within the Netherlands (van Buuren, 2014; Defares, 2011), but an exploration for an entire corridor has not been done. Therefore, it is still needed to map these weak spots in the corridors, before it is possible to act and create a better connected Europe. Also, it is important to look which terminals already meet European standards, so other terminals that do not meet this standards yet, could benefit from this. This research aims to give a clear understanding in what is needed for a terminal to facilitate efficient transport, according to EU standards. Research that has been conducted on the matter, focusses solely on quantitative data, whilst this research aims for broadening of the subject, by looking into different opinions of stakeholders, in a qualitative way.

Also, this research might be able to say something about certain needs for terminals to be efficient. When the data is analyzed, it is possible to critically reflect the already existing scientific literature, that can be found in chapter 2 of this research, about terminals. Elements that are underlined or perhaps too important in the literature can be brought up. In this way, this research can contribute to scientific literature about terminal efficiency. Research can be used to test the existing literature to the current situation. This also means that certain concepts about transport efficiency can be tested and to see to what extent this can be improved on the basis of this thesis. By doing this, transport theory could also benefit from the outcomes of this research.

1.5 Outlines of this thesis

Throughout this research, the main question that is posed in paragraph 1.3 will be answered. This will be done step by step. In different chapters, the drawn sub questions will be answered. This will result in answering the main question of this thesis.

First, in Chapter 2 the most relevant theory about efficient transport is explained. In this chapter, multiple scientific sources are discussed, which form the framework of the further research in this thesis. In this thesis, the sub question *'how can a container terminal be efficient?'* will be answered.

In Chapter 3 the methods that are used in this research are examined. In this chapter, a distinction between two parts (The quantitative and qualitative parts) of this thesis will be made.

Chapter 4 will introduce the case, the Rhine-Alpine corridor. In the first part a description of the corridor will be given. Where it starts, where it ends and the geographical locations that are involved. Paragraph two focuses on basic statistic data that is gathered for this research.

Chapter 5 will contain the second part of the quantitative part of this thesis. This chapter will reflect on the gained data from the terminals, which is processed in SPSS. In this chapter the main quantitative outcomes of this research will be presented. This will answer the second sub research question, '*To what extent are the existing terminals in the Rhine-Alpine corridors efficient?'*

The 6th chapter will have a qualitative design. With the help of interviews, there will be examined how different actors perceive TEN-T legislation. This will in the end answer the research question *'How is TEN-T legislation perceived by local actors?'*.

In the last chapter of this thesis, a conclusion will be drawn and recommendations will be made. On the basis of the thesis, the main research question '*To what extent can the Connecting Europe Facility contribute more to the transport efficiency of terminals in the Rhine-Alpine corridor?'* will be answered.

2. Factors determining terminal efficiency

In this chapter, the most relevant theories and concepts in relation to efficient transport will be examined. In paragraph 2.1, an overview of the existing ideas and concepts about transport, container terminals and perceiving policy will be given. This will lead to a conceptual model, which will be presented in chapter 2.2.

2.1 Theoretical Framework

2.1.1 What is a container terminal?

In this paragraph, the most important theories about transport will be examined. Different literature is observed, so in the end the current ideas about transport are clear.

The need for different solutions of transport keeps getting bigger. In 2010, 57% of all the containers in the port of Rotterdam were transported inlands by roadways, 10% by railway and 33% by the inland waterways (Visser, Francke, & Gordijn, 2012). The supply of containers will only keep growing in Rotterdam in the coming years, because of the realization of Maasvlakte II. Without any change in transport networks and/or -methods, a further congestion on the motorways around Rotterdam, and other main ports in Europe, are a logical consequence. To be sure this will not be the case, the focus lays on developing innovative logistic concepts. One of those concepts is that of multimodal transport. Multimodal transport focuses on adequate switching between different modalities within the transportation process. Multimodalism refers to a transport system that offers users diverse transport options that are effectively integrated, in order to provide a high degree of accessibility (Litman, 2014). Jiang, Li & Mao (2012) determine three types of multimodal transport, namely roadway - railway, roadway - waterway and waterway - railway. The idea of multimodal transport, is that the transport is not necessarily executed by one modality, but that there is the possibility to switch these modalities at a terminal. This must lead to a more efficient way of transport. Also, this kind of transport is more durable. Transport through waterways and railways are less polluting than transport via roadways (Jiang et al., 2012). By using multimodal transport, transport will be shifted from roadways to railways and waterways. This will result in less congestion and CO_2 emission.

There are a lot of concepts that are closely related to multimodal transport, such as the dry port concept and synchromodal transport. A dry port or Inland Container Depot is an inland container terminal, which is used as an extension of the main seaports (Haralambides & Gujar, 2011) or ‘an inland intermodal terminal directly connected to seaport(s) with high capacity transport mean(s), where customers can leave/pick up their standardized units as if directly to a seaport’

(Roso, et al., 2009).The dry port provides in storage, consolidation, and depot-storage of empty containers, maintenance and repair of containers (FDT, 2007). In this way, it is easier for a seaport to expand, even if there is no room in the direct environment, or if the land prices are too high in the port area (Monios, 2011). Bergqvist, Falkemark & Woxenius (2010) argue that these terminals are mainly controlled by companies that have a link somehow to transport in a main port, because it is very risky to invest in terminals without controlling the operations on the links since the demand for transshipment is derived from transport services.

Another concept that is closely linked to multimodal transport, is so-called synchromodal transport. Just like multimodal transport, it focuses on shifting modalities in the transportation process. The difference is that multimodal transport has a fixed mode for transport, and in synchromodal transport it is possible to switch between modalities at any time (Platform Synchromodality, N.D.). This means in essence that for multimodal transport the modalities are chosen in advance of the trajectory, whilst in synchromodality the best available modality at that time will be chosen. This means that the mode of transport is not specified beforehand, but on the basis of availability of that moment. In this thesis, the difference between these concepts are insignificant, and therefore the term multimodal transport will be used.

2.1.2 The role of container terminals in multimodal transport

Within the concept of multimodal transport, switching from modalities is very important. Multimodal terminals are supposed to make quick transshipment to enhance the good use of the surrounding resources, such as rail wagons or lorries (Bergqvist, et al. 2010). Terminals serve as connecting points in the entire intermodal transport system (Chu & Huang, 2004). Therefore, container terminals spread across the corridors will play a big role in efficient transport. The next paragraph will give some more in-depth information about the role of container terminals.
Bückmann, Kortweg, Tillema & van der Gun (2010) define the following 5 different kinds of terminals:

-Sea ports with a international hub function
-Terminals with a national trimodal function
-Bi- or trimodal terminal as a container transfer point
-Bi-modal inland terminal with a national transship and storage function
-Bi-modal inland terminal with a local transship and storage function

First, it is important to clarify the difference between a bi-modal and tri-modal terminal. Tri-modal terminals are container terminals that are located near water, motorway and railroad and have throughput facilities for all three of this modalities. So in such a terminal, there can be chosen out of three types of modalities (Visser et al., 2012). A bi-modal terminal is, quite logically, a terminal where only two out of the three modalities are represented. Below, a short representation of all the above mentioned kinds of terminals will be reflected.

Seaports with a international hub function are terminals that are important destinations or areas of origin for intercontinental container transport. A good example of such a terminal, is the port of Rotterdam. *Terminals with a national trimodal function* are connected to water, railroad and motorways and with a capacity with more than 200.000 TEU. A TEU, or Twenty-foot Equivalent Unit, is a standardized unit for a container, to measure throughput. One TEU is a standard container and is 20 feet long, 8 feet deep and 8,5 feet high (Shipping-containers, N.D.). To give an impression, the worlds largest sea ships have a capacity up to 10.000 TEU now (Jacobs & Lagendijk, 2014). These ships can only reach very few seaports, because of their deep and width bodies. An average train has a capacity between 70 and 90 TEU and a barge vessel around 400 TEU (Bartosek & Schönemann, 2012).

A bi- or trimodal terminal as a container transfer point is strategically located on the corridor to the sea port. This terminal can serve as a location to combine different container flows to and from the seaport. This terminal is at least accessible through motorways, and also by railroad or waterways. A *bi-modal inland terminal with a national transship and storage function* is accessible by roadways and railway or waterway. These terminals have a large amount of costumers in the nearby area and the terminal can also serve as a warehouse. At last, *the bi-modal inland terminal with a local transship and storage function* are quite the same as the bi-modal inland terminals with a national transship and storage function, but smaller.

Notteboom & Rodrigue (2005) determine 3 different functions for a terminal. First of all, a terminal could serve as a cargo bundling point. A container terminal enables small shippings to combine their cargo and by doing this become more efficient. Second, terminals should offer space for transport companies to drop their full containers and take an empty one back. In this way, circulation occurs among the containers. The consequence of this is that transporters do not have to wait until their container is emptied, so the transport becomes more efficient. The third function for terminals, as clarified by Rodrigue & Notteboom (2005), is to facilitate in a broader service of logistics. Land availability may attract different forms of logistic service providers. The terminals act more or less like a magnet.

2.1.3 What is terminal efficiency?

Efficiency plays a central role in this research. In order to cope with this term, a definition about efficiency in general, and specifically transport or terminal efficiency, should be determined. The next paragraph aims to do so. Irrek & Thomas (2008) define efficiency as the ratio of benefits to the expenses. The Productivity Commission of the Australian government (2013) states a similar definition about efficiency. This definition states that *'efficiency requires the production of the set of goods and services that consumers value most, from a given set of resources. An allocatively efficient outcome is the output mix of the economy that best satisfies preferences'*. When this definition is used regarding terminal efficiency, this means that transport is arranged in such a way that it suits the costumer the most. This may be the case in terms of budget, but also because it is more durable or faster, according to the preferences of the consumer.

Peters (2001) determines terminal efficiency as 'the speed of container handling and consequent vessel turnaround'. Thus, substantial productivity improvements are generally required to enable ports to meet the stringent service requirements of their costumers and to obtain competitive advantages (Tongzon & Heng, 2005). This implies that a on-port improvement will enhance a terminals efficiency. Productivity is a measure of the efficiency of port or terminal operations, and accounts for the amount of resources usually required to perform a given task in a given time. Therefore, the level of efficiency can represent how quickly containers are handled and how quickly vessels are turned around at ports. The higher the efficiency level of a port or terminal operation, the more port users are likely to choose it as their port of call, which will make the port gain more market shares (Tongzon & Heng, 2005).

This definition of terminal efficiency does not only take into account that the time of the handling of containers is better spend, but this will also lead to lower costs. By looking at terminal efficiency this way, it is possible to measure the efficiency of a container terminal, which is the reason that this definition of terminal efficiency will be used in this research. How this is done, will be elaborated on in paragraph 2.1.4.

Chin & Tongzon (1998) emphasize the importance of an efficient container terminal. they claim that efficiency is an important factor for a nation to achieve internationally competitive advantage. This highlights the need to take a closer look into the current efficiency of container terminals and how this can be improved.

2.1.4 Needed terminal facilities

To make transport efficient, the inland terminals need some core facilities. In this paragraph, there will be determined which kind of facilities are essential for a container terminal. It should be noted that it is difficult to determine the minimum requirements. This is because terminals come in many shapes and sizes. Some terminals just offer basic services like container handling, while other terminals offer other, more in-depth services, like container storage or facilitating empty containers. Therefore, it is difficult to set ground rules about the specific needs for terminals. However, a discourse can be discovered. Van Buuren (2014) distinguishes the following four concepts regarding terminal efficiency, which are elaborated further with the use of various scientific literature. This is described in the section below.

Accessibility

Accessibility is described as the easiness by which people can reach the desired activity sites (Hanson, 2009). This is also underlined by Fleming Baird (1999), that claim that efficiency of inland transport grows with a bigger landside accessibility. For a container terminal, this means it could be reached by road, rail or water. A terminal should always be accessible by rail and/or waterways, next to the access by road (Rodrigue & Notteboom, 2013). This definite connection with road is necessary, because of the bigger flexibility roads have in comparison with waterways or railways for delivering a product to the costumer. In order to be efficient, water- and railways need to cope with different standards. Regarding to inland waterways, Rijkswaterstaat (2011) and Pršić & Kunštek (2003) explain a international classification for waterways, the so-called CEMT-classification. This classification divides inland waterways in seven different categories, from I to VII. This classification comes from the 7 types of vessels that can be established. This categorizing makes it easier to have a overview which vessels are suitable for certain inland waters, and which are not. Nowadays, a lot of the vessels are class V, which means that the waterways on which the terminals are located should at least be classified as a CEMT class V waterway. A related subject to this, is the quay length of terminals. According to Pršić & Kunštek (2003), a quay length of 135 meters would be sufficient to meet the requirements from a vessel from CEMT-classification V. this means that the quay length should at least be 135 meters.

Also, the railroads should meet certain expectations. A longer track enables train operators to limit the number of decoupling, while a short rail track forces train operators to decouple more (van Buuren, 2014). This of course would mean that the transport would be getting less efficient. Therefore, it is important to look at maximum train lengths. According to Rail Freight Portal (2014) and Bartosek & Schönemann (2012) the length of transport trains usually vary from 400 to 600 meters. Therefore, the minimum track length on the terminal should be 600 meters, for a more efficient throughput of goods. In this way, practically all trains can load and unload without decoupling.

Capacity

Also the capacity of a terminal plays a role in efficient transport. The container yard operation plays a vital role and acts as the control hub among all operations in a container terminal. All the other operations are either destined for the container yard (from the quayside to the yard for an inbound container) or originated from the container yard (from the yard to inland transportation for an inbound container) then to the further operation. Therefore, it is essential for the terminal operators to provide sufficient capacity within the container yard to facilitate all the terminal operations (Chu & Huang, 2004).

The number of the minimum capacity that is required differs per kind of terminal. Van Buuren (2014) and Defares (2011) claim terminals should have a minimum capacity varying from 200.000 to 20.000 TEU. Furthermore, Bartosek & Schönemann (2012) claim that a container terminal should have the facilities to enable two trains or vessels entering and leaving at the same time. To be able to cope with this, there are various options. First of all, as well trains and vessels can be able to enter a terminal. Because they use other load stations, this automatically means that it is possible for two vessels or trains to enter at the same time. For a terminal with solely rails, a minimum of two different tracks should be available. For a terminal with solely access by vessels, the quay should be bigger than 200 meters. This is because, according to Rijkswaterstaat (2011), the vessels that have access to class V CEMT waterways have a length of at least 95 meters. 200 Meters is the minimum length for a quay to accept two different vessels, in the most favorable conditions.

On-port facilities

The basic function for a container terminal is simple: Shifting containers from one modality to another. To do this, multiple hardware adjustments are needed. First of all, reach stackers and/or cranes are required on the terminal (van Buuren, 2014). These tools are used to load and unload trucks, boats or trains. Reach stackers are mainly used to load and unload trucks and small vessels, while a crane is more suited for the bigger vehicles, like trains and bigger barges. The number of cranes and/or reach stackers determine the capacity of the terminal. With more cranes, the capacity should be bigger. However, one crane or reach stacker can be sufficient to handle containers for a terminal.

Port services

It is important that a terminal can at least provide dry port based services (Roso et al., 2009). According to the earlier mentioned definition of Roso et al. (2009) of dry ports, this means that every inland terminal needs a direct connection to a seaport. Which port this is, depends on the geographical location of the terminal. To reach the requirement for high capacity transport means, a terminal should at least have one direct link to a main hub a day, or 7 a week (van Buuren, 2014; InlandLinks, N.D.).

On the basis of the given information, requirements for inland terminals is converted into a scheme. This scheme is partly adopted by van Buuren (2014).

		Type 1 terminal	Type 2 terminal	Type 3 terminal	Type 4 terminal	Type 5 terminal
		Seaport Terminal	Tri-modal inland terminal with a national function	Bi- or tri-modal inland terminal as a container transfer point	Bi-modal inland terminal as a national transship and storage function	Bi-modal inland terminal as a local transship and storage function
Accessibility	Mode of transport	X	Accessible via road, water & rail	Accessible via road, water & rail	Accessible via road, water or rail	Accessible via road, water or rail
	On terminal rail track	X	Minimum of 600 meter rail track on the terminal	Minimum of 600 meter rail track on the terminal	If rail, Minimum of 600 meter rail track on the terminal	X
	Quay length	X	Minimum quay length of 135 meter	Minimum quay length of 135 meter	If barge, minimum quay length of 135 meter	X
	Waterway access	X	Accessible via class V waterways	Accessible via class V waterways	Accessible via class V waterways	Accessible via class IV waterways
Capacity	Handling capacity	X	Minimum capacity of 200.000TEU	Minimum capacity of 200.000TEU	Minimum capacity of 100.000TEU	Minimum capacity of 20.000TEU
	Entering facilities	X	At least two trains entering and leaving at the same	At least two trains entering and leaving at the same	At least two trains entering and leaving at the same	At least two trains entering and leaving at the same

			time	time	time	time
On-port facilities	Container crane/Reach stackers	X	One crane or reach stacker should be available	One crane or reach stacker should be available	One crane or reach stacker should be available	X
Port services	Barge lines from/to main port	X	Minimum 7 direct lines a week	Minimum 7 direct lines a week	If barge, minimum 7 direct lines a week	If barge, minimum 7 direct lines a week
	Barge lines from/to main port	X	X	X	If rail, minimum 7 direct lines a week	If rail, minimum 7 direct lines a week

Table 2.1 Requirements for inland terminals (van Buuren, 2014)

2.1.5 Aspects of perceiving legislation: The policy arrangements approach

Next to an analysis of the extent to which existing container terminals along the Rhine-Alpine corridor are efficient, on the basis of the before mentioned framework, this research also searches for possible legislation improvements. Legislation can be examined in many different ways, but in this research a choice is made for the policy arrangements approach. A policy arrangement refers to the temporary stabilization of the organization and substance of a policy domain, at a specific level of policy making (Van Tatenhove, Arts & Leroy, 2000).

There are multiple reasons why this approach is chosen. First of all, this approach aims at the analysis of institutional patterns of change and stability. It describes and characterizes arrangements, but also interprets and understands different changes in this arrangements (Arts & Leroy, 2006). This makes this approach very useful to use as a tool to analyze (transport) policy. Still, the policy arrangements approach is not the only approach that is useful for analyzing different policies. However, what makes it strong, and what is the main reason that this approach is used in this research, is that it combines different existing strategies into one, to find a position between on the one hand strategic acting behavior of actors and on the other hand the underlying structural developments that are of influence (Arts & Leroy, 2003; Dobbelaer, 2011). This fact makes the perspective interesting, because it examines policy from different angles. A policy arrangements approach does not claim in advance that rules, rational behavior of actors, environment or other factors structure the policy, but takes into account that one (or more) of these factors could be of importance (van Tatenhove, Arts & Leroy, 2000). This open view makes it possible to detect more outcomes, which could lead more to a critical reflection of the policy.

Arts & Leroy (2006) define a policy arrangement as the temporary stabilization of the content and organization of a particular policy domain at a certain policy level. In order to understand this approach, in the framework of the approach, the meaning of two different concepts are important. First of all, a policy arrangement is a *institutional* concept. Institutionalization can best be determined as the phenomenon whereby over time day to day actors behavior solidifies into patterns and structures, whereas these patterns in turn structure day to day actors behavior. As a consequence the concept refers to the gradual sedimentation of meanings into rules of behavior and organizational structures, that in turn reproduce and recreate these meanings (Arts & Leroy, 2006). In other words, institutionalization is the becoming of regular behavior out of regular patterns. Policy arrangements can be seen as an institutional concept, because it aims to analyze institutional patterns of change and stability, rather than explaining day to day practices. It seeks the solidified patterns and aims to say something about these patterns. This means, that in the framework of this approach for the different policies must be taken into account that institutions structure the behavior of relevant actors. Although actors have some own say in choice making, they are structured by existing institutions.

Another important term that defines the policy arrangements approach is *political modernization*. Political modernization refers to changing relationships between state, market and civil society, as well as to new conceptions of governance (Arts & van Tatenhove, 2002). It tries to capture those structural transformations in political domains in contemporary societies, which have or may have consequences for day-to-day policy practices (Arts & Leroy, 2006). Due to these processes of political modernization, in combination with the before mentioned institutions, there is a shift from traditional policy arrangements to a combination of traditional and innovative ones in current policy domains (van Tatenhove, Arts & Leroy, 2000).

So these two terms set the framework for the policy arrangements approach. Out of this, four different dimensions which are important in policy making emerge, namely *actors or policy coalitions*, *power & resources*, *rules of the game* and *policy discourses*. These different dimensions are captured in figure 2.1 and will be spoken of in the part below.

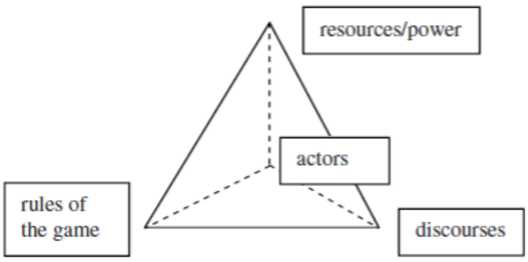

Figure 2.1 Dimensions of the policy arrangements approach. Source: Arts & Leroy (2003)

Policy coalitions

Policy coalitions, or actors, can be characterized as a number of players who share resources and/or interpretations of a policy discourse, in the context of the rules of the game (Arts & van Tatenhove, 2002). This dimension contains the actors concerned in the policy domain and their coalitions. As can be seen in figure 2.1 and also is underlined by the above stated definition of policy coalitions, this term plays a central role in policy arrangements. Coalitions have a interconnection with the other three dimensions and can therefore be placed in the center of the model. The other dimensions influence the actors, but the actors influence the other dimensions as well, so this is a two-way process. These policy coalitions identify similar policy goals, and engage in policy processes to achieve those goals. Each phase for political modernization results in different coalitions between representatives of the state, the market and the civil society(Arts & van Tatenhove, 2002).

In this research, this dimension is also filled by different actors that form a policy coalition. National, regional and European governments work together to make transport more efficient, by making policy to structure this better. Therefore, not only state is connected to the coalition, but also the market and civil society, in the form of transport companies and structuration of the land. The way this actors act, what is examined in this research is determined by the other three dimensions of the policy arrangements approach, who will now be elaborated on.

Power and resources

A second dimension of the policy arrangements approach is the existing power and resources. Power should hereby be regarded as the ability of actors to mobilize resources in order to achieve certain outcomes in policy coalitions. This means that power can influence certain policy outcomes (Dobbelaer, 2011; Arts & van Tatenhove, 2002).

In this dimension, the way power can be used to affect the actors and the outcomes is important. In the case of a subsidy application, this means how power and resources can be allocated to achieve the wanted outcomes. In here, there is an important role for *co-funding*. Because the granted projects only get funded a percentage of the project, it is interesting to see how this allocation of resources affects the subsidy application. Therefore, this will be examined in this research.

Rules of the game

Next to power and resources, the rules of the game also have an impact on how policy coalitions view legislation. Rules of the game define the possibilities and constraints for policy agents to act within that domain (Arts & Tatenhove, 2002). In other words, rules of the game set the framework in which can be acted by policy coalitions. This can count as well for effective rules for interaction, as well as for the formal procedures of decision making (Dobbelaer, 2011). Also informal institutionalized rules and routines are part of the rules of the game (Arts & Leroy, 2006).

For this investigation, it is interesting to see what these formal rules and informal routines are. Therefore, it is interesting to take a closer look into the rules for a grant application, to see the formal rules. Furthermore, it is interesting to see what the view from the policy coalition is on these rules, to take a look into the informal rules. Therefore, for examining the rules of the game, the *process of application* can be explored. Conducting research in this way, means as well the formal set of rules (information about the process of application) as the informal rules and routines (How this process is perceived by the policy coalition) can be examined.

Policy discourses

A last dimension that can be discovered in the policy arrangements approach is the policy discourse. Where the other dimensions focus more on organizational aspects of a policy arrangement, does this one focus more on substantial aspects of such an arrangement (Arts & Leroy, 2006). This means that this dimension focusses on conceptions on solutions for a problem (Dobbelaer, 2011). Hajer (1997) defines a policy discourse as a specific ensemble of ideas, concepts and categorizations that are produced, reproduced and transformed in a particular set of practices and though which meaning is given to physical and social realities. This dimension focusses on possible solutions, rather than on organizational aspects.

In this research, it means that the focus for this dimension will lay on *key projects*. This means that there will be examined what the key projects should be according to the policy coalition, in order to achieve the biggest improvement in terminal efficiency. All the dimensions combined will lead to insights of the policy coalition regarding transport subsidies and legislation. This view can be used to say something about more efficient container terminals.

2.2 Conceptual Model

On the basis of the theoretical framework, a conceptual model that compromises the field of this research can be constituted. This model was leading by the conduction of this research. The model is constituted in the following way:

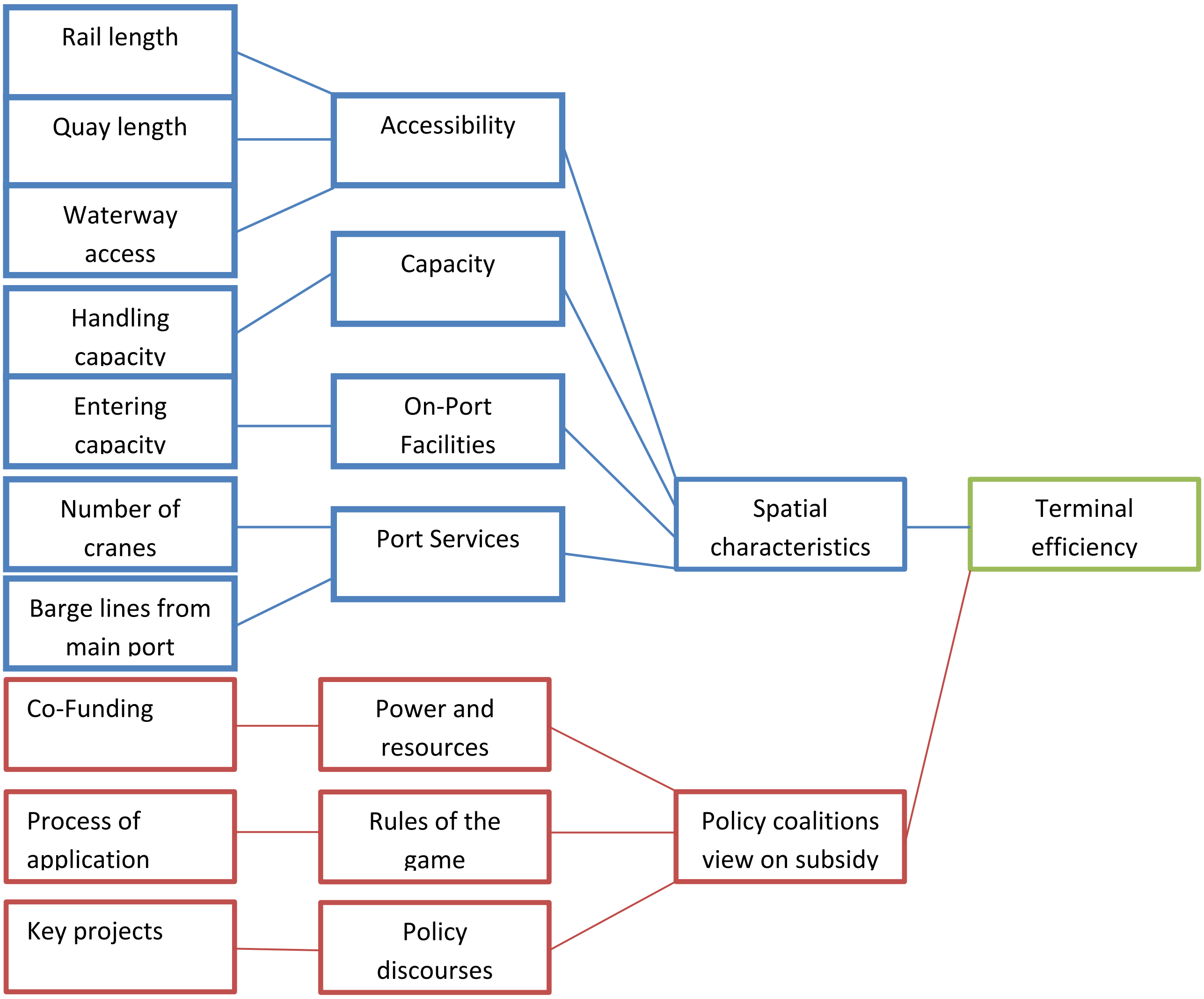

Figure 2.2 Conceptual Model of this research

This model consists of two different parts, which both have a need for their own research strategy, which will be elaborated on in Chapter 3. The part of the model that is represented by the blue boxes and lines focuses on the existing spatial characteristics of container terminals. This is split in the categories accessibility, capacity, on-port facilities and port services, which all consist of different indicators. These indicators are all checked for existing terminals. An overview of the existing spatial characteristics of this terminals is given in Chapter 5.

