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Eurodelta: improving train connections as a mean for
cross-border collaboration – and vice-versa

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A thesis is never done by oneself.

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ABSTRACT

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The present work studies the Eurodelta passenger cross-border railway connections in order to indicate which one has the greatest potential for immediate improvement from a spatial planning perspective. The planning perspective is divided in three core aspects of analysis: the current and potential connectivity efficiency of the Eurodelta services; the economic interactions between the regions which can justify the improvement of connections; and the national and cross-border political coordination between the territories which could facilitate or create barriers for better collaboration between the cross-border regions.

The four Eurodelta cross-border connections analyzed are: Rotterdam (Netherlands) \leftrightarrow Antwerp (Belgium); Eindhoven (Netherlands) \leftrightarrow Antwerp (Belgium); Eindhoven (Netherlands) \leftrightarrow Duisburg (Germany); Arnhem (Netherlands) \leftrightarrow Duisburg (Germany). To achieve its objective, this research first utilizes a literature review to understand the current context and then examines the three core aspects through quantitative and qualitative analysis. It does so by comparing the cross-border connections to Dutch national ones, assessing maps and data of economic competition of regions and interviewing professionals that can add practice to theory.

Results indicate that the link between Eindhoven and Duisburg has the strongest potential of improvement, followed by the Eindhoven and Antwerp link. The outcome emphasizes issues around cross-border collaboration which create inconveniences for developing the railway connections and gives suggestions on how to improve the collaboration within the Eurodelta, such as borrowing size from one another.

Keywords: Eurodelta, cross-border collaboration, passengers train connection, borrow size

“The main precondition (...) [for borrowing size from one another] is physical accessibility and connectivity by road and rail, for public and private transport.” (Groot et al, 2015, p.10)

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1. INTRODUCTION

The present wave of globalization distinguishes from the former ones in the fact that the latter assisted in strengthening the power of the central states, while the current one is responsible for weakening their power (Santos, 2002). Political agreements such as the European Union, NAFTA and Mercosul illustrate the displacement of the traditional national unit to transnational interactions and regulations of flows. The functional and territorial capacities are being reorganized in different scales – at the supra-national and sub-national levels, and the attention gradually moves away from countries as relevant spatial units of analysis (Santos, 2002). This generates discussions regarding the definition of regions, their spatial scope of agglomeration effects and creates value to cross-border cooperation.

The European single market and the economic integration weakened national barriers and brought up new competition between cities, that acquired similar status within the European Union (Newman and Thornley, 1996). However, when several cities are part of a region, this polycentric reality calls for borrowed size solutions, i.e. “connect existing medium-sized cities better with each other in order for them to function as a larger agglomeration” (Groot *et al*, 2015, p. 10). Adjacent cities may use each others’ performance and functions in order to benefit from sharing, learning and matching opportunities. Studies show that the main cities from the Netherlands, the Flemish Belgian cities and the German cities in the Ruhr-region can make use of one another (Groot *et al*, 2015). This research focus in this relevant polycentric area, called as Eurodelta. This region displays physical, historical, economic and social connections, yet faces substantial challenges in improving cross-border cooperation (Groot *et al*, 2016).

“The main precondition (...) [for borrowing size from one another] is physical accessibility and connectivity by road and rail, for public and private transport” (Groot *et al*, 2015, p.10). The Eurodelta lags behind in terms of railway passenger connectivity. Groot *et al* (2015) contributes with suggestions for a Research and Investment Agenda Networking for Urban Vitality and believes in potential opportunities. Considering the existence of future development opportunities in the Eurodelta for sharing and matching profits, the author makes some recommendations, such as: identify borrowed functions and urban density functions based on economic performance (e.g. knowledge, markets...); use the support from local governance for global economy; optimize territorial connections and integration between the countries’ borders; develop economic hubs according to job and housing market; allow interregional institutional relations and cooperation; among others.

The goal of this research is to corroborate with the impression that the passengers' railway service in the Eurodelta is lagging behind and most important, to point out from the existing cross-border train connections in the Eurodelta, which one has the greatest potential for immediate improvement in order to reduce the current challenges of borrowing size and cross-border cooperation within this area. The research covers a short term period, studying the current context situation and does not contemplate possible future scenarios, such as building or modifying of infrastructure.

The research question that is proposed to assist on achieving its main goal is: *Which Eurodelta passenger cross-border railway connection has the greatest potential for immediate improvement from a spatial planning perspective?* In order to identify the potential of improvement of the connections, the research uses a spatial planning perspective, which takes in consideration the three following aspects: the connectivity efficiency (a), the economic relations (b) and cross-border collaborations (c) within the Eurodelta.

In view of displaying a high economic importance in the area and for being a region's gateway when entering the country by crossing-borders, four existing cross-border passengers' railway connections within the Eurodelta were selected to be studied: Rotterdam (Netherlands) \leftrightarrow Antwerp (Belgium); Eindhoven (Netherlands) \leftrightarrow Antwerp (Belgium); Eindhoven (Netherlands) \leftrightarrow Duisburg (Germany); Arnhem (Netherlands) \leftrightarrow Duisburg (Germany). These connections are analyzed through chosen aspects of a spatial planning perspective: the current and potential connectivity efficiency, economic relations between the regions that could justify and encourage better service connections and the institutional facilitators and barriers between the regions within the Eurodelta that could embolden a better collaboration.

To simplify the research analysis and the reader's comprehension, each of these aspects is turned into a sub-question. Moreover, through the analysis and the outcomes of each of these sub-questions, it is possible to answer the main research question and achieve its principal goal.

- Sub-question (a): *How efficient are the Eurodelta passenger railway cross-border connections when compared to Dutch national ones?*

This investigates the connectivity efficiency of the Eurodelta services. The Dutch national connections are considered as a reference of high quality service for daily commuters and will be used as benchmark against the Eurodelta cross-border connections and a standard to be followed.

- Sub-question (b): *What are the existing economic relations within the Eurodelta?*

It examines the economic interactions that exist inside the Eurodelta, e.g. which areas present a relevant economic context for justifying the improvement of a railway connection and where economic competitors can become partners.

- Sub-question (c): *How is the transportation planning coordinated between the different territories?*

This section explores the national and cross-border political coordination between the different territories in the studied area, and examines where there is an easier acceptance for cross-border collaboration, with more institutional acceptance and less barriers for further improving cross-border connections.

Among the four cross-border connections considered for this study, the link between Eindhoven and Duisburg presents itself as having the strongest potential of improvement. The link between Eindhoven and Antwerp also shows promising potential that can be considered as pertinent for this study. Additionally, some possible solutions for improving the cross-border collaborations are introduced and discussed. There is no need for creating a new layer of governance, what is needed is deeper understanding of the region's role inside the larger area and the creation of an arena for meetings, discussions and planning. Looking at the region from an economic perspective and economic agglomeration factors can help bringing political support to the area, and also adding new actors that could have an important stake in the project.

1.1 Research relevance

Ministries from Belgium, Netherlands and Germany have demonstrated interest in strengthening the collaboration within the Eurodelta area. They recognize the importance of the region and have signed a declaration of interest. Also the Dutch provinces of South-Holland and Gelderland are currently concerned in improving the passenger train connections across their national borders, to Belgium and Germany respectively. This research acquires stronger societal relevance, once such important public organizations acknowledge the relevance of the area. This study can assist them on providing extra information, to look at the area from different perspectives and opportunities and also give some directions in the decision making process. Spatial planning issues are most of the time complex and involve many stakeholders, which leads to uncertainties about how and at which level a problem should be solved. Besides,

the topic about cross-border areas is multifaceted and has many levels involved. Hence, it is in the society's interest that this research is conducted in order to point out cross-border train service potential and have it developed. It is beneficial for the society in terms of increasing the transport flexibility and making sure that the investments are done in a profitable connection.

In terms of academic relevance, this study fits in the trend topic about cross-border collaborations and at the same time corroborates with statements that positions the cross-border train connections, more specifically inside the Eurodelta, as underdeveloped. However, it was not possible to find other studies that focus on these two topics concomitantly. So, it is beneficial to the academic environment to have a research like this one, which can add new data and new methods of analysis to the matter. Meanwhile, the organization Deltametropolis Association works with projects and studies in the Eurodelta area, which one of the topics is related to people mobility. Its projects and subsequent publications of the projects' outcomes are frequently used by the academia for research and on the other direction, the academia usually helps on their projects. This research intends to help further studies of Deltametropolis Association and other organizations that could be interested in creating data for university studies.

1.2 Structure of the report

This academic work is divided and organized in the following manner: the second chapter discourses existing methods and explains how this research is performed. It explains the methods of data collection and further analysis. Afterwards, the third chapter elaborates on background theory for a better understanding of the current context and focuses on the scope of this study. This is followed by the disclosure of the results and additional discussion. And lastly a brief summary of the conclusions is presented, together with its implications and a direction for further researches is proposed.

2. RESEARCH METHOD

This chapter shows the existing research methods and different types of data. It also presents the ones that were adopted for the accomplishment of this research, the analytical framework assumed for the selection and further study of the data and the selection and profile of the interviewees. In the end of this section one can also find the limitations of the chosen method for this study.

2.1 Existing methods

In the research process, when choosing a method to generate data, some considerations must be taken. The method will indicate the technique for collecting data, which may represent the core of the research project. According to Kitchin & Tate (2013), there are two methods of producing data. The data can be generated either by the researcher, what would be a primary data; or by someone else, which would be a secondary type of data. The data type can be qualitative, quantitative or a mix of both. The definition of these research strategies can be seen as a “general orientation to the conduct of social research” (Bryman, 2012, p. 35). While qualitative data is “unstructured and consist of words, pictures and sounds”, the quantitative is usually structured and can be easily quantified by numbers or facts (Kitchin & Tate, 2013, p.40). Meanwhile qualitative research might be considered to reflect the point of view of the participant, the quantitative might reproduce the researcher’s point of view (Bryman, 2012).

The research strategies are a broad orientation for the research. Together with the strategies, the research design and methods are important decisions regarding the data collection. According to Bryman (2012), the research design is “a structure that guides the execution of a research method and the analysis of the subsequent data” (p.45). In other words, it is a framework for data collection and subsequent analysis. Once the research design is defined, research method(s) must be determined in order to collect the data (Bryman, 2012). The method characterizes the techniques the researcher should use; it can relate to a specific instrument, or a certain way the researcher should behave during the data collection (for example, a participant observation) (Bryman, 2012).

That said, Bryman (2012) presents five different types of research design: experimental design, cross-sectional or survey design, longitudinal design, case study design and comparative design. Using those as a start, the author mentions that some variations are also

possible. Additionally, a research can use one or more types of research design, depending on its main goal.

2.2 Chosen method

Regarding the research design of this study, chosen to answer its research question, it can be classified mainly as a case-study, about the Eurodelta region. Although it may present some characteristics of other types of research design, the “case-study” is the one that best describes it. Bryman (2012) defines “case study” as “the detailed and intensive analysis of a single case” (p.66), and is concerned with the complexity and particularities of the specific case. This referred study is focused on a defined geographic area on the global map and intends to work on an intensive examination of particularities of this setting. Although there is a tendency of relating case studies to a qualitative research strategy, this specific case presents a mix of qualitative and quantitative strategies, associated to different research methods, that will be explained below.

Case studies can produce unique academic insights, because they are concerned with the complexity and particular nature of the case in question. The main difference of a case study compared with other research designs is that it can produce an intensive and detailed examination. Despite of the case-study limitations, which will be mentioned at the end of this chapter, it allows the investigation through a more deductive approach. That means, it is interesting to narrow down a specific conclusion from a generalized concept and test it on this specific case, as a way of investigation.

In the attempt of achieving the main goal of this research and point out which Eurodelta passenger cross-border railway connection has the greatest potential for immediate improvement from a spatial planning perspective, primarily a deep literature research is presented to better understand the context and the current situation of the different levels of governance related to the case studied. At the start of this research, it is recognized that scales of functional and territorial capacities are being reorganized at supra-national and sub-national levels. The literature research and theoretical focus then describes the supra-national level (European Union) and move on focusing on cross-border projects, ending on the case-study level: The Eurodelta area.

Furthermore, four already existing international passenger railway links within the Eurodelta are considered in the study. These connections are studied with the intention of answering the main research question to determine one having the greatest potential of improvement. The four routes were chosen based on the criteria of displaying a strong economic importance in the area and the fact of being key gateways for entering the countries by crossing borders. The international cross-border links studied are:

- 1- Rotterdam (Netherlands) \leftrightarrow Antwerp (Belgium)
- 2- Eindhoven (Netherlands) \leftrightarrow Antwerp (Belgium)
- 3- Eindhoven (Netherlands) \leftrightarrow Duisburg (Germany)
- 4- Arnhem (Netherlands) \leftrightarrow Duisburg (Germany)

The above connections are investigated through a spatial planning perspective, which is divided in three aspects for this specific research: connectivity efficiency, economic relations and cross-border collaboration. The research studies the current and potential connectivity efficiency of the train services; the economic relations between the regions that could encourage a better service connection; and the institutional facilitators and barriers of the regions within the Eurodelta that could embolden a better collaboration.

In order to answer the main research question, sub-questions were developed linked to these three aspects of analysis. The main research question is therefore answered according to the outcomes of the sub-questions. The later are simply presented below with their respective chosen method and type of data analysis and will be further explained in terms of analytical framework and selection of data in the next section. Each of these sub-questions will be answered accordingly:

Sub-question (a) investigates the connectivity efficiency of the Eurodelta connections: *How efficient are the Eurodelta passenger railway cross-border connections when compared to Dutch national ones?* The Dutch national connections are considered a reference of high quality service for daily commuters and for this research will be used as benchmark against the Eurodelta cross-border connections. The potential for these international cross-border connections are measured using the Dutch national ones as standards to be achieved. It is answered using primary data through desk research. Most of the data is generated from information provided by the service providers, more specifically on their own websites, and articles from the media, and then added to a table with quantitative data. Some numbers are also calculated by the researcher. The table is used as a matter of comparison between national and

international railway links. The analytical framework and selection of data will be explained in the next section.

Sub-question (b) examines the economic interactions that exist in the Eurodelta regions, i.e. which areas present a relevant economic context for justifying the improvement of a railway connection: *What are the existing economic relations within the Eurodelta?* Answers are delivered with primary data through desk research and literature research plus secondary data gathered by third parties using quantitative and qualitative strategy. This method will examine documents of public institutions, existing statistics, and maps created by research institutions are examined. The numerical answers will be added to tables and further compared between each other. The qualitative data from literature research will be further added to this to help finding answers to this sub-question.

Finally, sub-question (c) investigates the national and cross-border political coordination between the different territories in the studied area, and examines where there is easier acceptance for cross-border connections: *How is the transportation planning coordinated between the different territories?* This sub-question is answered with qualitative data from semi-structured interviews. The interviews were done with professionals that have worked or still work with projects related to the Eurodelta and have know-how in the area, and thus can provide more practical information. They are further analyzed generating primary data for the study, together with the analysis of maps created by other organizations that present secondary data.

By reviewing the literature and being able to answer the three sub-questions listed above, it is possible to answer the main research question and achieve the goal of this research.

2.3 Analytical framework and selection of data

The research design assists the definition of the framework for collection and analysis of data. The research question and sub-questions help in further narrowing down the framework, focusing on the type of information the researcher is looking for. Therefore, the analytic framework carried out during the research is described below, in order to better elucidate the process.

The research question is focused on a spatial planning perspective, which, in this research, is divided in three aspects: connectivity efficiency, economic relations and cross-border collaboration. As mentioned before, sub-question (a) investigates one of these aspects – the efficiency of the connections from the Eurodelta, and performs that by comparing the cross-border rail connections efficiency to the Dutch national connections. Dutch trains and corridors are well known for their high quality in providing reliable and frequent service to passengers (Sigger and Waveren, 2011). The Nederlandse Spoorwegen (NS) – Dutch national railway company – carries over 1.1 million people per weekday and runs 5,500 trains per day on regular interval timetables. The company has the concession to operate the Dutch core rail network and is on the top three list of the public transport companies in Europe (Abellio, 2017) Therefore, in this research, the Dutch national train service is considered a positive example used for daily commuters as a standard reference for the transnational cross-border links. The Dutch connections are used as the highest standard the cross-border international connections can potentially achieve.

The categories considered in the comparison are: distance between the cities (km); speed of the service (km/hour) – calculated considering the distance between the cities divided by the travel time; number of train changes during the route; train frequency (amount of trains/day); travel time (hour); and price (€). The railway routes contemplated are:

Cross-border connections:

1b- Rotterdam \leftrightarrow Antwerp

2b- Eindhoven \leftrightarrow Antwerp

3b- Eindhoven \leftrightarrow Duisburg

4b/5b- Arnhem \leftrightarrow Duisburg

Dutch national connections:

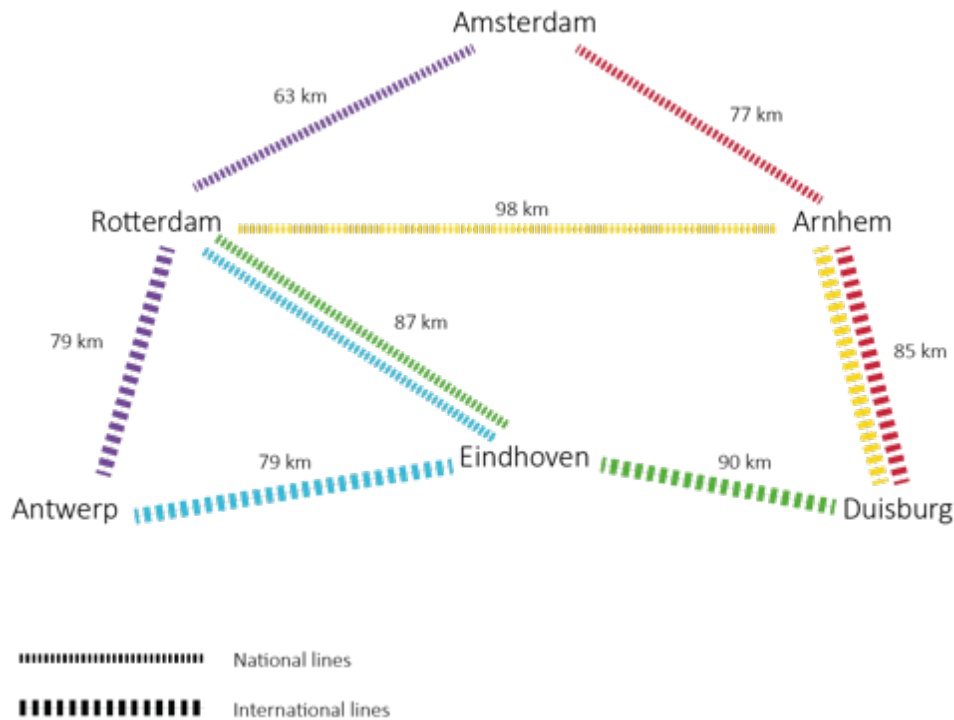
1a- Rotterdam \leftrightarrow Amsterdam

2a/3a- Eindhoven \leftrightarrow Rotterdam

4a- Arnhem \leftrightarrow Rotterdam

5a- Arnhem \leftrightarrow Amsterdam

In the scheme below, the connections that are being compared present the same color of lines. The national ones are shown in thin lines and the international ones in thicker lines:



Source: Developed by the author

The Dutch-German link Arnhem \leftrightarrow Duisburg is compared to the national Arnhem \leftrightarrow Amsterdam. This cross-border connection is also compared to the Dutch Arnhem \leftrightarrow Rotterdam link. The southern Dutch-German link Eindhoven \leftrightarrow Duisburg is correlated to Eindhoven \leftrightarrow Rotterdam. On the Belgium side, Eindhoven \leftrightarrow Antwerp is compared to Eindhoven \leftrightarrow Rotterdam and Rotterdam \leftrightarrow Antwerp to the Rotterdam \leftrightarrow Amsterdam connection.