The part that is shown in red in the conceptual model reflects the qualitative part of this research. This part focuses more on the view from policy coalitions on subsidies and the impact they can have on terminal efficiency. This is done with the help of the policy arrangements approach. With the help of the three indicators power & resources, rules of the game and policy discourses will be tested in a qualitative way what the view of the policy coalition is on European transport subsidies. An overview of the most important outcomes of this part of the research can be found in Chapter 6. This will be accumulated to the existing spatial characteristics of container terminals to be able to give a adequate answer to the main question of this research. First, existing terminals will be tested on their efficiency and how this can be improved with using quantitative data, and further on a qualitative approach is used to see whether there are more aspects that can define terminal efficiency.

3. Methods

A scientific research can be done in various ways. Verschuren & Doorewaard (2007) distinguish five possible research strategies. First of all, there is the *survey*. In this type of research it is common to do broad research, so not to much in depth. Usually, for this kind of research data is gathered through questionnaires. A second research method is a experiment. In this kind of research, the reality is fabricated in a 'laboratory', so accurate predictions can be done. Third, a *case-study* can be done. In this type of research, one case is exemplary for a broader sets of processes. For the case study to gain relevance, it requires engagement in fieldwork, studying people in action (Näslund, 2002; Näslund, 2004; Ellram, 1996). Furthermore, a *fundated theory approach* could be applicable to the thesis. In this type of research, situations in real-life are compared to a theoretical concept. By doing this, differences and similarities can be examined and explained. Last, Verschuren & Doorewaard (2007) distinguish desk research. In this type of research, empirical data is not gathered. On the basis of existing academic literature, conclusions are drawn.

It could be argued that this research is a case study. A case study is a research for the specificity and complexity of one single case, to understand this case in her own important circumstances (Stake, 1995). Not the entire core region of TEN-T is examined, but only the part of the Rhine-Alpine corridor. Therefore, the Rhine-Alpine corridor can be stated as an example for the entire TEN-T, and from here on out some recommendations are made. This may profit the entire core region. However, as Creswell (2007) already mentions, can this case study never be sufficient to talk about the core network as a whole, but it does give an idea for the other corridors.

This research is conducted with mixed methods. In this kind of research, multiple types of research are combined (Creswell & Plano Clark, 2007). In this thesis, quantitative as well as qualitative research is conducted. The reason why this method is chosen over a single method, is that mixed methods can combine their advantages as a method. Both the methods have their own advantages and disadvantages, but by using mixed methods the most suitable approach to the part of the research can be chosen (Bryman, 2006).

How these mixed methods are used in this research is elaborated on in this Chapter. In the first paragraph, the research strategy and material of the quantitative part of this research is defined. In paragraph 3.2 the focus will be on the research strategy and material of the more qualitative part of this research.

3.1 Research strategy and material of the quantitative part

3.1.1 Methods of the quantitative research

This thesis consists of two parts. The first part of this thesis focuses on the mapping of the different properties that the terminals along the Rhine-Alpine corridor possess. This research will have a quantitative background. For all of the terminals along the corridor is examed how they score on the characteristics of a efficient terminal as mentioned in Chapter 2. The goal of this part of the research is to answer the sub question to what extent the existing terminals in the Rhine-Alpine corridor are efficient.

This is done by doing a survey. The survey approach refers to a group of methods which emphasize quantitative analysis, where data for a large number of organizations are collected through methods such as mail questionnaires, telephone interviews, or from published statistics, and these data are analyzed using statistical techniques. By studying a representative sample of organizations, the survey approach seeks to discover relationships that are common across organizations and hence to provide generalizable statements about the object of study (Gable, 1996). Surveys can accurately document the norm, identify extreme outcomes, and delineate associations between variables in a sample (Attewell & Rule, 1991). Bryman (2004) describes quantitative research as entailing the collection of numerical data and as exhibiting a view of the relationship between theory and research. Quantitative research brings a objectivist conception of reality, so there is less room for interpretation than in qualitative research.

For all the terminals along the terminal the properties have been checked. This was done by approaching the responsible authorities in the terminals. The way this is done is elaborated on in paragraph 3.1.2. This data is processed in the data program SPSS. All of the terminals along the Rhine-Alpine corridor are included in this research. This means that the entire target group will play a role in the research and it is not necessary to select a percentage of the existing terminals. The reason why all the terminals were examined, is because of the quantity of the research units. In total, along the Rhine-alpine corridor there are 79 container terminals to be found between the border of Germany and the Netherlands and Genoa (Agora, 2013; InlandLinks, N.D.). 20 of these terminals are in Belgium, 41 in Germany, seven in Switzerland and 11 in Italy. Van Buuren (2014) already established information about the Dutch terminals along the corridors. In his research, he distinguished 29 different container terminals in the Netherlands along the corridor. This means, that in total a data set of 108 different terminals are examined along the Rhine-Alpine corridor. This number is needed to do statistical tests, so the choice has been made to involve all the existing terminals in the research. For some terminals, the needed information was already gathered to some extent. However, for the most terminals the data still needed to be gathered. This is done by approaching the specific terminals about the information that can not be found directly. The exact way this data has been gathered can be found in paragraph 3.2.1.

After the existing terminals were collected, they are compared and their assets are tested. Statistical tests about how many terminals are prepared for the TEN-T legislation, but also what the main problems are for the terminals, are collected in this way. By doing this, statements can be made about the properties of a terminal as a whole, but also on a individual basis.

The material of this research will contain the existing terminals along the Rhine – Alpine corridor of the TEN-T as established by the European Commission (2013). This will be done for the terminals starting from the main ports of Rotterdam and Antwerp all along the corridor, through Germany and Switzerland, to the end, in Genoa. A recent research by van Buuren (2014) already gave useful insights in the Dutch situation, so information of Dutch terminals is partly adopted from this research. Here must be stated that the data gathering itself is done separately from the research by van Buuren (2014). The terminals have not been mapped in the rest of the corridor, so this is also done in this research. A more in depth analysis of this corridor and its terminals along it will be given in Chapter 4 of this thesis.

3.1.2 Justification of the quantitative data gathering

In Chapter 5, different statistical data is examined. For all the terminals, the native country and city, the type of terminal, length and number of tracks, quay length, waterway access, handling capacity, number of cranes and lines to a main port are examined. Of course, these statistics have an origin. In the following paragraph, there will be explained from where this data is gathered and how this is done.

The way the quantitative data is gathered, is shown in figure 3.1. This data gathering worked stepwise. This is why the data gathering is presented in a pyramid. First, Most of the

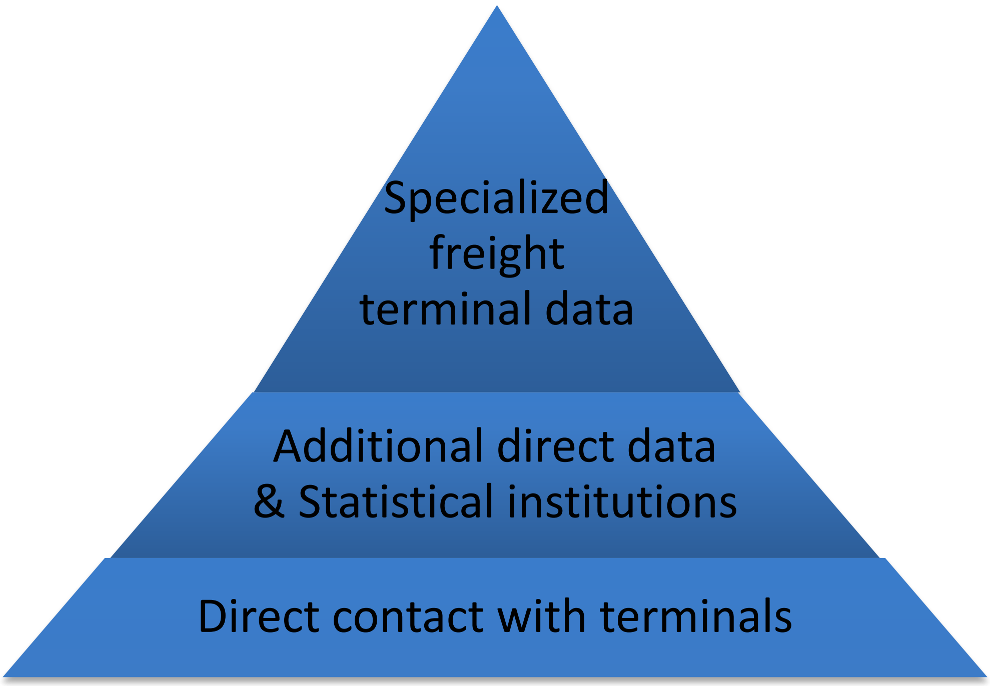

Figure 3.1 Quantitative data gathering in this research

needed data could be found on the specialized freight terminal websites. InlandLinks (N.D.) and Agora (2014) provide information about all the before mentioned indicators. Also Railcargo (2014) and intermodallinks (2014) mention the interlinkage of intermodal terminals. This helped to find data on connections to main ports.

However, the provided information was not complete with the use of these sources. Therefore, websites of the concerned container terminals were consulted to find additional information. After this was done, still some information missed. This was the case for at least one variable, but most of the times more variables, for most of the terminals. Some of the needed was found in the statistical institutions of the countries in question (CBS, 2014; Insee, 2014; ISTAT, 2014; Regionaldatenbank Deutschland (2014); Statbel, 2014; Swiss Statistics, 2014), in Pulfer et al. (2014) and Panteia (2014b). This last document gave insights on waterway access in Europe and can be found in Appendix IV. This document was used to determine waterway access, when waterway access of a container terminal could not be found in another source. In this document, only three categories were established: Less than IV, IV and V or more. Therefore, waterway access that is based on this definition automatically is marked as 3, 4 or 5 in SPSS. This is no problem for this research, because the waterway access should be at least class IV or V, depending on the type of terminal. Therefore, all the variables with a 4 or 5 or higher score positive on this point.

Still, a lot of data could not be gathered through the internet. In total, out of the 129 terminals that are included in this research, for 36 terminals not all the data was found on the internet. The data that could not be gathered through internet, was gathered in another way. The concerning terminals were contacted by email, to reveal the desired information. This was mainly the case for handling capacity, which was hard to find on the internet. Most of the terminals responded to this email, which meant this data also was gathered. The terminals that did not answered the email, have been called. This was the case for 14 different terminals, which were located in different countries. For a few of these terminal, one number missed, for some others two or three different numbers missed. Handling capacity, number of cranes and vessels to a main port turned out to be the hardest information to find. Eventually, all the needed data was gathered, and all the terminals were willing to cooperate. Out of all this data, the final SPSS dataset is made. Chapter 4.2 and 5 are based on the statistical results of this data set. So, in principle secondary data is used for the data set. All the data that was not available is collected especially for this research. In this way, the collected data for this research is a combination of secondary and primary data.

3.2 Research strategy and material of the qualitative part

3.2.1 Methods of the qualitative research

The second part of this thesis focuses more on a qualitative research design. After the different properties of the terminals along the corridor were mapped, recommendations about how the TEN-T legislation can be used are given. The aim is to speak with different actors that are involved with European inland transport, to hear different sides of the story regarding this topic. Not only terminal holders will be asked for their opinion, but also a specialized company in the field of subsidy applies is questioned. From out of these conversations, conclusions can be drawn about the way that the TEN-T and CEF legislation works up to this point and see if there are any recommendations to be made to enhance the current CEF subsidy, and as a corollary terminal efficiency.

This information is gathered by doing interviews with the different actors. Doing a interview with these actors, rather than doing a survey, has the benefit that the subject can be examined much more in depth (Rubin & Rubin, 2005). This is needed in this research, because the existing spatial characteristics alone are not sufficient to answer the main question of this thesis. This thesis aims to answer to what extent the CEF can contribute to the transport efficiency of terminals in the Rhine-Alpine corridor. By just looking at the quantitative data, only a answer can be given about whether or not a terminal can be labeled as efficient, but not how CEF can contribute to this efficiency. Therefore, a more in depth research about the view on CEF is needed to be able to answer the main question adequately.

To be able to come up with representative research results, multiple actors in the spectrum were interviewed. First of all, different terminal holders were interviewed. They are asked for their opinions of the before mentioned aspects of the TEN-T legislation. Furthermore, the opinion from specialized authorities that make an application for the subsidies, on behalf of other bodies, is interesting for this research. These companies have much expertise on how to make an application for a European subsidy, CEF or otherwise. The opinion of this companies is also asked.

In total, five terminal holders were interviewed. Because some of these terminal holders have multiple terminals, in total nine different terminals were conducted in the qualitative research. The last interview is conducted with an actor that is responsible for make an applicationing for a subsidy. This interview was meant to shine another light on the subject, because this companies have another view on how this subsidies are organized. The interview guides for this interviews can be found in Appendices XII and XIII.

A justification of the chosen terminals can be found in Chapter 3.2.2. the results of this five terminals are also confirmed by another German terminal holder, with who another interview is done through phone. There could be argued that five interviewees do not seem very much to make trustworthy statements about an entire population. However, the five original interviews are done with Dutch terminals. This means that out of the 29 possible terminals, experiences of nine different terminals are examined. This is a fair amount and able to reflect the entire Dutch terminal population along the Rhine-Alpine corridor.

The interviews were analyzed and there is looked for trends in the different interviews. After the interviews are analyzed, specific conclusions and later on recommendations towards CEF subsidies can be made.

3.2.2 Justification of the qualitative data gathering

This paragraph focuses on explaining how the qualitative data that is used in this chapter is gathered. First of all, there are companies that are specialized to make an application for CEF subsidies. Parties that are interested to make an application for a CEF subsidy, may contact these kind of companies to help them to submit an application to INEA. This has the advantage that these companies know the exact pitfalls of the CEF subsidies and, more importantly, how to avoid these. Therefore, the chance that the application gets approved is bigger when such a company helps during the process. In this research, also one of these companies is approached to give their view on the CEF program. In this case this has been Pecunia Non Olet (PNO). PNO is a Dutch based company with offices in five other European countries. PNO is specialized in writing applications for many (European) subsidies, of which the CEF is one. With this background, the expertise of PNO can be very helpful. Not only do they have a view on how the CEF subsidies are regulated, but they also have a lot of knowhow about other subsidies and how they are managed. The view of such a actor might bring up some more refreshing ideas. A interview is conducted with one of the consultants from PNO. The contact with this consultant has been made through Jarl Schoemaker, who is the manager of the team Transport, Logistics and Infrastructure. Here should be noted that this interview is conducted by email, because of practical reasons. Because at the time the interview were conducted the first call for CEF applications was near, it was due to a busy schedule not possible to arrange a meeting. However, it was possible to fill on a questionnaire by email for this consultant. Although that it is clear that this makes it harder to extract the needed data, there is still chosen to conduct this interview in this way, because of the expertise the respondent has. this information was too valuable to ignore for this study, and therefore the decision is made to conduct the interview in a digital way. The report of this interview can be found in Appendix VI .

Furthermore, the second category that is interviewed in the light of how TEN-T legislation is perceived by local actors, are the relevant terminals along the Rhine-Alpine corridor. Because of the available time for this research, it was not possible to do a in-depth interview with all of the 108 available container terminals along the corridor. Therefore, there was chosen to make a selection out of the existing terminals. In order to keep the research organized, there is chosen to keep other parameters equal. Because the subsidy application usually is a interplay between the terminals and a national government, there is chosen to only interview terminals on Dutch territories. By doing this, the influence of a national government on the subsidy supply is given as a constant factor, which makes the interpretation of the statements of the actors easier. In this way it is more fair to compare the different interviews to each other.

In total, five different Dutch terminal holders were interviewed. In here, there is chosen to conduct interviews with terminals that are geographical spread along the Rhine-Alpine corridor). Not all the terminals that approached wanted to contribute to this research. When this happened, another terminal was approached. The following terminal holders were involved in this research: Marnix Vos (Employee at Alpherium terminal in Alphen aan den Rijn), Rien Geurts, who is managing director at BCTN (terminals in Rotterdam, Den Bosch, Nijmegen, Wanssum/Venray and Belgium), Eric Nooijen (General director at the terminal in Oss, previous chair of the association of inland terminals), Frans van den Boom (Director at the terminal in Ridderkerk) and Hanneke Bruinsma (Projectmanager Business Development for the terminals in Veghel and Cuijk). Reports of the conducted interviews with employees of the terminals can be found in Appendices VII through XI. Last, to validate what has been said by Dutch terminals, a conversation is held with mister Wilms from the German container terminal in Emmerich. This interview is conducted through phone, and was primarily meant to validate what was heard at the Dutch sites. This terminal has been chosen deliberately, because of its close connections to the Dutch hinterland, being located close to the Dutch border. This means that in total 7 interviews are conducted for this research, next to the gathering of the quantitative data. From all of this interviews a transcript is available in Dutch. These transcripts were used to analyze the interviews. Different codes were used in analyzing this research. All that has been said, is labeled as information on ‘subsidy application’, ‘rate of co-funding’ and ‘Key projects and solutions’. This labels are translated directly into different paragraphs in the empirical part of this research. The outcomes of this interviews will be elaborated on in Chapter 6.

4. Introducing the case: The Rhine-Alpine corridor

This research is conducted within the geographical boundaries of the Rhine-Alpine corridor, that is established by the TEN-T regulations. The Rhine-Alpine corridor is set as one of the nine corridors that together form the core network of European transport. This chapter will answer the sub question *'Where is the Rhine-Alpine corridor and how many terminals can be located?'.* In paragraph 4.1, detailed information about the geographical aspects of the corridor and the existing terminals will be given. In paragraph 4.2, statistical data about the different terminals is provided. By describing the geographical aspects of the terminals, this chapter is set to be the solid basis for the coming chapters and the fieldwork that evolves around this research.

4.1 Geographical aspects of the Rhine-Alpine corridor

The Rhine-Alpine corridor plays a prominent part in the European TEN-T legislation. Not only as being one of the nine corridors in the core network, but also because the corridor covers the biggest part of the 'blue banana' (EEIG Rhine-Alpine corridor, 2014). The blue banana is a banana shaped metropolitan axis that runs from Manchester to Milan, and have been Europe's breading place for innovation and growth (Hospers, 2003). A map of this blue banana, and the position of the Rhine-Alpine corridor within it, can be found in figure 4.1. This banana contains some of the major industrial clusters in Europe, such as the area around Manchester, the port of Rotterdam and the Ruhr-Area. Its position is strategic because it connects some of Europe's biggest ports, industrial centers and major market areas (Executive Board Rail Freight Corridor 1/A Rhine Alpine, 2014).

Figure 4.1 The blue banana. Source: EEIG Rhine-Alpine corridor (2014)

A large part of the blue banana is represented in the geographical location of the Rhine-

Alpine corridor. This corridor runs roughly from the sea ports of Rotterdam and Antwerp, through the west of Germany and Switzerland into Italy, where it ends at the sea port of Genoa. The total line distance of the corridor is about 1.500 kilometers and has a total railroad track length of 4.900 kilometers (EEIG Rhine-Alpine corridor, 2014).

In this paragraph, the corridor will be discussed in detail, country by country. First, the Netherlands will be examined. After that, the Belgian part of the corridor will be looked at. In paragraph 4.1.3, The German side will be examined and in paragraph 4.1.4 we will take a closer look into the Swiss part of the corridor. Last, Italy's part of the Rhine-Alpine corridor will be looked at.

4.1.1 The Netherlands

The Dutch part of the Rhine-Alpine corridor is named by the European Commission (2013b) as can be seen in figure 4.2. In the map can be seen that the corridor crosses the big cities Amsterdam, Rotterdam, Utrecht, Arnhem and Nijmegen. Motorways that are represented in the Area are the A15 from Rotterdam to Arnhem and Nijmegen, the A2 from Amsterdam to Utrecht and the E35 from Utrecht to Arnhem.

Railways are also represented within this part of the corridor. Next to integrated rail, which accommodates both passengers and freight trains, the Netherlands also accommodates the Betuwelijn. This is a rail line between Rotterdam and Nijmegen, exclusively meant for the transport of freight (Witlox, 1999). In 2012, about 65 freight trains crossed these tracks every day (NRC Next, 2012). This is less than the 150 trains the government aimed for, which indicates that the maximum capacity for this track is not yet reached. A further increase of demand for train paths is expected to occur due to the entry into service of the Maasvlakte 2 in the Port of Rotterdam (European Commission, 2013b).

Figure 4.2 The Dutch part of the Rhine-Alpine corridor Source: European Commission, 2013b)

Waterways play a big role in the Dutch part of the corridor too. The biggest main port of this corridor, the Port of Rotterdam has an obvious connection to water. The Port of Rotterdam and the North Sea are connected through a canal. This canal, the New Waterway or Nieuwe Waterweg, was dug in 1872 under the supervision of Pieter Caland and was a necessary step to guarantee the accessibility of the Port of Rotterdam (van Evelingen, 2013). Also, beyond the Port of Rotterdam, there are many rivers and canals that form the inland waterways of the Netherlands. From the German hinterlands, the river Maas flows to the Biesbosch. Over here, the river evolves in the Merwede and flows through Dordrecht and as the New Maas to Rotterdam. Amsterdam is connected to the big rivers through the Amsterdam-Rhine canal. This canal flows From the Lower Rhine through Utrecht and ends in Amsterdam eventually. The Lower Rhine flows from Arnhem to Rotterdam, at which it at some point evolves in the river Lek. Last but not least, The river Waal starts from the Dutch/German border at Nijmegen and leads through the Dutch region de Betuwe to the Merwede.

This set of rivers and canals in the Netherlands together form the core network of inland waterways for the Rhine-Alpine corridor. Together with the mentioned motorways and railways, this entails the entire Dutch part of the corridor, as set up by the European Commission (2013b).

The current Dutch terminal situation is already described by multiple sources (van Buuren, 2014; Logistiek.nl, 2013). According to the logistics map of the Netherlands, twelve different hotspots can be named within the Dutch logistics framework (Logistiek.nl, 2013). These hotspots correspond with the information that van Buuren (2014), Defares (2011), Buck Consultants International (2008) and Inlandlinks.eu (N.D.) provide about terminals in the Netherlands. Also, information that is given by legislation 1315/2013 by the European Union (2013), that provides the cities that are involved in the core and comprehensive network.

A map of these hotspots can be found in figure 4.3. Inlandlinks.eu (N.D.) and van Buuren also adds an inland terminal in Tiel, and several inland terminals in Rotterdam, which are not included in the map of Buck Consultants International.

Of course, not all of these inland terminals are included to the Rhine-Alpine corridor. All terminals north of the line Beverwijk, Utrecht and Nijmegen are not included to the Rhine-Alpine corridor, and will therefore not be examined in this research. Furthermore, also the container terminals south of Oosterhout, Tilburg, Den Bosch and Wanssum also do not correspond with the

Figure 4.3 The Dutch terminal situation, Source: Buck Consultants International (2008)

Rhine-Alpine corridor. These terminals will also not be examined in this research. In total, 29 terminals can be established in the Netherlands. An overview of all the existing container terminals in the Netherlands can be found in Appendix III.

4.1.2 Belgium

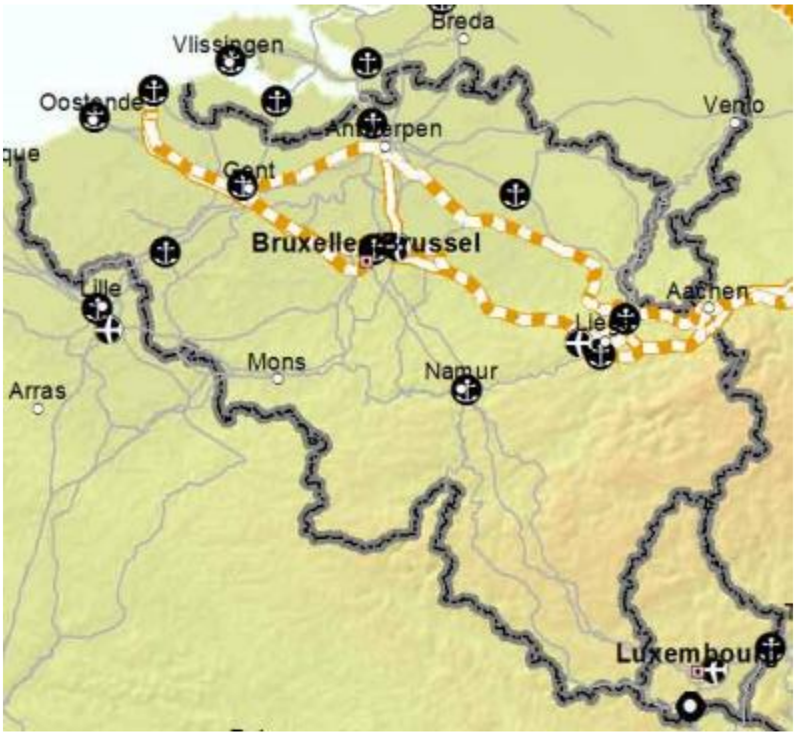

Figure 4.4 The Belgian part of the Rhine-Alpine corridor, Source: European Commission, 2013b)

The Rhine-Alpine corridor also crosses Belgian territory. As can be seen in figure 4.4, this is mainly the case for the northern part of the country. The corridor contains the ports of Antwerp and Zeebrugge, and furthermore the cities Ghent, Brussels and Liege.

One of the main motorways that is affected by the TEN-T legislation is the A10 from Ostend to Ghent and Brussels. The A3 that leads from Brussels to Liege and into Germany is also included in the core network. Furthermore, The E19 from Antwerp to Brussels is included in the TEN-T core network. The A14 from Ghent to Antwerp and the A13 from Antwerp through Hasselt to Liege are the last motorways that are part of the core network.

The railroad network that is included in the TEN-T core region is displayed in figure 4.4. There can be seen that there are direct connections between the big cities Belgian cities Ghent, Antwerp, Brussels and Liege. This corresponds to the rail road map that shows the most important rail road lines in Europe, that can be found in Appendix II.

Belgium has the same direct link to water and sea as the Netherlands. In the core corridor two Belgian sea ports are included. One of them, the port of Antwerp, may call itself one of the biggest ports in Europe with a freight volume of 184 million tonnes in 2012 (Port of Antwerp, N.D.). However, the way that the Belgian hinterland is connected is different. This part of Belgium does not have such waterway accessibility as the port of Rotterdam does. The river Scheldt flows a little past Antwerp, but furthermore not much main inland waterways can be found in this part of Europe. Therefore, almost no inland waterways are included in the core corridor in the Belgian part.

Next to the Netherlands, Belgium also have container terminals to offer along the Rhine-Alpine corridor. The information about where these terminals are located are derived from InlandLinks (N.D.), The European Union (2013) and Agora (2013). 20 terminals have been established on Belgian ground. An overview of the existing Belgian container terminals along the Rhine-Alpine corridor can be found in Appendix III.

4.1.3 Germany

In figure 4.5, the German situation regarding the Rhine-Alpine corridor is sketched. The corridor crosses the borders of the Netherlands and Belgium at the line of Emmerich for the Netherlands and Aachen for Belgium. From here on out, the corridor shifts southwards towards Switzerland. This part of the corridor covers the most western part of Germany. In the core network, big cities like Duisburg, Aachen, Düsseldorf, Cologne, Koblenz, Frankfurt am Main, Mannheim, Karlsruhe, Strasbourg, Freiburg and Mulhouse are included. This means, the French border at Mulhouse and Strasbourg are is also involved in the corridor.

This area is characterized by transport possibilities by all three modalities, so that means inland waterways, railroads and motorways. A main motorway in the core corridor is the E35 that reaches all the way from the Dutch border at Emmerich to Frankfurt am Main. Meanwhile it passes cities like Duisburg, Essen, Düsseldorf, Cologne and Bonn. From Frankfurt am Main on out, The E451, E50 and E35 lead the Rhine/Alpine corridor through Mannheim to Karlsruhe. The E35 goes on further south, and travels via

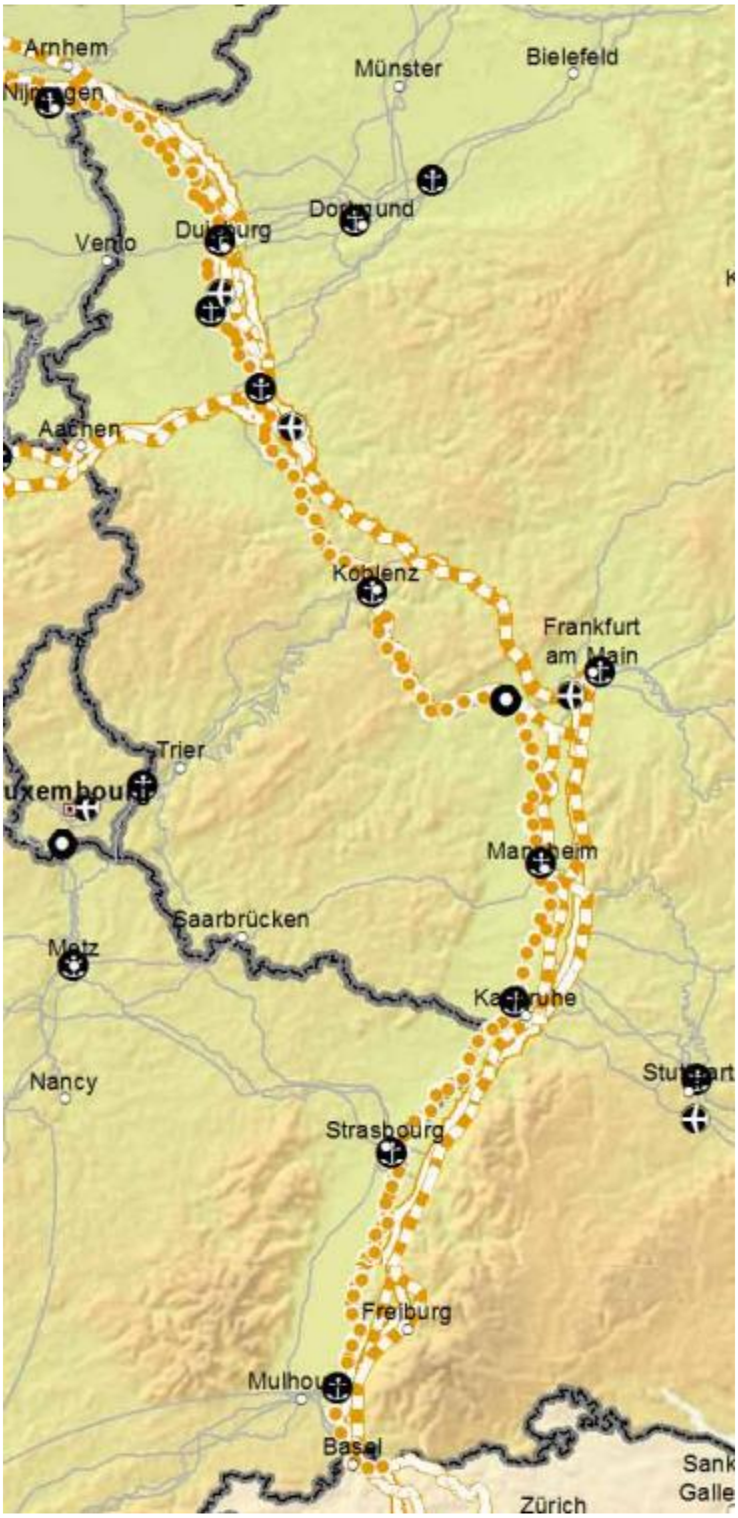

Figure 4.5 The German part of the Rhine-Alpine corridor, Source: European Commission, 2013b)

Figure 4.6 The German terminal situation, Source: Gaidzik et al., 2012)

Mulhouse to the Swiss border at Basel.

The entire German rail road route that is shown in figure 4.5, is also observable in the rail road map in appendix II. A direct rail road from Köln to Frankfurt am Main and Basel is available. This rail road also got his place in the Rhine-Alpine core network.

When it comes to inland waterways, one river is greatly represented in the German part of the corridor. As the name of the corridor already suggests, the Rhine plays a central role in the transportation of goods. Starting at the Swiss border at Basel, the Rhine flows through the German landscape, all along the before mentioned cities towards the Dutch border at Emmerich. From here on, the Rhine flows further into the Dutch landscape.

The German terminal situation also has been mapped (Gaidzik, Karcher & Riebe, 2012). This is shown in figure 4.6. This figure contains the different container terminals along the Rhine-Alpine corridor. According to other information that Gaidzik et al. (2012) states, two different terminals can be established. One in Bonn Hafen and one in Gernsheim, between Mainz and Wormshafen. This information is combined with data from InlandLinks (N.D.) and Agora (2013). All together, there are 41 German container terminals along the Rhine-Alpine corridor. An overview of this terminals is given in Appendix III.

4.1.4 Switzerland

When the network leaves Germany, the Rhine-Alpine corridor continues on non-European Union ground. Switzerland also participates in the TEN-T program, although they are not a member state of the European Union. Through a set of regulations, known as Bilaterals, the Swiss government managed to join some agreements, like the Schengen agreement and a scientific research agreement. Cooperation in the TEN-T program

Figure 4.7 The Swiss part of the Rhine-Alpine corridor, Source: European Commission, 2013b)

is one of them (Federal Department of Foreign Affairs FDFA, 2014).

The core network splits up in three different ways when it crosses the Swiss-German border, as is visible in figure 4.7. For all these routes, both motorways and rail roads are available. The motorway E25 from Basel to Bern is one of the main motor routes. From here on, the route goes on southwards on highway 6. Along this way, the roads, as well motorway as railway, cross the Lötschbergtunnel. This tunnel has a length of 35 kilometers and is up to now the longest railway tunnel to cut through the Swiss alps. From here on it leads straight to the Italian border at Domodossola.

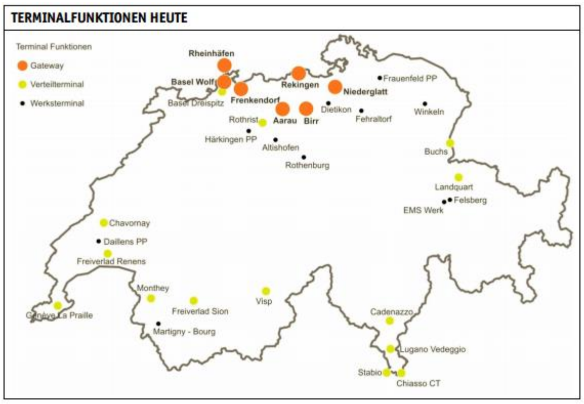

Figure 4.8 Container Terminals in Switzerland, Source: Ickert et al. (2012)

The other two routes that occur from Basel tend to travel a bit more east. The E60, that leads past Zürich, and the E35 are both set as part of the core network. These two roads come together at Luzern and, after they have split for a short time, at Altdorf again. From her on it crosses the Gotthard tunnel as it travels to the Italian border at Lugano.

A Swiss research about existing terminals is done by Ickert, Maibach, Bieler, Bruckmann & Fumasoli (2012), which is shown in figure 4.8. The outcomes of this research are again compared to Inland-Terminals (2014) and InlandLinks (N.D.), which did not brought up any new conclusions. In total, 7 different terminals can be established in Switzerland. An overview of these terminals can be found in Appendix III.

4.1.5 Italy

Last but not least, the Rhine-Alpine corridor includes Italy. Figure 4.9 shows that the corridor enters Italy at two places and that they both lead to the port of Genoa. Also in Italy only two modalities are combined in the core network. There is no place for inland waterways in the network, because of the lack of suited rivers or canals.

From the border of Switzerland at Domodossola to Genoa, there is a direct highway connection, the A26. This motorway is part of the core network. Also, the highway that leads form the Swiss-Italian border from Como to Milan, the A9, is part of the core network. Also the A7 from Milan to

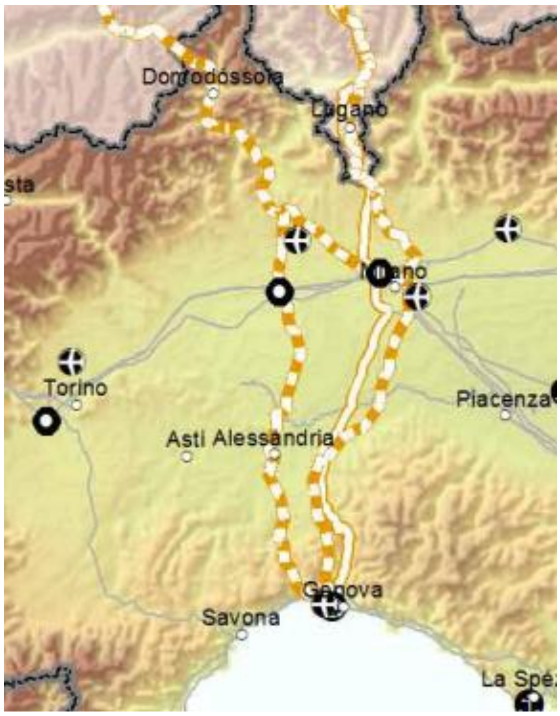

Figure 4.9 The Italian part of the Rhine-Alpine corridor, Source: European Commission, 2013b)

Genoa and the A8 from Milan to airport Milan-Malpensa are part of this.

The railroads applicable for the core network are more or less similar to this roads. This is confirmed by the railroad map in Appendix II.

No official document is written that frames the container terminal situation in Italy. Therefore, the data from InlandLinks (N.D.) and Agora (2013) are used to provide the information for the existing Italian container terminals along the Rhine-Alpine corridor. From out of these documents, 11 terminals can be established. An overview of these terminals can be found in Appendix III.

4.2 Overview of the characteristics of the existing terminals

In total, 108 container terminals are examined along the Rhine-Alpine corridor. 29 of these terminals are in the Netherlands (26,85%), 20 in Belgium (18,52%), 38 are located in Germany (35,19%), seven in Switzerland (6,46%) and 11 in Italy (10,19%. Last, three terminals are located in France, next to the German border. This accumulates to 2,78% of the terminals along the corridor.

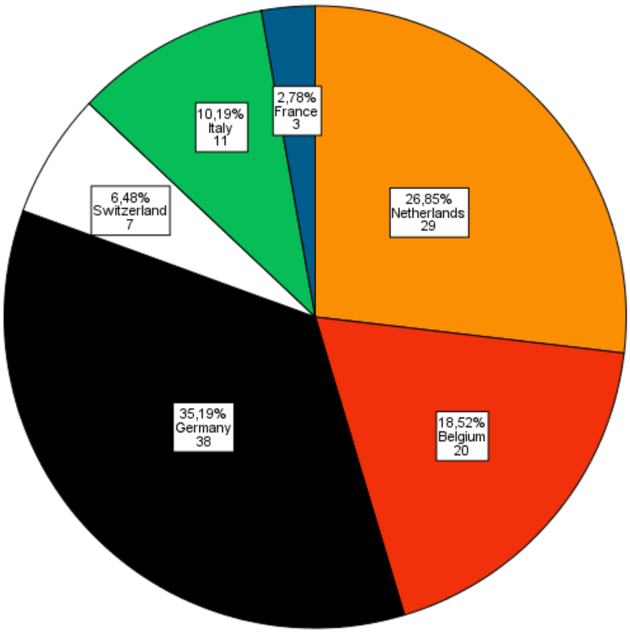

Figure 4.10 Spread of terminals along the countries

What is remarkable in the spread of container terminals, is the big percentage that Germany, Belgium and the Netherlands represent in the distribution of the terminals. These three countries together represent 80,56% of the existing terminals along the Rhine-Alpine corridor, whilst this only represents 50% of the countries (three out of six). There are three arguments that can explain this difference in the quantity of the various terminals. First of all, a reason to explain this is that the population density in mainly the Netherlands and Belgium, but also to some extent in Germany, is higher than in the other areas along the corridor (Brittannica, 2014; Gallego, 2010). This means that the demand for products per square meters is higher than in areas with a lower density. Therefore, more products will be transshipped and this could explain why there are more container terminals in this area.

Another reason of the high percentage of container terminals in this area are the nearby main hubs of the ports of Antwerp and Rotterdam. These ports transport goods throughout the whole of Europe. It is only logically that the closer a terminal is located to a big supply source, the more work it provides. This also is a reason why container terminals are richly represented in the Netherlands, Germany and Belgium.

A third explanation, which mainly counts for the German terminals, can be found in geographical aspects. Although the corridor crosses six different countries, this does of course not automatically mean that every country takes the same amount of kilometers to its account. As can be seen in figure 4.10, almost half of the corridor is located on German territory. Therefore, it is only logically that more terminals are located in Germany and less in Switzerland, because only a small part of the corridor crosses this country. A combination of these three factors explain the skewness of the distribution of the terminals along the corridor.

As mentioned in Chapter 2, container terminals come in different sizes and shapes. This is shown in figure 4.11. The most terminals that are examined in this research, are trimodal terminals. In this terminals, there is a direct connection to water, rail and road. The bimodal terminals Road-Water and Road-Rail are both equally represented. Both kind of terminals, where only two kind of modalities are connected, represent 28,7% of the existing terminals along the corridor. In this research, only one terminal is determined where only transport with one modality, namely road, is possible. This concerns the terminal *'Progeco Holland Depot 2'* in Rotterdam, which basically serves as a warehouse for another terminal in Rotterdam, *'Progeco Holland Depot 1'*. This terminal is furthermore not connected to other inland ports.

What is interesting to mention in the division of types of terminals however, is the differences between the countries. A crosstab analysis is conducted on the terminals in SPSS. The output of this analysis can be found in Appendix V.

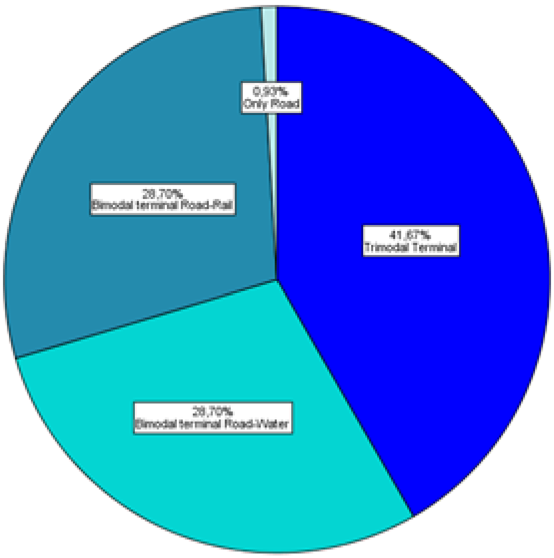

Figure 4.11 Types of terminals along the corridor

The analysis shows that the Netherlands and Belgium represent a big part of the bimodal terminals Road-Water. 65,5% of the terminals in the Netherlands are this type and 40% in Belgium is only accessible via road and waterways. Switzerland, Italy and France all do not have a Road-Water terminal along the Rhine-Alpine corridor. The opposite can be said for bimodal terminals that can be reached by road and rail. For this kind of terminals, Italy (100%) and Switzerland (71,4%) score high. The German terminals are mainly trimodal (68,4%), although some of the German terminals lack access via water (21,1%) or rail (10,5%). France has three terminals, which are all trimodal.

According to the analysis, there is a strong dependency between the type of container terminal and the country of origin of the container terminal. This can be said on the basis of the statistical test *Cramér's V*. This coherence measure is 0,483 in this example, which means that the coherence between the type of terminal on the one hand and the country of the terminal on the other hand is high. In other words, the country where a terminal is located has a major impact on what the type of the terminal is. This is confirmed by the significance of 0,000 of this test. Because this does not cross a significance of 0,05, there is sufficient evidence to believe there is a link between these variables.

The reason why the terminals are constituted in the following way, is not that difficult. Switzerland and Italy barely have sufficient inland waterways that are classified CEMT class IV or higher, which means that transport by water is impossible. Therefore, in Italy and Switzerland only transport by road and rail is possible, which is reflected in the available types of terminals. For the Netherlands, Belgium and Germany quite the opposite counts. These countries have various inland waterways that are qualified as CEMT Class IV or higher, which means that transport by water is possible. This is the reason that a lot of bimodal Road-Water terminals and trimodal terminals occur in these countries.

Many cities house one or two container terminals. A few cities however, house at least three container terminals. Among others, the sea port of Rotterdam (9), Antwerp (8) and Genoa (3) house more than two terminals. The other cities that do so, can be stated as important pivots in inland transport. This goes for the cities of Mannheim (5), Duisburg (4), Basel (4), Düsseldorf (3), Frankfurt am Main (3) and Milan (3). What is noteworthy about these statistics, is that these pivots all are located in cities with at least 250.000 inhabitants, whilst this is not the case per se for a container terminal. Only 51 terminals (47,2%) are located in cities with at least 250.000 inhabitants. This includes the previously mentioned 42 terminals that are located near a sea port or inland pivots. This means that only 9 of the 66 terminals that are not located in a mainport or pivot are situated in a city with a population of at least 250.000. this is only 13,63%, which is much less then the 100% of the terminals in mainports or pivots. That these differences are very big, also gets underlined by doing more in-depth statistical tests. A independent samples T-Test is done, for which the results again are shown in Appendix IV. By doing this test, possible significant differences between the two groups can be found. Because of a significance of 0,789 for the Levene's test, which is much bigger than the test value of 0,05, equal variances may be assumed. With a significance of less than 0,001 for equal variances, there can be stated that the means of inhabitants in pivot or main hub areas and other cities differ significantly, which means that it is proven that terminals cluster more around bigger cities than to more rural areas.

An explanation can be found with a look at selling markets. Bigger cities serve bigger hinterlands and therefore a bigger demand for goods. This means that there is more room for extra terminals in the area.

4.3 Conclusion

In the past chapter, the situation on the Rhine-Alpine corridor is described. This chapter aims to answer the following sub question:

Where is the Rhine-Alpine corridor and how many terminals can be located?

In the first paragraph, overall characteristics about the geographical position and most important waterways, railroads and motorways of the corridor have been described, for the countries the Netherlands, Belgium, Germany, Switzerland and Italy. This answers the first part of the above mentioned sub question. The first paragraph of this Chapter does also answer the second part of this research question to some extent. Information is given on the research unit of this thesis: container terminals. By using different sources it is tried to identify the existing container terminals along the corridor. When reports of existing terminals where available, these reports were used and tested on the basis of different sites that claim to give an overview of different terminals in Europe (InlandLinks, N.D.; Agora, 2013). For the three countries where already information was accessible throughout various reports (The Netherlands, Germany and Switzerland), this information was quite uniform to the information the websites provided. For Belgium and Italy however, there were no previous reports available that have mapped the existing terminals. Therefore, for these two specific cases the information provided by InlandLinks (N.D.) and Agora (2013) are used to map the existing terminals along the Rhine-Alpine corridor in these countries.

The outcomes of this mapping are as following. In the Netherlands, 29 terminals are available along the Rhine-Alpine corridor. Belgium represents 20 terminals, Germany concludes 41 terminals in the network, Switzerland has 7 container terminals and Italy 11. This means, that in total 108 container terminals can be examined along the Rhine-Alpine corridor. This corresponds with the information of EEIG Rhine-Alpine corridor (2014), that claims that along the Rhine-Alpine corridor approximately 100 terminals are located.

In paragraph 4.2, these terminals are described more in depth. In this part, things like the division of terminals per country and the distribution of types of terminals are elaborated and explained. The high amount of trimodal terminals, as well as the bigger part of terminals in Germany, Belgium and the Netherlands are explained. Also in which countries the different types of terminals can be found is elaborated on. From out of the data there can be concluded that the German terminals are mostly trimodal, the Dutch and Belgian terminals are often bimodal Road-Water and the Swiss and Italian terminals have a bimodal Road-Rail character.

In the next Chapter, these terminals will be elaborated further. On the basis of the material that is discussed in Chapter 2, the different terminals are examined in terms of accessibility, capacity, on-port facilities and port services.

5. Efficiency of Container Terminals

In this chapter, a quantitative analysis is done. On the basis of the indicators shown in chapter 2, some statistical information can be given on the existing terminals along the Rhine-Alpine corridor. Paragraph 5.1 focusses on the different indicators and to what extent they are represented in the terminals along the Rhine-Alpine Corridor, whilst in paragraph 5.2 the total accumulated assets of the terminals are discussed. In the end, the sub question *'to what extent are the existing terminals in the Rhine-Alpine corridor efficient?'* will be answered.

5.1 Terminal efficiency along the Rhine-Alpine corridor

This paragraph will take a closer look at the current characteristics the terminals possess at the moment. On the basis of the in Chapter 2 mentioned features of efficient container terminals, these existing terminals will now be examined.

5.1.1 Accessibility

This paragraph focuses on the accessibility of the existing container terminals. First, aspects regarding to rail transport are examined. After that, the situation for inland water transport is looked at. The choice is made to examine these two aspects separately, because the research group differs between aspects of rail and aspects of water transport. Bimodal terminals only possess accessibility to rail or to water, so these aspects are examined separately.

Rail aspects

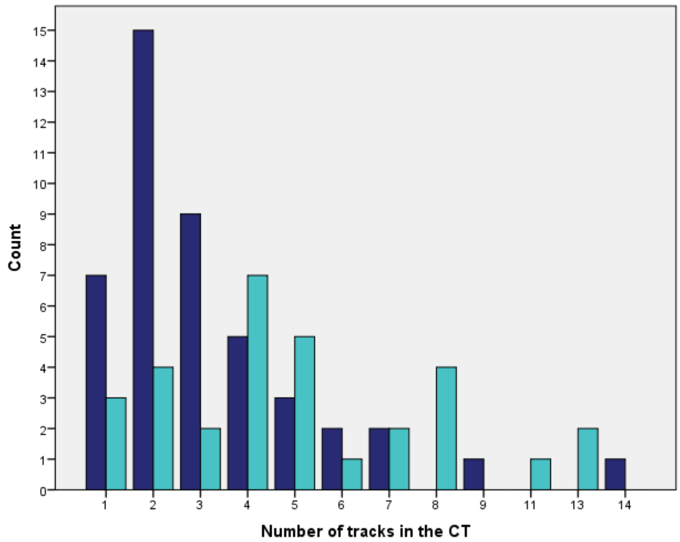

Figure 5.1 Number of rail tracks on terminals

First, the number of tracks are examined. The number of tracks at a terminal is not per se an indicator for an efficient terminal, but it helps other variables, such as the 'entering facilities'. Because this is a rail aspect, there is chosen to speak of this asset of container terminals in this part of the chapter. This is only done for trimodal terminals and for bimodal Road-Rail terminals, because these are the only terminals that possess a direct connection to rail tracks. This means that the bimodal Road-Water terminals are not examined in this analysis, because the lack of a railroad connection. In figure 5.1, a overview of the number of railroad tracks is given, where the dark blue bars represent the trimodal terminals and the light blue bars represent the bimodal Road-Rail terminals. Many of the trimodal terminals have one, two or three tracks and the frequency of the number of tracks drop in a evenly distributed way. The most trimodal terminals have two tracks available, fifteen. The most tracks that are available in one trimodal container terminal is 14. This is the case in the terminal of ATO in Antwerp.

Two bimodal Road-Rail terminals have access to 13 rail tracks, namely Köln Eifeltor and Ludwigshafen KTL in Mannheim. For this kind of terminal, the peak in the most common number of tracks seems to be a bit higher. In total there are seven bimodal Road-Rail terminals with four tracks. Also five and eight tracks are more common than the lower numbers of tracks.