The criteria for choosing which Dutch link is compared to the cross-border one is that they present similar distances, which proves that the cross-border services can be better developed the same way as the Dutch national INTERCITY services. So, for example, the link between Rotterdam and Antwerp, that stretches 79 km, is compared to the link between Rotterdam and Amsterdam which are 63 km away from each other. In terms of connectivity, this research considers the service between Rotterdam and Antwerp could provide the same characteristics (train speed, number of train changes, train frequency, time travel and price) offered by the Rotterdam-Amsterdam service.

For the investigation, the characteristics mentioned above (train speed, number of train changes, train frequency, travel time and price), determinant to encourage or discourage the commuting between cross-border regions, were measured and added to Table 1 (see next page). Aspects like high costs and waiting time are negatively related to the probability of displacement (Heinz & Ward-Warmedinger, 2006).

Some routes analyzed presented different types of services, i.e. different train options or different service providers serving the same route. The table encompasses them all, although for the calculation, only the best service option for each route was included. In other words, service connections that have more of a “commuter” profile were taken in consideration instead of the services that offer the same route but require booking the ticket in advance with reserved seat, offer more expensive prices, are not very frequent, etc. These characteristics are not attractive for commuters, so the calculation did not consider those. It is important to mention that the reliability of the service is not considered because the data for the cross-border connections was not available.

Source from table 1 (next page)

- | | |
|---------|---|
| Source: | (1) ns.nl |
| | (2) Thalys.com |
| | (3) bahn.com |
| | (4) http://www.euregio.org/werkgebied/ |
| | (5) https://ec.europa.eu/eures/public/en/eures-in-cross-border-regions#/details/50 |
| | (6) http://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/europe/2014tc16rfcb023 |
| | (7) http://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/europe/2014tc16rfcb046 |
| | (8) http://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/netherlands/2014tc16rfcb038 |
| | (9) http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=urb_cpop1&lang=en |
| | (10) NS by phone 030 230 0023 |

	Connections	Distance (km)	Speed (km/h) - calculated by the researcher	Service provider	Nationality	Train Changes	Frequency	Time	Price
1a (i)	Rot-Ams	63 Km	102 Km/h	Thalys		0	14/day (1)	0:37(1)	\$21(2)
1a (ii)	Rot-Ams	63 Km	93 Km/h	NS(InterCity direct)	Dutch - public	0	66/day (1)	0:41(1)	\$17,60(1)
1a (iii)	Rot-Ams	63 Km	52 Km/h	NS(InterCity/sprinter)	Dutch - public	0/1	163/day (1)	1:13(1)	\$15,20(1)
1b (i)	Rot-Ant	79 Km	149 Km/h	Thalys	French (SNCF), Belgium (SNCF) and German (DB) companies	0	14/day (2)	0:32(2)	\$35(1)
1b (ii)	Rot-Ant	79 Km	72 Km/h	NS(IC Brussel/IC-regional)	Dutch - public	0/1	17/day-15/day (1)	1:06/1:49(1)	\$29(1)
2a (i)	Ein-Rot	87 Km	87 Km/h	NS(InterCity)	Dutch - public	0	37/day (1)	1:03(1)	\$18(1)
2b (i)	Ein-Ant	79 Km	44 Km/h	Thalys+NS		1	13-14/day (1)	01:48 h(1)	\$60-80(1)
2b (ii)	Ein-Ant	79 Km	40 Km/h	NS	Dutch - public	2	26/day (1)	aprox. 2:00 h(1)	\$18-24(1)
3a (i)	Ein-Rot	87 Km	87 Km/h	NS(InterCity)	Dutch - public	0	37/day (1)	1:03(1)	\$18(1)
3b (i)	Ein-Dui	90 Km	36 Km/h	NS(C)+DB(ICE)	Dutch + German - public	1	7/day (1)	2:30(1)	\$25-35(1,3)
3b (ii)	Ein-Dui	90 Km	54 Km/h	NS(C)+DB(REG)	Dutch + German - public	2	17/day (3)	1:42(3)	\$23(1)
4a (i)	Arn-Rot	98 Km	70 Km/h	NS(IC+C)	Dutch - public	1	69/day (1)	1:24(1)	\$18,70(1)
4b (i)	Arn-Dui	85 Km	57 Km/h	Abellio Germany	Dutch - public	0	17/day (3)	1:31(3)	\$28,60(10)
4b (ii)	Arn-Dui	85 Km	92 Km/h	DB(ICE)	German - public	0	8/day (3)	0:55(3)	\$19(3)
5a (i)	Arn-Ams	77 Km	70 Km/h	NS(IC+C)	Dutch - public	1	32/day (1)	01:04(1)	\$16,60(1)
5a (ii)	Arn-Ams	77 Km	70 Km/h	NS(InterCity)	Dutch - public	0	35/day (1)	01:04(1)	\$16,60(1)
5a (iii)	Arn-Ams	77 Km	84 Km/h	DB(ICE)	Dutch - public	0	8/day (1)	0:56(1)	\$19(1)
5b (i)	Arn-Dui	85 Km	57 Km/h	Abellio Germany	Dutch - public	0	17/day (3)	1:31(3)	\$28,60(10)
5b (ii)	Arn-Dui	85 Km	92 Km/h	DB(ICE)	German - public	0	8/day (3)	0:55(3)	\$19(3)

Table 1 – developed by the author

Potential of Improvement (P.I.) – this measure is used to compare one characteristic of a connection against another. As stated above the connections of NS are excellent services and the values of their different categories are all given a value of 100%. Therefore, the same characteristic of the cross-border connection is given a proportional value. For example, the connection Eindhoven-Rotterdam has a speed of 87km/h which is considered an ideal speed and hence given the value of 100%. When comparing this connection to Eindhoven-Duisburg, which has a speed of 54km/h, we can determine that the P.I. (Speed) is $= 100 * 54 / 87$ which equals 62%. This means that the potential of improvement for the speed on this connection is of 62%.

Weighted average: To provide a final potential of improvement for each connection, a weight is determined for all of the categories above described. The categories analyzed are classified with a rating from 1 to 3, according to their importance in terms of commuting services (1 being the lowest rate and 3 the highest and most important): Speed and Time – rate 1; Price and number of train changes – rate 2 and train frequency – rate 3 (Table 2). The weight of each category is determined exclusively for this research, considering the assesment provided by Ravalet as futher explained in the following paragraph.

Category	Weight
Frequency	3
Price	2
Train Changes	2
Speed (km/h) - calculated by the author	1
Time	1

Table 2 – Weight value of Characteristics. Developed by the author

As mentioned before, Ravalet *et al* (2017) states that the commuting willingness and perceived mobility is not specifically about the distance and travel time, but how the commute is caried out. Based on this, the respective weight for each category is:

Frequency: the high frequency of the trains was considered the most important factor (obtaining weight 3), as it will determine how long the traveler will have to wait and how flexible the travel start time can be. The waiting time, directly related to the frequency of trains, is considered to influence the commuter’s perception of the trip.

Train changes: the number of train changes will also influence the waiting time, besides the hassle to get out of a train and wait and walk to another one (obtaining weight 2).

Price: (Also weighted with 2), it affects the willingness of travelling, depending on the travellers affordability of the train ticket. It also depends on the cost compared to other types of transportation like the car/motorcycle or even the airplane for some of the cities considered.

Travel time and Speed: (Weighted with 1) these are considered the least important categories for commuting. The time the commuters spend on trains and the train speed influences the travel time. Although, these are not exceptionally relevant if the time spent in the train is used for working in good conditions, like having a good internet connection and comfortable seats, or even relaxing and getting prepared for a working day.

Based on the subjective weight given to each of these categories above, the following formula is created to determine the “Weigthed Potential of Improvement”:

$$\text{W.P.I.} = \frac{\text{P.I.}(\text{frequency}) * 3 + \text{P.I.}(\text{price}) * 2 + \text{P.I.}(\text{train changes}) * 2 + \text{P.I.}(\text{speed}) * 1 + \text{P.I.}(\text{time}) * 1}{(3+2+2+1+1)}$$

W.P.I → weighted potential of improvement

P.I. (category) → potential of improvement calculated for of each category

By doing this, each connection can be analysed and compared against each other. The higher the percentage, the more room for improvement the connection has. This can assist governments and train service providers in understanding which connections to invest in and improve. The ones with a higher Weigthed Potential of Improvement (W.P.I.) are the ones that require more modification (and therefore investment) to improve the service to customers.

For example, if the link Rotterdam-Antwerp has a W.P.I. of 50% and Eindhoven-Antwerp has a W.P.I. of 75% this means that the connection Eindhoven-Antwerp has more room for improvement than Rotterdam-Anwerp. If a connection has a W.P.I. of 0% it means it has reached the highest standard when compared to an internal Dutch connection.

As a final result, when comparing these cross-border connections scores, the ones that have two results for the same route, will have the highest potential disregarded. The final result will consider the services that are better developed, i.e. present the lowest W.P.I., as this is already available to the client. The aim is to find gaps within the route and not in a specific service. So, the best service from each route (the lowest W.P.I.) is considered for the final result. For example, the connection route Eindhoven-Antwerp offers two types of service, one from

Thalys+NS and another one only from NS. After calculating the W.P.I. of each, the service with the highest W.P.I. value is disregarded.

As mentioned before, sub-question (b) investigates the second aspect from a spatial planning perspective: the economic interactions within the Eurodelta; the areas that present a relevant economic context for justifying the improvement of a railway connection. For the data collection and analysis, maps prepared by Deltametropolis Association, an independent Dutch network for metropolitan development, were used. Studying these maps, it is possible to grasp important and relevant economic context in the area. The data gathered is related to international commuters' numbers, knowledge economy, presence of universities – research and development, high skilled population, compatibility in economic sectors like the region's employment rate, smart specialization.

Additionally, the regional competitiveness data of each area is also considered on this study. This secondary type of data comes from the “Competitiveness Scores” research presented by the *PBL Netherlands Environmental Assessment Agency* which provides information about locational characteristics of competing regions, pointing out opportunities for improving them. The research information comes from a web tool presented by the Joint Research Centre, the European Commission's in-house science service and the PBL Netherlands Environmental Assessment Agency. It is said to deliver evidence-based scientific support to the European policy-making process.

Adding to the topic of competition between cities, the literature review indicates that the biggest Dutch cities (part of the REOS agreement), Flanders and the German Ruhr-region can make connection as strong as a single metropolitan area (Groot *et al*, 2015). The action of “borrowing size” would use each of the cities' economic specialization to balance each other. Instead of competing with each other, they can collaborate and compete with other metropolitan areas. That is why in the following part, the “Competitiveness Scores” of those areas are analyzed.

The reason for analyzing these characteristics is due to their importance for the “borrowing size” between regions. For the borrowed functions and borrowed performance to happen successfully and generate good opportunities, there must be common factors like “accessibility, knowledge relations, openness, social networks, diversification and specialization, economic complementarities and institutional unity (governance involving the European Union, nation states, regions, border regions, cities and network providers in

tandem)” (Groot *et al*, 2016, p.4). It is important to mention that the governance topic is considered in the third aspect of the spatial planning perspective, contemplated in sub-question (c).

The Research and Development topic is extremely relevant for European integration. The EU initiative European Research Area (ERA) for innovation and growth has the ambition to surpass national borders through direct funding, better mobility and reorganized innovation policies (Chessa *et al*, 2013). Research activities are usually found around universities’ areas, which contains a large number of students. Those Universities and their students are big trip generators (Donners, 2016), so it is an important factor to be considered, and this can be observed in Deltametropolis Association’s maps used for this research. Also, compatibility in economic sectors are relevant, once according to Heinz & Ward-Warmedinger (2006), a specific economic sector with substantial demand for particular skill groups may stimulate employment displacement. High skilled population are also great trip generators and are usually registered at the core of great cities within Europe according to Eurostat statistics (Donners, 2016). “Economic activity also results in a willingness to travel in order to enact activity or trade” (Donners, 2016, p.15).

Lastly, sub-question (c) investigates the third spatial planning perspective aspect, the national and cross-border political coordination between the different territories in the studied area; and examines where there is an easier reception for cross-border collaboration, with more institutional acceptance and less barriers for further improving cross-border connections. The data is collected in literature research, maps from Deltametropolis Association and semi-structured interviews. The direct and individual interviews are made with the aim of observe and identify thoughts and practices in the field. Frequently, theory and practice are not exactly the same and may differ depending on the context. Qualitative data is expected as a result, with considerably open questions and answers, in order to get better and relevant results.

The interview script includes questions that relate to the sub-question studied in additions to more open questions, depending on how the interview process develops and on the interviewee’s working field. The structures encompass the following order, exclusively focused on the Eurodelta issues:

- The respondent’s impression of the railway connections in the Eurodelta
- The location of the bottlenecks
- Specific routes and services

- The impression of the open railway market
- Services that were successful and others that failed
- Difference between the different types of governments in the three Eurodelta countries and difference in their spatial planning and processes
- Ways of developing the collaboration in order to improve the connections
- Best level of governance for collaboration between the regions

The key objectives of the interview is to question the specialists about the quality of the current Eurodelta connections and their potential, find out where the main bottlenecks are located and how to better improve the cross-border collaboration by developing the train connections. They are extremely relevant for this research because they add new and unpublished information and provide expert views specific to this case-study area, which is not easy to find. The duration of the interviews varies between one and one a half hour and all of them are recorded with the permission of the interviewees who also all agreed to have their names published.

Furthermore, with the assistance of the Deltametropolis Association maps to illustrate the matter, this research also assesses the existence of governance collaborations between the regions, which could already facilitate further cooperation between cross-border institutions. The existence of these cross-border region organizations or governance collaborations shows that shared interests are already being processed by a common institution or agreement. It is an important factor since it seems to currently be used as a standard model for seeking cross-border alliances (Perkman, 2003).

2.4 Selection of interviewees

After defining the type of research, it is still necessary to decide on the profile of the interviewees, looking for ones that would be adding more data and insights to the research. Considering that one of the main goals of this research is to analyze and identify potential cross-border passenger rail connections, the respondents were chosen according to their organization and relationship with the Eurodelta. The respondents' information, interview dates and places are:

- Paul Gerrertsen: director of Deltametropolis Association. He has work experience in the Eurodelta area, specially in the Ruhr area. He is currently working on the *Lage Landen* project which examines the cross-border spatial potentials of Netherlands and

Flanders and win-win situations for the areas. The research project encourages an agenda for common and coherent spatial planning between them to provide a competitive position. The interview was held in Rotterdam, the Netherlands in July, 2017.

- Bas Govers: program director of Excellent Cities – joint international program for offering mobility planning and tooling for better cities, and consultant strategic planning of infrastructure in Goudappel Coffeng. His main role in Goudappel Coffeng is strategic development in the field of mobility with focus on public transport, spatial development and urban mobility plans for Rotterdam and Utrecht. He has great participation in the discussion of the Dutch national railway plan for 2030, where initially there was no attention to the international links, only to the national ones. Govers, together with other forces, worked on reconsidering a new national plan for the railways in which the Eurodelta links would be more integrated. The interview was held in Rotterdam, the Netherlands in August, 2017.
- Helmut Thoele: urban planner who works for the Province of South Holland. He is a senior policy advisor in spatial development. He is tasked with running a strategic plan for European interaction, looking at neighbouring countries with similar spatial economic structures and the benefits of a collaboration between them. The interview was held in The Hague, the Netherlands in September, 2017.

At the start of every interview, the interviewees agreed on being recorded. The benefit of this is that it increases the reliability of the analysis. It makes the investigation more consistent for interpretation, once it is possible to listen to the interviews many times and also to make sure not to miss any important and unexpected information. Following a technique of content analysis for data processing, transcripts of the interviews were made, which were then carefully and repeatedly examined to check for common topics and opinions. Different categories of analysis were created. The categories are found in the appendix and their results were further compared to each other allowing to get to a conclusion. It is important to mention that all of the respondents have authorized the disclosure of their names and profiles on this research.

2.5 Research limitations

Every research has its own limitations. In the case of the analysis of secondary data, four types of the limitations are listed by Bryman (2012): lack of familiarity with data, complexity of the data, no control over data quality and the absence of key variables. In agreement with the stated by Bryman (2012), the following happened while working with the data:

- The lack of familiarity with data: The times when data collected by others were used in this research, a long period of familiarization was required. It took some time to understand the variables used and the rationale behind the structure and contours of the data.
- Complexity of the data: the amount of data was a lot bigger than what was needed, and presented problems with the management of the information. The data presented was initially investigated on a different level of governance than the one used on this research, and it had to be adapted to this study.
- Absence of key variables: the data was not specifically collected for the purpose of this research, so it is possible that some other key variables were important, but were not presented.

Regarding the primary data, according to Creswell (2003) and Yin (2005), the interviews might present some limitations such as the following ones:

- The data is collected in a specific place and time, and not gathered in a natural environment, i.e. the respondent knows his discourse is being analyzed;
- The presence of an interviewer can entail biased responses, interpretations and outcomes;
- The interviewee may answer what he/she thinks the interviewer is expecting to listen;
- If the question is misunderstood, it generates an unreliable answer.

It is important to mention that the results from this research cannot be generalized to other similar areas because they are quite specific, Eurodelta-binded.

3. RELATED LITERATURE AND THEORETICAL FOCUS

This chapter is dedicated to a better understanding of the topic addressed in this research, its background, complexities and other subjects that are directly connected to the matter. The review of articles and books from this chapter aims at exploring the regions collaborations and integration and the transport connections at different levels. The chapter is divided in three sections, which goes from the most comprehensive level to the most specific: The European level, the regional cross-border level and more precisely focusing on the Eurodelta area.

3.1 European Level

3.1.A The globalization as an international integration process

Transnational interactions have intensively augmented during the last four decades. It went from dissemination of systems production and financial transfers to the global information spreading and mass movements of people; tourists, migrant workers and refugees. Some may look at those series of transnational interactions as a discontinuity between current and former forms of cross-border exchanges (Santos, 2002). Santos (2002, p. 68) considers globalization as “a phase which follows after the internalization and multinationalization since, unlike them, it heralds the end of the national system as the central nucleus for organized human activities and strategies.” Several interconnected transformations have occurred at the international level. New information and communication technology (ITC) allowed finances and other information to become available worldwide, incessantly, and less dependent on national regulatory systems. Alongside those, new forms of agreements between public and private companies have been settled and national economic planning has started to open space in favor of deregulation (Newman and Thornley, 1996).

It dates back from the post-war period, when European countries created a bond with the ambition of ending disagreements that motivated the Second World War. As of 1950, six countries: Belgium, France, Germany, Italy, Luxembourg and the Netherlands founded the European Coal and Steel Community in order to safeguard peace and connect them economically and politically (The history of the EU, 2017). Afterwards, the Treaty of Rome, signed in 1957, instituted integration and economic improvement through trade (European Union Law, 1957), which would pave the way for further and greater forms of integration. The document established the European Economic Community (EEC) and created a common

market based on the free movement of goods, people, services and capital, which at the start was very limited. Later on, the document has been amended in several occasions and is currently considered the “Treaty on the Functioning of the European Union” (European Union Law, 1957). The treaty, from the beginning, already fixed some common policies among the countries including agricultural, trade and transport policies, and later on in the environmental, regional, social and industrial fields.

In mid-90’s, when the EU was already composed by 15 members, The Schengen agreements, named after a small village in Luxembourg, gradually consent people to travel without passports being checked at the borders. That meant millions of young people studying in other EU countries. In 2008, when a financial crisis hits the global economy, all the EU countries ratified the Treaty of Lisbon, providing modern institutions and efficient working methods for the union (The history of the EU, 2017). The 2016 (consolidated version of) Treaty on the Functioning of the European Union secures the freedom of movement for workers of the Member States and also the right to reside freely within the EU territory. It confirms the abolition of any discrimination based on nationality between member states’ employees (TFEU, 2016).

There has been an increased trend regarding political agreements between states, such as the European Union, NAFTA, Mercosul. If on the one hand agreements involved forms of joint or shared power, on the other hand the nation states appear to have lost its traditional centrality as the unit for economic, social and political initiatives. The across borders and transnational interactions have displaced the capacity of States to guide and regulate the flow of people, goods, capital and ideas, as they did before. The present wave of globalization distinguishes from the former ones in the fact that the latter assisted in strengthening the power of the central states, while the current one is responsible for weakening their power (Santos, 2002). “In Europe the Single Market and closer economic integration have served to remove national barriers and bring about a new competition between cities” (Newman and Thornley, 1996, p. 10).

3.1.B The European Union policy and its relation to its members

“Only a strong state can efficiently create its own weakness” (Santos, 2002, p. 81). According to Santos (2002), when states decide on integration policies, it is possible to observe three general trends in its power’s transformation:

- The *denationalization of the state*, when both the new and old functional and territorial capacities of the state are being reorganized at sub-national and supra-national levels.
- The trend of a *denationalizations of political regimes* is reflected in the transitional effect from government to governance, where the State does not have the central role in the social and economic regulation, which is now in the hands of partnerships and other forms of association with governmental, para-governmental and non-governmental organizations.
- And the *internationalization of the national state* comes from the impact of the international context on state activities, which may involve expanding the field of action of the national state, in cases when the internal conditions have to be adapted to transnational demands (Santos, 2002, p.80).

The most visible and maybe powerful institution of the European Union is the European Commission (EC), which has, over the last decades, powerfully impacted the progress of the European integration. The EC has great responsibilities in the EU policy making, and its directors are politicians with a lot of experience in the field that often present their political proposals to the public. However, sometimes the Commission may suffer from protests against its prominent role in the EU politics. Governments and interest groups are inclined to blame controversial EU decisions on the “Commission’s bureaucratic ignorance” (Wonka, 2015, p. 84).

The EC has its active competencies in the areas of EU policy-making, policy implementation and monitoring, and external representation. In policy-making, this institution has the exclusive right to formulate the legislative proposals and outline the content of EU policies and also the course of the European integration. In order to do so, the Commission publishes decisions that will become active in a specific area and test the political reactions. However, not all of the proposals and consultation papers are shaped by the EC. National governments often ask the Commission to become active in the Council or European Parliament. Even if it is not compulsory for the Commission, European Citizens’ initiatives are allowed to ask for legislation proposals (Wonka, 2015).

The EU policies’ implementation is also a prominent role of the Commission. The responsibility is shared between the EC and national and regional administrations. The latter are the ones implementing the policies in the EU member states, while the first helps determining specific standards that must be applied (Wonka, 2015). The External Action

Service, responsible for the external representation, informs the world about local and regional developments. On behalf of the EU, the Commission discuss international agreements and contracts, which influences the actual policy-making. Those treaties can cover initially all policy areas and are highly political giving the EU an extensive participation in the global trade (Wonka, 2015).

The Treaty of the Functioning of the European Union (TFEU) establishes the forms of European Union legislation and how they impact national legislations of the member states (MS) (Donner, 2016). A simple explanation about the different types of EU legislation is presented below (Table 3):

EU LEGISLATION	Relation with EU Member States (MS) legislation	Who is affected	Implications
REGULATIONS	Binding in its entirety	All EU MS and citizens	Directly applicable
DIRECTIVES	Binding after MS transfer into national legislation	All EU MS	Differ between MS but provides directions for national legislation
DECISIONS	Binding on those to whom is addressed	Individual EU MS or an individual company	Direct implication of a regulation as EU applicable law
RECOMMENDATIONS	Not binding	Party to whom they are addressed	No legal consequences but political and moral weight
OPINIONS	Not binding	The Union or individual MS	No legal consequences but political and moral weight

Table 3 - Information from: Donner (2016); Regulations, Directives and other acts (2017) and European Union Law (2017)

The *regulation* is the most restrictive type and has common application in every member state, compulsory in its totality across the EU. When the regulation is adopted, it is directly applicable for EU member states and citizens. For example, in order to determine common safeguards on imported goods from outside the EU, it was adopted a regulation. A *directive* shall be binding after the member states transfers it to their national legislation. Due to that characteristic, the consequences of the directive differ between the member states. The directive gives more emphasis on the goals that EU members should achieve and less on how they should be achieved. It is up to each country to shape their own laws in order to comply. One example is the “EU consumer rights directive” that aims to strength the rights for consumers across the EU. *Decisions* are compulsory for the addressees or even completely binding. The addressees can be either an individual member state or a company. Usually they are the outcome of juridical procedures. An example is the decision on the EU participating in the work of various counter-terrorism organizations, which only relates to these specific organizations. The *recommendations* and *opinions* are not binding instruments. The first refers to the party to whom they are addressed, so they behave in a specific way without any legal penalties. With this instrument, institutions can show their point of view and suggest a line of action. While the latter are opinions from EU institutions for new laws that are being considered, regarding their specific regional, economic or social perspective. They both may prepare the terrain for subsequent legally binding acts (Donner, 2016; Regulations, Directives and other acts, 2017 and European Union Law, 2017).

As mentioned before, the European Commission’s co-responsibility in the implementation of policies by national and regional administrations is laid down in legislative acts, which define the framework and give the power to the Commission to set some specific standards. Also the EC monitors the compliance with EU treaties and legislation. By giving powers to the EU level, the member states show their commitment to comply with their decisions. The Commission is composed by experienced party politicians who were previously part of the parliament and ministries of their own countries. They often also consult private and public stakeholders before proposing new legislation in order to reduce delays in the political dynamics (Wonka, 2015). It is possible to imply that EU decisions are not completely independent from the member states and private stakeholders, who are still capable of making explicit their interests and their voice heard.

3.1.C The role of the EU in spatial planning

The institution of a “Single Market” comprises removing border barriers, promoting economic integration and delivering the necessary infrastructure to empower the Member States to compete for economic development. Combined with the economic development, the EU has demonstrated some concern regarding its consequent social and economic effects, which lead into policies, plans and programs (Newman and Thornley, 1996, p. 17). It is noticeable that the European Commission policies and the single European market influence the evolving of local planning systems and practices (Healey and Williams, 1993). Although, the EU has no formal authority in the spatial planning from its member states.

The EU influence in planning systems was actually commenced by environmental policies. Concerned about the economic development consequences, the EU implemented the Environmental Impact Assessment for major projects, that became an EU law since 1985. In 1986, with the Single European Act, the environmental interest was legitimized and allowed EU to interfere in environment and regional affairs. The EC then produces binding legislation and acts as an international regulatory agency, establishing standards and objectives for environmental matters (Newman and Thornley, 1996). Spatial planning at the European level then started to be discussed after 1988 (Waterhout, 2008). And subsequently, several other plans and instruments were created, adding a strong emphasis to spatial planning evolvement, taking as examples:

- The Green Paper on the Urban Environment (1990) targeted urban policies that related to common problems in the European cities urban environment and made suggestions such as better emphasis on mixed uses and higher densities (Newman and Thornley, 1996). The document also recognizes the importance of open and green spaces around built-up areas (Goodchild, 1994).
- The Fifth Environment Action Program in 1992, which adopted the spatial planning as a tool for achieving environmental objectives (Newman and Thornley, 1996). In 1992, was created an EC Committee for Spatial Development (Healey and Williams, 1993). The Committee task is to coordinate EU spatial policy activities and apply resolutions decided by the Informal Council of Ministers of Spatial Planning (Williams & Williams, 1996).
- With the Maastricht Treaty of 1993, the EU received the power to undertake measures concerning town and country planning, land use and water management (Treaty of

Maastricht, 1993, article 130). Even though, it would have to be in unanimity with all the member states, and the Union could only intervene if the member state couldn't take action by itself. That makes the authors Newman and Thornley (1996) to believe that the probability of an EU intervention was extremely low. However, they mention how this EU measures can have a strong reflect on planning within the countries themselves (Newman and Thornley, 1996).

- In 1999, the 15 EU ministers responsible for spatial planning by that time, created the European Spatial Development Perspective (ESDP), which was a non-compulsory document. Despite its informal nature, the document was a turning point in the story of the spatial planning in the European level, as EU planners were given an orientation for the first time (Waterhout, 2008). Although planners could use it as a guideline for recommendations, the authority for spatial planning is still the exclusive role of the member states.

“European spatial planning is organized around a number of interrelated programs and initiatives” (Waterhout, 2008, p.8). Waterhout (2008) indicates that spatial planning is more than a development policy, as it involves other issues regarding the development itself. It also encompasses creating long-term strategic scenarios and presenting land use restrictions, besides others. For that, and the institutionalization of the EU, it creates concrete legislation such as policies, regulations, subsidies, formal and informal rules. And also generates more abstract notions such as the single market, the plan for European integration and gives the stakeholders the feeling of being part of the whole. This relates to the impact that the Union causes in the national and sub-national levels and how their practices adapt to it (Waterhout, 2008, p.25).

However, domestic planning is not only affected by EU level, but also by transnational cooperation such as the INTERREG (interregional cooperation) program and by the subnational and national levels' needs to spatially position themselves internationally. Due to the fact that European planning community consists predominantly of the national representatives, the processes between the levels run in parallel and mutually influence each other. Nevertheless, the effects may vary between the member states, which implies that no single model can explain the processes. (Waterhout, 2008).

One planning system does not have a permanent single model, they are not static but rather dynamic and have socially negotiated regulations for planning activities. It depends on the current domestic institutional context in time and space, methods of social order and the

collaboration that give permission and rule the collective use of the space. Domestic planning systems in a context of increasing “Europeanization” suffers from great pressure in order to adapt to changes. The national reactions can be expected either with adaptation or resistance mechanisms and significantly differ from one member state to the other (Reimer *et al*, 2014). Despite the EU strategic spatial concepts (to achieve its territorial cohesion goal) do not have a compulsory effect, it is enforced though by other instruments, by facilitated coordination and bargaining. So, in a medium to long term, the European spatial development plans attempt to insert it in the national agenda. Far from implementing regulations and directives, EU endeavors to achieve its goals with money incentive systems, which increases the acceptability by the individual member states. That is the case especially of the European Union INTERREG program (Reimer *et al*, 2014).

3.1.D EU governance and spatial policies

Even though the European Union has no formal authority in the spatial planning from the member states, it attains its goals through money incentive systems. Several EU policies, such as regional policies, environmental policies, realize functions that are generally carried out by the member states’ spatial planning systems. Below are presented a couple of those types of incentive systems.

3.1.D.A The INTERREG program and international collaboration

INTERREG is European Union’s primary instrument for encouraging collaboration between bordering countries (Duhr *et al*, 2007). The initiative, also known as European Territorial Cooperation (ETC) provides funding for international cooperation across Europe, and its main goal is to improve the effectiveness of regional policies and instruments (European Regional Development, 2017). In 1990 was launched the first 31 INTERREG programs supporting cross-border cooperation, with a budget of \$1.082 billion euros. At first, it was developed as a Community Initiative and covered exclusively cross-border cooperation for solving common issues. Later, the program was extended to interregional and transnational cooperation (European Territorial Co-operation, 2017). The three types of cooperation are: *Cross-border* (areas divided by an EU border or potential candidate for EU member state),

transnational (a specific larger area such as the Alpine Space) and the *interregional* (for all EU regions) (European Union, 2011).

The *cross-border* programs (INTERREG A) are granted funding under the condition that organizations from both sides of the border accept to collaborate with each other to implement projects to satisfy border regions' needs. These organizations can be regional authorities, universities, SMEs etc. The decision on which projects will be supported is executed by representatives of cooperating regions, thematic ministries and other local partners. This structure is done in order to set a sustainable collaboration that can endure long after the program is finished. Partners have to fulfil at least two of the conditions of common financing, common staffing, common preparations and common implementation of the project (European Union, 2011). It involves regional and local actors embodied by program's joint organizations.

Transnational cooperation (INTERREG B) involves national, regional and local authorities to promote better integration across European regions. It deals with challenges such as reduce water pollution (sea, river) which needs to be addressed by strongly connected involved countries. The programs usually cover great areas like the Baltic Sea Region, Alpine Space, Mediterranean and South East Europe.

Interregional cooperation (INTERREG C) connects European regions and cities creating networks in order to work on common issues, share ideas and solutions for them and together discuss new solutions such as how to make cities greener and progress on buildings' energy efficiency (European Union, 2011).

The INTERREG initiative is already on its fifth phase: INTERREG I (1990-1993), INTERREG II (1994-1999), INTERREG III (2000-2006), INTERREG IV (2007-2013) and INTERREG V (2014-2020). Initially, the program was only taken as a community initiative, with 11-15 benefiting member states and up to 4 billion Euros budget. From 2000-2013, INTERREG was already integrated into the structural funds regulation and, with 13 more members, had an increase on the budget until almost 9 billion Euros. On the current period, INTERREG V has its own regulation, embracing the 28 member states with a 10 billion euro allocation fund (European Territorial Co-operation, 2017). It is the first time that the program has its own regulation, once the "general regulations are not fully adapted to the specific needs of the European Territorial Cooperation goal" (Interact, 2015). The regulation consists on specific INTERREG provisions, and covers its scope, geographical area, financial resources etc. (Interact, 2015). The program is constructed on the top of 11 investment priorities financed

by the European Regional Development Fund (ERDF) (European Territorial Co-operation, 2017). Those priorities are divided into 3 themes, which are the Europe 2020 goals: smart growth, sustainable growth and inclusive growth (European Commission, 2015) (Table 4).

SMART GROWTH	SUSTAINABLE GROWTH	INCLUSIVE GROWTH
Research and innovation	Low-carbon economy	employment and mobility
information and communication technologies	combating climate change	social inclusion
competitiveness of small and medium enterprises	environment and resource efficiency	better education
	sustainable transport	better public administration

Table 4 - source: (European Territorial Co-operation, 2015 and European Commission, 2015)

According to European Union (2011), the EU acts as a facilitator. The European Commission, by means of the INTERREG program, is responsible for significant financial support for Cross border cooperation initiatives. Therefore, cross border regions must comply with rules established by the European Union. Consequently, cross borders regions end up acting as implementation agencies for this specific type of transnational regional policy (Perkmann, 2003). Thus, when globalization facilitates the loss of member states' sovereignty and the functional interdependencies between regions, it creates space for the emergency of cross borders cooperation (Duhr et al, 2007).

In the document of Executive Summary of the Impact Assessment from the EC, it is stressed how the European regional policy has an essential role in activating local assets and developing internal potential. However, that sometimes goes in the opposite direction of the problem stated by the document, which is: EU budget should finance EU public goods, programs that Member States and regions cannot do it themselves, or also where it can guarantee better outcomes (European Commission, 2011). In other words, there might be

relevant programs for improving local areas that not necessarily will receive EU funding and the ones that will receive are the ones with high interest for the EU.

The document focuses exclusively on three areas, where it is believed that adjustments are necessary. One of these areas is the “territorial cooperation”. The added value of the European Territorial Cooperation (ETC) (or INTERREG) is the opportunity for collaboration actions that are essential for issues that intersect national and regional boundaries, such as cooperation for improving governance, cooperation where there are economies of scale and critical mass, etc. The Assessment document exposes that the program needs improvement on its strategic focus and consequent broad interventions with hard-to-identify impacts; and it also needs an effective coordination capable of looking for arrangements between the EU Regulations requirements and Member States’ legal frameworks (European Commission, 2011).

3.1.D.B The TEN-T program

Another area which the aforementioned document considers is the “support for investment in infrastructure”. The document emphasizes how the lack of ability to focus on EU priorities is the main issue for transport infrastructure funding in the existing cohesion policy. Although the Trans-European Transportation Network (TEN-T) guidelines were focused on the cohesion funding, the document states that they were not specifically focused on the parts identified as the largest European value added (European Commission, 2011). Here, the idea of value added derives from Gutiérrez *et al* (2011): “the degree to which the project contributes to the goal of European integration by helping to develop truly Trans-European Transport Networks” (p.841). So, the challenge for the cohesion policy is to effectively contribute to the before mentioned EU budget necessities in the core TEN-T infrastructure (European Commission, 2011).

Planning policies have recently started considering infrastructure investment with special attention, which consequently attracted the interest from policy makers and academics. This interest is due to the awareness of the large infrastructure planning and approvals are becoming more problematic. In the past years, this large infrastructure debates occurred in the national levels, and more recently, around the last ten years, is being taken to an EU level. This comes with the revision of the Trans-European Networks (TENs) policy (Marshall, 2014).

According to Marshall (2014), the trans-European network programs were based on the Single Market vision, where all-types traffic flow would increase and easily happen between national boundaries. Also, as part of the movement, transport and energy systems should be integrated and opened up to competition. The programs were increasingly detailed and, in the case of transportation, given large provision from the EU funding (Marshall, 2014). On the one hand, many European countries have traditionally prioritized their national transport networks improvement, which favored their territories' integration and the strengthening of their national markets. On the other hand, transnational connections were disregarded generating sets of independent national transport networks, disconnected from their borders. In a context of European cohesion, connecting those EU transnational networks became a political priority (Gutiérrez et al, 2011).

The TEN-T (trans-European transport networks) program goals is to ensure the cohesion, interconnection and interoperability between those national networks by means of several projects. It is an attempt to surpass national proportions to a European magnitude (Gutiérrez et al, 2011). In 1994, 14 EU core schemes were designated to increase, mostly focused on railways, which also gathered support from political parties, interested in environmental issues (Marshall, 2014). Marshall (2014) indicates that the selection of TENs projects was extremely political, when national and industrial bodies started shaping them according to their interests. It was in 2008, when most of the original projects had barely started, that the EU saw the need for a policy revision and to a more ambitious approach. The revision of the programs was followed by proposals for expanding the role of the EU in promoting the TEN's. In parallel, EU policy-making and spatial planning were becoming increasingly interconnected through different works, including the INTERREG programs supporting cross-border initiatives (Marshall, 2014). In other words, even though member states are the ones responsible for spatial planning in their own countries, the EU policy-making exerts strong influence on them through its programs.