On the first hand, the number of tracks seem to differ between trimodal and bimodal terminals. With the use of a independent T-test has been viewed if the differences between these terminals are significant. This test tells that the trimodal terminals have an average of 3,29 railroad tracks, with a standard deviation of 2,45. Bimodal Road-Rail terminals have an average of 5,13 railroad tracks, with a standard deviation of 3,201. This means that bimodal Road-Rail terminals on average have more rail tracks, but that the variances within the bimodal terminals are also higher, as can be seen by the bigger standard deviation. The T-test also has clarified whether this differences are significant. With the help of Levene's test can be argued that equal variances may be assumed. The probability of exceedance is 0,095, which is higher than the common 0,05. Therefore, the situation where equal variances are assumed is examined. In this case, the significance is measured at 0,006, which is smaller than the confidence interval of 0,05. This means that there is significant evidence that the means of tracks in bimodal- and trimodal terminals differ. In other words, there can be said, with a probability bordering on certainty, that the number of tracks in a bimodal terminal are bigger than in a trimodal terminal. This can be explained by the fact that the bimodal terminals are dependent on rail, whilst trimodal terminals also can lean on access by water.

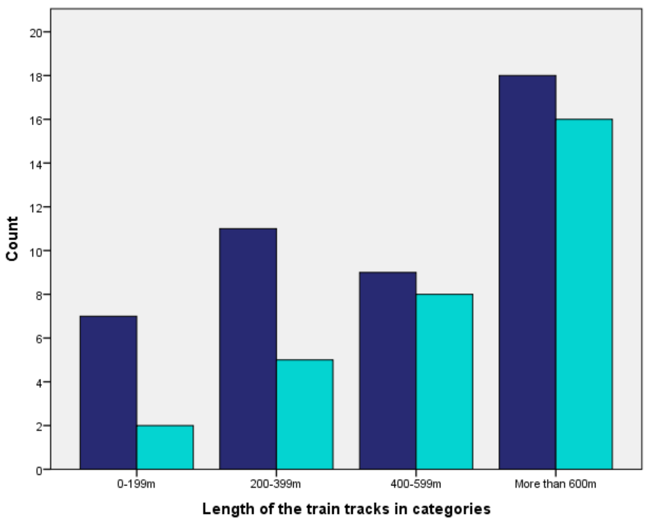

Figure 5.2 Length of the tracks

What furthermore is interesting to look at regarding the number of tracks, is if a higher number of tracks does really contribute to more handling of containers by a terminal. To research this, a linear regression is done with the number of tracks as independent variables and the annual handling capacity as a dependent variable. This test shows that there is a significant link between these variables, but that the explained variance is 13,4%. In other words, the number of tracks does influence the handling capacity, but other factors do also influence the handling capacity. This is logical, because in the theoretical framework other factors are described as well. This other factors will be discussed in the remainder of this chapter. The slope coefficient is 18.442. This means that per increasing track the handling capacity should rise with 18.442 containers per year, according to the used data.

Next to the existing number of tracks in a terminal, also the length of the existing tracks is important for efficient transport. In figure 5.2, the total track length of the two types of terminals is made visible. Also here are the trimodal terminals represented by the dark blue bars and the bimodal Road-Rail terminals by the light ones. In order to present this in a clear way, a categorization of four even distributed classes is made in the length of the tracks. A distinction is made between 0-199 meters (Poorly adapted), 200-399 meters (Needs drastic improvement), 400-599 meters (Does almost meet requirements) and 600 meters and more (meets the requirements). What is hopeful to see is that as well for trimodal as for bimodal terminals the class of rail track bigger than 600 meters is best represented. For bimodal terminals the number of terminals decreases as the length of the tracks decreases, which means that the larger tracks are stronger represented than the smaller tracks. Length of rail tracks of trimodal terminals seem to follow a somewhat more random pattern.

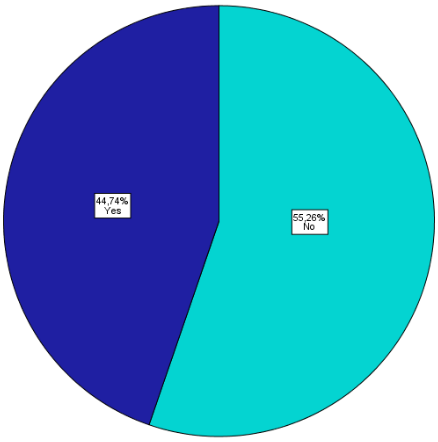

Figure 5.3 Rail track is bigger than 600 meter

The data from trimodal terminals does not seem to differ greatly from bimodal terminals. The means, 565 meters for a trimodal terminal and 529,32 meters for a bimodal terminal, are similar to each other. This is also underlined by a paired samples T-Test. This test has shown that the means of the two terminals regarding the length of rail tracks. The test criterium of 0,05 is exceeded with a score of 0,657. This means that on the basis of the data of this research it is not possible to make a clear distinction in rail track length between trimodal and bimodal terminals.

The rail track length within a terminal should be at least 600 meter (Rail Freight Portal, 2014; Bartosek & Schönemann, 2012). To what extent this is the case is shown in figure 5.3. As can be seen, less than half of the terminals possess rail tracks bigger than 600 meter. This is the case for trimodal terminals and bimodal Road-Rail terminals combined. In total, 18 of the 45 trimodal terminals posses over tracks that are at least 600 meters. This means that 27 of the terminals have smaller tracks. For bimodal Road-Rail terminals, the statistics are a little less drastic. Out of the 31 terminals, 16 terminals do posses tracks of at least 600 meter, whilst 15 terminals do not possess these tracks. This means in total, that only 34 out of the 76 terminals with rail facilities have a sufficient track length available on site. 42 terminals do not meet the standards (55,26%). So this means that although the tracks that are at least 600 meter or more were best represented in figure 5.3, still more than half of the terminals do not possess the needed tracks in terms of length.

Also for this variable the relation to handling capacity is looked at by doing linear regression analysis. This analysis also shows a significant relation between the two variables, with an explained variance of 9,6%. For every meter a track is longer, the annual handling capacity rises with 113,72 containers per annual.

Waterway aspects

Next to rail aspects, container terminals also must meet expectations regarding waterway aspects. For this analysis, trimodal terminals and bimodal Road-Water terminals are examined. The bimodal Road-Rail terminals are excluded, because of their lack of waterway access. In total, 76 terminals are examined in this analysis. 45 of this terminals are trimodal and 31 only have a connection to water and road, and therefore not by rail.

First, the length of the quays of the terminals is looked at. For a terminal to be efficient, the quay should have a minimal length of 135 meter. Almost all of the terminals meet this requirement. Only one trimodal terminal, Mannheim Container Terminal, and one bimodal Road-Water terminal, CT Vrede Zaandam, do not meet this requirement. Almost all other terminals exceed this requirements by far. The length of the quays however do tend to differ greatly between the two different types of terminals. The quays in trimodal terminals have an average length of 511,82 meter. Quays in bimodal Road-Water terminals are on a average 313,10 meter. This seems like a big difference, and this is underlined by a independent T-Test. With a significance of 0,014, this test confirms that the quay lengths of trimodal terminals are significantly bigger than the quays of bimodal Road-Water terminals. This is striking, because of the earlier mentioned multimodality the trimodal terminals have and the bimodal terminals do not know. However, almost all of the bimodal and trimodal terminals do meet the requirements for efficient transport in the field of quay lengths, by having a quay that is larger than 135 meter.

Also for this variable it is interesting to see whether or not it affects the handling capacity. A linear regression analysis shows a quite low, but significant, explained variance of 4,5%. Every extra meter of quay provides for a bigger handling capacity of 93,3 containers per year.

Next to length of the quays, the CEMT waterway access is also important for inland terminals. According to sources mentioned in Chapter 2, inland waterways should at least be accessible via class IV waterways for the small terminals with a local function and class V for the bigger terminals. In figure 5.4 is visualized in which way this CEMT classes are distributed for trimodal and bimodal terminals. Trimodal terminals are only located along at least CEMT IV terminals. Because a trimodal terminal must always be located on at least a CEMT V waterway, can be said that one trimodal terminal does not meet the requirements. For bimodal terminals this is a bit more complex to say. According to the used theories and concepts in this thesis, in some cases CEMT class IV may be sufficient, whilst in all other cases the terminal must be located on a CEMT class V waterway. It could be said that the three terminals classified as CEMT I, II or III are not sufficient and that the 24 bimodal Road-Water terminals with a CEMT classification V or higher are per definition sufficient. This leaves four terminals that are sufficient as a small type terminal, but are not for the other types of terminals. This is dependent on other factors, such as handling capacity and the number of cranes on the site.

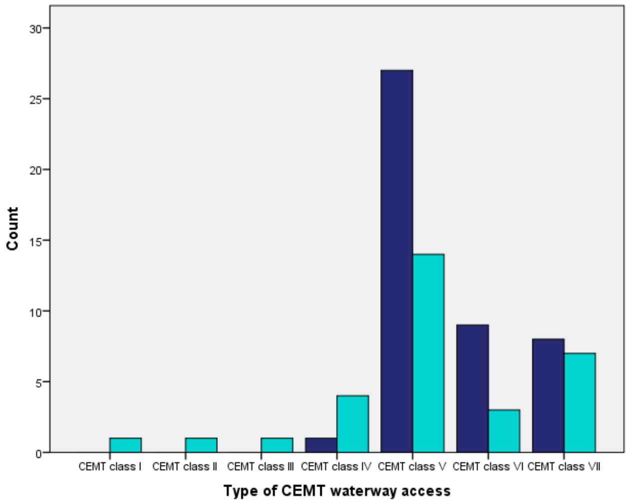

Figure 5.4 Type of CEMT waterway access of the terminals

A linear regression analysis shows that there is not a significant relation between the CEMT accessibility and the handling capacity of a terminal. With a significance of 0,74, this hypothesis can be rejected.

5.1.2 Capacity

Next to accessibility, capacity also plays a role in the efficiency of terminals. To examine this, first handling capacity is looked at. The handling capacity that is needed for a terminal also depends on the type of terminal. For the smallest terminal 20.000 TEU is sufficient, whilst the biggest types of terminals require at least 200.000 TEU´s of handling capacity. Furthermore, the in-between terminals must have a handling capacity of at least 100.000 TEU. Figure 5.5 shows to what extent the terminals along the Rhine-Alpine corridor meet these expectations. One trimodal, one bimodal Road-water, four bimodal Road-Rail and the one Road only terminal do not meet any expectations regarding handling capacity. This means that the handling capacity of this terminals is less than 20.000 TEU's. But, as mentioned in Chapter 2, a trimodal is always a type 1 or type 2 terminal, so this is only the last category. This means that only 15 trimodal terminals meet the requirements of a handling capacity of at least 200.000 TEU. All the other

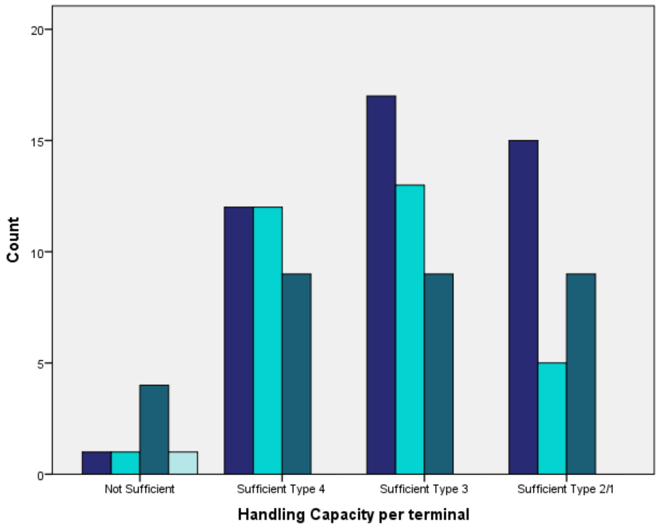

Figure 5.5 Handling capacity per terminal

trimodal terminals, 30 in total, do not meet the set requirements. This means that two out of three trimodal terminals do not score sufficient regarding handling capacity.

For the bimodal terminals, this is more nuanced. Because a bimodal terminal also can be a type 4 or type 3 terminal, it is also possible this terminals do meet requirements when the handling capacity is less than 200.000 TEU. This depends on the function that the container terminal holds in a area and the scale of which activities take place. In total, five bimodal Road-Water and nine bimodal Road-Rail terminals have a capacity of at least 200.000 TEU, which means that they are sufficient for terminal types 1 and 2. 13 bimodal Road-Water terminals and nine Road-Rail terminals are sufficient for type 3, so with a capacity of at least 100.000 TEU, whilst 12 bimodal Road-Water terminals and nine Road-Rail terminals are type 4 sufficient, with a capacity of at least 20.000 TEU per year.

To see to what extent the means of the three types of terminals correspond, a one way ANOVA is processed. With the help of a *Bonferroni* test can be mapped to what extent more than two means differ in relation to each other. The outcomes of this test show that the handling capacity of none of the types of terminals differ significantly. With a significance of 0,152 for the relation between trimodal and Road-Water terminals, 1,00 for the relation of trimodal and Road-Rail terminals and 0,337 for the relations between the two bimodal terminals, it is impossible to say that these means differ significantly. This is striking, because it would be logically that the trimodal terminals have a bigger handling capacity on the average, because it should always have a handing capacity of at least 200.000 TEU, whilst this is not per se the case for the bimodal terminals. The fact that, however the mean of the trimodal terminals is higher than the means of the bimodal terminals, this is not the case suggests that there is still room for a lot of improvement for the trimodal terminals.

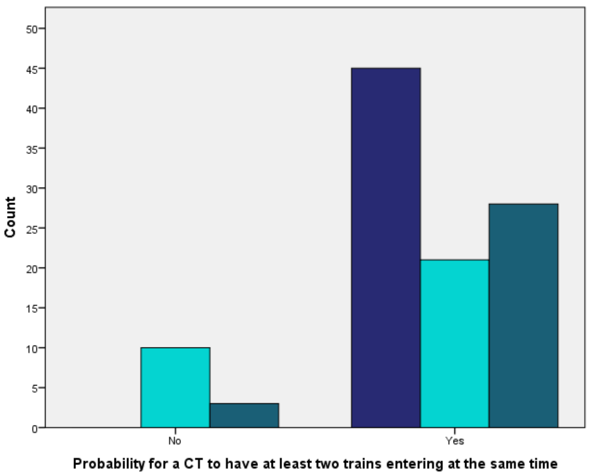

Figure 5.6 Entering facilities of the terminals

Next to the handling capacity per annual, also the entering facilities are important regarding capacity aspects of container terminals. Entering facilities are needed, because this enables a terminal to be reachable for at least two vehicles of transport, trains or vessels, in the same time. Therefore, a terminal should at least have two rail tracks, a minimum quay length of 200 meters or a combination of these aspects. As is shown in figure 5.6, all the trimodal terminals meet these expectations. This must be, because a trimodal terminal by definition accomodates transport by rail and water, so it is always possible for two different modes of transport to enter the terminal, at least one by rail and one by water.

What is a more interesting aspect to look at regarding the entering facilities is the difference between bimodal Road-Water and bimodal Road-Rail terminals. Ten out of the 31 bimodal Road-Water terminals do not have a quay length of at least 200 meter, whilst three out of 31 bimodal Road-Rail terminals do not meet expectation, which means that these terminals have only one rail track available for loading containers. When a independent T-Test is done, it shows that these means differ significantly. With a significance of 0,029 it can be stated that Road-Rail terminals are better prepared for two incoming trains than Road-Water terminals are for two incoming vessels at the same time. A linear regression analysis shows that the relationship between entering facilities and handling capacity is not significant. In other words, the entering facilities do not seem to have a direct effect on the handling capacity of a terminal.

5.1.3 On-Port Facilities

The on-port facilities are examined by one indicator, namely the number of cranes available on a terminal, which should at least be one. For the container terminals along the Rhine-Alpine corridor, this is the case in 100% of the cases. This means that all the container terminals have at least one crane available at the site, so all the terminals meet the requirements. The number of cranes per terminal, however, do differ. As is showed in figure 5.7, the most terminals possess between 1 and 5 cranes on their site. As the number of cranes rise, the number of terminals drop, which means that the lower values are higher represented than the terminals with many cranes. A small exception to this seem to be for bimodal Road-Rail terminals, which show a small peak in the high number of cranes, 16 or more. However, when the means of the different types of terminals is examined, there can be stated that the above displayed picture is a little distorted. The means shows that bimodal terminals Road-Rail have 5,11 cranes available on a average , bimodal terminals Road-Water have 5,39 cranes available and trimodal terminals have 5,82 cranes available on site. However, a Bonferroni one way ANOVA shows that these differences are not significant.

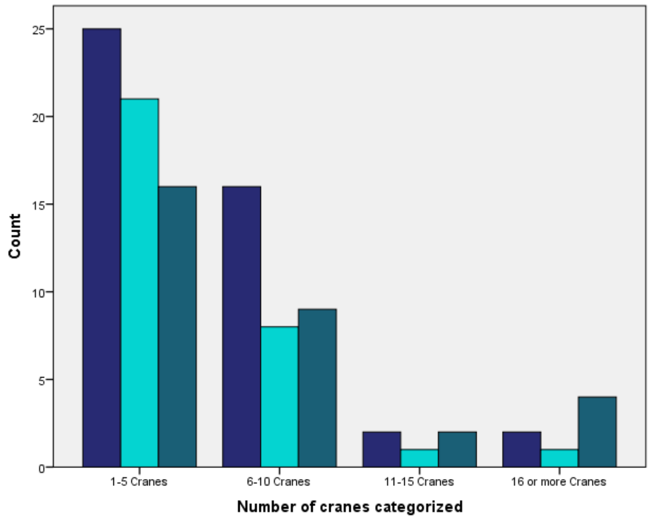

Figure 5.7 Number of cranes available per terminal

What also is interesting to see, is to what extent the number of available cranes contribute to the handling capacity of a terminal. By doing a linear regression analysis it is possible to test this coherence. This test states that 29,8% of the outcomes for handling capacity can be traced back to the number of cranes, with a slope coefficient of 20.124. this means that the handling capacity rises with 20.124 containers when one extra crane is placed on site. This can be said with a significance of 0,000, which means that the pattern that is traced is significant. Out of this analysis can therefore be stated that there is a positive relationship between the number of cranes on a container terminal and the annual handling capacity.

5.1.4 Port Services

the last aspect of terminal efficiency are the direct lines to the main ports of Rotterdam and Antwerp. Figure 5.8 shows the outcomes of this analysis. Also for this analysis the data has been categorized in different categories. The first category embodies zero to three direct lines to a mainport. This category may be classified as not sufficient, because of the seven main lines an inland terminal needs to have. The second category consists of terminals that are almost sufficient, with direct lines between four and six lines per week. The last category consists of terminals that already meet the requirements. This means that these terminals already have at least seven direct lines to a main port.

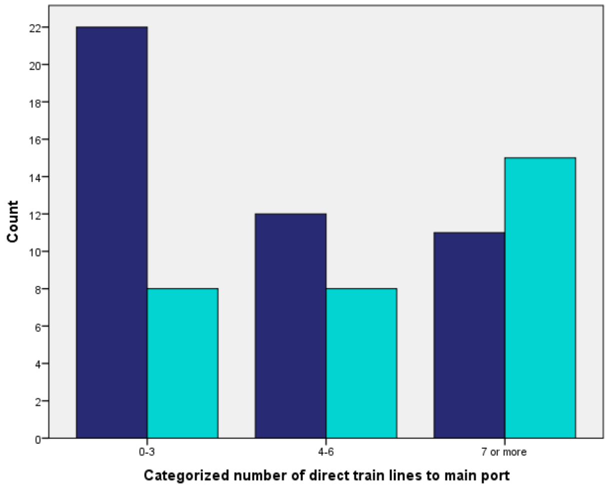

Figure 5.8 Number of train lines to mainports

What is clear to see in figure 5.8 is that there do exist differences between trimodal and bimodal terminals. The number of trimodal terminals decline as the direct links to a main port rise, whilst the number of bimodal Road-Rail terminals seem to rise as the number of direct links to a main port rise. This can be explained by the fact that the bimodal terminals are solely dependent on the rail links, whilst trimodal terminals also may use inland waterways. Therefore it only seems logically that the bimodal terminals are better represented in the higher numbers of direct links to main ports. Still, the outcomes of a independent T-Test tell that the differences in the means of both types terminals are negligible, with a significance of 0,119. In other words, the differences in direct lines to a main port between trimodal and bimodal Road-Rail terminals are not big enough to state with certainty that an obvious line can be discovered,

However, what could be argued, is that 16 bimodal terminals Road-Rail do not meet the set requirements of seven direct links to a main port. Eight of them do only have zero to three direct lines and eight of them have four to six direct lines, which is not sufficient. Because of the lack of a water connection, it is not possible to extend these direct lines. Therefore it can be argued that these six terminals fall short on this aspect of an efficient container terminal.

Also for this variable there is a direct link to the handling capacity of a terminal. With a explained variance of 7,6% and a slope coefficient of 4263,1 can be argued that more direct lines result in a higher handling capacity of a terminal. In this case however, it seems more logically that the number of direct lines to a mainport is higher because of the high handling capacity, instead of the other way around.

5.2 Accumulated assets of container terminals

In the previous part, different aspects of efficient container terminals have been discussed. This gave useful insights in the degree to which the different named indicators score in terms of efficient container terminals. This however does not say something about terminals as a whole. As mentioned before, can there be four different types of terminals characterized. These types of terminals will all be discussed in the following part.

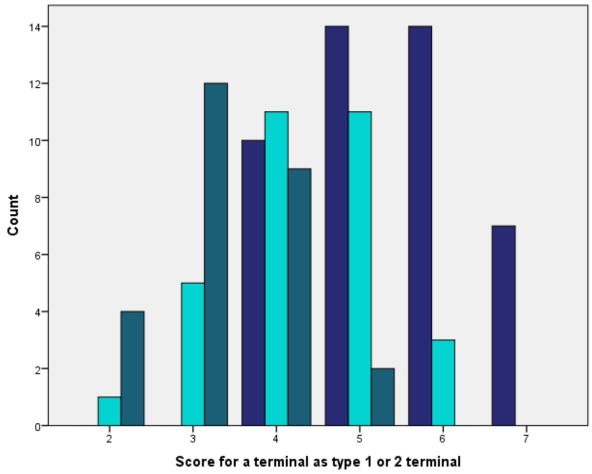

Figure 5.9 Score for a terminal as a type 1 / 2 terminal

Type 1 terminals, which are tri-modal inland terminals with a national function, and type 2 terminals, which are bi- or trimodal inland terminals as a container transfer point, both have the same set of requirements. For this kind of terminals it is important that they possess at least 600 meter of rail track (Except for bimodal Road-Water terminals), a minimum quay length of 135 meter and CEMT class V accessibility (Except for bimodal Road-Rail terminals), a handling capacity of at least 200.000 TEU, at least two trains entering and leaving at the same time, one crane and a minimum of seven direct lines to the main ports of Rotterdam or Antwerp. So, this means that trimodal terminals should meet seven different demands, bimodal Road-Water terminals should meet six demands and bimodal Road-Rail terminals have five demands they have to comply. The extent to which this is done is made visual in figure 5.9. Seven out of the 45 terminals do already meet the seven requirements for efficient terminals, which is 15,56%. Many of the trimodal terminals come short of one attribute (14) or two attributes (14). These terminals only need to make adjustments on one or two aspects, which means that these terminals are almost sufficient. 10 terminals do not meet the expectations on three aspects. In order to make this terminals more efficient, more work is needed.

The bimodal Road-Water terminals can score between zero and six points, where six means that the terminal is optimized in terms of efficient terminals. Three out of the 31 bimodal Road-Water terminals already meet the expectations and score sufficient on the six different attributes. This is 9,68% of the total bimodal Road-Water terminals. Eleven terminals are one or two attributes short. For six terminals a lot of work needs to be done. Five terminals only score positive on three attributes and one terminal only scores positive on 2 attributes out of six.

Only two out of 31 bimodal Road-Rail terminals do already possess the five possible attributes for this terminals. This is only 6,45%. Nine terminals only miss one attribute, twelve miss two attributes and four of them are far from efficient with a score of 2 matching attributes. This means that they do not score sufficient on three attributes.

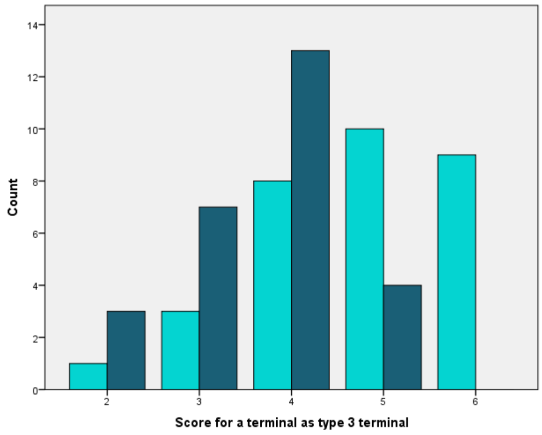

Figure 5.10 Score for a terminal as a type 3 terminal

In total, twelve out of 108 terminals reach a maximum score as a efficient terminal, type 1 or 2. This means that in total 11,11% of the existing terminals along the Rhine-Alpine corridor have the attributes that match the expectations for a type 1 or type 2 terminal. The remaining 88,89% still needs some work. 51 of those terminals, which is 47,22% of the total share of terminals, need adjustments to one or two attributes in order to be efficient according to the standards for a type 1 or type 2 terminal. The remainder of terminals comes more than 2 attributes short in order to be efficient in this types.

Type 3 terminals are bi-modal terminals with a national transship and storage function. These types of terminals must meet slightly other criteria than the type 1 and type 2 terminals. The rail length must be at least 600 meter for bimodal Road-Rail terminals, the quay length must be at least 145 meter and the waterway access must be at least CEMT class V, the minimum capacity must be at least 100.000 TEU per annual, at least two trains entering and leaving at the same time, one crane available at the terminal and at least seven direct lines to the main ports of Rotterdam or Antwerp. The main difference with a type 1 or 2 terminal hereby is the minimum capacity that may be less in a type 3 terminal. Because a type 3 terminal is per definition a bimodal terminal, the trimodal terminals are not taken into account in this analysis.

Nine out of the 31 bimodal Road-Water terminals (29,03%) meet the criteria for a type 3 terminal. Furthermore, ten terminals come one attribute short and 8 terminals come two short. The remaining four terminals miss more than two attributes. Four out of 31 bimodal Road-Rail terminals (12,90%)score 5 points out of a possible 5 for a type 3 terminal. Thirteen terminals come one attribute short and nine terminals are not sufficient in two different ways. Three terminals miss more than two attributes.