Nine transnational corridors were defined as *core network corridors* for the 2014-2020 period (Figure 1), which according to the EC were based on their added value for the TEN-T projects and their maturity status (Trans-European Transport Network, 2017). They are based on the economic interconnectivity, existing travel and freight flows and historical relations (Donners, 2016). Each corridor has a work plan that defines their current status of infrastructure and a time frame for removing barriers and a summary of the financial resources (EU, international, national, regional and local, public and private). Those corridors are considered

significant for the EC to raise funds and showcase accomplishments of wider EU transport policy objectives. “The ultimate objective of infrastructure development along these corridors – and on the core network as a whole – is to complete seamless connections for the sake of efficient, future-oriented and high- quality transport services for citizens and economic operators” (Trans-European Transport Network, 2017). According to Nash (2010), the TEN-T projects priorities are heavily focused on high speed passenger lines, since this can help existing congested lines with high volumes of passengers to create capacity for freight traffic (Nash, 2010).

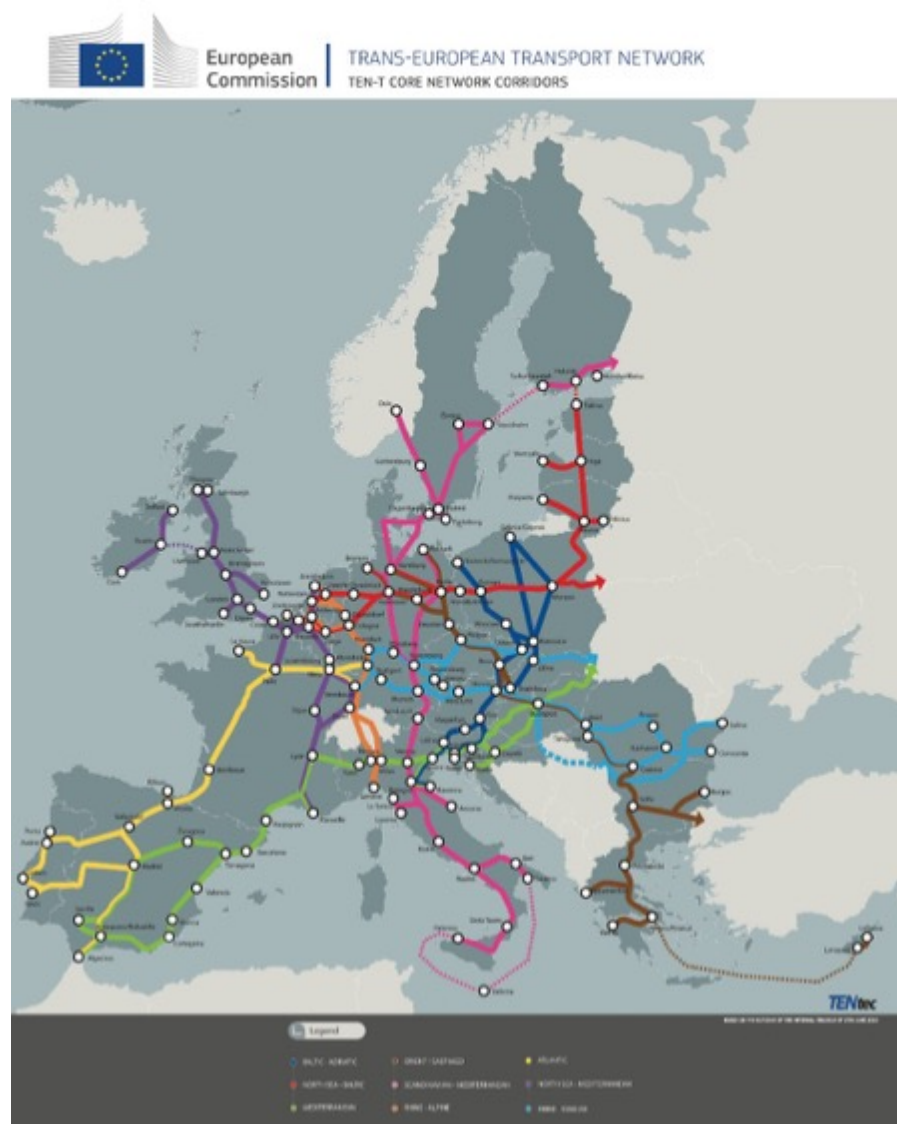


Figure 1 – source: TEN-T core network corridors (2017)

The TEN-T is a directive, directly binding and applicable to all member states to act on the improvement of the network according to the EU vision. Still, it is important to mention that the member states are the ones who decide how they will satisfy the goals. Once the TEN-

T defines the requirements for developing existing and building new infrastructure, it also expects member states to guarantee interoperability within the EU. Subsequently it creates a single European Rail Space, which Donners (2016) points out to be a unification in the railway traffic management and not a single economic market. It also triggers the formation of a European Railway Agency (Donners, 2016).

Not only the TEN-T legislation influences the member states in their railway policy, but also other railway packages. The EU vision for an integrated seamless transport network across EU member states that started in 1991 with the “First Railway Directive” was succeeded by amendments and different packages. The packages correspond to regulations, directives and amendments on top of already existing legislation, where the national level has a secondary role. Nearly every policy intends to guarantee the interoperability for the free market (Donners, 2016). Donners (2016) asserts that even though the European Railway Agency succeeded in unifying passenger rights, provision of passenger and service infrastructure like information, timetables, ticketing; those are still only partially included in the policies (Donners, 2016).

3.2 Cross-border projects

Priority projects from TEN-T are highly associated with their contribution to European interests. The European value added from trans-national projects can be measured by spillover effects caused by themselves. In other words, a project real contribution to the European goals is strictly connected to the benefits one project can bring to two or more different countries/areas (Gutiérrez *et al*, 2011). According to the authors Gutiérrez *et al* (2011), cross-border projects compared to national ones generate superior spillover effects and thus have greater regional integration. That said, although international corridors may have large effects (due to their size), if calculated in relative terms, it is possible to say that cross-border projects are responsible for greater integration results than international ones (Gutiérrez *et al*, 2011). The international projects are not necessarily focused on the cross-border regions but on the countries as a whole and have a much bigger scale than the cross-border ones. International corridors might present some fragments with major effects and others with minors (Gutiérrez *et al*, 2011). Considering the cross-border larger spillover upshots, one might say that those are the fragments with major effects in the international corridors.

In the same rationale, network effects should be mentioned. That is, when upgrading one part of a network does impact many others parts. Then again, it is beneficial to the country

that contains the infrastructure, and the benefits may also spillover across the borders to other countries. Deciding upon a major cross-border transport infrastructure corridor can be of high significance, since it can potentially benefit substantial areas due to the network effect (Gutiérrez *et al*, 2011). Thus, cross-border projects and cross-border interactions are of extreme importance to achieve territorial cohesion. The aforementioned INTERREG A program, European cross-border cooperation, supports collaboration between NUTS III¹ areas from different member states positioned on the borders or adjacent to them. The cooperation plans to find solutions to common issues and to seize undeveloped opportunities in the regions. Joint structures from the areas are the ones responsible for the entire program (Interreg A, 2017)

3.2.A Interregional and cross-border cooperation

Notably, local and regional governments are increasing their participation in international cooperation, more specifically involved in interregional and cross-border cooperation (ICC). After the integration of the EU as higher level, defining what is internal and international politics can be tricky (Perkman, 2003). Perkman (2003, p.156) describes cross-border cooperation as “a more or less institutionalized collaboration between contiguous subnational authorities across national borders”. ICCs are considered to be “forms of stable international contacts between non-central governments” (Perkman, 2003, p.158). Cross border cooperation is a special type of the ICC, once they are necessarily geographically connected, part of a contiguous cooperation (Perkman, 2003).

Eurocities is an ICC (interregional and cross-border cooperation) organization with long distance interaction that has a strong lobbying power on the EU level (Perkman, 2003). The MAIA (metropolitan areas in action) report (Eurocities, 2013)² brings up the fundamental role those metropolitan areas have in achieving the territorial cohesion. The EU cohesion policy

¹ NUTS (Nomenclature of territorial units for statistics) areas are hierarchical divisions on the economic territory of the EU. NUTS I – “Major socio-economic regions grouping together basic regions”, NUTS II – basic regions, NUTS III – “regions that are too small for complex economic analyses, may be used for specific analyses or to pinpoint where regional measures need to be taken” (European Union, 2011). The NUTS 2 regions level are the ones eligible for cohesion policy support (NUTS, 2017).

² “EUROCITIES is the political platform for major European cities towards the EU institutions. We network the local governments of over 130 of Europe’s largest cities and 40 partner cities that between them govern some 130 million citizens across 35 countries” (Eurocities, 2013)

recognizes the relevance of “integrated working throughout functional urban geographies” (Eurocities, 2013, p.5) and thus, attempts to prevent negative effects that previous funding caused such as the impediment of cooperation across administrative boundaries and different types of territories. The report brings up the necessity for cities to cooperate beyond their boundaries. While the urbanization happens boosted by different factors, cities often grow beyond formal borders, through sprawling into polycentric shapes and higher densities in the urban core. It also relates to regional and national boundaries. There are several examples of functional urban areas that extrapolate the administrative regional limit. It is also possible to find a number of cities that, following the European integration, have become reliant on international cross-border cooperation. Those have to deal with different legislative frameworks on each side of the border, such as land use planning, which influence the territorial dynamics. The report mentions examples of cross-border cooperation like Malmo and Copenhagen connected by a rail and road bridge, and Strasbourg and Basel that developed ways to function together considering their different system (Eurocities, 2013).

3.2.B Definition of regional cross-border cooperation

As mentioned before, cross-border cooperation denotes contiguous territories that engage in cooperation agreements. Perkman (2003) has divided cross-border collaborations in four principles. They are: considered public agencies; different countries authorities from subnational levels with no legal status and hence incapable of making international contracts; more focused in practical problem-solving; involved in consolidating cross-border contacts over the time. Furthermore, according to the author, cross-border region carries the concept of functional region: geographical areas united by their high level of inner interactions. The areas might present functional interdependencies and similar characteristics (Perkman, 2003). Those type of regions are usually called as Euroregions, Euregios, Working Communities and they are very well established in the EU.

It was in 1958 when the first formal cross-border region was instituted. The EUREGIO on the border regions of Gronau (Germany) and Enschede (Netherlands) was the start of a new period of increasing emergence of other Euregios and other forms of cross-border cooperation throughout Europe. Even though, local and regional authorities are the ones interacting with their counterparts across the border, cross-border cooperation was still an area reserved for central state actors. Over the last decades, this has changed and the role of “non-central

governments” has become broader associated with the macro regional integration in Europe. In other words, the EU and European organizations facilitated the non-central governments’ cooperation across borders through the acknowledgement of their legal status and the provision of financial support for the cooperation initiatives (Perkman, 2003).

As administrative bodies in charge of a subnational cross-border areas was hard to sustain, the first cross-border regions were specially based on agreements with different degrees of formalities and good will. In some cases, in order to stablish Cross-border regions, municipalities and provinces find a legal way inside their own systems to form associations that then join each other on a cross-border agreement (Perkman, 2003). Cooperation becomes more intense when stablishes a public body. Although cross-border initiatives can find great support on powerful public bodies, one cannot assure that actors will be willing to jointly elaborate policies. Public authorities may struggle to define their effective roles in cross-border policies (Oosten, 2003).

The MAIA reports presents different cases of metropolitan area cooperation that receive different amount of funding, considering their level of collaboration. It is possible to observe examples of collaboration between local authorities’; some cases that present a larger size rely on joint secretariat and shared office (sometimes a joint implementation body). And the ones that receive the largest budgets are the joint public transport services and infrastructures and might be a step closer to become semi-autonomous metropolitan authorities (Eurocities, 2013). The research with some cases studied by this same report points out most cities’ partnerships are a mixture of top-down and bottom-up initiatives, and core cities present the highest degree of leadership. And results also show that, when private sector has a participation role, the likelihood of metropolitan areas to work on joint policy agreement is higher, so partners can commit themselves in following the agreement (Eurocities, 2013).

3.2.C The functioning of cross-border cooperation

“The significance of the concept of interaction is that it emphasizes the process more than the form and it positions the analysis in a systemic perspective where the relationships between the system elements prevail over their attributes” (Sohn *et al*, 2009, p.923). In other words, the barrier and its control functions associated to the borders yield over the real purposes of interaction: the contact and exchanges. The border is still a strong barrier from a political

perspective, however, considering EU policies facilitation on increasing the borders porosity, it can consider changing its role for a mediator and channel between both sides. The border then presents itself as an instrument for opportunities, likely to provoke stimulation and creativity on a territory with similar and diverse characteristics, and attend necessities. It has a potential for raising awareness of the benefits (or necessities) that one side can profit in collaboration with the other (Sohn *et al*, 2009).

Sohn *et al* (2009) mention two forms of cross-border integration: a mechanical, connected by the system structure and the expansion of its homogeneity; and an organic one, based on the flows between the members of a system (Sohn *et al*, 2009). Considering structure as the infrastructure and all the governance factors connected to this, it is possible to assert that mechanical integration can lead to an organic integration, and vice-versa. Already existing infrastructure facilities may foment stronger flows while flows already generated by other reasons might stimulate the investment for developing infrastructure.

3.2.D Cross-border cooperation at EU level

As pointed out before, there are numerous EU regions that are already involved in some type of cross-border cooperation (Magone, 2003). Regions and EU integration have changed the political interaction, building new spaces below and above the national level, leading to three-level relations (Keating *et al*, 2015). This might suggest a more flexible territorial structure. The region's institution has a lot in common with the EU, for being a “complex, patchily institutionalized and contested” (p. 447). Some regions have even been able to promote their vision in the European and global markets contexts (Keating *et al*, 2015). Meanwhile, EU cities are going on the same direction, also in collaborating with cities from different member states. Cooperation within others from the same level can make them stronger and enhance their lobbying capabilities with the supranational level.

Many regions and local governments have opened permanent offices in Brussels. Regions offices frequently cooperate with their member states for policy objectives. Or they may be linked to powerful corporation placed in the region itself (Keating *et al*, 2015). Although member-states, regions and municipalities have a high degree of autonomy, they have a great level of shared responsibility regarding decision-making (Keating *et al*, 2015).

One example of association between subnational levels is the Interprovincial Council

(IPO). The IPO is an *association of and for the provinces* from the Netherlands. Its association's board consists of one representative per province and an independent chairman. The IPO is based in The Hague and since 2000 has a representation in Brussels. The *House of the Dutch Provinces* was established together with the Dutch provinces in Brussels. The representation in the Belgian city is responsible for taking care of the provinces' interests on the European level IPO (2017).

Additionally, Eurocities is one illustration of a network of European cities. The same way as the IPO, the members are part of their elected local and municipal governments of the 135 cities' members. The association aim is to strengthen the local governments' role in a multilevel governance context. The office is located in Brussels and can directly influence EU institutions in order to attend the cities' own interests, looking for solving issues in the local level. The city members present five principal topics as a framework that are somehow aligned with EU's strategic priorities. Their focus is on: cities as drivers of quality jobs and sustainable growth; inclusive diverse and creative cities; green, free-flowing and healthy cities; smarter cities; urban innovation and governance in cities (Eurocities, 2017).

3.2.E Cross-border cooperation and transport

The MAIA report, from Eurocities, is a result from a study covering 88 examples of metropolitan cooperation of 31 cities. Most of those cases are working with topics in the area of transport and mobility, strategic spatial planning, economic development, or a combination of them. And the few collaborations that are based on only one field, the most common ones are economic development or transport and mobility (Eurocities, 2013). Several of those partnerships are also involved with private actors, such as NGOs, private companies, business association that have responsibility in providing public transport to the population. As mentioned before, the metropolitan networks that receive larger amount of funding are the ones connected to joint public transport services and infrastructure (Eurocities, 2013).

The transport theme is dealt by the European Commission with special importance, having a great responsibility on the topic trade and economic growth; a foundation of a country's economic system. The creation of the single market and borderless Europe is extremely dependent on strong transport connections, vital to allow the free movement of people, services and goods (European Commission, 2014). That is one of the reasons why over

the past 60 years, the EU has invested on different types of transport: road, rail, air and water. European transport policy was able to open the national transport markets to cross-border competition that were before controlled by public monopolies, in the aviation and rail context (European Commission, 2014). Such advances combined with the development of key cross-border railways helped to create a more competitive and customer-responsive rail industry and reduce carbon emissions (Rail Market, 2017).

Nearly every policy related to the rail-passenger-service market is determined by EU legislation with: directives that are directly binding to every member state, and regulations that establishes the objectives that the countries should consider. Consequently, the member states define how they will comply with the objectives. Some of the legislation apparatuses concern public government and some others are related to train operating companies (Donners, 2016). The railway package is expected to increase railway service's efficiency and open it up for a more competitive sector, with pleasant and high-quality cross-border services (European Commission, 2014). With the open railway market, state-owned railways companies were privatized and separated into infrastructure managers and train operating companies (Donners, 2016; Marshall, 2012). The management is responsible for the capacity distribution and some provisions for safe operations (Donners, 2016).

In theory, considering the open market goal, infrastructure managers should provide services for every operating company. Although, according to Donners (2016), in practice it does not work like that (Donners, 2016). In contexts where politics have a high level of influence, there are state-run railway tracks, government regulating company, and other companies delivering the trains services. Several member states have already opened the market for freight railway transport systems, but the same is not happening that fast with the passengers' sector (Marshall, 2012). In most of the public transport regulations, the operators are constricted to public service contracts, which limits the access of possible companies and also imposes strict settings. The market of train operating companies is very complex and controlled by national authorities, which can restrict large start-up investments and give weak guarantees of business continuity (Donners, 2016). Even though there is a great movement to develop better railway connections inside the EU, there is still a real potential to be achieved.

3.2.F Transport and cross-border commuting

“The average travel time has increased for Europeans in recent years” (Ravalet *et al*, 2017, p.564). If on one hand the mobility of goods, money and information across the EU has greatly developed, on the other hand, the labor mobility has not conquered the same achievement. It is possible to observe most of the EU workers bounded to their national-labor market, while the cross-border commuting is not that recurrent (Van Der Velde, 2004). Although, commuting is the most frequent practice of cross-border geographic labor mobility in the EU (Heinz & Ward-Warmedinger, 2006). In a context where location is not a solid driver for job choice anymore (Ravalet *et al*, 2017), this can be a synonym for wasted opportunities for better developing EU and member states economy.

Several households recognize house ownership and local ties, such as family, friends and neighbors, as main motivations for residential choice, meanwhile their workplace is not on the list as a key reason. And when there are dual-earner couples, is even more complicated for living around the working vicinities (Ravalet *et al*, 2017). And “residential choices are often long term” (Ravalet *et al*, 2017, p.565). This factor, added to recent mobility facilitators, have increased the commuting willing distances. This also depends on the way how people perceive mobility. It is not only about the distance they have to travel, but also how the mobility is done (Ravalet *et al*, 2017).