In total, 16 of the 62 bimodal terminals meet expectations for a type 3 terminal. This is with 25,8% around a quarter of the existing bimodal corridors along the Rhine-Alpine corridor. Fourty of these terminals (64,52%) miss one or two attributes. Together with the 16 terminals that already meet the expectations there can be stated that many terminals are well on their way to be a efficient type 3 terminal, or at least can be with some changes.

Last, terminals can also be efficient as a type 4 terminal. These are bimodal inland terminals as a local transship and storage function. This type of terminal knows less strict attributes regarding the CEMT class accessibility. Where the other terminals should be accessible via class V, should terminal type 4 at least be accessible by CEMT class IV. Furthermore, instead of a annual handling capacity of 200.000 or 100.000 TEU, a handling capacity of 20.000 TEU per annual is sufficient for the type 4 terminals. All the other requirements for a type 4 terminal are the same as for the other types of terminals.

Also for this analysis is only looked at the two types of bimodal terminals, because a trimodal terminal can not be a type 4 terminal by its definition. Fifteen out of the 31 bimodal Road-Water terminals meet all the six expectations (48,39%). Eleven terminals lack one attribute and four terminals lack two attributes. Only one bimodal Road-Water terminal miss more than two attributes. Six out of the 31 bimodal Road-Rail terminals possess al the 5 attributes in a sufficient way (19,35%). Fifteen terminals miss one attribute and six bimodal Road-Rail terminals miss two attributes. None of these terminals miss more than two attributes. In total, 21 out of the 62 terminals score positive on all the relevant test values, which is 33,87%. Furthermore, 36 out of 62 terminals (58,06%) do not score sufficient on only one or two attributes. This only leaves one terminal that does not meet the set expectations by far.

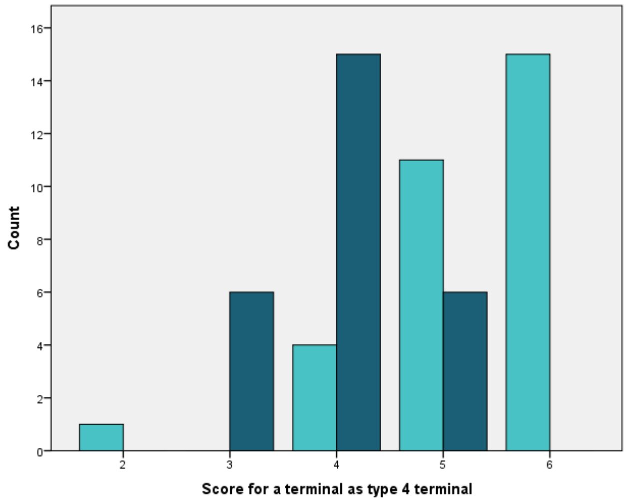

Figure 5.11 Score for a terminal as a type 4 terminal

5.3 Conclusion

In the past chapter, the gathered quantitative data of this research is discussed. The goal of this chapter is to provide insights in to what extent the existing terminals in the Rhine-Alpine corridor are efficient. When this is known, it is also known what work there is needed for terminals to be more efficient. Therefore, throughout this chapter the following sub question is answered:

'To what extent are the existing terminals in the Rhine-Alpine corridor efficient?'

In paragraph 5.1, all the terminals are tested on the basis of the categories accessibility, capacity, on-port facilities and port services. The accumulation of the indicators provides insight in the extent to which the different indicators are represented in the existing terminals along the Rhine-Alpine corridor. In this part, a overview of the degree of realization of the indicators is given. By doing this, useful insights on what indicators are more fulfilled than others can be given.

		Trimodal terminal	**Bimodal Road-Water terminal**	**Bimodal Road-Rail terminal**	**Total**
Accessibility	Track length (%)	40	-	51,61	44,74
	Quay length (%)	97,78	96,77	-	97,37
	Waterway access class IV or more (%)	-	90,32	-	90,32
	Waterway access class V or more (%)	97,78	77,42	-	89,47
Capacity	Handling capacity 200.000 TEU (%)	33,33	16,13	29,03	27,10
	Handling capacity 100.000 TEU (%)	-	58,06	58,06	58,06
	Handling capacity 20.000 TEU (%)	-	100	87,10	93,55
On-port facilities	Entering facilities (%)	100	67,74	90,32	87,85
Port services	Cranes on site (%)	100	100	100	100

	Direct lines to mainport (%)	71,11	74,19	48,39	65,42

Table 5.1 Degree of realization of the different indicators

The degree to which existing terminals already possess the characteristics they need to possess, do vary a lot. The best prepared indicator relates to the number of cranes that is available on each terminal. As well the trimodal terminals as both the bimodal terminals are 100% prepared, which means all the terminals have at least one crane available. Also the quay length, both sets of waterway access, a handling capacity of at least 20.000 TEU and the entering facilities of terminals are in many cases sufficient. The minimum track length, handling capacity of 200.000 TEU and 100.000 TEU and direct lines to a main port are indicators that are considerably less satisfied. For these indicators, the discrepancy between the required and the actual situation is the highest. Therefore, for these situations the most progress can be made in terms of efficient terminals.

What furthermore is interesting to see, is that the percentual differences between the three types of terminals are small for the most indicators. However, a few remarks must be made. First, the water way access of CEMT class V is higher for trimodal terminals than for bimodal Road-Water terminals. Also the number of that kind of terminals with a handling capacity of at least 200.000 TEU is lower than that is observed for trimodal and bimodal Road-Rail terminals. A third aspect in which bimodal Road-Water terminals score a lower score than the other two types of terminals, is about the entering facilities. Where trimodal terminals and bimodal Road-Rail terminals score relatively high, do only roughly two out of three bimodal Road-Water terminals possess the facilities for two vessels to enter and leave at the same time. The fact that this is different can be explained by the fact that the way this indicator is measured is different per terminal. Where for a railroad terminal it is necessary to have at least two rail tracks, it is necessary for a bimodal Road-Water terminal that the quay is at least 200 meter. For the Rhine-Alpine corridor, the quays are less adapted than the number of the tracks. However, the fact that the measurement of the indicator is different does not mean that the problem is less important. Still only two out of three bimodal Road-Water terminals meet the requirements, which is less than for the other two types of terminals. The other indicators seem to show about the same percentages, which indicates that all these terminals are prepared to the same extent.

Also the relation between the handling capacity and the other variables is examined in this chapter. By doing this, it gets more insightful which variables have the biggest influence on the ability of a container terminal to process more containers per year. Two variables, CEMT accessibility and entering facilities, did not seem to influence the handling capacity. All the other variables however, can forecast something about the handling capacity per annual of a container terminal. This is mostly the case for the number of cranes on site, with a explained variance of 29,8%. The other variables do however also contribute to the handling capacity. Number of tracks (13,4%), Length of tracks (9,6%), Length of quays (4,5%) and direct lines to a mainport (7,6%) all have a direct connection to a the handling capacity of a container terminal.

Paragraph 5.2 focusses more on the accumulated assets of container terminals. In here there is analyzed to what extent terminals already meet the requirement in three situations, as a type 1 / 2 terminal, a type 3 terminal or a type 4 terminal. The results are shown in the table below.

	Trimodal terminal	**Bimodal Road-Water terminal**	**Bimodal Road-Rail terminal**	**Total**
Suited as type 1 or 2 terminal (%)	15,56	9,68	6,45	11,21
Almost suited as type 1 or 2 terminal (%)	*62,22*	*70,79*	*68*	*66,36*
Suited as type 3 terminal (%)	-	29,03	12,90	20,97
Almost suited as type 3 terminal (%)	-	*58,06*	*64,52*	*61,29*
Suited as type 4 Terminal (%)	-	48,39	19,35	33,87
Almost suited as type 4 terminal (%)	-	*48,39*	*67,74*	*58,06*

Table 5.2 Terminals suited as type 1, 2, 3 or 4

This table consists of two different kinds of data. In here, as well the terminals that are suited as a specific type as the almost suited terminals are examined. The suited terminals are the terminals that already meet all the requirements, while terminals that are almost suited as a specific type of terminal still miss one or two improvements, but do have the potential to meet the requirements with some changes.

What can be seen, is that not many terminals are optimized in terms of efficiency. For a type 4 terminal, one on three terminals is already suited, for the other types this is even less. This indicates that a lot of work needs to be done for the terminals. What also can be seen in the table, is that many of the terminals are almost suited to be a specific type of terminal. For all the types of terminals, more than half of the terminals lack one or two attributes. This means that by adjusting this single indicators, for instance the extension of a quay, this terminals can grow efficient quite quick. This indicates that the CEF subsidies might have a huge impact in achieving more efficient transport in Europe. The way this can be done best, will be handled in Chapter 6.

6. TEN-T legislation perceived by relevant actors

Now that the quantitative data is gathered and processed, a more qualitative view on the matter can be presented. This will be done in this chapter. The goal of this chapter is to critically reflect on the current TEN-T legislation and the affiliated Connecting Europe Facility. This is done by interviewing different relevant actors, who can be stated as the policy coalition, according to the policy arrangements approach. In total, six persons in a managing position in companies that run terminals have been spoken to. Because some of these companies run more than one terminal, in total ten terminals are included in this part of the research. Furthermore, the opinion of one employee from a company that is has much expertise in writing applications for different subsidies is asked for its opinion. The results of these interviews are shown in this chapter.

Chapter 6.1 focuses on the experiences of the different actors in making an application for a European subsidy for the purpose of a more efficient transport in Europe. This is not only for TEN-T or CEF subsidies, but also other experiences were taken into account, to also benefit from the flaws in this application processes. In this chapter the dimension *rules of the game* from the policy arrangements approach will be discussed. Chapter 6.2 focusses on the co-funding part of the regulation. Actors are asked about the extent of cofinance and their opinions are bundled in this paragraph. This paragraph focusses on the *power and resources* dimension of the policy arrangements approach. In paragraph 6.3 the focus lays on the requirements for a subsidy. Not only is looked at the actual requirements, but also to what are the needs and problems for actors at this moment. This corresponds with the dimension of *policy discourses*. At the end of the chapter, a conclusion is given. In this paragraph, 6.4, the sub question '*how is the CEF subsidy perceived by relevant actors*?' is answered on the basis of the information that is presented in this chapter.

6.1 Rules of the game: Perception on subsidy applications

This paragraph focusses on the process of application for an European subsidy. In here, the *rules of the game* are examined. Not only experiences regarding CEF are looked at, but also other European transport subsidies are examined, because these subsidies have their strong and weak spots. By learning from these points, other recommendations can be made for the CEF subsidies. The terminals that were involved in this research all have some experience with these subsidies, whether the application was granted or not. They also had an opinion about Dutch subsidies, since all the terminals that were interviewed were Dutch. The only exception to this was one German terminal, that is interviewed to see to what extent they could confirm conclusions that can be drawn from the

Dutch experiences. The experiences with national subsidies are also taken into account.

There are some *formal rules* to be eligible for a CEF subsidy. To be eligible for a subsidy, the relevant authority must send a written application to INEA. This is only possible for a few months, after which the possibility to write an application disappears again for a limited time, so the applications come in periods (RVO, 2014b). this is an example of how political modernization is represented in the TEN-T policy. The process of writing an application for such a subsidy goes as follows. First, the relevant authority must make known that it would like to make an application for a CEF subsidy and give a short overview of where the subsidy is needed for. By doing this, the subsidy-taker can make contact with relevant actors in the government, for instance for matching ideas. Also, a first separation between plausible and non plausible ideas are made.

When the plan cuts the first round, a concept plan must be presented. This plan will be reviewed by the respective ministry, after which some changes can be made to the proposal. When this is done, there can be applied for a subsidy from INEA (RVO, 2014b). Throughout Europe, there are multiple companies specialized in helping authorities to write applications for subsidies. For this study, it will be interesting to see what the view is from different respondents on the process of the subsidy application, together with related aspects, such as cooperation with a government.

The way this process for applications are organized, are not well received by the policy coalition of this research. Therefore, the *informal routines* seem to differ from the formal rules. The projects that get financed by CEF subsidies are often quite big. Almost always collaboration with governmental institutions is needed. The type of government varies, but mostly the terminals have to do with their local municipalities and provinces. Also the Dutch government granted some of the subsidies. The extent to which the different terminals are happy with the way these governmental institutes are cooperating and open towards the ideas of the terminals vary. Some of the terminals are very happy with their collaboration with the governments, others are somewhat critical towards the issue. This seems to be dependent on the municipality. Some of the respondents have the idea that they are not heard by the municipality or province or that their lines of interest differ too much. This results in an uneasy partnership between the terminals and the government. On the other hand, other terminals are mostly positive about the way they cooperate with governmental institutions. They say that this contact is ‘good and productive’. For them, they think that these governmental institutions try to represent their interests in the best possible way. The communication between the parties was good and they were willing to help where they could. A good example is when the van Berkel group wanted a better waterway accessibility for their terminal in Veghel. In the past, a CEMT class IV was promised to them, but the canal turned out not to fit the standards. In collaboration with nearby companies, but also with the help of the community of Veghel and Rijkswaterstaat (The Department of Waterways) they managed to improve the existing waterway. Still this is not just a ‘success story’, because this process also has known its negatives. A lot of time was lost in the process, when Rijkswaterstaat and the municipality argued about who was responsible for the costs of the operation. This meant that the works got delayed and the local companies, including the terminal, became the victims of this process.

Judging the past interviews with the different terminals, the above mentioned example of a collaboration with the government is striking. None of the respondents was really anti- or pro-government, but had a bit more of a nuanced opinion on the case. This was as well with a slight more negative attitude towards the government, as well as respondents with a slight more positive attitude regarding this cooperation. That is underlined by statements that are made in these interviews, such as ‘they would like to help you, but they do not always show that they do’. One of the respondents argued that a government ‘not can be stated as cooperative, but as not-obstructive’. In general, the terminals are moderately positive about the way the government cooperates with them. This is a sign that the cooperation between the terminals and the governmental institutions functions right. It is only logical that an actor is negative about the government, since they have more interests to watch then just the economic gain of a terminal. Therefore, the governments are likely to make choices that are not per definition in favor of the terminals. The fact that the terminals still are predominantly positive, means that the way how the different layers of the Dutch government operate, can serve as a example for the European Commission, when looking at how to deal with the European inland terminals.

An example of a subsidy the Dutch government grants is the SOIT (Subsidieregeling Openbare Inland Terminal; Subsidies for public inland terminals). This subsidy is a subsidy that is provided by the Dutch government, in order to achieve a modal shift from road to rail and water. Therefore, they granted subsidies for Dutch inland terminals. This subsidy ended in 2012 (Dutch ministry of Infrastructure and Environment, 2012). Different terminals have had experiences with these kind of national or regional subsidies. A few made use of the SOIT subsidies, for different reasons. One terminal had a negative experience with this subsidy, because the application got rejected.

Some terminals made use of the quick wins regulation for inland ports. The quick wins regulation is also a national subsidy to ‘realize a future-proof network of waterways and ports in collaboration with local authorities’ (Dutch ministry of Infrastructure and Environment, 2013). In order to do this, this subsidy aimed for a quick realization of infrastructural facilities, such as improvements of quays and removing bottlenecks in existing waterways. For this, co-funding up to 50% from the national government is possible. This in combination with a local supported subsidy, is perceived as ‘very constructive’ by the different terminals. For instance, the terminal that is build in Cuijk and opened recently, is financed for 50% by the Dutch government, the province contributed

12.5% and the operator of the terminal, van Berkel logistics, only had to finance 37,5% of the costs. This makes it doable to invest for a terminal, which is one of the reasons why all of the interviewed actors were enthusiastic about the quick wins regulation, but actually about all the Dutch subsidies that are granted for inland ports.

Another reason why they are enthusiastic about the national subsidies, is the way the applies are organized. All the respondents that are interviewed for this research are enthusiastic about the simplicity of the applies. The type of application does not matter, as well the quick wins and the SOIT as other Dutch subsidies all are very organized. This way it is clear for the subsidy takers what the most important demands are in order to be eligible for such a subsidy. The biggest benefit of this, is that the different terminals know in advance whether or not they stand a chance for a subsidy. If so, it is profitable for them to make an application for a subsidy, because they also have to invest time, and in some cases money. Also the direct lines with the subsidy granters are praised. Usually they have direct contact with somebody with the province, who acts as a first selection pointSubsidies should be organized more in this structure, according to the terminal holders.

For European subsidies, quite the opposite counts. Without an exception, all the respondents are very negative about the application for the TEN-T and other European subsidies, such as the Marco Polo subsidy. Where national subsidies are rated as good and accessible, European subsidies are rated as way too complicated and too difficult. This is confirmed by people who write applications for such subsidies for a living. Things as *the guide for applicants* or the *FAQ*s of INEA are not clear and do often create more vagueness then it brings clarity.

What was striking the most, is that for some respondents it was not clear the TEN-T program even existed. Some of them said 'they heard about it once, but they do not know what it entails exactly'. Many of the other respondents who did knew what it entails, complained about the 'visibility' of the regulation. Although the terminals play an important role in efficient transport, they were never informed by a body of the European Union, such as INEA, that informed them about the TEN-T program and the possibilities for a CEF subsidy. The information that they have about the TEN-T program, is because of their own interest in the regulation or because they have been approached by a third party in the past. These third parties are companies that are specialized in conducting the subsidy application for the terminal. This was only the case for one of the terminals, the others were not approached.

Different terminals have been interested in a CEF subsidy. All these respondents told the same story. When they took a better look in the matter and opened the document with requirements, they closed the form as quickly as possible. The reason for this is the high complexity of the subsidy. The document with the requirements is so big that it scares them, or at least makes them think that they do not stand a chance to successfully write an application for a subsidy of this sort. This is not only the case for CEF subsidies, but also for other European subsidies. For the ones who made it passed phase one and did an attempt to see whether or not their terminal stand a chance, it did not become clearer after reading the document. The document is full of 'vagueness' and therefore almost impossible to interpret for a non specialist. Therefore, the respondent choose not to make an application for such a subsidy as well. This story is underlined by the German reference point, the terminal in Emmerich. They made use of German subsidies, such as a KLV subsidy. This was not complicated for them to get. They never applied for any European subsidy, because they have no clue whether or not they stand a chance for this subsidy. They discussed the CEF opportunity with many other German inland ports, but none of the terminals eventually tried to write an application for such a subsidy. This is much in line with the already given Dutch line of interpretation.

When the respondents were asked whether they were interested in a third party to handle a subsidy application for them, they reacted hesitant. The reason why they are not very enthusiastic about these companies, is rooted in the before mentioned vagueness of the demands for the subsidy. Of course, if it is 100% sure that such a company is able to write a fitting application, which is likely to succeed, in general they are willing to hire such a company. However, hiring such a company of course also costs money, and because of the vagueness of the demands they actually have no clue if they stand a chance for a European subsidy in the first place. Therefore, they are afraid that an application written by a third party is not a rock hard promise that the subsidy gets granted. Therefore, they play it safe by not writing an application at all, even though if this means that no extra investment in the terminal can be done. It speaks for itself that this does not contribute to the European goal of a better connected transport system.

All in all, there could be stated that the terminals are satisfied in the way the national subsidies are organized, but that the European subsidies lack clarity. In their opinion, these European subsidies can learn a lot from how the Dutch subsidies are organized. Also, there can be looked at how terminal subsidies are organized in Germany, according to some of the Dutch and the German terminal holders. Over there, it is quite simple to get a subsidy. However, a strong requirement in obtaining a subsidy in Germany is that there may not be another terminal present in a radius of 70 kilometers. The reason behind this is that a container terminal has a radius from about 35 kilometers to serve the hinterlands. With this demand, there will not be an overpopulation in inland terminals.

6.2 Power and Resources: The Co-Funding Aspect

The Connecting Europe Facilities work on the basis of co-funding. This means that the European Union only finances a percentage of the investment, and that the other, bigger part has to be paid in another way. This means that the European Union has the power of the operation, by controlling the spend resources. The percentage that is co-funded by the EU is dependent on the type of operation. The maximum TEN-T co-funding rates are 50% for studies/plans, 10-20% for works, 50% for ERTMS and 20% for traffic management systems (Schade et al., 2013). Studies and plans are projects where research is done regarding the corridors or efficient transport. Works are determined as physical works, for instance the deepening of a river or building a extra rail track. ERTMS is the European Rail Traffic Management System and has the goal to provide the basic framework to the interoperable rail signaling and train control in Europe (Barger, Schön & Bouali, 2010). Traffic management systems are systems that stimulate an efficient traffic flow (Wang, 2005). Examples of this traffic management systems are Intelligent Transportation System (ITS) for road, SESAR for planes and River Information Services (RIS) (Schilk & Seemann, 2012) to help with inland waterway navigation. This systems help making transport more efficient.

According to the information of PNO, in the entire European Union about 100 projects have submitted an application for the CEF subsidy call that closed in the end of February 2015. Although it is not clear yet who are all these applicants, a framework can be noticed. Most of the applicants are from a government body. Bodies as the Ministry of Infrastructure and Environment, Rijkswaterstaat, Pro Rail and provinces are the biggest applicants for the subsidies. However, different (international) companies also submit an application for European transport subsidies. Industry parties focused on alternative fuels, but also container terminals, are examples of these applicants. Exact numbers of how many container terminals have submitted an application can not be given, but it is clear that at least two Dutch terminals will submit an application for a CEF subsidy. This is likely to be even be more.

Out of the nine terminals that were involved in this research, one made use of a subsidy for a project to bundle containers at their terminal. All the other terminals have not made use of a TEN-T or CEF subsidy. However, they do have a strong opinion on the degree to which cofinance for the projects is possible. The interviewed persons from the terminals are unanimous on the matter. The rate for a CEF subsidy is too low according to the actors. In a TEN-T subsidy only 10% of the funds could be financed through subsidies. Because of a lot of criticism towards this low rate, this has been adapted for the last CEF call. This subsidy has a co-finance rate of 20% at the most. Although this is the double amount of the original, the opinion still exists that 20% of co-funding is way too less to contribute in a sufficient way to a plan. This is still a lot less than the 62.5% of co-finance that is described in chapter 6.1 for the Cuijk case. Therefore, one of the terminal holders said that 'the percentage did not contributed significantly to the entire project, and that the costs they had to make themselves were still too high'. It is more likely for a terminal to invest step by step in their terminal, because their budget is limited.

As mentioned in chapter 6.1, terminals find it hard to make contact with a company that is specialized in writing an application for a subsidy for them. Next to the fact that hiring such a company is not a guarantee for success, the terminals also think that a big amount of the percentage that they can save with the subsidy, 20%, will be cancelled out by the costs that are involved with hiring a specialized company. This is another reason they let the subsidy pass, instead of making an application. Therefore, it can be stated that the rate of co-funding has a negative effect on the willingness of the different container terminals to write an application for a CEF subsidy.

Another issue regarding this subject, is that the projects that CEF subsidies can be used for are often too expensive to implement. When a terminal does a renovation, this often is a very expensive procedure. For instance, a new gantry crane that one of the respondents wants to buy costs around €3 million. Therefore, they usually choose to invest in phases, to spread the costs. When they write an application for a CEF subsidy, they need to hand in a complete plan, including quantitative data of the impact the works will have. This means that there has to be a fully developed plan, in order to qualify for the subsidy. Because the co-funding is only 20%, it is really hard for them to finance the remaining 80% by themselves. This is also a important reason why container terminals are skeptical towards CEF subsidies. The consequence of this, according to one of the interviewees, is that it is not possible to write an application for a subsidy, unless the company is really big and wealthy. The problem with this is, that in general these are not the kind of companies that need a subsidy. A subsidy is much better spend in a company that has less capital. These kind of companies do not have the funds to finance big operations, whilst this is a smaller problem for bigger companies. Therefore, it is more difficult for the smaller players in the market to compete with the bigger players and this does not benefit the competitiveness of transport with the negative effects, such as higher transport costs, that come with it. This opinion is not only brought up by the smaller interviewed players, but also by the bigger ones and the terminal holders with multiple terminals.

So, there are two main problems for container terminals when looking at the co-funding aspects of CEF subsidies. The costs of the project are too high and the rate of co-funding is too low to contribute significant for them. Also they think that the benefits of a subsidy are wiped out with the costs for a specialized company. On the basis of the information of the costly projects that a project is likely to be, this argument can be countered. Although a specialized company does cost money indeed, it is not likely that it is so expensive that it alters a big amount of the money that comes in through co-finance. As is mentioned, the projects often are very expensive. The higher the costs of a project, the higher the amount of co-funding is. Therefore, the money it costs to hire a agency are not as big as the profit that is gathered. However, this is the image that the different container terminals have. A lot of possibilities get lost because of this view of the container terminals. Therefore, it would be helpful if more insights are provided for the container terminals. Not only about the possibilities for a subsidy, but also by informing them actively what the costs are of hiring such a company and what the benefits could be. By doing this, it seems logically that more terminals are interested in making an application for a subsidy with the help of a specialized company, which will eventually benefit the durability and efficiency of European transport.

This responsibility lays with different parties. First of all, the European Commission (Or INEA) should be more assertive in informing different possible subsidy appliers about the possibilities, because it is the EC's responsibility and objective to improve the European transport system (European Union, 2013). From the interviews can be stated that one of the ways in which this can be done is a more clear understanding of the possibilities. Second of all, there lies a role for the specialized companies. For these companies its core business lies within attracting assignments which are profitable. Judging the opinion of the different container terminals, the fact that they think hiring such a company is not very profitable while it in fact is, means a lot more profit could be gained for these kind of companies in this field. When they approach these kind of companies more often and lay out what the costs are and what the benefits could be, it is likely that this attitude of terminals will change. Still, it is not clear if this change in thinking patterns will contribute a lot to the applications from container terminals. The reason for this is that the projects are too costly for most of the terminals, which is mentioned before.

6.3 Policy discourses: Key projects as solutions

In this paragraph, the views on what key projects should be are assessed and what are the plans for terminal development in the coming years. The desirable policy discourses of TEN-T policy, in the eyes of the policy coalition, are named in this paragraph. This paragraph seeks an answer to what projects have been done in the past years, but also where attention should be paid to in the coming years.

In the past few years, a lot of changes have been made regarding Dutch container terminals. A lot of new terminals were build, which means that there are about 35 terminals in the Netherlands today. Also, the existing terminals have been busy with adjusting their property. For almost all the terminals that are included in this qualitative research, there are plans for works on the terminal, or works already have been done in the past years. What is striking in this case, is that for none of these projects a European subsidy is used. In some cases a Dutch subsidy, quick wins or SOIT, is used, and in some cases the renovation is paid for all by the terminal itself. Examples of what already has been done vary from expansion of a existing terminal to building an entire new terminal. Also different projects to make the handling of containers more durable and efficient are examples which are done in the past years in the different container terminals.