Stimulating the cross border commuting (and other types of labor mobility) may offer a lot of advantages from not only a whole EU perspective, but for both of the sending and receiving countries. It allows a “more efficient matching worker’s skills with job vacancies and facilitating the general upskilling of European workforces” within the Euro area (Heinz & Ward-Warmedinger, 2006, p.4, Ravalet *et al*, 2017, Van der Velde, 2004). In addition to that logic, it can help balance the labor market in times of crisis. According to the authors Heinz & Ward-Warmedinger (2006), if the cross-border barriers are not dismantled in the short term, it might go against Europe’s goal of improving its international competitiveness and might even trigger illegal work in some of the countries. Also, it would not be optimal in a context where the EU populations are ageing. An optimal situation would be when EU member states’ citizens are not exposed to restrictions on its mobility to other member state within the Union, allowing national labor markets to adjust in cases of economic fluctuations and asymmetric shocks. It would be a great loss for EU economy if talented individuals, instead of choosing a job position in a EU member state, are absorbed by traditional migration countries outside the EU, such as

USA and Canada (Heinz & Ward-Warmedinger, 2006).

The Netherlands are considering this situation in their politics. Cross border economy and labor is part of the current country's agenda. Professionals, entrepreneurs and students are the ones that the Action Team *Grensoverschrijdende Economie en Arbeid* (cross border economy and labor) is focusing on. It works with the collaboration of border municipalities, provinces, Euregio, MKB-Nederland (the largest Dutch entrepreneurs' organization) and the national government (Actieteam Grensoverschrijdende Economie en Arbeid, 2017). The report highlights the importance of cross border accessibility for labor mobility, and adds that the country's mobility with neighboring member states is limited with less frequent and less acceptable public transport availability. Therefore, the travel time for potential commuters is time-consuming and/or workplaces are not accessible by public transport. Not having the same public transport system that would allow passengers to use one public transport card in both countries, also hampers the border crossing of students and employees (Actieteam Grensoverschrijdende Economie en Arbeid, 2017).

3.3 Eurodelta

After studying the general conditions in the European level and in a cross-border level, this study focuses on its main area: the Eurodelta. This is a very specific cross-border area with its own characteristics and where the regions have relevant spatial-economic similarities. This section presents the characteristics of such area, its economic relevance from a national and international perspective and how different its countries planning systems can be. Subsequently, it is possible to recognize that the development of the area's economy depends on the enhancement of the cross-border connections and this is a key policy instrument for these regions.

3.3.A The relevance of the Eurodelta

Connecting metropolitan urban areas as networks can make profit on agglomeration benefits. Urban regions can "borrow" size and "share" their sizes with others (Vereniging Deltametropool, 2017). The idea of borrowing size was long presented by Alonso (1973), that is, when a small city or metropolitan region makes use of another concentration close by and

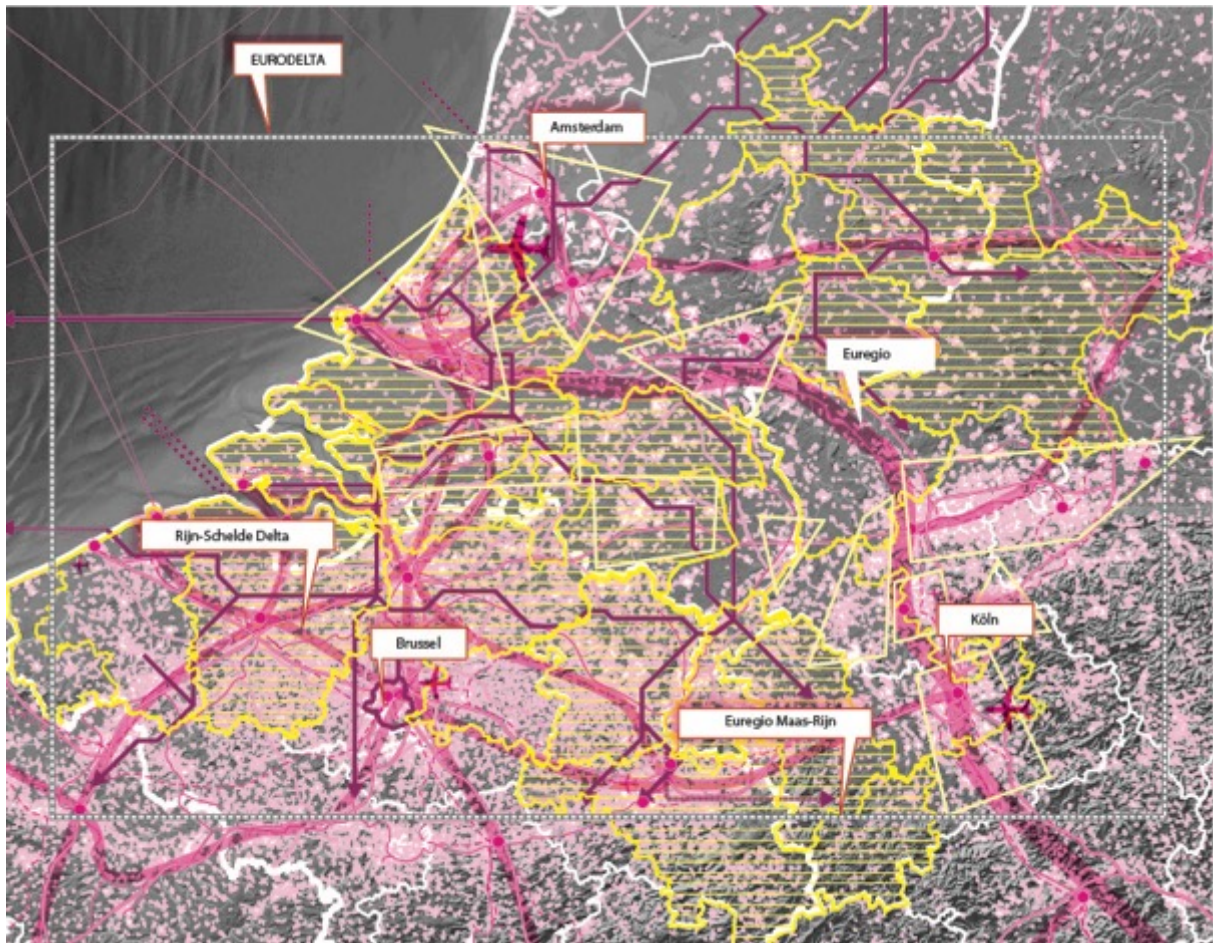
acquires characteristics of a larger area. It is possible to find complementarity between individual urban cities, which enhances joint competitiveness and also the provision of facilities. This concept of borrowed size can be observed in every level. From a Netherlands perspective, there is a local example of the Arnhem-Nijmegen cooperation. The REOS network can be seen as an example in a regional scale. In a higher level it also works for Europe as a whole, where TEN-T corridors are the link between international urban regions. Therefore, those collaboration parts do not compete with each other, but add value to the other. Although the metropolitan level has a lot of opportunities, it does not receive the attention that it deserves (Vereniging Deltametropool, 2017).

It is believed that the Dutch biggest cities, together with the ones from Flanders and from the Ruhr-region might use each other's economic specialization to balance with their own and "profit from sharing, learning and matching opportunities – equally as larger cities do" (Groot *et al*, 2015, p.10). During the last decades, metropolitan regions have increasingly united millions of inhabitants in the same territory. Those areas compete between each other for the attraction of companies, investment and high qualified labor.

In a Dutch context, it is not possible to find a metropolis with such Paris or London size in the country. However, if networks are considered, it creates possibility for a more competitive approach with other metropolitan areas. The Dutch borders from Belgium and Germany are believed to make a strong connection as a single metropolitan area, for being favorably urbanized and have more than 30 million people inhabiting the area. This area is also called as the Eurodelta metropolis (Vereniging Deltametropool, 2017).

Map 1 – Eurodelta

source: Deltametropolis Association, archive



The Eurodelta area comprises the Netherlands, the Flanders region of Belgium and the German state of the North Rhine-Westphalia. This megaregion scale outlines how metropolitan economy will function in the coming years (Groot *et al*, 2015; Florida *et al* 2008). This may be the optimal scale for agglomeration economies, where “infrastructure, housing and real state have high returns on investment; and firms and employees profit from economic density” (Groot *et al*, 2015, p.10). The Eurodelta area presents four urban clusters, the Randstad/Delta metropolis, Brabantstad, the Flemish Diamond and the Ruhr Area (Advisory Council for Transport, Public Works and Water Management, 2005). Today, it is possible to consider the Randstad and Brabantstad as one strategic region, which is known as the REOS network. In geographic and economic terms, the Eurodelta region covers around 2.8% of total EU area, holds 7% of the Union population and is responsible for 12% of the continent’s economy (Advisory Council for Transport, Public Works and Water Management, 2005). The area presents very similar socio-economic and landscapes characteristics (Tennekes *et al*, 2015).

If on one hand Germany is considered the main trading partner from the Netherlands, on the other hand the Dutch market has, in several times, stronger economic bonds with the

state of North Rhine-Westphalia than with the rest of the country (Advisory Council for Transport, Public Works and Water Management, 2005). The mass Dutch investments in Germany goes to North Rhine-Westphalia state, the receiver of 35% of the total. The same happens the other way around (International relations, 2017). Also the German state is responsible for receiving alone 43% of the total Dutch exportation to Germany. The North Rhine-Westphalia has the largest economy of the country and through the Rhine, its border with the Netherlands delivers an excellent navigable waterway (CBS, 2016). Additionally, from the other perspective, 84% of the Belgian exports to Germany comes from Flanders region, its most important trading partner. The North Rhine-Westphalia state, from all the Flemish exports to Germany, receives alone one-third of the whole (Hope, 2016). And those are just some of the important relations within the area.

The Eurodelta axis has presented a promising development for new employments due to the reallocation of businesses, the attraction of new international businesses and economic restructuring. The corridor Rotterdam-Antwerp is an important economic route which is being studied to facilitate greater accessibility and improve its transport connectivity (Royal HaskoningDHV, 2017). In Brabant and the Belgian Kempen area, the closing of textile and mining businesses led to the development of new industrial and logistics companies. Also new industries are showing up within the area's urban networks, like manufacturing companies and distribution centers, causing the development of smaller cities. This is consequently increasing modernization processes and urban facilities.

The report from the Advisory Council for Transport, Public Works and Water Management (2005) had already foreseen a very strong economic interrelationship for the Eurodelta area, considering the Netherlands the leader in the field. However, the area was unfrequently considered as one coherent region because it covers three different countries and in practice there is not much administrative and policy collaboration within it (Advisory Council for Transport, Public Works and Water Management, 2005). Recently, this has changed, catching the eye of politics considering the relevance of the area and importance of good cross-border relations between them. One example is the vital frontier infrastructure for the economies of ports of Rotterdam and Antwerp and development of the port of Duisburg in Germany (Hope, 2016). In 2005 it was already observed an active shift in cross-border traffic from business location and business making, labor and living, shopping, leisure, etc. (Advisory Council for Transport, Public Works and Water Management, 2005). Besides, it is also important to mention that the nodes are less than 100 kilometers from each other, which can be

considered as daily commute distances.

3.3.B Different Governance and Spatial Planning Systems

The Netherlands and the REOS area

“Political decision-making in the Netherlands is concentrated in the central government, inside unitary state” (Marshall, 2012, p. 84).

From a national perspective, the Netherlands is a unitary country, divided into 390 municipalities and 12 provinces, and then counts with 402 sub-national governments. The first are regulated by the Provinces Act and the second by the Municipalities Act. The Central authorities are responsible for appointing the heads of the municipal mayors and provinces King’s Commissioner. Although, their respective councils also have a participation in their selection. There was an attempt of turning provinces into larger regions but this has never occurred. In 2015, it was created two metropolitan governance arrangements, the Metropolitan Region of Amsterdam (MRA) and the Metropolitan Regions of Rotterdam- The Hague (MRDH). In the Dutch political system, the national government and sub-national governments divide many areas of responsibilities, although since 2007, on a decentralization process, new obligations were transferred to the municipal and regional levels. Some of the provinces main responsibilities are spatial planning, traffic and transport and regional economic development. And a few of the municipalities responsibilities are urban development and land-use planning, local roads and public transport and local economic development (OECD & UCLG, 2016).

The Dutch REOS is the spatial economic development strategy between the Northern and Southern Randstad and Brainport Eindhoven. The area is divided into several regions and alliances, a polycentric metropolitan area. The three (out of nine) top sectors concentration from Dutch economy are located inside REOS urban area, having the highest priority on a national scale. National and regional governments are currently working together on a project that links the international and regional scales, and aims for the expansion of the complementarity of urban regions and vital links at several scales to develop the country spatial-economic sector. The area comprises numerous economic sectors with opportunities for mutual interaction, innovation and economic growth.

Germany and the North Rhine-Westphalia

From a German point of view, this country comprises 11.092 municipalities, 402 districts on an intermediate level and 16 states on a regional/state level. Germany contains 11.510 sub-national governments. It is based on cooperative federalism, and differently from the Netherlands has this three-tier subnational system. Below the state level there is a local government level with rural districts and district-free cities. And the municipalities are part of the lowest level. The latter are governed by the state, that have diverging organizations between one state and the other. Policies from the districts and municipalities are executed by the state. The federal states have the responsibilities over the legislative and administrative functions, with exception to the exclusive ones from the central government. There is an overlap in many fields, including joint tasks between the national and regional levels. Some of the states' main roles are in the areas of education, internal administration, regional economic development. They also establish the functions of the districts on the intermediate level, which consequently differ between them. The mandatory functions include secondary roads, public transport, spatial planning and nature and landscape. The lower level then takes care of local roads, town planning, housing (OECD & UCLG, 2016).

The Rhine-Ruhr German region, located in the North Rhine-Westphalia federal state, is the largest German metropolitan region, split into different areas and alliances with diverse formal status. Those areas are: Dusseldorf Metropolitan Region, Ruhr Metropolitan Region and Cologne-Bonn Metropolitan Region. The federal state is divided into five government districts, responsible for executing the state's policy. The state's capital, Düsseldorf, is one of the most important cities in the country and is well known for its strong industrial clusters (which, according to Curzio & Fortis (2012), are also along the state) and important governance functions. The urbanized aforementioned region is a conglomerate of several cities, and is linked to Dutch provinces through the Rhine-Alpine TEN-T corridor, which provides valuable connections with the port of Rotterdam (Deltametropolis Association, 2015).

Belgium and Flanders

Belgium is also a federal state, that presents 6 organizations at the regional level, three regions (Flanders, Wallonia and Brussels capital-region) and three communities (Flemish, German, and French Speaking Communities) that physically overlap each other. The lower levels are the ten provinces and 589 municipalities. The latter are governed by regional legislation. The regions of Flanders and Wallonia started reformulating their levels below. In

Flanders specifically, the government is working in voluntary mergers from the municipalities and reducing the provinces, concentrating on increasing “territory-related powers” and decreasing “people-based powers” (OECD & UCLG, 2016). The states themselves have great autonomy, where only the residual tasks are taken on a national level. The division on the regional level is: regions competences are related to the territory, such as infrastructure, and to employment and taxes matters; while the communities’ tasks are focused on people-related matters. The responsibilities of the lower levels are not clearly demarcated and may overlap. The intermediate level usually deals with education roads and waterways, transport, public works; and the municipalities take care of duties by higher levels and the ones regarding municipal interest (OECD & UCLG, 2016).

The provinces of Antwerp, Flemish Brabant and East Flanders and also Brussels-Capital Region are part of the “Flemish Diamond”. The latter is an agglomeration of diverse cities and has no governmental organization. Meanwhile, Flanders and Brussel capital have direct elections. The Flanders’ ports (specially the Antwerp one) as a whole is half the size of the whole Southern Randstad ports. The infrastructural connection with the Netherlands is through the North Sea-Mediterranean TEN-T corridor and high-speed rail (Deltametropolis Association, 2015).

Table 5 below shows the correlation between the different member states:

MEMBER STATE	TYPE OF STATE	POLITICAL/ADMINISTRATIVE REGION
BELGIUM	FEDERAL	COMMUNAUTES (3), REGIONS (3)
GERMANY	FEDERAL	LANDER (16)
NETHERLANDS	UNITARY DECENTRALIZED	PROVINCES

Table 5 - Adapted from Magone (2003)

In this important polycentric and spatial planning diverse area, the infrastructure is particularly relevant to link the different sub-regions and has been the central focus of many policy initiatives. In these countries, the major infrastructural investments are realized by several governmental levels, and because they belong to different political states, the share of government budget spent in the regional level diverges greatly (Groot *et al*, 2016). “Germany and Belgium both have higher shares of public expenditure at the regional level; yet the

Netherlands spends a relatively large part of the regional budget on economic affairs” (Groot *et al*, 2016, p. 19).

Groot *et al* (2016, p.24) use examples to illustrate the association between the improvement of cross-border connections and the increase of competitiveness for the whole area, where the infrastructure is used as the key policy instrument. The first relates to a freight rail route that connects the Port of Rotterdam to Germany and is part of the TEN axis to Genoa. During its construction, the project was contested by many who expected that it would not achieve the necessary traffic number to justify the construction. However, after the opening, traffic has progressively increased and “by 2015 the line had a market share of 60% of all cross-border freight traffic”. The second case is the fragmented region Maastricht-Aachen-Liege-Hasselt, that has been targeted by Interreg programs, but still has a small number of cross-border commuters (17.500) if compared to Luxembourg (127.000) and Basel (49.000). On one hand there is a big potential for an integrated labor market, on the other there are strong language, institutional and cultural barriers in the area, where opportunities for collaboration are occasionally blocked by political considerations. In this situation there is the airport of Maastricht that connects itself with Aachen, being described as Maastricht-Aachen airport, even though 40 km away. But at the same time it competes with the airport of Liege, which has a similar size and is also 40 km away.

As discussed before, the agglomeration benefits are innumerable. However, in order to better exploit these benefits, the areas must be very well-connected. This relates not only to “visible” and “invisible” infrastructure such as roads, railways, water, energy and data infrastructures, but also to make sure they provide a reliable service and allow movement on its highest potential. This is the reason why the upgrading of the cross-border railway services is so important for the region. Removing barriers, facilitating and encouraging travelers’ mobility can strengthen the area, attract investors, companies and labor to the region. However, this can be a difficult step when dealing with such different political and spatial planning systems, which can obstruct decision-making processes on joint programs.

4. RESEARCH RESULTS AND DISCUSSION

4.1 Partial Results

With the purpose of answering the research question, the initial analysis focuses on resolving each of the aspects separately: connectivity efficiency, economic relations and cross-border collaboration. Further, the individual results construct a superior and broader consideration for answering the main research question. On this next phase, the data is partially presented.

4.1.A Connectivity Efficiency

As presented before, Gutierrez *et al* (2011) indicates the conflicting results regarding national and transnational development of transport corridors. Traditionally, European countries prioritized their national transportation network improvement while transnational connections were overlooked. This generated strong national markets and integrated national territories, meanwhile they became less connected from their borders. This fact can be observed in the Dutch – Eurodelta scenario. If on the one hand, the Dutch national train network system is extremely well developed, with high frequency of trains, great speed and a full schedule of train services, on the other hand, the Eurodelta situation is quite different.

When judging the current passengers' train connections in the Eurodelta, all of the professionals that were interviewed for this research have critics about it. All of them believe in the importance of the area and that it is important to improve the links, although this is a very complex issue to assess. “(the connections are) sometimes very poor and generally under the level we should strive for.” (Gerretsen, 2017); “It is incredible; it is unbelievably bad.” (Govers, 2017); “We have the Thalys, the intercity trains, and this direction works quite well in my perception. But this one to the German side is a big problem for us and also for Eindhoven” (Thoele, 2017).

The Dutch connection to the Belgium side, although is believed to urge several improvements, is considered to provide a better service than to the German side. “And when you see to Duisburg is two hours travel time (...) with two times changing trains, so it is really a very poor offer” (Govers, 2017). Most of the direct problems described on the interviews are: the low frequency of the trains, low speed, accessibility of booking systems and payments,

trains that do not run early or late enough... And their upgrading is affected by other indirect problems that are going to be reported ahead.

The table 6 in the next page presents the relevant characteristics gathered for this part of the research and the results of the Weighted Potential of Improvement calculated by the formula described in section 2.3 – Analytical Framework and Selection of data:

	Connections	Distance (km)	Speed (km/h) - calculated by the researcher	Service provider	Nationality	Train Changes	Frequency	Time	Price	Weighted Potential Improvement
1a (i)	Rot-Ams	63 Km	102 Km/h	Thalys		0	14/day (1)	0:37 (1)	\$21 (2)	
1a (ii)	Rot-Ams	63 Km	93 Km/h	NS (intercity)	Dutch - public	0	66/day (1)	0:41 (1)	\$17,60 (1)	
1a (iii)	Rot-Ams	63 Km	52 Km/h	NS	Dutch - public	0/1	163/day (1)	1:13 (1)	\$15,20 (1)	
1b (i)	Rot-Ant	79 Km	149 Km/h	Thalys	French (SNCF), Belgium (SNCB) and German (DB)	0	14/day (2)	0:32 (2)	\$35 (1)	8,9%
1b (ii)	Rot-Ant	79 Km	72 Km/h	NS (IC Brussel/C+Regional)	Dutch - public	0/1	17/day-15/day (1)	1:06/1:49 (1)	\$29 (1)	112,2%
2a (i)	Ein-Rot	87 Km	87 Km/h	NS (intercity)	Dutch - public	0	37/day (1)	1:03 (1)	\$18 (1)	
2b (i)	Ein-Ant	79 Km	44 Km/h	Thalys+NS		1	13-14/day (1)	01:48 hs (1)	\$60-80 (1)	
2b (ii)	Ein-Ant	79 Km	40 Km/h	NS	Dutch - public	2	26/day (1)	aprox. 2:00 hs (1)	\$18-24 (1)	60,1%
3a (i)	Ein-Rot	87 Km	87 Km/h	NS (intercity)	Dutch - public	0	37/day (1)	1:03 (1)	\$18 (1)	
3b (i)	Ein-Dui	90 Km	36 Km/h	NS (IC) +DB (ICE)	Dutch + German - public	1	7/day (1)	2:30 (1)	\$25-35 (1,3)	
3b (ii)	Ein-Dui	90 Km	54 Km/h	NS (IC) +DB (REG)	Dutch + German - public	2	17/day (3)	1:42 (3)	\$23 (1)	77,5%
4a (i)	Arn-Rot	98 Km	70 Km/h	NS (IC+IC)	Dutch - public	1	69/day (1)	1:24 (1)	\$18,70 (1)	
4b (i)	Arn-Dui	85 Km	57 Km/h	Abellio Germany	Dutch - public	0	17/day (3)	1:31 (3)	\$28,60 (10)	113,1%
4b (ii)	Arn-Dui	85 Km	92 Km/h	DB (ICE)	German - public	0	8/day (3)	0:55 (3)	\$19 (3)	
5a (i)	Arn-Ams	77 Km	70 Km/h	NS (IC+IC)	Dutch - public	1	32/day (1)	01:04 (1)	\$16,60 (1)	
5a (ii)	Arn-Ams	77 Km	70 Km/h	NS (intercity)	Dutch - public	0	35/day (1)	01:04 (1)	\$16,60 (1)	
5a (iii)	Arn-Ams	77 Km	84 Km/h	DB (ICE)	Dutch - public	0	8/day (1)	0:56 (1)	\$19 (1)	
5b (i)	Arn-Dui	85 Km	57 Km/h	Abellio Germany	Dutch - public	0	17/day (3)	1:31 (3)	\$28,60 (10)	50,5%
5b (ii)	Arn-Dui	85 Km	92 Km/h	DB (ICE)	German - public	0	8/day (3)	0:55 (3)	\$19 (3)	

Table 6 - Source: Developed by the author

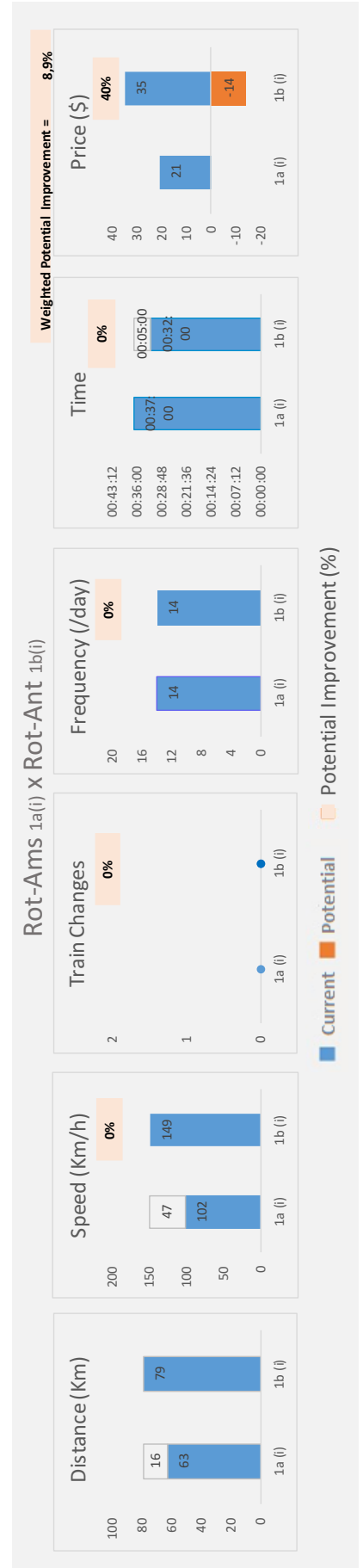
When comparing the Dutch national connection Rotterdam \leftrightarrow Amsterdam (1a) to the transnational Dutch-Belgium connection Rotterdam \leftrightarrow Antwerp (1b), it is possible to point out some differences. Connection (1a) offers 3 types of service within this route: Thalys international, Intercity direct with supplement and normal Intercity service; while connection (1b) offers 2 types of service: Thalys international and Intercity service. Both connections have the same service providers: NS – Dutch state-owned company – and Thalys – two joint companies whose shareholders are French, Belgian and German rail companies and has the NS as a partner. It can be noticed that the international connection lacks in the time schedule and price.

A relevant matter to address is that both national and international connections have the same travel time. This international/cross-border connection (1b) could be further considered as an intercity direct service for daily commuters with a more developed service, instead of the current international service type that is significantly more expensive and has lower train frequency. This means that daily commuters between Rotterdam and Antwerp do not have much flexibility on time schedule and have to spend almost twice the amount of money to ride on this train service. The two cross-border services within this route have a W.P.I. of 8,9% (Table 7) and 112,2% (Table 8). As explained before, the result used to compare the international routes contemplates the most developed service, the one with the lowest score of W.P.I. Therefore, the route Rotterdam – Antwerp has W.P.I. 8,9% of development potential.

Rotterdam – Amsterdam 1a(i) x Rotterdam – Antwerp 1b(i)

		1a (i) x 1b (i)	
		Dif.	Potential Improvement (%)
1a (i)	Distance (km)	63	16
1b (i)		79	
Potential Improvement (%)			
		14	0%
1a (i)	Frequency (/day)	14	
1b (i)		14	
Potential Improvement (%)			
		00:37:00	0%
1a (i)	Time (ii)	00:32:00	
1b (i)		00:05:00	
Potential Improvement (%)			
		21,0	40%
1a (i)	Price (i)	35,0	
1b (i)		-14	
Potential Improvement (%)			
			8,9%
1a (i)	Weighted Potential Improvement		
1b (i)			
Potential Improvement (%)			

Table 7 – Developed by the author



Rotterdam – Amsterdam 1a(ii) x Rotterdam – Antwerp 1b(ii)

1a (ii) x 1b (ii)		
	Dif.	Potential Improvement (%)
Distance (km)		
1a (ii)	63	16
1b (ii)	79	

1a (ii) x 1b (ii)		
	Dif.	Potential Improvement (%)
Speed (km/h) - calculated by the researcher		
1a (ii)	93	21
1b (ii)	72	29%

1a (ii) x 1b (ii)		
	Dif.	Potential Improvement (%)
Train Changes (i)		
1a (ii)	0	0
1b (ii)	0	0%

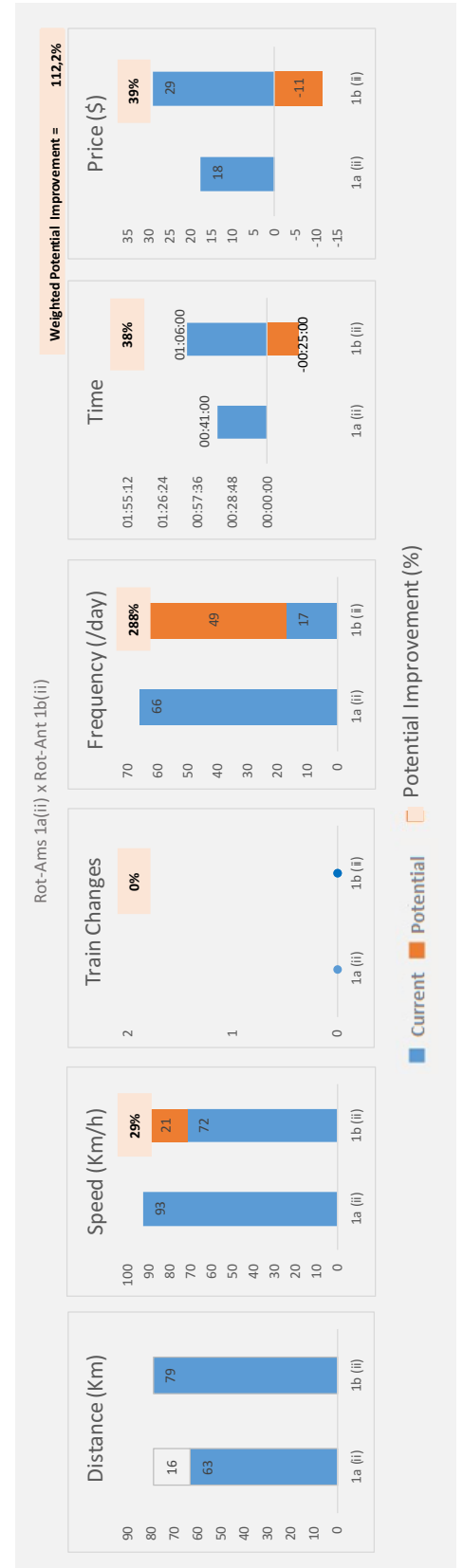
1a (ii) x 1b (ii)		
	Dif.	Potential Improvement (%)
Weighted Potential Improvement		
1a (ii)		
1b (ii)		112,2%

1a (ii) x 1b (ii)		
	Dif.	Potential Improvement (%)
Frequency (/day)		
1a (ii)	66	
1b (ii)	17	288%

1a (ii) x 1b (ii)		
	Dif.	Potential Improvement (%)
Time (ii)		
1a (ii)	00:41:00	
1b (ii)	01:06:00	38%

1a (ii) x 1b (ii)		
	Dif.	Potential Improvement (%)
Price (i)		
1a (ii)	17,6	
1b (ii)	29,0	-11,4

Table 8 – Developed by the author



In the case of **Eindhoven ↔ Rotterdam (2a)** and **Eindhoven ↔ Antwerp (2b)**, the national train connection (2a) is a lot superior to the international (2b) one. Though the international distance is shorter, the train travel takes twice the time of the national connection. The national and international services are provided by NS and part of one international option is serviced by Thalys. Also, the international service falls short in frequency when compared to the national one. The price between the national and international links vary significantly, and the Eindhoven-Antwerp link can be a lot more expensive than the link Eindhoven-Rotterdam. Also, while on one hand there is no train change on the national route, the passenger of the international route has to change once or twice to get to its destination. It is possible to observe that this international route is not developed as a commuting route, limiting daily travel between the two cities.

This international route (2b) still lacks improvement if compared to the national (2a) in terms of commuting. It indicates that route (2a) is not a route planned for itself. It is a train trip that is doable by changing trains, but it does not have its main goal as connecting people from Eindhoven to Antwerp. The train change seems to be a critical factor in this case. As mentioned previously, the commuters are more willing to travel longer distance in Europe, however, it depends on the way mobility is experienced. Changing trains can be a hassle for commuters that depend on different services and consider waiting for the next trains a waste of time and more unreliable in terms of arrival time. Flood and Barbato (2005) raise the commuting stress problem which is influenced by the number of times they have to change train lines. According to the authors, the more train changes, the bigger the stress for commuters. The international route Eindhoven – Antwerp has a W.P.I. of 60%. (Table 9)

Eindhoven – Rotterdam 2a(i) x Eindhoven – Antwerp 2b(ii)

2a (i) x 2b (ii)		
	Dif.	Potential Improvement (%)
2a (i)	87	
2b (ii)	79	8

2a (i) x 2b (ii)		
	Dif.	Potential Improvement (%)
2a (i)	87	
2b (ii)	40	48
		120%

2a (i) x 2b (ii)		
	Dif.	Potential Improvement (%)
2a (i)	0	
2b (ii)	2	-2
		100%

2a (i) x 2b (ii)		
	Dif.	Potential Improvement (%)
2a (i)	18,0	
2b (ii)	23,4	-5,4
		23%

2a (i) x 2b (ii)		
	Dif.	Potential Improvement (%)
2a (i)	01:03:00	
2b (ii)	02:00:00	-00:57:00
		48%

2a (i) x 2b (ii)		
	Dif.	Potential Improvement (%)
2a (i)	37	
2b (ii)	26	11
		42%

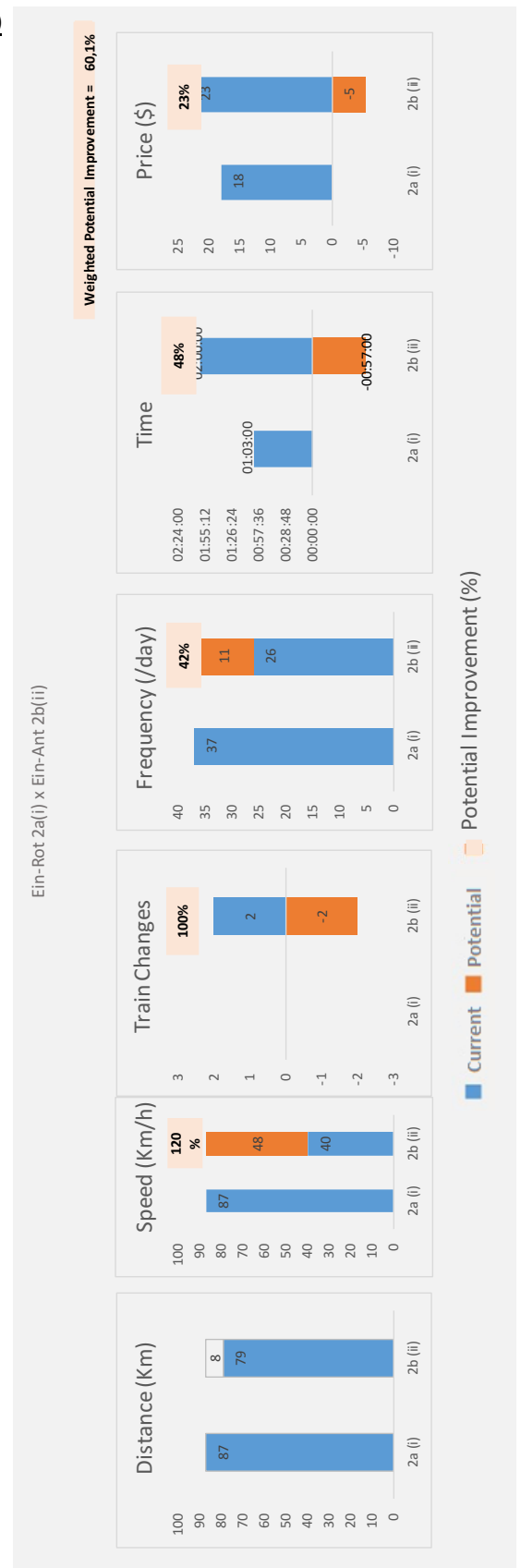


Table 9 – Developed by the author

Another comparison taken considered in this research is between the national **Eindhoven ↔ Rotterdam (3a)** train travel and the cross-border link between the Netherlands and Germany, **Eindhoven ↔ Duisburg (3b)**. Both routes have the same distance, however they have very different characteristics in terms of service. For the international connection (3b), one or two train changes are needed, while the national does not require any type of train change. Part of the international service is done by Deutsche Bahn – German national train company, and part by the Dutch national, NS. Also, the train frequency in the cross-border /international service is different from the national link, which has less than half of trains per day than the latter. Regarding the price, the route to Duisburg can be up to 94% more expensive (when the passenger changes train once) or 28% more expensive (when the passenger changes trains twice).