Not only different renovations have taken place in the past years, also all the terminals do have some wishes and plans for improvements, on-site as well as off-site. In general, the terminals are quite happy with the facilities on the terminal. They think that they work quite efficient already, although this could be optimized. This is mainly the case for working more durable. Therefore, replacing diesel cranes for electric cranes is a possible improvement that is heard multiple times. Furthermore, things like improvements of the power supply, expanding the surface of the terminal and the construction of a complete new container terminal are plans that are named, regarding on-site terminal improvements. One of the terminal holders states 'this can never be called a short time plan, because the preparation time for this kind of projects is very high'. What terminals want to revise, is different for each terminal. This is logical, because what is needed is dependent on the existing facilities, which are different for every terminal. Therefore, it is hard to say what typical investments are that can be made in the existing container terminals. An opinion that was heard frequently is that it is impossible to form a blueprint of minimum requirements for a terminal. This is dependent on the way the terminal operates and the ambitions of a terminal. For instance, a terminal that uses reach stackers, which are driving cars that can shift containers, needs more space to maneuver than a terminal with a portal crane. The way this is operated therefore determines other aspects of a terminal. So this is the opposite of what is researched earlier in this thesis, in Chapter 5. Although some sort of minimum requirements are necessary, it is difficult to frame this exact requirements, because it is dependent on how a terminal operates.

Still, by looking at the outcomes of the conducted interviews, in combination with the in Chapter 5 used quantitative data, it is possible to reflect on that quantitative data. In some cases, the possible improvements for the terminal matched the shortcomings that were found in the qualitative part. This is a hint that the provided theoretical framework of this research does hold up to some extent, but a personal view is needed for all the terminals to take a closer look at the specific needs. What can be noticed as a flaw of the theoretical framework, and what can be formulated more critically, is the minimum required number of cranes on a terminal. Instead of one crane, many terminal holders agree that a terminal should at least two different cranes. Whether this is a reach stacker or a portal crane is dependent on how the terminal operates, this does not make a great difference, though a portal crane usually can handle a higher volume per hour than a reach stacker, but also are more expensive. The reason why every terminal should possess at least two cranes, is because in this way they are less vulnerable, might one break down.

Next to these on-site improvements, the different container terminals do also see a lot of possible improvement in the area surrounding the terminal. A container terminal is very dependent on the surrounding infrastructure, such as an adequate waterway, railway and motorway access. The extent to which this is the case is not the same for all the terminals. This is of course not strange, because all these terminals have different locations and therefore different surrounding infrastructure. A few terminals are happy with the infrastructure, partly because in recent times adjustments to the terminal accessibility have been made. Most terminals do have some wishes regarding railway, waterway or motorway access. In most cases this means they would like to see a less congested motorway near the terminal, but also things like a better cooperation with lock keepers are mentioned. The opinion of all of these terminal holders, is that the improvement of this infrastructure is the responsibility of the government. They would like to see that these off-site aspects get handled, because this would improve the efficiency more than on-site improvements. This also means that they would rather see that the CEF subsidies get spend on off-site improvements then on on-site improvements.

Even more clear than on improvements near the terminal, the respondents all had a very strong opinion about another aspect of transport that should be improved further. This concerns improvements that are a little further away from the terminal, but are still of vital importance for the terminals. The big problem in this is the supply they get from the seaports of Rotterdam and Antwerp. Usually, on a container terminal there are no waiting times for vessels and trains. The terminals have labor attached to the planning of the arrival and departure of the different inland vessels, which means at the inland terminals they are used quite efficiently already. However, what all the terminals frame as the biggest bottleneck for an efficient transport network in Europe, is the supply from the two big main ports. It is more a rule than exception that the planning of the inland terminals get disrupted because of the 'extreme long waiting times' in the port of Rotterdam or Antwerp. This waiting lines are 'a big contrast to how inland ports manage their business'. One of the respondents compared these ports with a Bermuda Triangle, since 'the vessels have to go in there, but once they are in you do not know what to expect or when they come out'. Another respondent ensured that this was a big problem for his terminals as well, and that is not just a problem of the last few months, but something that has been a problem for years now. Because the inefficiency of the main seaports, the inland ports have problems too. It is often the case that because of the waiting times in the ports, more vessels arrive at the inland port at the same time than they can handle. The result of this is that the vessels (or trains) have a waiting time in the inland terminal as well, which makes the transport more inefficient, a lot more than a lack of facilities, such as rails that are slightly too small, of the concerning terminals.

Above all, the terminal holders would like to see this aspect of multimodal container transport improve. Out of the nine terminals which are represented in this interview, only one had 'a few problems' with the seaports, but he did acknowledge the problems and he knew that a lot of other inland ports have had problems with this inefficiency of the seaports. The reason that their problems were restricted to a minimum, was because of 'the good relations they maintain with the ports of Rotterdam and Antwerp'.

All the other inland terminals agreed with the theorem that they suffer under the inefficiency of the seaports. For the future, they are afraid this inefficiency will lead to less business for them. This may happen in two different ways. First, it could be so that shipping companies will choose more often to unload in other seaports, such as Le Havre or Hamburg. This does not only have negative effects for these seaports, but also for the entire TEN-T corridor behind these seaports. When this would happen, the entire TEN-T corridor would not be used as effectively as possible anymore, which has a negative influence on the efficiency of European transport.

Second, they think the consequence will be that inland waterway transport will lose support, because of a high uncertainty of this mode of transport. It is not unthinkable that a modal shift from water or rail to road will be made, while in the last decades the opposite shift has been made possible. If this shift will be made undone because of the inefficiency in the seaport, would not only be unsustainable and bad for the environment, it would also be a waste of the invested European and national money of the past years and have the contrary effect of what the European Commission aims for. This makes it desirable to get to the bottom of the problems in the seaports and to take a closer look for possible solutions.

The main opinion of the different terminal holders is that this is a big problem, which must be tackled first and which should deliver the highest growth of efficiency of container transport in the Rhine-Alpine corridor. One of the respondents even says that no subsidies should be rewarded at all to inland terminals, but that all the possible funds should be allocated to tackle this kind of problems. This is underlined by the specialized company that is interviewed. They mention it is only logical that only a small amount of the entire available funds should be available for the improvement of a container terminal, because 'the TEN-T funds are meant to give substance to European ambitions in the field of transport and infrastructure'. According to this respondent, this could mean that different container terminals get optimized, but chances are that there are other projects that have more impact. A higher efficiency of the seaports can be such a project.

Still, much of the respondents have a wish list of possible improvements for their terminals, as is mentioned in the beginning in this paragraph. They would like to see this improved after a solution is found for the above mentioned off-site problem, because that is more urgent.

6.4 Conclusion

On the basis of the information that is provided in the past paragraphs, conclusions can be drawn on the attitude of different actors regarding European subsidies. In this conclusion, the main points out of the analysis in this chapter are shown below. The aim of this paragraph is to answer the following sub question:

How is the CEF subsidy perceived by relevant actors?

The first part of this chapter was about how the process of application for a CEF subsidy is organized. A few conclusions can be drawn, regarding this part. First of all, the cooperation with different layers of government is perceived positive in general. Not every respondent was as enthusiastic as the other, but the main opinion was that the government 'likes to help you, but does not always show that they do'. The terminals that have been looked at in this qualitative part of the research have a lot of experience with national and regional subsidies and not so much with European subsidies, such as TEN-T or Marco Polo. The most important reason for this is the high complexity of a European subsidy application. These processes take up much of time and an expert view is needed, which in most cases leads to a startle response for the person from the terminal who delved into the subsidy application. Therefore, many terminals decide not to make an application for a European subsidy, even before they know if it is even possible to do so.

Different respondents also complain about the 'vagueness' of the TEN-T program. A few respondents are not up to date about what the TEN-T program entails, whilst other respondents do know the program, but find the lack of provided information disturbing. They would like to see that the European Commission will be more straight forward in informing them about the possibilities for a CEF subsidy. This vagueness creates a reticent attitude from the different terminals regarding hiring a specialist company to write an application for them. Because the requirements are not clear, something that is underlined by a specialist in CEF subsidies, they do not dare to hire a specialist company, which would increase the changes of getting a subsidy. Still, the terminals are afraid that the subsidy will not be granted and that they will be left with the costs of getting an application written.

Also, they believe that the eventual gain in the form of a subsidy will not lead up against the costs that are spend on such a company. This has to do with the height of co-finance that is available for the projects. Before this was 10%, today it is 20%. Terminal holders are afraid that the amount of money they get as a subsidy are lost in the cost for a specialized subsidy. This is an important reason they do not seek contact with such a company and therefore do not make an application for a subsidy.

Another reason why they do not make an application for a subsidy is that the projects that need to be done are very expensive. The respondents think the amounts of money that has to be financed by themselves is too high to spend in one go, which is why they usually invest in terms. Because this amount is so high, it is almost exclusively possible for very big companies to claim such a subsidy, while these kind of companies normally are less needy for a subsidy than the smaller players. This argument of high costs for a project however, does strike down the argument about the profitability of hiring a specialized company for an application. When the amount of the entire project is high, the co-funding also gets higher. The consequence of this is that it seems profitable to hire such a company. Therefore, it can be stated that the perception around this issue needs some clarification.

Last, there has been a closer look on requirements for a terminal. For most of the terminals, a lot of work has been done, as well renovation as new build terminals. The wishes of what still needs to be done on the terminals itself vary from terminal to terminal. It is not possible to give a blueprint about minimum requirements about a container terminal, however many of the wishes of the terminal holders correspond with the provided quantitative data that is described in Chapter 5. Here should be said that, according to the terminal holders, a terminal should possess at least two cranes in stead of the one crane that is used in this research. The reason for this is that it makes a terminal less vulnerable.

Next to on-site improvements, many of the terminals would like to see some off-site improvements. This are mainly changes in infrastructure to make the terminal more accessible. Also the seaports of Rotterdam and Antwerp work too inefficient at the moment. The waiting times in this ports are so high, that the inland ports get into trouble because of this. Furthermore they are afraid of losing business: Either because waterway transport will lose the competitive battle with road transport or the ports of Rotterdam and Antwerp will get a lower throughput in the coming years, because shipping companies choose to serve other, more efficient, seaports. This both is contrary to the ambitions of the EU of a more efficient and durable transport, so it is important to tackle this problem. This is also underlined by the different terminals, who all think it is more important that money from the EU gets spend on this problem than on projects on their terminals, because this will lead to a higher increase in efficiency than a project on their terminal. Therefore, tackling this problem seems to be the most effective way to increase the efficiency of the Rhine-Alpine corridor.

7. Conclusion & Recommendations

In the previous chapters, a lot has been written about transport policy, European transport policy and the extent to which this already functions. This all has been done in order to be able to answer the following question:

To what extent can the Connecting Europe Facility contribute more to the transport efficiency of terminals in Europe?

In order to answer this question, first it is needed to understand what the Connecting Europe Facility (CEF) is. The CEF is the funding program of the TEN-T program. The TEN-T program aims to improve European transport. They do so, by setting up different corridors, and along this corridors transport efficiency must be optimized. They finance projects that optimize transport efficiency with the CEF. This thesis aims to answer how this subsidies can contribute more to transport efficiency as they already do. In a nutshell, the answer to the research question is as follows: *It can be useful to look at on-site terminal improvements, but it is actually much more important to look at the broader context and spend the European funds on off-site projects.* This kind op projects improve efficiency in a higher rate than on-site improvements. This conclusion can be elaborated on and recommendations can be made on the basis of that conclusion, recommendations for praxis as well as recommendations for future scientific research. This is done in the paragraphs below.

7.1 Conclusions and recommendations for praxis

First, there is framed to what extent different container terminals are already efficient. To do so, a framework of four different categories is derived from scientific transport literature. These categories, accessibility, capacity, on-port facilities and port services all consist of different indicators, seven in total. For these indicators has been checked to what extent the different terminals along the Rhine-Alpine corridor, which was the case-study for this research, matched the prescription of an efficient terminal. In total, 108 terminals were established along the corridors and with the gathered quantitative data, statements are made about the efficiency of these terminals. A in depth analysis of the efficiency of these terminals can be found in Chapter 5.

The general outcome of this part of the research was that only a few terminals can be labeled as efficient according to the guidelines, a few very poor and that most terminals can be described as nearly adapted, since they come one or two attributes short. This indicates that there is still room for the TEN-T program to achieve a higher efficiency in container terminals, with adapting only one or two indicators. Instead of drastic changes in a lot of terminals, it seems that the number of interventions per terminal are limited. This is why European TEN-T policy is justified, because it can have a positive effect on European transport.

The next step in the process is to look at the attitude of relevant actors regarding TEN-T and CEF legislation. Just because the TEN-T program and the CEF subsidies can be useful, does not mean the budget is allocated in the right way. Therefore, terminal holders of 9 Dutch and 1 German terminal and a specialized subsidy applier were asked for their experiences with TEN-T or other (European) subsidies. A few recommendations can be made on the basis of the view of the different respondents. First of all, it is striking that national or regional subsidies are used on a large scale, whilst European subsidies are far from popular. The reason for this is that the national subsidies are easy to understand and the process to make an application is not complicated. European subsidies, however, are more complicated. Because of this high bureaucracy, the different actors prefer not to make an application for a subsidy. Also it is not made clear what the exact conditions are to get such a subsidy granted. Therefore, a top priority of the European Commission should be that the application gets more insightful. This could be done in various ways. Right now, a guide for applicants already exists. This guide scares possible applicants because of the size of the document and still what is said is not clear enough. Therefore, it is recommended that this document gets revisited, or maybe a 'easy guide' gets produced. When this is done, it should get more insightful for the different applicants what the exact conditions are for a subsidy. Also, many terminals did not know exactly what the TEN-T program was or that there were possibilities for a subsidy. In order to make the project a success, all the relevant actors should be up to date about the program. Therefore, the European Commission should be more progressive in informing actors such as container terminals what the possibilities are.

Still, that a subsidy of this scale is complicated is understandable. Therefore, the possibilities should be checked for a simplification of the application, but this is not likely to end this problem. Specialized companies in making an application for such subsidies might still be needed, but also for this branch problems exist. The reason why almost no container terminal is willing to reach such a company is, next to the vagueness of the requirements, also a critical attitude towards these companies. Different terminals think the costs of having a application written by such a company will not outweigh the benefits. For the specialized companies it is of vital essence that they can prove what addition they can offer to container terminals, and the costs that come along with it.

This also has to do with the rate of co-funding that is possible for CEF subsidies. A co-funding rate of 20% is way too low, according to the container terminals. For them it is not possible to finance the remaining amount, because they do not possess the necessary funds themselves, mainly because the projects that have to get done in order to get a subsidy are too expensive. There are multiple acts that can be done to encounter this problem. First, the rate of co-funding can be raised to a more desirable rate. However, this is not very realistic because in the eyes of the terminals such a co-finance rate should be around 50%, which is a huge increase. A more suited approach is to find other forms of co-finance, which makes the percentage that the terminals have to contribute themselves less. For instance, a better tuning could be arranged between European government, Dutch (or local) government and the terminal, where all three parties account for a percentage of the total. In this case, the CEF subsidies will be keep paying around the same amount of co-finance and the terminals will pay less. Also for the Dutch government this could be a benefit, because this prevents proliferation of different scaled subsidies on transport.

Other interesting things that can be said about how CEF can be of more use to improve European transportation lies in what the key projects should be. All the terminals have some ambitions about on-site improvements. The content of these plans varies from terminal to terminal. This is logical, because at the moment, not all the assets of the different terminals are the same, so the wishes also vary. A more common line can be discovered in off-site improvements. Most of the terminals like to see that their terminal gets better connected to the surrounding infrastructure. Less congestion on the roads and care for lock keepers are things that are mentioned in this research. By doing this, terminals themselves will work more efficient, because they are less dependent on factors outside the terminals.

There is one off-site project that is unanimously named as key project for the terminals. The inefficiency of the seaports of Rotterdam and Antwerp, where the waiting times for a vessel are very long, gives them a lot of trouble. They are quite dependent on these seaport terminals. When a vessel gets delayed in the port, this also troubles their schedule. Therefore, the most important measure to increase an inland ports efficiency is, quite frankly, an off-site project. The interviewed actors agreed that a lot of effort, and CEF money, should be put in tackling this problem first, this is for them more important than on-site improvements. The solution for this can be achieved by developing a smart planning system in the seaport, which will lead to more clarity about when the vessels can return and also will contribute to a faster handling. Also, at the moment, one vessel usually has to visit multiple seaport terminals, and pick up a few containers at every seaport terminal. This process also can be upgraded, for instance with a hub and spoke model, where different less filled ships get combined. A improvement of this sort is likely to have a bigger effect on efficient transport than to invest the subsidies in the terminals directly.

Next to off-site improvements on a terminal, on-site improvements can also be made. This should only be done when the off-site problems, and then mainly the problems in the seaports, get tackled first. When this is done, it is possible to look at the possibilities for on-site terminal improvements. As said before, which kind of works this will be, depends on many factors, such as the type of terminal, the way the terminal gets run, the height of own capital that they can invest and, most importantly, on the assets and flaws the terminal already possesses. Therefore, a one on one recommendation about 'the best' on-site investment can not be made. It is however possible to follow the guidelines as set in Chapter 5 of this thesis. These guidelines seemed pretty accurate, with the one side note that a terminal should possess at least two cranes, instead of the tested one. It turns out that out of all of the tested values in Chapter 5, only CEMT accessibility and entering facilities do not affect the maximum handling capacity of a terminal. all the other indicators did have a positive effect on the handling capacity, which means that improving this indicators will most likely lead to a higher maximum handling capacity.

All in all, still a lot of progress can be made in European transport. Therefore, there lies a clear chance for CEF to contribute to this. In order to do so, the biggest win in efficiency can be gained by optimizing off-site processes, such as optimizing the container handling for inland vessels in the port of Rotterdam. When this is done, it is possible to look at specific on-site terminal wishes to improve this part of inland container transport.

7.2 Limitations of this research and recommendations for further scientific research

Next to recommendations for the praxis, also some recommendations for the scientific field can be made. This will be done by reflecting on how this research is conducted and its shortcomings. Furthermore, recommendations can be made on how the used theory can get used in a more constructive way and some recommendations for further research can be made.

What is most clear for this research, is that the theory focused too much on on-site improvements. All the dimensions on how terminal efficiency can be optimized have to do with on-site (or at least really nearby) aspects, such as the number of cranes or the number of railroad tracks on the terminal. this has given useful insights in the current situation of the terminals along the Rhine-Alpine corridor, but does not take other aspects into account. Improving these off-site aspects turned out to be even more essential for a container terminal than the on-site aspects. Therefore, it is important that further research in the field of transport efficiency is looked at from different angles: In order to achieve a higher efficiency it is not only important to look at factors that are close, but also to the more distant factors, since they might even influence more.

A second limitation in this research is that it is assumed that a blueprint can be made on how a terminal should be ran. On the basis of the interviews with the respondents can be said that it is not easy to come up with such a blueprint, because this is dependent on many factors, such as how the terminal is operated and what the ambitions of the terminal are. Therefore, in the future it is useful to take this other aspects in consideration as well, instead of coming up with one framework for an efficient terminal. That was tried in this research as well, by dividing the different terminals on the basis of their modalities and function. This division turned out to be helpful, for instance when properties of trimodal terminals were tested. However, for future research it is important to know that a one on one blueprint on terminal necessities can not be given, but that it is possible to give direction to this. The fact that many views on on-site improvements from terminals correspond with the quantitative database, is an indication that the framework is valid. However, this framework should never be leading, but cases must always be assessed individually. The framework that is used in this quantitative research may serve as a first exploration within this field. This goes for most of the mentioned indicators. This research showed that *entering facilities* and *CEMT waterway access* do not lead to an increase in efficiency. This means that these aspects do not have to be examined in future research. The focus should lay on the other indicators and, most importantly, the off-site improvements that can be made. It is recommended that future studies focus on what the impact is of different off-site improvements to a terminal and how this contributes to more transport efficiency.

Third, some remarks can be made about the case. Although this research was meant as a example for other corridors, in the end the conclusions that can be drawn may be more context specific than expected in the beginning of the research. For instance, the information about the inefficiency of the port of Rotterdam and Antwerp brings up very useful information on how transport efficiency can be improved, but this is only the case for the three corridors these seaports are involved in. if this is also the case for the other major seaports along the corridors is not known. Therefore, a more in-depth research in all of the corridors is recommended, to see whether these kind of problems occur in multiple places or if it is just a context specific problem. To do so, different terminal holders along the entire corridor can be interviewed.

Another interesting perspective in addition to this research, is to take the view of more actors into account. Because of time limitations, for this research there is chosen to only look into the opinion of container terminals and one specialized company. It might be interesting to get to know different opinions, such as seaport operators, transport carriers or different scales of governments. This opinions might lead to different insights or nuances to the conclusions that are drawn in this research. Therefore, it is recommended that more research is done towards the attitude of different actors in European transport.

A last recommendation for the scientific field can be made regarding the policy arrangements approach. Using this approach brought some interesting insights, but this could be elaborated more. Also, there are other theories to look at policy. It can be expected that these other theories will lead to the same conclusions, but this is not the case per se.

Despite the fact that this research has known some restrictions, it is clear that it did provide many useful insights, as well in the field of praxis as for the scientific community. First of all, science about transport efficiency is helped by this research. The insight that an improved terminal efficiency is more than only on-site improvements, is a refreshing sound in this field of research, which future research could benefit from.

Also, specific recommendations can be made on the basis of this research to improve the CEF subsidies. This means that this research can have a direct effect on transport efficiency. It has become clear that CEF really can contribute to a more efficient transport and what the possibilities are to do so. Therefore, there can be stated that the social relevance of this research is high and implementation of the made recommendations should lead to a higher transport efficiency on the TEN-T corridors.

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Appendix I: The nine TEN-T Corridors

Below, a overview of the nine different European TEN-T corridors are given (European Union, 2014a).

The North Sea-Baltic Corridor connects the ports of the Eastern shore of the Baltic Sea with the ports of the North Sea. The corridor will connect Finland with Estonia by ferry, provide modern road and rail transport links between the three Baltic States on the one hand and Poland, Germany, the Netherlands and Belgium on the other. Between the Odra River and German, Dutch and Flemish ports, it also includes inland waterways, such as the "Mittelland-Kanal". The most important project is "Rail Baltic", a European standard gauge railway between Tallinn, Riga, Kaunas and North-Eastern Poland.

The North Sea-Mediterranean Corridor stretches from Ireland and the north of UK through the Netherlands, Belgium and Luxembourg to the Mediterranean Sea in the south of France. This multimodal corridor, comprising inland waterways in Benelux and France, aims not only at offering better multimodal services between the North Sea ports, the Maas, Rhine, Scheldt, Seine, Saone and Rhone river basins and the ports of Fos-sur-Mer and Marseille, but also better interconnecting the British Isles with continental Europe.

The Baltic-Adriatic Corridor is one of the most important trans-European road and railway axes. It connects the Baltic with the Adriatic Sea, through industrialized areas between Southern Poland (Upper Silesia), Vienna and Bratislava, the Eastern Alpine region and Northern Italy. It comprises important railway projects such as Semmering base tunnel and Koralm railway in Austria and cross-border sections between PL, CZ and SK.

The Scandinavian-Mediterranean Corridor is a crucial north-south axis for the European economy. Crossing the Baltic Sea from Finland to Sweden and passing through Germany, the Alps and Italy, it links the major urban centers and ports of Scandinavia and Northern Germany to continue to the industrialized high production centers of Southern Germany, Austria and Northern Italy further to the Italian ports and Valletta. The most important projects in this corridor are the fixed Fehmarnbelt crossing and Brenner base tunnel, including their access routes. It extends, across the sea, from Southern Italy and Sicily to Malta.

The Orient/East-Med Corridor connects the maritime interfaces of the North, Baltic, Black and Mediterranean Seas, allowing optimizing the use of the ports concerned and the related Motorways of the Sea. Including Elbe as inland waterway, it will improve the multimodal connections between

Northern Germany, the Czech Republic, the Pannonian region and Southeast Europe. It extends, across the sea, from Greece to Cyprus.

The Rhine-Alpine Corridor constitutes one of the busiest freight routes of Europe, connecting the North Sea ports of Rotterdam and Antwerp to the Mediterranean basin in Genoa, via Switzerland and some of the major economic centres in the Rhein-Ruhr, the Rhein-Main-Neckar, regions and the agglomeration of Milan in Northern Italy. This multimodal corridor includes the Rhine as inland waterway. Key projects are the base tunnels, partly already completed, in Switzerland and their access routes in Germany and Italy.

The Atlantic Corridor links the Western part of the Iberian Peninsula and the ports of Le Havre and Rouen to Paris and further to Mannheim/Strasbourg, with high speed rail lines and parallel conventional ones, including also the Seine as inland waterway. The maritime dimension plays a crucial role in this corridor.

The Rhine-Danube Corridor, with the Main and Danube waterway as its backbone, connects the central regions around Strasbourg and Frankfurt via Southern Germany to Vienna, Bratislava, Budapest and finally the Black Sea, with an important branch from Munich to Prague, Zilina, Kosice and the Ukrainian border.

The Mediterranean Corridor links the Iberian Peninsula with the Hungarian-Ukrainian border. It follows the Mediterranean coastlines of Spain and France, crosses the Alps towards the east through Northern Italy, leaving the Adriatic coast in Slovenia and Croatia towards Hungary. Apart from the Po River and some other canals in Northern Italy, it consists of road and rail. Key railway projects along this corridor are the links Lyon – Turin and the section Venice – Ljubljana.

Appendix II: Rail map of Europe

Source: Perma Culture Marin (2013)

Appendix III: Established terminals

The table below displays the different established container terminals along the corridor. These terminals form the basis of the quantitative research that is conducted in Chapter 5.