The cross-border connection that has a single train change, is not attractive due to its high prices for daily uses and long waiting time, either for the second train or also a longer travel time. The other international service, with more frequent trains and less expensive prices still lacks in frequency and has a couple of train changes. The options offered for the international route are not compatible with a commuting route and do not encourage the displacement between Eindhoven and Duisburg. The fact of having different companies of different nationalities operating the route can be an issue when trying to improve this connection. The international route Eindhoven – Duisburg has 77,5% of W.P.I. (Table 10)

Eindhoven – Rotterdam 3a(i) x Eindhoven – Duisburg 3b(ii)

3a (i) x 3b (ii)		
	Frequency (/day)	Potential Improvement (%)
3a (i)	37	
3b (ii)	17	118%

3a (i) x 3b (ii)		
	Time (ii)	Potential Improvement (%)
3a (i)	01:03:00	
3b (ii)	01:42:00	38%

3a (i) x 3b (ii)		
	Price (i)	Potential Improvement (%)
3a (i)	18,0	
3b (ii)	23,0	-5

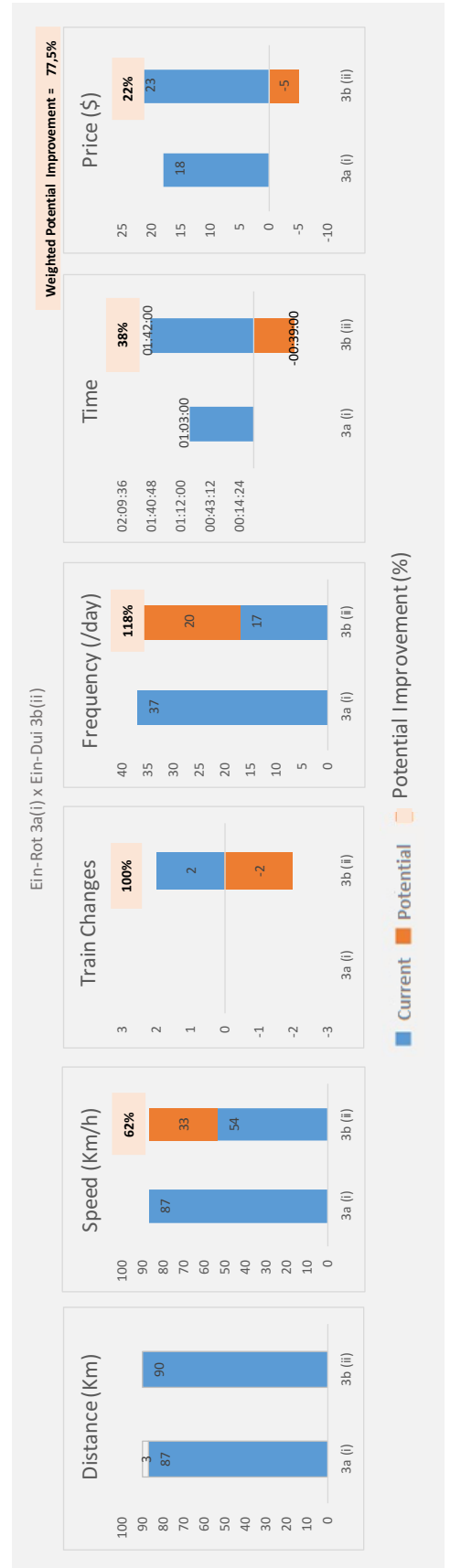
3a (i) x 3b (ii)		
	Distance (km)	Potential Improvement (%)
3a (i)	87	
3b (ii)	90	3

3a (i) x 3b (ii)		
	Speed (km/h) - calculated by the researcher	Potential Improvement (%)
3a (i)	87	
3b (ii)	54	33

3a (i) x 3b (ii)		
	Train Changes (i)	Potential Improvement (%)
3a (i)	0	
3b (ii)	2	-2

Dif.		
	Weighted Potential Improvement	Potential Improvement (%)
3a (i)		
3b (ii)		77,5%

Table 10 – Developed by the author



Also regarding the German border side, the Dutch national link **Arnhem ↔ Rotterdam (4a)** is compared to the cross-border connection **Arnhem ↔ Duisburg (4b)**. The international route (4b) between the Netherlands and Germany is shorter when compared to the national one. It is possible to observe some type of interest and action in developing this connection with a new service provider – Abellio – and no train changes during the route, while in the national connection (4a) train change is needed. Although, for a commuting route, the train service is not very frequent, being 4 times less frequent than the connection Arnhem to Rotterdam. The international connection to Duisburg (4b) has a good option, the fast ICE service, that takes less than an hour ride, and the price is more accessible for a daily/weekly ride, nevertheless the trains are not frequent enough on an 8 times/day schedule, which is not consistent with a commuter route. The other new international option for the route (4b) is more frequent, however it takes 30 minutes more than the first international option, still the same travel time as the national connection (4a).

It is important to mention the story of the company to better understand the current situation. Abellio was first established by the NS in 2002 with the name of NedRailways, to take advantage of European legislation with the opening of the railway market. Seven years later the company was purchased by Abellio Deutschland and changed the company name to Abellio. Its history allowed the expansion of a beneficial relationship between Abellio and NS, that today collaborate on a Pan-European scale. The improvement of the connection Arnhem – Duisburg happened just recently. This service that, on its entirety, connects Arnhem Central to Dusseldorf airport, started on the summer of 2017 and complements the fast ICE service, for which reservation is required. While the ICE service rides once every two hours and only stops on large stations, this new service stops also on smaller stations and does not require pre-reservation. This connection seems to have had some development in terms of turning it into a commuting line, although it needs further improvement to facilitate the users' experience. The train frequency needs to increase to allow passenger more flexibility and become an attractive option for commuters instead of using other transportation types as well as to increase the number of commuters. The international route Arnhem – Duisburg has 113% of W.P.I. (Table 11)

Arnhem – Rotterdam 4a(i) x Arnhem – Duisburg 4b(i)

4a (i) x 4b (i)		4a (i) x 4b (i)	
Frequency (/day)	Dif.	Potential Improvement (%)	
69			
17	52	306%	
4a (i)			
4b (i)			

4a (i) x 4b (i)		4a (i) x 4b (i)	
Time (ii)	Dif.	Potential Improvement (%)	
01:24:00			
01:31:00	-00:07:00	8%	
4a (i)			
4b (i)			

4a (i) x 4b (i)		4a (i) x 4b (i)	
Price (i)	Dif.	Potential Improvement (%)	
18,7			
28,6	-9,9	35%	
4a (i)			
4b (i)			

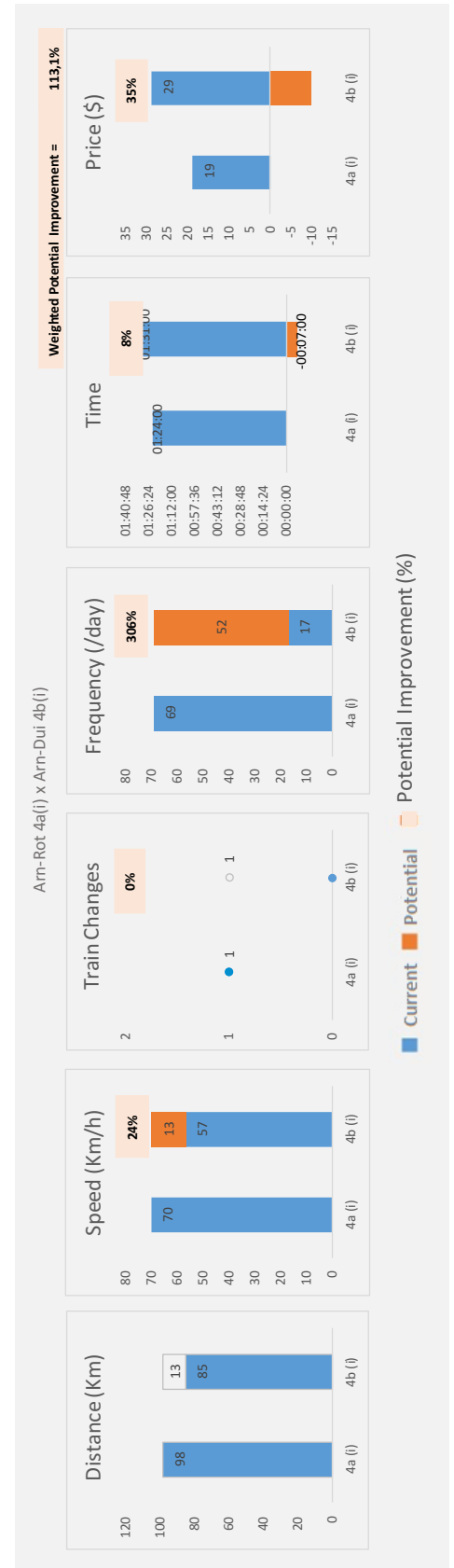
4a (i) x 4b (i)		4a (i) x 4b (i)	
Distance (km)	Dif.	Potential Improvement (%)	
98			
85	13		
4a (i)			
4b (i)			

4a (i) x 4b (i)		4a (i) x 4b (i)	
Speed (km/h) - calculated by the researcher	Dif.	Potential Improvement (%)	
70			
57	13	24%	
4a (i)			
4b (i)			

4a (i) x 4b (i)		4a (i) x 4b (i)	
Train Changes (i)	Dif.	Potential Improvement (%)	
1			
0	1	0%	
4a (i)			
4b (i)			

4a (i) x 4b (i)		4a (i) x 4b (i)	
Weighted Potential Improvement	Dif.	Potential Improvement (%)	
		113,1%	
4a (i)			
4b (i)			

Table 11 – Developed by the author



The same international route **Arnhem ↔ Duisburg (5b)** is also compared to another national route **Arnhem ↔ Amsterdam (5a)**. Considering the link Arnhem – Amsterdam has a service option that runs 35 times a day, the Abellio service falls short providing only half of this number. The difference in frequency in this comparison is not significant as the one between the Arnhem – Rotterdam, which in the end gives the connection Arnhem – Duisburg a W.P.I. of 50,5%. As mentioned before, the lowest potentials are being considered for each route. (Table 12)

Arnhem – Amsterdam 5a(ii) x Arnhem – Duisburg 5b(i)

5a (ii) x 5b (i)			5a (ii) x 5b (i)		
Distance (km)	Dif.	Potential Improvement (%)	Frequency (/day)	Dif.	Potential Improvement (%)
5a (ii) 77	8		35	18	106%
5b (i) 85			17		

5a (ii) x 5b (i)			5a (ii) x 5b (i)		
Speed (km/h) - calculated by the researcher	Dif.	Potential Improvement (%)	Time (ii)	Dif.	Potential Improvement (%)
5a (ii) 70			01:04:00		
5b (i) 57	13	24%	01:31:00	-00:27:00	30%

5a (ii) x 5b (i)			5a (ii) x 5b (i)		
Train Changes (i)	Dif.	Potential Improvement (%)	Price (i)	Dif.	Potential Improvement (%)
5a (ii) 0	0	0%	16,6		
5b (i) 0	0		28,6	-12	42%

5a (ii) x 5b (i)		
Weighted Potential Improvement	Dif.	Potential Improvement (%)
		50,5%

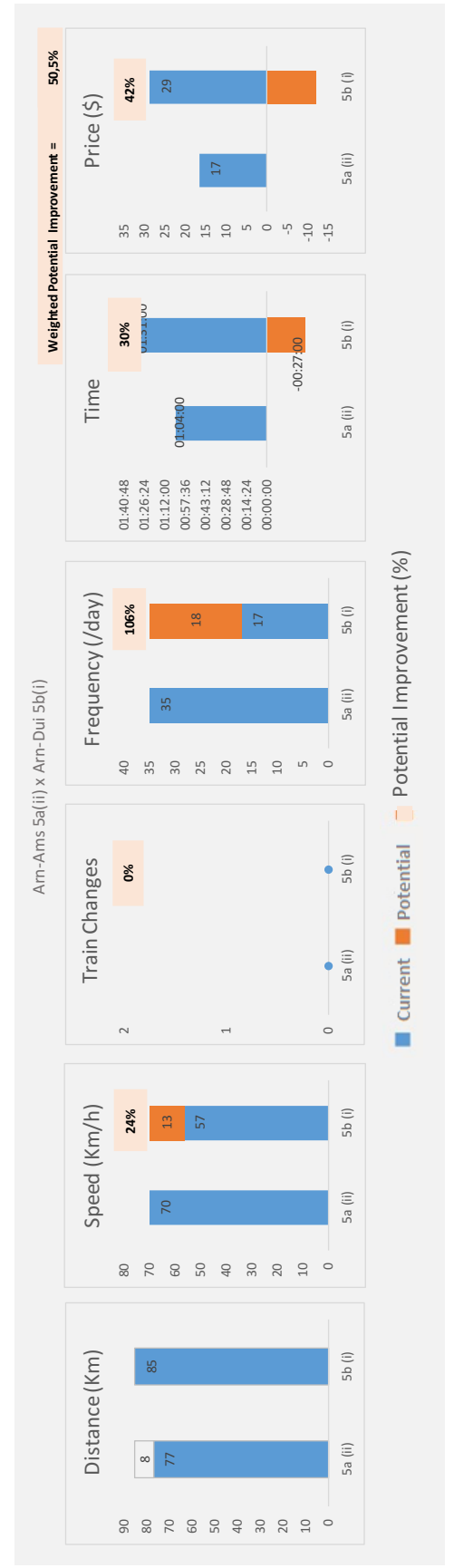


Table 12 – Developed by the author

4.1.B Economic relations within the Eurodelta

The interviews confirm the importance of the area due to its high concentration of population, market, companies, universities, knowledge, with a strong agglomeration power and a relevant matching economic profile that present similar challenges. The advantage is that the cities are extremely close to each other and could be easily accessible with daily trips, if there were better links. During the interviews, the importance of this area was sometimes compared to other big agglomerations around the world like London, Paris, some areas in Asia or North America, and it is believed to be an important European central point in a Brexit context.

On map 2 from Deltametropolis Association, it is possible to observe large number of international commuters who crosses borders to work within Belgium, Netherlands and Germany. The biggest share commute to areas right at the borders, although in the Belgian case, cities like Antwerp, Brussels and Gent still receives a considerable number of Dutch commuters. On the other direction, Rotterdam and Eindhoven are significant magnets of Belgium employees, even though not located on the borders. Looking at the German-Dutch commute, Dusseldorf and Duisburg attract quite a few number of Dutch workers and Rotterdam, Eindhoven and Arnhem-Nijmegen on the other way around. In the current context, the Dutch ministry of economic affairs is seeking to develop the international working conditions between these countries, such as diplomas, internship places, entrepreneurship and employment mediation.

The issue of economic competitiveness between cities becomes very pertinent in this context. In line with the argument described before by Heinz & Ward-Warmedinger (2006), it is beneficial not only for the EU as a whole but also for the receiving and sending countries in the Eurodelta to stimulate cross-border commuting, which allows a more efficient combination of workers and labor market. Considering the areas contemplated on this research, Antwerp and Brussels receive a larger number of Dutch employees then Duisburg and Dusseldorf. Meanwhile, from a Dutch labor market perspective, the number of commuters from Belgium and Germany seem to be quite similar, including in Rotterdam when considered by itself. Looking at Eindhoven alone, the city receives more commuters from Belgium then from Germany, probably due to its proximity with the country, in the same way as Arnhem's number coming from Germany is bigger than from Belgium.

Page for Map 2 – Cross-Border Commuters

Regarding knowledge economy, it is important to observe on the map 3 the amount of highly educated dwellers per municipality. Spatial labor mobility is influenced by cross-border commuting and depends on socio-economic features and personal circumstances. It also, depends on “institutional framework shaped by the labor market, social insurance, and tax laws of the jurisdictions involved” (Gottholmseder and Theurl, 2007, p. 97). Stimulating the cross-border commuting inside the area supports its international competitiveness and helps national labor markets to adjust. It is a lot more beneficial for the Eurodelta area if one of its neighboring countries absorb talented individuals instead of them choosing a job position somewhere else. Unfortunately, on the map 3 analyzed there is no data about highly educated dwellers on the German side, but in general, it is possible to observe a great amount of those individuals living nearby big universities.

If on one hand the areas of Eindhoven, Rotterdam (metropolitan area) and Arnhem present a relevant amount of highly educated dwellers, on the other hand the area around Antwerp shows a significant number of them, a lot more than the Dutch cities. The latter also constrains an important number of universities. Even though there is no data about from the German side, it is possible to observe a pertinent number of Universities in the area. These conclusions might not help determine which connection is more relevant for development due to the missing information of the German side, and also present similar university realities on both sides. However, it shows that strong passenger's connections are extremely meaningful for the area as a whole. The aforementioned Dutch Action Team *Grensoverschrijdende Economie en Arbeid* (cross border economy and labor) is concentrating on professionals, entrepreneurs and students and is already working in collaboration with different levels of government of the different areas.

Map 4 shows that Duisburg and Antwerp have a high density of employed population per hectare, but the Duisburg area has a superior extension, spreading continuously to the east until Dortmund. Eindhoven has a more considerable number than Arnhem, while Rotterdam is the most important of the three with an extensive area around the city. The German side presents an important labor market, employing an average of 20-25 individuals per hectare in an extension more than two times the size of Antwerp. The same can be seen on the west side of the Netherlands with relevant employed population per hectare in the metropolitan region of Rotterdam-The Hague.

Page for Map 3 – Highly educated dwellers per municipality

Page for Map 4 – Density of Employed population

According to Thissen *et al* (2013), “smart specialization” is not a strategy of developing an extremely specialized region, but rather a strategy of strengthening links within the region and between the regions that relate to each other. That means, connecting regions with large potential for scale effects, assist on diversifying the regions and creating links to become high competitive networks. “A well-designed specialization policy should take into account regional interactions and regional complementarities” (Thissen *et al*, 2013, p.14). Thereby, the already polycentric Eurodelta structure can “borrow size” from each and benefit from learning-sharing-matching opportunities.

The regional competitiveness within the Eurodelta can help understand the current economic situation and which area could better benefit from each other. The locational characteristics of the competing regions can indicate opportunities for improvements. “The distinguished locational factors (...) are supposed to affect a regions’ competitiveness and form the basis of a number of policies aimed at attracting and retaining mobile resources, such as physical and human capital” (Regional Exports/Imports, 2017). The locational factors considered in this PBL research are believed to “create an optimal environment for business to flourish, increase the level of amenities the region offers, and the creation or fostering of clusters such as incentives for firms to group together and collaborations with local universities” (Regional Exports/Imports, 2017).

The used indicators (locational factors) are:

- **Public knowledge:** indicator composed of
 1. the amount of public R&D
 2. the rank of universities in the region.
- **Private knowledge:** indicator composed of
 1. the amount of business R&D
 2. the number of patents per inhabitant in the region.
- **Agglomeration size:** indicator composed of
 1. the size of the population
 2. the share of the active population

3. the population density in the region.

- **Connectivity by road and rail:** measures the number of people which can be reached by road and rail from a region weighted by the travel time of reaching those people.
- **Connectivity by air:** measures the number of people which can be reached by air from a region weighted by the travel time of reaching those people.
- **Connectivity internet:** percentage of companies in the region having access to broadband internet.
- **Performance labor market:** indicator composed of
 1. the percentage employed people > 55 years
 2. percentage employed women
 3. the unemployment rate
 4. the long-term unemployment rate in the region.
- **Foreign owned companies:** the share of foreign owned companies in the total number of companies in the region.
- **Concentration of a sector:** the ratio of the share of this sector in the region as a share of this sector in Europe (location quotient).
- **Cluster orientation of a sector:** the degree to which supply relationships in the agriculture sector exist within the region.
- **Network orientation of a sector:** the degree to which supply relationships in the agriculture sector in a region exist with other regions.
- **Labor productivity:** output per unit of labor.

The competitiveness score - table 13 (page 79) shows the importance and score of the locational factors for each area. The blue shades show how important the indicator is for the area's competitors and the yellow shades represents how this area performs in this topic. For example, on the table it is possible to observe that *public knowledge* has a high importance for

the Dusseldorf competitors. However, Dusseldorf has a low score on the topic, which means that it underperforms in the sector compared to its competitors. The table shows where the regions could invest for improving their position in relation to their competitors. In the example given, it would be interesting for policies in the Dusseldorf area to focus on developing the public knowledge and become more competitive in this topic.