Country of the terminal	Place of the terminal	Name of the terminal
The Netherlands	Beverwijk	MEO Container Terminal
	Zaandam	CT Vrede Zaandam
	Amsterdam	CT Vrede-Steinweg Amsterdam
		Amsterdam Multipurpose Terminal
	Alphen aan den Rijn	Alpherium
	Ridderkerk	GCR
	Utrecht	CTU Utrecht
	Rotterdam	Rail Service Center Rotterdam
		Barge Center Waalhaven
		Progreco Holland depot 1
		Beatrix terminal
		Progreco Holland depot 2
		CTT Rotterdam
		Waalhaven Botlek Terminal
		Van Doorn Containerdepot
		Rotterdam Container terminal
	Gorinchem	Logistiek Centrum Gorinchem
	Moerdijk	Delta Marine Terminal
		CCT Combined Cargo Terminal
	Oosterhout	Oosterhout Container Terminal
	Waalwijk	ROC Waalwijk
	Tilburg	Barge terminal Tilburg
	‘s Hertogenbosch	BCTN Den Bosch
	Oss	Osse Overslag Centrale
	Tiel	CTU Rivierenland
	Nijmegen	BCTN Nijmegen

	Cuijk	Inland terminal Cuijk
	Veghel	Inland Terminal Veghel
	Venray	BCTN Venray/Wanssum Intermodal terminal
Belgium	Zeebrugge	Progeco Zeebrugge
	Ghent	Ghent Container Terminal
	Antwerp	Katoen Natie Terminals
		Antwerpen Main Hub
		Van Doorn Container Depot/Zomerweg
		Progreco Antwerpen
		Gosselin Container terminal
		Antwerpen Combinant
		Antwerpen ATO
		Antwerpen Cirkeldyk
	Grobbendonk	Beverdonk Container Terminal
	Willebroek	Trimodale Container Terminal
	Mechelen	Dry Port Muizen
	Brussels	Trimodal Terminal Brussels
		Cargovil Container Terminal
	Meerhout	BCTN Meerhout
	Genk	Haven Genk N.V.
		Genk Euroterminal
	Liege	Liege Container terminal S.A.
		Liege Logistics Intermodal
Germany	Emmerich	Rhein-Waal Terminal Emmerich
	Emmelsum	Emmelsum Hafen
	Duisburg	DeCeTe Duisburg
		Duisburg RRT
		Duisburg Trimodal Terminal
		Duisburg DIT
	Krefeld	Krefeld Container Terminal (KCT)

	Düsseldorf	Düsseldorf Hafen DCH
		Neuss Hessentor
		Dormagen
	Cologne	Köln-Niehl CTS (Stapelkai 1 & 2)
		Köln Eifeltor
	Hürth	Hürth-Knapsack
	Bonn	Bonn
	Koblenz	CSA Terminal Andernach
		Koblenz
	Gerolstein	Gerolstein CT
	Mainz	Mainz CT
		Gustavsburg
	Frankfurt am Main	Contargo Industriepark Frankfurt Höchst
		Ost
		Osthafen
	Aschaffenburg	Aschaffenburg
	Gernsheim	Gernsheim
	Worms	Worms
	Mannheim	Ludwigshafen KTL
		Handelshafen
		Mannheimer Container Terminal (MCT)
		Mannheim Container Terminal Contargo
		Ludwigshafen Contargo
	Germersheim	Germersheim (Contargo)
		Germersheim (DP World)
	Wörth	Wörth
	Karlsruhe	Karlsruhe (Contargo)
		Karlsruhe (DUSS)
	Stuttgart	Kornwestheim
		Stuttgart Hafen

	Kehl	Euro Terminal Kehl
France	Strasbourg	Strasbourg Terminal Conteneurs Nord
		Strasbourg Terminal Conteneurs Sud
	Mulhouse	Ottmarsheim
Switzerland	Basel	Rheinhafen/Weil am Rhein
		Kleinhüningen
		Frenkendorf
		Wolf
	Aarau	Aarau Torfeld
	Zürich	Niederglatt
	Rekingen	Rekingen
Italy	Busto Arsizio	Busto Arsizio-Gallarate
	Oleggio	Oleggio
	Novara	Novara Boschetto
		Novara CIM
	Milan	Terminal Intermodale Milano Certosa
		Terminal Intermodale Milano Segrate
		Terminal Container Melzo
	Mortara	Terminal Intermodale Di Mortara
	Genoa	Genova Voltri
		Genova Sampierdarena
		Genova UM Bacino

Appendix IV: West-European Waterway access

Waterway access on the Rhine-Alpine corridor, source: Panteia, 2014b

Appendix V: SPSS Output

Types of terminals in the different countries

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Type of the CT * Country of origin of the CT	108	100,0%	0	0,0%	108	100,0%

Type of the CT * Country of origin of the CT Crosstabulation

			Country of origin of the CT						Total
			Netherlands	Belgium	Germany	Switzerland	Italy	France	
Type of the CT	Trimodal Terminal	Count	8	6	26	2	0	3	45
		% within Type of the CT	17,8%	13,3%	57,8%	4,4%	0,0%	6,7%	100,0%
		% within Country of origin of the CT	27,6%	30,0%	68,4%	28,6%	0,0%	100,0%	41,7%
	Bimodal terminal Road-Water	Count	19	8	4	0	0	0	31
		% within Type of the CT	61,3%	25,8%	12,9%	0,0%	0,0%	0,0%	100,0%
		% within Country of origin of the CT	65,5%	40,0%	10,5%	0,0%	0,0%	0,0%	28,7%
	Bimodal terminal Road-Rail	Count	1	6	8	5	11	0	31
		% within Type of the CT	3,2%	19,4%	25,8%	16,1%	35,5%	0,0%	100,0%
		% within Country of origin of the CT	3,4%	30,0%	21,1%	71,4%	100,0%	0,0%	28,7%
	Only Road	Count	1	0	0	0	0	0	1
		% within Type of the CT	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%	100,0%
		% within Country of origin of the CT	3,4%	0,0%	0,0%	0,0%	0,0%	0,0%	0,9%
Total		Count	29	20	38	7	11	3	108
		% within Type of the CT	26,9%	18,5%	35,2%	6,5%	10,2%	2,8%	100,0%
		% within Country of origin of the CT	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	75,614[a]	15	,000
Likelihood Ratio	78,177	15	,000
Linear-by-Linear Association	3,173	1	,075
N of Valid Cases	108		

a. 15 cells (62,5%) have expected count less than 5. The minimum expected count is ,03.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	,837	,000
	Cramer's V	,483	,000
N of Valid Cases		108	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Number of container terminals per City

City of origin of the CT

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rotterdam	9	8,3	8,3	8,3
	Antwerp	8	7,4	7,4	15,7
	Mannheim	5	4,6	4,6	20,4
	Duisburg	4	3,7	3,7	24,1
	Basel	4	3,7	3,7	27,8
	Düsseldorf	3	2,8	2,8	30,6
	Frankfurt am Main	3	2,8	2,8	33,3
	Milan	3	2,8	2,8	36,1
	Genoa	3	2,8	2,8	38,9
	Amsterdam	2	1,9	1,9	40,7
	Moerdijk	2	1,9	1,9	42,6
	Brussels	2	1,9	1,9	44,4
	Genk	2	1,9	1,9	46,3
	Liege	2	1,9	1,9	48,1
	Cologne	2	1,9	1,9	50,0
	Koblenz	2	1,9	1,9	51,9
	Mainz	2	1,9	1,9	53,7
	Germersheim	2	1,9	1,9	55,6
	Karlsruhe	2	1,9	1,9	57,4
	Stuttgart	2	1,9	1,9	59,3
	Strasbourg	2	1,9	1,9	61,1
	Novara	2	1,9	1,9	63,0
	Beverwijk	1	,9	,9	63,9
	Zaandam	1	,9	,9	64,8
	Alphen aan den Rijn	1	,9	,9	65,7

Ridderkerk	1	,9	,9	66,7
Utrecht	1	,9	,9	67,6
Gorinchem	1	,9	,9	68,5
Oosterhout	1	,9	,9	69,4
Waalwijk	1	,9	,9	70,4
Tilburg	1	,9	,9	71,3
's Hertogenbosch	1	,9	,9	72,2
Oss	1	,9	,9	73,1
Tiel	1	,9	,9	74,1
Nijmegen	1	,9	,9	75,0
Cuijk	1	,9	,9	75,9
Veghel	1	,9	,9	76,9
Venray	1	,9	,9	77,8
Zeebrugge	1	,9	,9	78,7
Ghent	1	,9	,9	79,6
Grobbendonk	1	,9	,9	80,6
Willebroek	1	,9	,9	81,5
Mechelen	1	,9	,9	82,4
Meerhout	1	,9	,9	83,3
Emmerich	1	,9	,9	84,3
Emmelsum	1	,9	,9	85,2
Krefeld	1	,9	,9	86,1
Hürth	1	,9	,9	87,0
Bonn	1	,9	,9	88,0
Gerolstein	1	,9	,9	88,9
Aschaffenburg	1	,9	,9	89,8
Gernsheim	1	,9	,9	90,7
Worms	1	,9	,9	91,7
Wörth	1	,9	,9	92,6
Kehl	1	,9	,9	93,5
Mulhouse	1	,9	,9	94,4
Aarau	1	,9	,9	95,4
Zürich	1	,9	,9	96,3
Rekingen	1	,9	,9	97,2
Busto Arsizio	1	,9	,9	98,1
Oleggio	1	,9	,9	99,1
Mortara	1	,9	,9	100,0
Total	108	100,0	100,0	

Minimum inhabitants of 250.000

Statistics

Minimum inhabitants of 250000

N	Valid	108
	Missing	0

Minimum inhabitants of 250000

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	57	52,8	52,8	52,8
	Yes	51	47,2	47,2	100,0
	Total	108	100,0	100,0	

Independent T- Test for significance of difference between city inhabitants

Group Statistics

	Is the city part of a mainhub or pivot?	N	Mean	Std. Deviation	Std. Error Mean
Number of inhabitants in the city	No	66	184610,15	271445,713	33412,658
	Yes	42	555234,69	263612,470	40676,287

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Number of inhabitants in the city	Equal variances assumed	,072	,789	-6,995	106	,000	-370624,539	52986,755	-475675,934	-265573,144
	Equal variances not assumed			-7,041	89,339	,000	-370624,539	52639,966	-475213,556	-266035,522

Independent T-Test for difference in rail tracks – Trimodal and Bimodal Road-Rail

Group Statistics

	Type of the CT	N	Mean	Std. Deviation	Std. Error Mean
Number of tracks in the CT	Trimodal Terminal	45	3,29	2,446	,365
	Bimodal terminal Road-Rail	31	5,13	3,201	,575

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Number of tracks in the CT	Equal variances assumed	2,916	,092	-2,839	74	,006	-1,840	,648	-3,132	-,549
	Equal variances not assumed			-2,703	53,121	,009	-1,840	,681	-3,206	-,475

Linear Regression for the relationship between number of tracks and handling capacity

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,366[a]	,134	,125	146474,740

a. Predictors: (Constant), Number of tracks in the CT

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	335427973349,146	1	335427973349,146	15,634	,000[b]
	Residual	2166939799660,564	101	21454849501,590		
	Total	2502367773009,709	102			

a. Dependent Variable: The annual capacity a CT can handle

b. Predictors: (Constant), Number of tracks in the CT

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	335427973349,146	1	335427973349,146	15,634	,000[b]
	Residual	2166939799660,564	101	21454849501,590		
	Total	2502367773009,709	102			

a. Dependent Variable: The annual capacity a CT can handle

b. Predictors: (Constant), Number of tracks in the CT

Independent T-Test for difference in length of rail tracks – Trimodal and Road-Rail Terminals

Group Statistics

	Type of the CT	N	Mean	Std. Deviation	Std. Error Mean
The available length of railroad tracks on the CT	Trimodal Terminal	45	565,00	493,624	73,585
	Bimodal terminal Road-Rail	31	529,32	174,243	31,295

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
The available length of railroad tracks on the CT	Equal variances assumed	5,690	,020	,386	74	,701	35,677	92,541	-148,714	220,069
	Equal variances not assumed			,446	58,547	,657	35,677	79,963	-124,355	195,710

Sufficient track length in terminals

Type of the CT * Rail length bigger than 600m Crosstabulation

Count

		Rail length bigger than 600m		Total
		No	Yes	
Type of the CT	Trimodal Terminal	27	18	45
	Bimodal terminal Road-Rail	15	16	31
Total		42	34	76

Independent T-Test for difference in means of direct rail lines to a main port – Trimodal and Road-Rail Terminals

Group Statistics

	Type of the CT	N	Mean	Std. Deviation	Std. Error Mean
Number of train lines from CT to Mainports Rotterdam, Antwerp and Genoa	Trimodal Terminal	45	6,51	9,241	1,378
	Bimodal terminal Road-Rail	29	10,76	13,922	2,585

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Number of train lines from CT to Mainports Rotterdam, Antwerp and Genoa	Equal variances assumed	1,686	,198	-1,579	72	,119	-4,248	2,690	-9,609	1,114
	Equal variances not assumed			-1,450	43,904	,154	-4,248	2,929	-10,152	1,657

Linear regression for the relation between rail length and handling capacity

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,306[a]	,094	,085	149847,583

a. Predictors: (Constant), The available length of railroad tracks on the CT

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	234483669219,987	1	234483669219,987	10,443	,002[b]
	Residual	2267884103789,722	101	22454298057,324		
	Total	2502367773009,709	102			

a. Dependent Variable: The annual capacity a CT can handle

b. Predictors: (Constant), The available length of railroad tracks on the CT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	131955,635	20131,553		6,555	,000
	The available length of railroad tracks on the CT	113,721	35,191	,306	3,232	,002

a. Dependent Variable: The annual capacity a CT can handle

Linear regression for the relation between CEMT class accessibility and handling capacity

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,033[a]	,001	-,009	157319,549

a. Predictors: (Constant), Type of CEMT waterway access

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2674282037,595	1	2674282037,595	,108	,743[b]
	Residual	2499693490972,114	101	24749440504,674		
	Total	2502367773009,709	102			

a. Dependent Variable: The annual capacity a CT can handle

b. Predictors: (Constant), Type of CEMT waterway access

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	168263,849	28636,184		5,876	,000
	Type of CEMT waterway access	1998,097	6078,489	,033	,329	,743

a. Dependent Variable: The annual capacity a CT can handle

One Way ANOVA in mean differences for handling capacity

Multiple Comparisons

Dependent Variable: The annual capacity a CT can handle

Bonferroni

(I) Type of the CT	(J) Type of the CT	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Trimodal Terminal	Bimodal terminal Road-Water	71459,068	36145,435	,152	-16552,14	159470,27
	Bimodal terminal Road-Rail	6149,630	37697,441	1,000	-85640,59	97939,85
Bimodal terminal Road-Water	Trimodal Terminal	-71459,068	36145,435	,152	-159470,27	16552,14
	Bimodal terminal Road-Rail	-65309,438	40764,773	,337	-164568,36	33949,48
Bimodal terminal Road-Rail	Trimodal Terminal	-6149,630	37697,441	1,000	-97939,85	85640,59
	Bimodal terminal Road-Water	65309,438	40764,773	,337	-33949,48	164568,36

Independent T-Test for entering Facilities – Bimodal Road-Water vs. bimodal Road-Rail

Group Statistics

	Type of the CT	N	Mean	Std. Deviation	Std. Error Mean
Probability for a CT to have at least two trains entering at the same time	Bimodal terminal Road-Water	31	,68	,475	,085
	Bimodal terminal Road-Rail	31	,90	,301	,054

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Probability for a CT to have at least two trains entering at the same time	Equal variances assumed	24,453	,000	-2,236	60	,029	-,226	,101	-,428	-,024
	Equal variances not assumed			-2,236	50,690	,030	-,226	,101	-,429	-,023

One Way ANOVA for available cranes available

Multiple Comparisons

Dependent Variable: Number of cranes and reach stackers on the CT

Bonferroni

(I) Type of the CT	(J) Type of the CT	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Trimodal Terminal	Bimodal terminal Road-Water	,435	1,002	1,000	-2,00	2,87
	Bimodal terminal Road-Rail	,711	1,045	1,000	-1,83	3,26
Bimodal terminal Road-Water	Trimodal Terminal	-,435	1,002	1,000	-2,87	2,00
	Bimodal terminal Road-Rail	,276	1,130	1,000	-2,48	3,03
Bimodal terminal Road-Rail	Trimodal Terminal	-,711	1,045	1,000	-3,26	1,83
	Bimodal terminal Road-Water	-,276	1,130	1,000	-3,03	2,48

Linear regression for the relationship between number of cranes and the handling capacity

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,543[a]	,295	,288	3,594

a. Predictors: (Constant), The annual capacity a CT can handle

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	546,949	1	546,949	42,337	,000[b]
1	Residual	1304,798	101	12,919		
	Total	1851,748	102			

a. Dependent Variable: Number of cranes and reach stackers on the CT

b. Predictors: (Constant), The annual capacity a CT can handle

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,900	,534		5,426	,000
	The annual capacity a CT can handle	1,478E-005	,000	,543	6,507	,000

a. Dependent Variable: Number of cranes and reach stackers on the CT

Linear regression for the relationship between the number of direct links to a main port and the handling capacity

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,275[a]	,076	,067	151330,280

a. Predictors: (Constant), Total lines to a mainport; By train and barge

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	189381561274,287	1	189381561274,287	8,270	,005[b]
	Residual	2312986211735,421	101	22900853581,539		
	Total	2502367773009,709	102			

a. Dependent Variable: The annual capacity a CT can handle

b. Predictors: (Constant), Total lines to a mainport; By train and barge

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	130898,244	21685,743		6,036	,000
	Total lines to a mainport; By train and barge	4263,145	1482,474	,275	2,876	,005

a. Dependent Variable: The annual capacity a CT can handle

Appendix VI: Interview report PNO Consultants

To validate what is heard at different container terminals, but also to hear different insights, an interview is conducted with Pecunia Non Olet (PNO). PNO provides financing solutions for innovation, research and investment. In this function, they also have experience in applying for CEF and TEN-T subsidies. Therefore it is interesting to see how they look at the subsidies, and at which points they differ from the arguments of the interviewed container terminals. For this interview should be noted that it is conducted via e-mail, because of a busy schedule of all of the consultants. The reason for this is that the call for subsidies close two weeks from the time this report was written. However, because of the before mentioned arguments that an interview with someone from PNO is of added value for this research, there is chosen to conduct this interview via e-mail. The contact with PNO has been established with Jarl Schoemaker, who is Manager team Transport, Logistics and infrastructure. He managed that one of his consultants filled in the questionnaire is send him. The results of this outcomes are represented in the written part below.

Because CEF is the successor of the TEN-T program, it is still not 100% clear which parties will apply for such a subsidy. Based on the past, they think that probably bodies such as the ministry of Infrastructure and Environment, Rijkswaterstaat, Pro Rail, Provinces, industry parties focused on alternative fuels, terminal builders and shipping companies. In general, the most applies come from the government. For the coming call, around 100 projects will apply for a CEF subsidy. PNO handles some of these applications. They handle two applications for Dutch container terminals and several applications for other projects. This is consistent with the fact that only a small portion of the TEN-T funds are available for terminals. This is only logical according to PNO, because TEN-T funds are not primarily meant to finance a container terminal. They are meant to improve European infrastructure and transport, this can be done by improving the terminals, but there are a lot of other possibilities to do so.

At PNO they think the process of applying for a CEF subsidy can still be improved. At this moment, appliers first have to apply at RVO, who make a first check. After that, the ministry of Infrastructure and Environment must approve the apply. This entire process of applying creates much administrative burden and complicated. Although the entire apply is a bit less foggy than the previous call, it is still quite a tour. The information that is provided by INEA, such as the guide for applicants and the FAQs do still not offer all the needed handles and are too complicated. AT PNO they would like to see that INEA improves this.

Also regarding the review of the applies, some changes can be made. The impact a plan has is very important in the applies. This impact must be underlined quantitatively, although this is not yet possible in some cases, such as infrastructure projects. Also, for a container terminal it is not always clear what the consequences of building a terminal will be in terms of durability.

The cofinancing aspect is also tricky in applying the subsidy. If the funding of a project is not taken care of for 100%, the EC is not likely to approve the apply, because they think it is a big risk when this is not taken care of yet. Therefore, the funding must be clear, although this is often very hard to realize. For the CEF program, the cofunding rate is 20%, where the cofunding rate of the TEN-T rate was 10%.

Appendix VII: Interview Report van Uden

Half January I visited Marnix Vos from Van Uden for a interview about the container terminal Alpherium, located in Alphen aan den Rijn in the Netherlands. Van Uden is the company that is responsible for the exploitation of the Alpherium. Next to this container terminal (Van Uden Multimodal), they represents different other branches, Van Uden Forwarding and Van Uden Logistics. Vos is concerned with the daily business at the container terminal Alpherium, which is why the interview is arranged with him. Van Uden mainly transports Heineken beer (About 99% of their export is Heineken and they are the exclusive transporter of Heineken from their brewery in Zoeterwoude) and retail for import.

In 2010, the container terminal is opened. Before this, they were already specialized in container transport, mainly over road but also by water. Since the opening of the container terminal however, the modal shift is changed more towards water transport. This day, about 98% of the transport between the seaports of Rotterdam and Antwerp and the container terminal is done by ship. From there on out, trucks transport the containers land inwards.

The high percentage of water transport can be explained by the fact that the highways around the seaports are getting more congested and it is therefore less predictable how much one truck will take to deliver its cargo. Also, waterway transport is a more durable form of transport, so the environment gets harmed less. Still, some trucks drive between the seaports and Alpherium, but this is only for emergencies. Because of haste of a project it sometimes is necessary to drive a truck because this is faster. But in almost al the cases, transport between the port of Rotterdam and the Alpherium goes by water.

In the coming years, the van Uden group has multiple plans for improvement. First of all, there are plans for a new container terminal in Haaften, along the river Waal. Right now, they already possess a distribution center in that area and they are investigating to what extent it could be possible to transform this into a new container terminal. This means this plan is still very early staged. Right now they are looking into the possibilities for permits.

Next to a entire new terminal, there are also plans for improvement on the existing terminal Alpherium in Alphen aan den Rijn. Right now, they possess revised cranes that are 45 years old. They are investigating the possibilities to replace these cranes. This is not a short term plan, but the plans are there. However, between ordering such a crane and the actual delivery takes a year. Because the crane is not ordered yet, it is safe to say that it will take a while before a new crane will be placed on site at the terminal. Also, the van Uden group is looking into the possibility to build a new distribution center at the Alpherium, but also for this project the permits need to be checked first.

When we look at different bottlenecks outside the terminal, there is also room for improvement. In contrast to the motorways, which are all well adapted to the terminal, there is a problem in the waterway access. The river that leads to the terminal, de Gouwe, has a bottleneck near Boskoop. At this place, the river is quite small. It is a wish of the van Uden group that this bottleneck will be removed, so bigger units can be transported to the terminal than that is possible right now.

For this kind of projects, they have a lot of contact with different scales of governments. The province of Zuid-Holland is responsible for the waterways and helped building the Alpherium. They also speak with the local municipality of Alphen aan den Rijn to discuss possibilities of the new distribution center. In both cases, the collaboration between the governmental institute and the van Uden group proceeds to expectation. For the current business the contact is ‘quite good’. However, they do notice that the interests of the container terminal on the one hand and the governmental institutes on the other hand do not necessarily match. A good example of this is the new distribution center in Alphen aan den Rijn. The province is somewhat shivery in building a new center, because there are other centers in the province that are empty and ready for use. Van Uden Group however, wants to build a new distribution center as close to the inland terminal as possible, in terms to improve the efficiency of the terminal.

The van Uden Group does not have experience regarding TEN-T or CEF subsidies. Marnix vos ‘did read something about it, but does not really know what it is’. Also, they never received any information on this program. They do have applied for a Marco Polo subsidy in the past. This is another subsidy of the European Union. The subsidy was applied for in order to improve the modal shift of the Alpherium. With the granted money they wanted to build a ship that made it easier to shift containers from the road to the water and vice versa. This subsidy was not granted, because of the financial situation of the Alpherium. The body wanted to use the results of the past three years of the terminal, but because the terminal only existed one year, this was not possible. This was something that Vos found very strange. Despite that the grant did not went through, they still could build the ship. Thanks to some ingenuous other possibilities, such as tax benefits, dutch government was able to contribute to the building of this ship.

Because the framework of applying for a subsidy is quite foggy most of the time, in any case for this Marco Polo subsidy, they feel compelled to hire specialists in this area, because without a specialist it gets too hard to understand. Also, the time to write a big report for the supply, what was needed for the Marco Polo apply, was not available by their own staff. Therefore, it would be more efficient if these kind of subsidies get structured easier and make it easier to understand. Instead of various different vague criteria for a plan, the most important thing should be the viability of this plan. It should be important that a subsidy helps a initiative on the road, but when the subsidy stops it has to be viable by itself. This along with the relevance of the plan are the two core aspects that a plan should be focused on, instead of multiple vague criteria.

According to Vos, it is really hard to say what standard demands for a container terminal should be. This is dependent on the terminal. For instance, in Tilburg the water is less deep than in other terminals. Because of a high throughput speed, they still do well. Therefore, it is hard to come up with a unified demand package for a inland container terminal. However, it does make it easier when the terminal is located near deeper water. Also, it is wishful to have at least two cranes, because this makes the terminals less vulnerable if your crane breaks down. This of course also has to do with the reliability of the crane and the terminal.

Last, Vos has something to say about the relation with the seaports. He sketches that waiting times are very rare at the Alpherium. However, congestion in the port of Rotterdam or Antwerp can cause some serious problems for them as inland port. The past time, there were quite big waiting times in these ports. This also reflected back to the inland ports, because they had to wait for their cargo as well. This reduces the efficiency of the container terminal even more then a possible lack in the container terminal itself. Therefore it is important to look into this waiting times at seaports.

Appendix VIII: Interview report BCTN

In order to get to know the opinions of terminals in the Netherlands regarding to a optimized subsidy, an interview is conducted with Rien Geurts, who is CEO at BCTN. BCTN is a company that runs multiple inland terminals from their base in Nijmegen. BCTN has terminals in Nijmegen, Den Bosch, Wanssum/Venray, Alblasserdam (East of Rotterdam) and in Belgium. Geurts has as a CEO a overview of what happens in the different terminals and therefore he was the perfect subject for this research.

BCTN is the owner of multiple terminals and their focus lays on the operation of this terminals. They do have their own transport branch, but they also make use of different carrier companies, with which they maintain good relations. Their terminal in Nijmegen for instance, serves as a hub for Danser. This terminal is solely used for this carrier. These different transport companies operate under the wings of BCTN, which means that BCTN plans the routes and times of the ships and trucks.

At least 80% of the travelled kilometers are transported through waterways, for the terminals of BCTN. Between the seaport and the inland terminal most of the transport is conducted by waterway and in some cases by road. From the terminal to the final destination, or the other way around, is conducted by transport by road. For the terminals of BCTN, this normally is a maximum distance of 30 kilometers.

At this moment, BCTN is investing drastically in their terminal in Nijmegen. Right now, a new quay is getting build from about 310 meters long. This project is almost finished. In order to finance this operation, they make use of the quick wins regulation. Furthermore, they do not make use of subsidies in general.

They do see that some work for their terminals is needed. First of all, they would like to see their terminal in den Bosch expanded in the future, but it is uncertain if this is possible, because of the waterway access. Furthermore, their terminal in Wanssum/Venray has some troubles too. The river Maas will be expanded in the area of their terminal, which means that the terminal will be split in two different areas. This is not wishful for them. This is why they want to move a part of the terminal, to keep it complete when the Maas gets expanded. For infrastructural improvement outside the terminal, he does not have specific wishes. However, he does think that Rijkswaterstaat has a strange policy, because they invested billions of euros in the waterways, but now they do not have enough money for the lock keepers.

In these kind of processes they have to collaborate a lot with different governmental institutions. When Geurts is asked if this collaboration runs smoothly, he says it normally does, but this is not always the case. As he says, ‘they would like to help you, but they do not always show that they do'. Overall spoken, a government can not be described as cooperative, but as not-obstructive. He still does give his an example on how the tuning between BCTN and the local municipality of Nijmegen is not always perfect. Because of the renovation of the terminal in Nijmegen, the office needs to be replaced and moved. They bought a new unit and modified it so it corresponds with the latest building codes. Somebody of the municipality show was responsible for this application did not approve this new unit, because it did not fit within the landscape. This is absurd according to Geurts, because of multiple reasons. First of all, the unit can not be seen by road or water, because of the containers on the terrain. This means that the unit can only be seen out of the air, which makes the relevance of how the unit looks makes less relevant. Furthermore, he claims that there are other aspects in the scape of Nijmegen that are way more present, such as a power station. Therefore he found the rejection madness. When he visited another person in the municipality he almost immediately granted permission for the new unit. Because of this discrepancy, his workers sat in a temporary unit for two months on the terminal, while the new unit already was placed.

This is a example in where the collaboration between a municipality and BCTN is not great, but they also have good experience with municipalities. The lock in den Bosch recently became property of the municipality, instead of Rijkswaterstaat. This means that the municipality is responsible for the maintenance and operation of this lock. The terminal in den Bosch is dependent on this lock, because it lays on their only access point by water. Therefore, they communicate with the municipality a lot about the operating times, to keep this functioning as smoothly as possible for them. This relationship is very good for now. They are still worried about how this will be in the future, because they do not know for sure that they will keep a communal interest.

Geurts knows a little about what the TEN-T program entails, because the made use of a CEF subsidy for a hub and spoke project. The aim for this project was to test with the carrier Danser if combining cargo was more efficient in waterway transport. The idea for this project was theirs and with the help of a specialist company, they got the subsidy. Therefore, for him it was not that hard to apply for a subsidy.

What is essential when a subsidy is granted, is that every subsidy needs to function without subsidy eventually. A subsidy only needs to function as a driver for a plan to get in function. A subsidy needs to be granted because it stimulates, not because 'it is nice to have'. In other words, a subsidy needs to contribute. A good example of this is the railterminal in Valburg that will be build. Although there is no need for a new terminal in this area, they will go on with the plans of building this terminal, because it is prestige to have a rail terminal just before the German border.

Germany is a great solution in his opinion on how subsidies should be granted.over ther, they have one strong requirement: Cofinancing to up to 90% is possible, but no other terminal in a range of 70 kilometers may be present. By doing this, this prevents too much terminals in a small place. In the Netherlands, somehow the opposite happened. In 2010, about twenty terminals were present in the Netherlands, while research stated that 10 to 15 terminals in the Netherlands are enough. However, in the last few years the number of inland terminals grew, up to 35 right now. This overpopulation of terminals in the country will work reversed eventually according to Geurts. Therefore, the loads that come from different terminals get smaller, because the total number of containers does not rise. A terminal therefore has three choices. The first is to have less lines to a mainport. The second is to have half filled ships. Both of these measures are not profitable. The third possibility is that a terminal ends its business. This means that he predicts that in the coming years a lot of terminals have to close their doors. This is a waste of government money and effort, when subsidies were granted before. This is why Geurts says that subsidies should not be granted at all. However, if it is done, this money is better spend in another way.

The perfect way to get this money allocated is to invest in preconditions. The port of Rotterdam works inefficient for quite a while now. He would like to see that money is invested in the realization of a new planning system, which makes it more insightful in when the ships get loaded. This makes it easier for shippers, inland terminals, but also the port of Rotterdam itself to coordinate efficient transport. So do not subsidize the companies that suffer from the delay, but do something about these delays.

Last, Geurts also reflects critically on the degree of cofinance. The degree in which this is possible now, in combination with the costs for the terminal itself, it is almost impossible for a smaller terminal to claim the subsidy. This measure ensures that only very big companies can get such a subsidy. This is far from wishful, so says Geurts. This is so, because these big companies have a bigger budget per definition and therefore the need for a subsidy is less, because they have the resources to launch a plan by themselves. Geurts thinks this is ‘bizarre’.

Appendix IX: Interview report OOC

In order to get to know the main opinions for terminals regarding subsidy policy, different actors are interviewed to ask for their views. The Osse Overslag Centrale, OOC, is a terminal that is located in the Dutch city Oss. I spoke with Eric Nooijnen, who is managing director for this terminal. In an interview he told about his most important views regarding different subsidies, which are discussed in the interview report below.

The OOC used to be part of the Nooijen groep. This group was a company which accommodated multiple companies, such as Nooijen weg- en waterbouw and Nooijen tereininrichting. Not so long ago, the OOC separated from the Nooijen group. The main reason for this was because of a further going privatization of the terminal, with a logical step to separate from the Nooijen groep.

The OOC does not have a own transport branch, as opposed to some other terminals. The main reason for this is that the main focus of this terminal lays on the exploitation of the terminal. For them it is not necessary to offer transport by themselves. They have a regular team of transporters that make use of their terminal and that works fine for them.

This terminal differs from other terminals that are interviewed for this research in the fact that they do not only possess a water and a road connection, but that they are also connected by rail. About 17% of the modal split of this terminal is reserved for traffic by train. The other part is destined for water and road transport. Almost all of the transport to and from the port of Rotterdam is done by water. However, this terminal also does continental transport. This means that from this terminal ships and trains depart more land inwards and so it also serves as a transit terminal and not just as a terminus for the region of Oss.

The terminal is opened in 1979. In that time, it was meant for the transfer of bulk goods. In 2008 Nooijen bought another terminal for bulk goods in Oss. The first terminal handles containers since 1995. In the beginning this was a mixed operation, so they handled both containers as bulk goods. In 2012 they split these operations. From that point on, one terminal handles the bulk good goods and one terminal handles the containers. For this adjustment, the entire terrain is renewed.

This is not entirely done with own money. The terminal got SOIT subsidy and profited from the DUB regulation. Also, the province contributed to this project. For the process in applying for this subsidies, Eric Nooijen is enthusiastic. The requirements and the applies are clear and the collaboration with governmental institutions did not provide any problems. This is usually the case for Dutch subsidies, and are a huge contrast with European subsidies. These kind of subsidies are a lot more difficult according to Nooijen.

Nooijen is known with the TEN-T policy, but has never applied for a TEN-T or CEF subsidy. He names multiple reasons why he has never done this. First of all, he always thought that his terminal was not part of one of the corridors, only some time ago he learned that it is. Still if he had known earlier, the chance that he would have applied still would have been small. First of all, he thinks that it is more important to focus the alleged funds to improve the entire corridor, than to get subsidy for its own terminal. As an example he names the inefficiency in the port of Rotterdam, that costs a lot of inland terminals time and money. This was less the case for his terminal, because ‘their relation with the port of Rotterdam is very good, which means that it makes things easier’. Still, as former president of the VITO (The interest group for Dutch terminals), he acknowledges these problems and thinks there needs to be done something. For a TEN-T policy it is more important to focus on this kind of aspects, then to apply for a subsidy for himself.

Furthermore, applying for an European subsidy is usually way too complicated. This does not only count for the TEN-T program, but also for the Marco Polo project. These applies are way more complex and this makes it way more difficult to succeed than a Dutch subsidy. The administrative burden of this kind of subsidies are very high, which means a lot of effort is lost in the process. On a frequent basis the OOC gets approached to talk about possibilities for a subsidy. This is usually done by specialized companies that want to do a subsidy research for them. The costs for this research are too high, mainly because of the uncertain outcome and the small benefit that can be won. The win of the subsidy, in the form of co-finance, is too low for him to do such a apply. A big part of the subsidy is already lost because of the extra working time it takes to apply for such a subsidy. The burden of a European subsidy is too high. Therefore Nooijen pleads for a clearer process in applying for this subsidies. Right now, a lot of plans do not fit within the complex rules of the subsidy granter, which is a shame.

Nooijen does have an idea how this kind of subsidies can be improved further. Next to the previously mentioned less complicated apply, grants should be given more on the basis of what exactly is done. At this moment, there is much attention for the trajectory phase. After that, money is paid, but there is not much attention for the actual outcomes of the plan. There should paid more attention to this outcomes, by using triggers in the apply. Right now this is done already for Marco Polo grants, but this is done in such a way that it is too hard. This may another reason not to apply for a subsidy.

According to Nooijen, it is very hard to form a blueprint on how to manage a container terminal. Different terminals need different things and that is dependent on how the terminal is managed. However, the location is the most important aspect for a terminal. The location must be robust. What he means by this is that the infrastructure and the location itself nead to be able to cope with the activities of the terminal. An example of where this has not been the case is named for the terminal of Veghel. Nooijen says it is ‘strange and unjustifiable’ that a canal worth €450 million is build in order to cope with the growth of the terminal. This is reasoned the other way around, because a terminal should be located in a place where the infrastructure is robust, instead of adapting the infrastructure to the terminal. The social costs of this canal are unreasonable for society and unjustifiable for a terminal. Therefore, a lot of money van be better allocated by taking a deeper look into these processes beforehand.

Appendix X: Interview report GCR

Groenenboom Containertransferium Ridderkerk, or GCR is part of Groenenboom B.V. Next to the container terminal, also a transport branch and a garage are part of this enterprise. The interview that is conducted for the research is done with Frans van den Boom, who is responsible for the daily affairs of the container terminal in Ridderkerk. The terminal opened in 2008, by a initiative of Groeneboom B.V. itself. In this year, the terminal is drastically improved. Before their opening of the terminal in 2008 the core business of Groenenboom was transporting containers from the port of Rotterdam through Ridderkerk to the hinterland. They noticed the increasing congestion on the A15 and found it much harder to cope with these delays. Today, it costs a trucker 4 hours to get a container in the port of Rotterdam and to deliver it in Ridderkerk. It is impossible to keep transport by road profitable when it takes so much time.

In reaction to this, they decided to build a brand new container terminal. The main reason was to avoid the congestion on the A15 between Ridderkerk and Rotterdam Maasvlakte. It was intended that this terminal would be a transshipment point for their own trucks. However, next to that this is the core business of the terminal, they also serve other customers on their terminal. This means that the container terminal also generates extra income, next to the higher efficiency their own transport branch gets from it.

The extra efficiency in transport is explained by a recent example. Groenenboom does a lot of transportation of paper rolls to Roosendaal. When this is done by truck, it is difficult to predict how late the trucker can deliver his second container. This is because it is not known how long the waiting times in the sea port will be and how congested the A15 is at that moment. What they do now, is load a barge ship with 25 containers and transport these containers to the terminal in Ridderkerk. From there, the trucks drive to Roosendaal. By doing it this way, they are way less dependent on waiting times and busy traffic. The result of this is that trucks can deliver 4 containers a day, which much more certainty regarding their arrival times. This is in the long haul more efficient and more pleasant for the customers. Also, by leaving the A15 alone, they also contribute to a less congested motorway and a more durable transport idea. Although a very high percentage of the transport between Rotterdam and the terminal is done through the waterway, they also send trucks to the port sometimes. This is done in case of emergencies. For instance, some shipping companies demand some types of their containers back within two days. If you can’t manage to deliver the container back within the set time, a fee of €75,- per container per day. It is impossible to keep the transport affordable in this way. This is why there is chosen to transport these special containers (mainly cooling and freezing containers) by truck. Regular containers are mostly transported by water to the terminal.

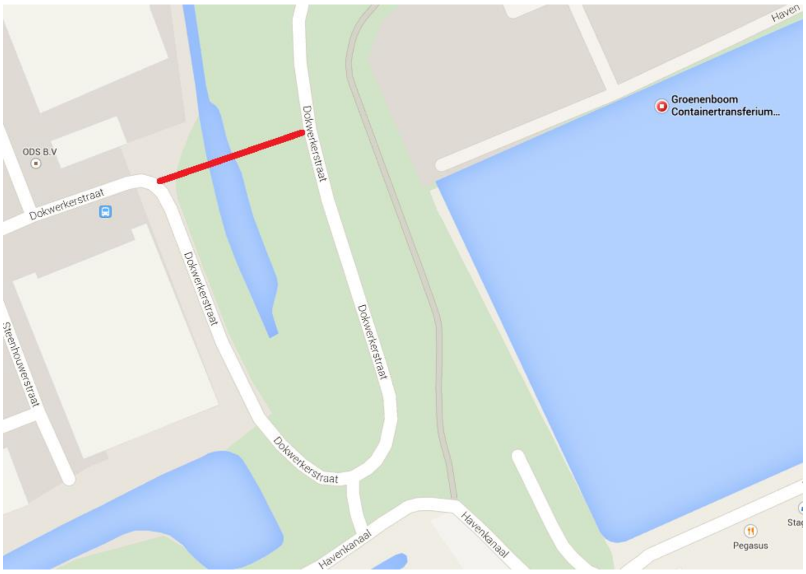
In 2008, the terminal is improved drastically. For a total amount of €3 million, the terminal is improved according to the newest regulations and certifications, which is reflected in the ISPS certificate that is handed out after the renovation of the terminal. This means that the terminal is well prepared in terms of terminal safety.

Although a quite high amount of money is spent on this renovation, Groenenboom paid for this operation al by itself. For the entire renovation, no single subsidy was granted. However, they did got a tax benefit. Because of a new crane, a diesel crane became redundant. From out of a durability aspect, they received a tax reduction. Furthermore, with the help of a specialized company, they tried a lot to qualify for different subsidies of different scales, but this did not work out for them. The main reason that Frans van den Boom gives for the rejection of the subsidies, is that he thinks that their plans were developed in such a matter that they did not even needed subsidy any more. Therefore, he thinks that they are punished for having their affairs in order. Furthermore he says: “When you just have a plan it is possible to get a subsidy here or there, but when the business is settled it’s a lost cause”. This conflicts with the idea of entrepreneurialism, thinks van den Boom. The core of entrepreneurmanship is seeing a opportunity and grasp it right away. This is not possible when you first need to get all the subsidies and bureaucracy in order first.

Furthermore, the possibilities for an European subsidy such as TEN-T are not well know. Van den Boom says “he did read something about the TEN-T program, but the possibilities are not clear to him. This therefore implies that the container terminal has never tried to gain a CEF subsidy. They did make use of a EURO6 subsidy, which was granted by Dutch government. In contrast to other subsidies, this subsidy was easy to apply for. Where for other subsidies it is almost too difficult to understand how to apply for a subsidy. For the EURO6 subsidy they only had to send in their details. The grant money was sent directly into their account. This is according to van den Boom a good example of how subsidies also can be taken care of. In most of the times, the apply for a subsidy is way too complicated, which means you have to hire a extern company that can handle the apply. For a terminal, it is almost impossible to do such a thing.

A few improvements can be named regarding the container terminal of Groenenboom. The most important one is their own power supply. Right now, the power that is used on the terminal in Ridderkerk is coming from a nearby factory. GCR would like to see that this will change and that they will get their own power supply. Van den Boom contacted the local municipality for this issue, but there was no response.

He thinks that subsidies can be allocated a lot more efficient. In stead of spending the money on the power supply, the municipality of Ridderkerk wanted to ‘help’ GCR by creating a new road. The way they wanted to do this can be seen in the picture that is shown in this appendix. Right now the road that leads to the terminal has a curve in it. The municipality of Ridderkerk wants to create a shortcut for the terminal, so ‘trucks have a shorter travel time’. In total, this travel time gets lowered with one minute, while the traffic situation gets more dangerous. For this project €400.000,- euro is available. Therefore, GCR has stated that this was a waste of money and that they would rather see that the money is spend in another way. Later, GCR heard from a third party that the €400.000,- was not available anymore, not for the new road, but also not for another cause. This miscommunication with the government is something that happens more often for them. Another example of this is that van den Boom needed to read in the papers that the municipality discussed the continued existence of the terminal. There were cares about the trucks that cross living areas, although van den Boom says that this hardly ever happens. In response to this he invited the mayor and aldermen to the site to discuss what was going on. On the other hand, he also says that good cooperation was provided by the municipality in other cases, such as the renovation of the terminal. Overall, he does not complain about the government, but he would like to notice some more understanding.



It is very hard to form a general understanding in the minimum requirements of a container terminal, as if this is dependent on different factors. However, two cranes should be available, because a terminal should not be dependent on one terminal, in case of malfunctions of this crane.

A big problem for the terminal in Ridderkerk is the handling of containers in the port of Rotterdam. Waiting times from 3 to 4 days can occur in some cases for their ships. This means that the entire inland corridor suffers from this. At the inland terminal in Ridderkerk, ships usually have no waiting time before entering the terminal. Because of the inadequate handling in the port of Rotterdam, they also get in trouble. This is a problem that needs to be fixed.

Appendix XI: Interview report van Berkel

The company that is responsible for the daily business of the inland terminals in Cuijk and Veghel is van Berkel. In order to get to know more about these terminals, an interview is conducted with Hanneke Bruinsma, projectmanager business development at van Berkel logistics. Van Berkel logistics is responsible for three branches, inland terminal Cuijk, inland terminal Veghel and van Berkel shipping. Next to van Berkel logistic, the company van Berkel group also possesses three other work companies, namely van Berkel Biomass & Groundproducts, Landscape & Infrastructure and Building & Transport. Because this interview was planned to gain more insights in the container terminals, the interview is done with Hanneke Bruinsma.

Both of the terminals have a frequent connection to the sea ports of Rotterdam and Antwerp. About 93% of the connections between Rotterdam and the terminals are transported through waterways and about 7% by truck. This is only done when there is a necessity to do it this way. However, trucks are being used a lot to deliver the containers more land inwards. In the words of Hanneke Bruinsma they 'use lots of roads, but not to and from Rotterdam'.

The inland terminal in Veghel is expanded recently. 1 hectare of ground is made available on the terrain and in the future another 2 hectare of ground will be added to the surface. Right now, two ships can load or unload at the same time. When the quay is finished, there will be room for three ships. There is also the plan of building a portal crane on site, which has to replace the reach stackers that now do service.

In the process of this expansions, van Berkel did not made use of any kind of subsidy. The reason for this is that the thought was that they did not think they would stand a chance because they are a commercial player in the market.

However, next to the expansion of the terminal, other events have taken place in the past time. The quay at the terminal also gets expanded and the canal is upgraded, in order to make it possible for class IV ships to enter the terminal. This is paid for by Rijkswaterstaat (Department of Waterways) and the local municipality of Veghel. The inland terminal does contribute to this however. They came up with a regulation with Rijkswaterstaat, where they pay a certain amount per container for a fixed period as toll. In this way, the terminal benefits from the better accessibility but also contributes itself to the project.

The initiative for the deepening of the canal comes from the inland terminal Veghel, together with the municipality of Veghel and the feed industry in Veghel. For all three parties there would be benefits to make this investment and therefore it was a communal initiative.

According to Bruinsma, the collaboration between the terminals and governmental institutes all works according to plan. Their contact with as well the local municipality as the province and the national government is good and productive. Still, different processes went a bit viscid. For instance, when looking at the deepening of the canal, there are multiple different phases of the implementation. The decision making, the laying open of the plan and objection of other actors made this process last much longer than necessary. However, the communication between the authorities and the terminal was good and they were willing to help where they could.

Also with the building of the quay, some problems occurred. This had to do with a difference in opinion between Rijkswaterstaat and the municipality of Veghel about who had to pay the costs. This took some time to figure out, which affected the terminal in a bad way.

There are multiple things that van Berkel logistics would like to see improve in the direct environment of the terminal, next to the adjustments they are already making right now. First of all, nearby there leads a rail line that is not used currently. Van Berkel logistics would like to reactivate this rail line and lead this line past their container terminal. When this is done, the inland terminal can shift between three modalities and then is therefore a trimodal container terminal. This is a project that takes seven years already, but the expectation is that this is not going to work out for them. The main reason for this is that the province, that has to decide on this topic, does not think that 'the risks outweigh the invest level that is asked'. Therefore, chances are that this plan will not be executed and the terminal will only be accessible by water and road.

Next to these rail problems, there is also a clear view on the accessibility by water and road. Congestion on the N79 is a problem for the terminal. Also, they are in favor of an improved infrastructure around Eindhoven, the so called 'ruit van Eindhoven'. Last, the connection between Veghel and the A50 is something that could be reflected critically. Regarding to the waterways, Bruinsma names the operations of the existing locks in the waterways is something that always needs attention. The terminal in Cuijk is build recently and for this terminal the access is good as it is.

About the connection between the sea port of Rotterdam, Bruinsma is also somewhat skeptical. The waiting times in the port of Rotterdam have also affected their terminals. In the summer of 2014 the waiting times were ridiculous, while there is practically no wainting time at the inland terminal. The past time these waiting times were getting less, but the handling of the inland shipping can still be described as far from optimal. They did bring this to attention in Next Logic, a program of the Port of Rotterdam with different actors involved. For Bruinsma it is difficult to see whether a program such as the TEN-T can contribute to the solution for this problem, because in her opinion the problems are a result of commercial interests that are being played out against each other. Still it is important that there comes a solution for this problem, because, because of the inefficiency of the port of Rotterdam, the entire corridor in the hinterland gets affected by this. This can eventually affect the entire Dutch economy, when shipping companies eventually will choose the port of Antwerp, Hamburg or Le Havre over the port of Rotterdam. This is not a desirable situation, as well for the port of Rotterdam as the Dutch inland ports.

When it comes to TEN-T policy, Bruinsma is familiar with the policy. She know about the different corridors and she visited a meeting about the TEN-T project once in Brussels. Despite all this, the entire policy is way too huge and complicated. The demands for a CEF subsidy are not clear for them, which does not make it attractive to apply for a subsidy, because the chance that it will be rejected is quite big. This is a waste of the invested time and money. Also, they are afraid to outsource this to a specialized company, because of this big chance of failure. This is only a possibility when you think your chances are quite big, so you will not lose money on something that will never bring you profit. They tried applying for a subsidy once, but when they saw the 50 paged document, that was way too difficult to understand, they decided not to apply for this subsidy almost at instant.

A second flaw of the TEN-T regulation according to van Berkel logistics, is the degree of co-financing for the project. The amount that is co-financed, 10%, and the height of the investment that comes along with it, means that the terminal itself has to pay a very large sum itself. For most terminals this is not really an option. This also is the reason why the terminal in Veghel gets upgraded step by step. The small part of subsidy is welcome for them, but they do not have the resources on their own to invest in the other 90% of the project. This means that in practice it is very hard to make such a project possible without the help of a third party.

A third critical point regarding TEN-T is the way the terminals are getting informed by the responsible European authorities. Apart from the fact that the TEN-T program is launched, the terminals are not informed about possibilities for a subsidy, which also does not contribute to the clarity of the project. You need to be very proactive and take the initiative yourself and even if you do so, the entire program is way too big and cloudy to oversee it.

The most important for the TEN-T network to function, are the preconditions, like for instance the infrastructure and the earlier mentioned situation in the port of Rotterdam. This should be the framework from where on out can be reflected more critical on the efficiency of a terminal.

Van Berkel logistics does make use of other Dutch subsidies. The IDVV project (Impuls Dynamisch Verkeers- en Vervoersmanagement) financed two projects for the terminal in Veghel. This were not infrastructural or physical projects, but this were innovative plans. The process in applying for this subsidy was rather simple and clear. The terminal in Cuijk is financed with a quick wins regulation. This terminal is build in 2010 and the government financed 50%, the province financed 12.5% and van Berkel itself financed 37.5%. This was an investment that could not have been made without the financial support of the government. Because of the short lines of communication between the different actors, this subsidy also was very insightful. First they had to apply for a subsidy at the province and after that the province assessed all the applies. The applies with a big chance to succeed were sent to the government. This process made it for the terminal much more insightful what the exact possibilities and demands were.

In the past, the terminal in Veghel also applied for a SOIT subsidy, but this was not granted because of political reasons. Other terminals objected against this subsidy because the terminal in Veghel served a too low variety of customers. Therefore the subsidy could not be named as a subsidy for public infrastructure. Therefore, this subsidy did not take place.

For Bruinsma it is difficult to say which should be the minimum requirements for a terminal. This depends on the type of the terminal. She names the example of Cuijk, where they only possess one crane. With an extra crane they can not work profitable anymore, but for other terminals this is a must to handle all their containers. The needed space is dependent on the cranes that the terminals possess. With reach stackers the site needs to be bigger, because these reach stackers need more space than a portal crane. Therefore it is dependent on how your terminal operates, what it needs and does not need.

A few factors can be named that are a advantage for every terminal. The location is the most important, along with the accessibility of the terminal. Also, a terminal should be progressive and innovative. This is something that van Berkel tries to do and they notice that customers like this. A last aspect is the service that you deliver. Van Berkel tries to optimize the process together with their costumers, which is a plus according to their customers.

Appendix XII: Interview guide PNO

-About CEF, what kind of bodies usually apply for such a subsidy? (Governments, terminals, something else?)

-How many CEF subsidies get applied for in the Netherlands? And how many are directly related to container terminals?

Available funds

-Only a small part of the available TEN-T funds are available for terminals/ Is it logical that this only contains such a small amount?

Subsidy apply

-Do you think it is possible that the process of application for CEF subsidies gets optimized further?

Co-funding

-Does the co-funding aspect leads to problems (For instance a bad cooperation within national government and other actors, is it hard to achieve the financing?)

-Where does the biggest amount of the not co-funded part comes from? (Do the terminals pay this themselves or do other governments also contribute?)

-Is the part the EU spends on co-funding a fair amount (Or should they be paying more?

Requirements

-What should be the requirements for a CEF subsidy according to you?

-Are there aspects in the current application review that have been made too important?

-Do you have anything else you would like to tell about CEF subsidies?

Appendix XIII: Interview guide container terminals

For every terminal, a custom made interview guide is used. The basis of these custom made interview guides was this interview guide.

About the terminal:

-Specific info found on the website, can you tell me something about this?

-What is the proportion between road, rail and water transport on your terminal?

-Are there any physical on-site aspects for your terminal that you would like to improve?

-Do you have any bottlenecks outside your terminal that you would like to see handled?

IF YES: How is the contact with other actors (governments, other companies etc.)

TEN-T subsidies:

-What do you know about TEN-T and CEF subsidies?

-Did you ever made use of such a subsidy, or another European subsidy?

-Did you ever use any other subsidy?

-Are you planning to applicate for a subsidy soon?

If there was a application:

-When and for what?

-How did this go? (Was it easy, did you have any help?)

-On the basis of co-funding, how did the terminal managed to do this? (Did the government help?)

-How did this cooperation with other actors go?

-How did the contact with the subsidy granter go?

If there was no application?

-Why not?

-Have you ever thought about doing this?

Process

-Do you think that you get informed well enough about the possibilities?

-What should be the demands to be eligible for such a subsidy?

-What are aspects that every terminal should posses?

-To what extent does your terminal distinguish itself from other terminals and how?