Table 13 - Developed by the author
Data from Year 2010

	Score	Value	Importance	Value
High		1,240-3,000		1-2
		1,100-1,239		3-4
Average		0,950-1,099		5-6
		0,600-0,949		7-8
Low		0,000-0,599		9-10

	Public knowledge ¹	Private Knowledge ²	Agglomeration size ³	Connectivity by rail and road ⁴	Connectivity by air ⁵	Connectivity internet ⁶	Foreign owned companies ⁹	Concentration of financial and business services ¹⁰	Concentration of high tech manufacturing ¹⁴	Cluster orientation financial and business services ¹⁵	Network orientation financial and business services ¹⁶
Antwerp	Score Importance	1,111 6	0,542 3	1,219 9	1,12 8		0,19 1	0,575 4	0,43 5	0,653 10	0,913 7
Dusseldorf	Score Importance	0,387 2	0,652 1	1,25 7	1,174 6	0,958 8	1,284 3	0,752 4	0,961 10	1,146 9	0,653 5
Gelderland	Score Importance	1,324 8	0,357 1	0,873 6	0,752 7	1,582 9	0,554 4	0,745 5	0,537 10		0,706 3
South-Holland	Score Importance	1,306 10	0,478 1	1,099 6	1,071 5	1,375 8	0,678 3	0,478 1		0,561 9	1,007 7
North-Brabant	Score Importance	1,155 6	0,672 3	1,03 8	0,893 7	1,367 9	0,494 1	0,619 4		0,655 10	0,681 5

¹ Public Knowledge: indicator composed of the amount of public R&D and the rank of universities in the region.

² Private knowledge: indicator composed of the amount of business R&D and the number of patents per inhabitant in the region.

³ Agglomeration size: indicator composed of the size of the population, the share of the active population and the population density in the region.

⁴ Connectivity by road and rail: measures the number of people which can be reached by road and rail from a region weighted by the travel time of reaching those people.

⁵ Connectivity by air: measures the number of people which can be reached by air from a region weighted by the travel time of reaching those people.

⁶ Connectivity internet: percentage of companies in the region having access to broadband internet.

⁷ Performance labor market: indicator composed of the percentage employed people > 55 years percentage employed women the unemployment rate the long-term employment rate in the region.

⁸ Labor productivity: output per unit of labor.

⁹ Foreign owned companies: the share of foreign owned companies in the total number of companies in the region.

¹⁰ Concentration of a sector: the ratio of the share of this sector in the region as a share of this sector in Europe (location quotient).

¹⁵ Cluster orientation of a sector: the degree to which supply relationships in the agriculture sector exist within the region.

¹⁶ Network orientation of a sector: the degree to which supply relationships in the agriculture sector in a region exist with other regions.

Source: <http://themasites.pbl.nl/eu-trade/index2.html?vis=chord>
PBL Netherlands Environmental Assessment Agency

When using results obtained from the EU regional competitiveness scoreboard please refer to: M.J.P.M. Thissen and C. Giannelis (2014), EU regional competitiveness scoreboard, <http://s3platform.jrc.ec.europa.eu/eu-competitiveness-scoreboard> and <http://www.pbl.nl/eu-competitiveness-scoreboard>, European Commission, Joint Research Centre, Institute for Prospective Technological Studies and the PBL Netherlands Environmental Assessment Agency.

The competitiveness score table was completed with selected data from the whole PBL research (see Thissen and Gianelle, 2014) that utilizes information from the NUTS2 level. The data from the cities studied in this research refer to their respective NUTS2 region provided by the PBL research. To clarify the rational of the data, the NUTS2 regions and their respective cities are pointed out below:

NUTS 2 region	Respective City (studied on this research)
Antwerp	Antwerp
Dusseldorf	Duisburg
Gelderland	Arnhem
South-Holland	Rotterdam
North-Brabant	Eindhoven

Source: Developed by the author

All the considered regions on this research: Antwerp, Dusseldorf, Gelderland, South-Holland and North-Brabant have high importance value on the *public knowledge* sector. That means *public knowledge* is very relevant for their competitors. However, Antwerp and Dusseldorf (specially) are underperforming, indicated by their low score of this indicator, while the Dutch regions present a higher performance. Attention should be given to those with high importance and low performance scores, which can be improved by strengthening the collaboration between the different regions. For example, the *foreign owned companies* factor goes the other way around: Dusseldorf has a very high-performance value and North-Brabant is lacking behind, even though this is more important for North-Brabant than for Dusseldorf. In this case, a vital collaboration could be done between the two regions, where Dusseldorf helps North-Brabant in the *foreign owned companies* indicator and in return, North-Brabant assists Dusseldorf on *public knowledge*.

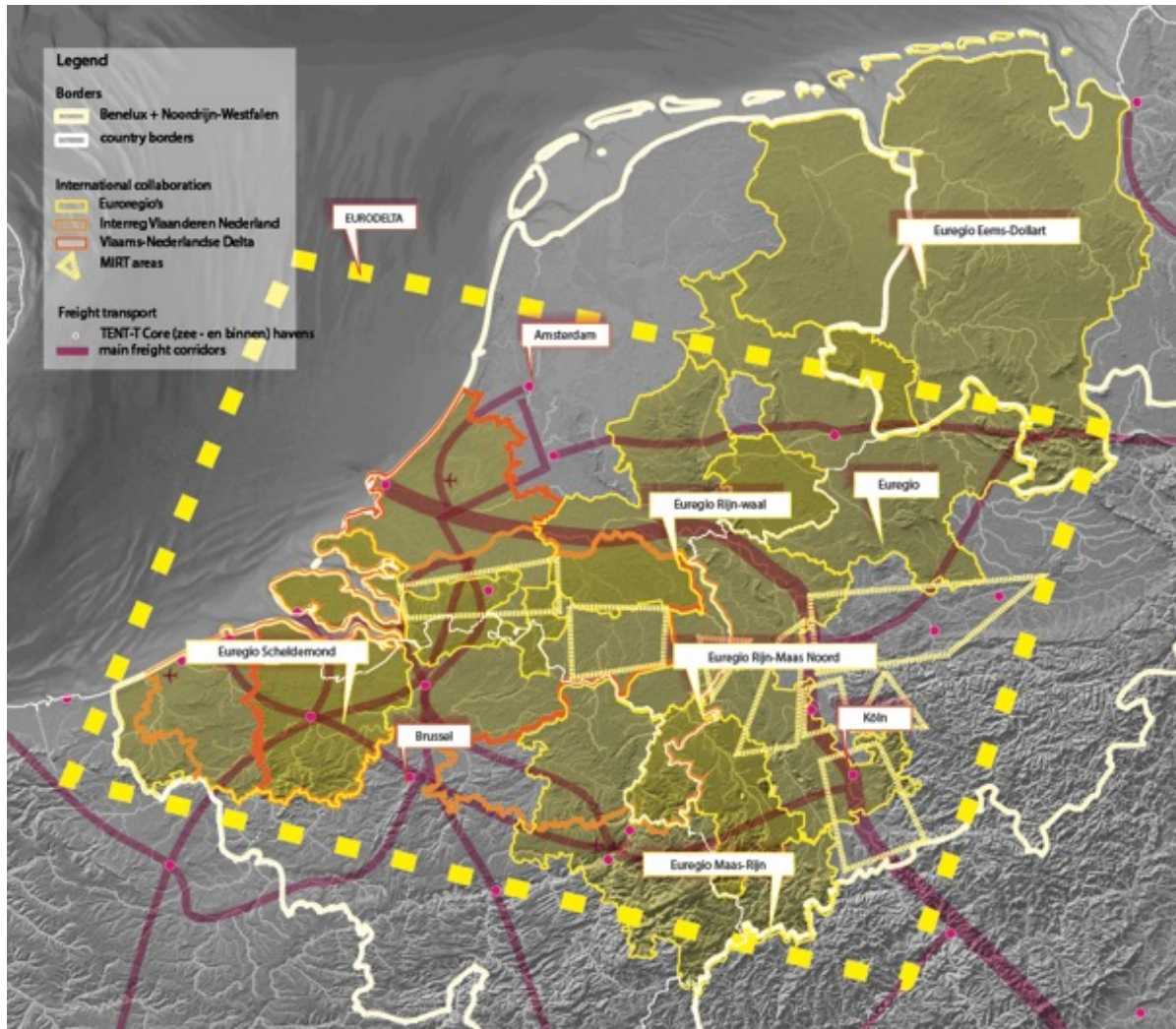
Another situation where there is also opportunity for collaboration is when more than one region needs to develop the same indicator. The regions of South-Holland, Gelderland and Dusseldorf have extremely high importance on their agglomeration size – considering their population number, share of active population and density. However, their score on this

locational factor is quite low. Investments could be done in collaborations between those regions to better improve their agglomeration size score as a whole. They would also be “borrowing size” from each other, creating a big cluster. Their trade relatedness would change from competition to cooperation.

North-Brabant and Antwerp have the *foreign owned companies*’ topic as a common interest with the highest value for importance, although both present insufficient performance. In this case, there is also an opportunity for collaboration between these regions in terms of achieving an economic development together in this subject, borrowing size from each other. And finally, South-Holland might have special interests in the *concentration of financial and business services* from Dusseldorf, that exceeds its value in score value however falls behind in importance.

4.1.C Cross-border collaboration

Lately, several cross border cooperation projects have been created, specifically in northwest Europe. However, there is a lack of information about these projects, which are not frequently communicated. For a brief overview about some of the cross border collaborations, see Map 5 – Euroregions.



Map 5 – Euroregions Source: Deltametropolis Association, Archive

As mentioned before, the rationale of Perkmann (2003) expresses the EU influence, as a facilitator, in cross border cooperation projects. The INTERREG program, for example, gives financial support for cross border cooperation initiatives which automatically make them comply with rules fixed by the EU. There are currently many existing cross border collaborations and projects within the Eurodelta, which can be identified as the *denationalization of the state* from Santos (2002): when both the new and old functional and territorial capacities of the state are being reorganized at sub-national and supra-national levels.

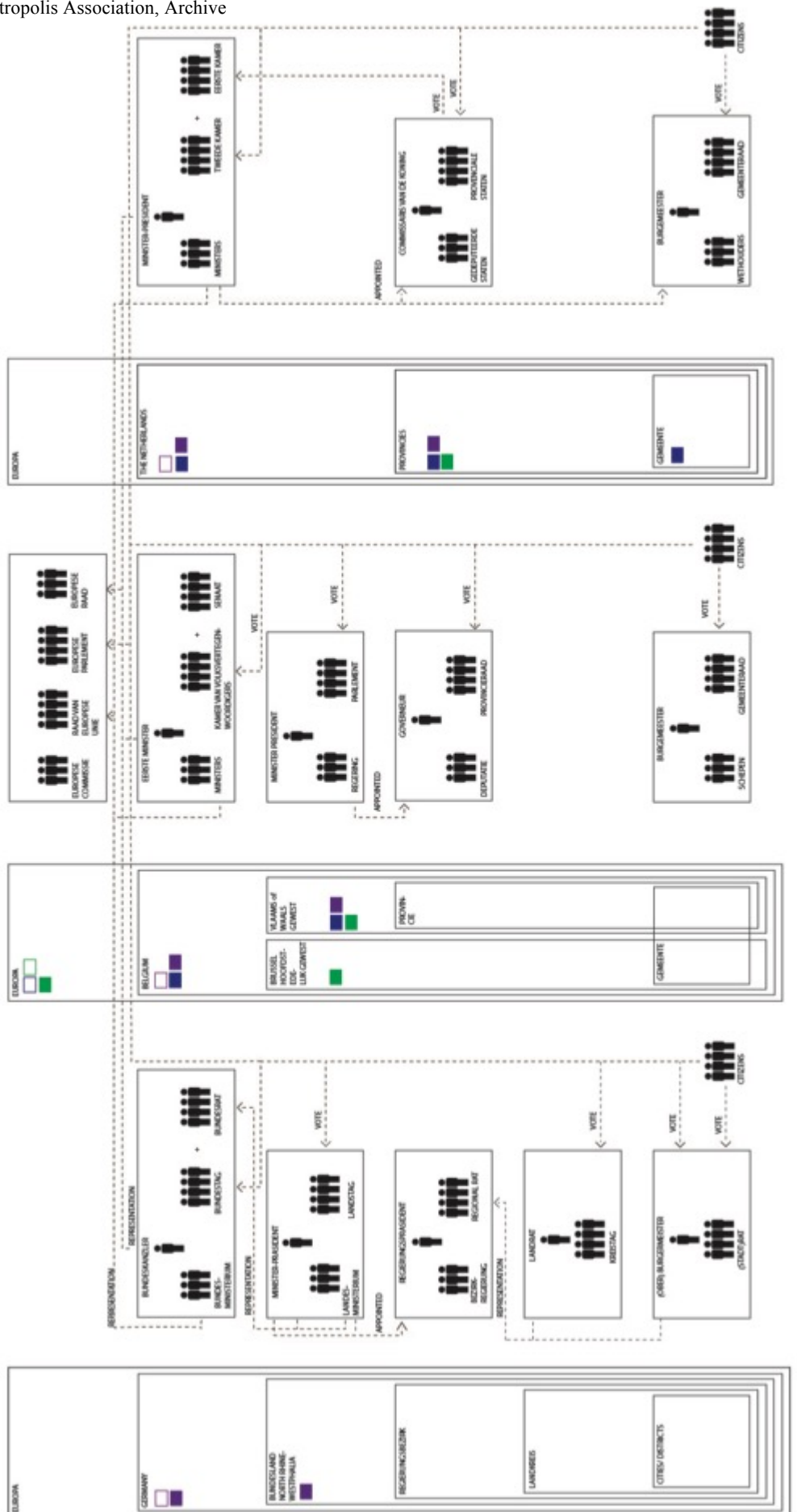
Eures, for example, is a cooperation network that assists the free movement of workers within the EU, also in the cross-border commuting process. The cross-border partnership EURES Scheldemond involves a collaboration between the provinces of Antwerp and Noord-Brabant and the provinces of Zeeland, East and West Flanders. Also, part of this area is covered by the Vlaanderen-Nederland Interreg V-A program, which tackles joint challenges and

opportunities. This program, besides other themes, works on developing the functioning of the cross-border labor market. Its priorities are on research and innovation, employment and labor market, besides a few others.

Another collaboration is the Euregio Rhein – Waal, located on the Dutch-German border. It covers a large part of the Province of Gelderland, including Arnhem-Nijmegen region, West Veluwe, Southwest Gelderland, parts of Northeast Brabant, and the northern part of the Province of Limburg. On the German side it counts with the District of Kleve, Wesel and the cities of Duisburg and Dusseldorf. Its main goals are to foster European integration and remove the national borders. This collaboration works at a municipal level and through strategic cooperation with institutions and governments. It deals with different themes, including cross-border economy and labor market. Still on the Dutch-German side, the Interreg V-A program Deutschland – Nederland covers the area of Eindhoven and Duisburg and works on intensifying cross-border links and interactions, focused on the thematic priorities of technical assistance, research and innovation, better public administration and low-carbon economy.

When looking at the governance side, it is important to notice how the Netherlands, Belgium and Germany work on different levels of governance. To get into agreements and joint funding for common interests, this should be taken into consideration. On Figure 2 (next page), it is possible to observe how the different levels of government relate to each other and what their government responsibilities are. The spatial planning in the Dutch unitary decentralized state is mainly realized by the national government. Although many areas of responsibility are shared between the national and subnational governments, the heads of provincial and municipal governments are appointed by the central government.

Figure 2 – Source: Deltametropolis Association, Archive



Despite vital similarities and associations between the Eurodelta regions, the interviews confirm that a coordination between these regions and countries is very complex. First because the national transportation plans are much stronger and more important for the countries themselves. According to Bas Govers, who is working on a strategic development plan for the Dutch railway, the attention was always much stronger on the national links and the international, trans-national ones were treated separately. “So, we joined forces and invited people to rethink a new national plan for the railways in which the Eurodelta links would be much more integrated” (Govers, 2017). His goal is to help both plans to be developed in coordination, since he addresses that the new national rail plan lacks attention in the Eurodelta lines. Second because of the differences in the transportation planning systems within the different countries.

“But what you see in the North Rhine-Westphalia is that they agree with the Netherlands, they say: we also need better connections. But they have to deal with Berlin, and Berlin makes the planning for all of the national infrastructure. It is called the Bundesverkehrswegeplan and it is very static and very political, also in the power structure of Germany” (Thoele, 2017).

“Because you have to know (...) who is talking to who. Not only different planning traditions but also different governance in each country. So, indeed we mainly deal with North Rhine-Westphalia and Flanders. But in Germany (...) the intercity links are with the national government, and the interregional links (...) with the North Rhine-Westphalia government. So it is hard to (find out) to which party you should be, and possible, in Belgium is even harder. (...) the Flanders region is not always clear which are the parties you should deal (with)” (Govers, 2017).

Additionally, the political issue was a unanimous topic in the interviews. They believe that the political will is very important for the development of the connections. “There are a lot of people who study these cases and says that this is very important. We can show it with data, but there is no political will to do something. Also because of the Fyra, nobody wants to be seen with trains, no politician” (Gerretsen, 2017). The Fyra trains were expected to connect Amsterdam, Rotterdam, Antwerp and Brussels at 250 km/h, but due to a sequence of failures, the service was canceled. This disaster cost the Dutch state eleven billion Euros (The Fyra high-speed train debacle, 2015). The interviewees opinion about the reason why this case has failed is diverse, although some may think this shows that the open market idea (abovementioned during this research) does not work in practice as in theory. The national companies are still monopolistic in their own countries and quite protected by their governments, that control the infrastructure and tenders to service providers. Their national train companies encompass a lot

of money for the country and is responsible for the employment of numerous national workforces.

One problem mentioned, regarding the lack of political will, is that railway plan is very much driven by capacity and demand. Although, it is a common belief that it is necessary to provide a good train service in order to create demand for it. “The service is so low that people don’t consider it an alternative and once it is there, it becomes such a normal, established route. (...) “if the service is not there, or not good enough, then people don’t take it” (Gerretsen, 2017). “(...) there is no evidence now that people are travelling a lot in this area. So “they” think it is very low and we don’t need the train. So this kind of thinking (...) will never lead to scale up the system, which you would actually want if you think of 40 million people in a very small area” (Thoele, 2017). Therefore, Bas Govers, in his strategic development plan is working on assisting the national plan to address the rails from a spatial economic perspective, which according to him can better assist the countries out of the crisis to a superior economic performance.

“(...) when better connections are installed, you see a region is going to focus on their strong holds, which they are better than the one they are connected to. So, instead of offering the same, you are going to specialize more, and you are going to take profit from the other one in this specialization and in the international economical field, specialization is a very strong point. So you will have larger markets, more clients, that can build your product, that can come to your events, universities. So, when the connections are good, chances that the right persons are going to fill the right jobs are going to improve” (Govers, 2017).

In this context (and also connected to the “economic relations” aspect), Helmut Thoele states that the development of the link with South Holland-Eindhoven and the Rhine Ruhr area is very important because they have a matching economic profile, especially with the technically oriented regions along the Rhine. “We have a lot in common with economic activities along the Rhine, so a lot of high tech, chemistry, smart industry, logistics...” (Thoele, 2017). However, Dutch regions compete with each other for developing this link with the Rhine Ruhr and other links. They want their connection to be developed instead of their neighbor’s. Thoele believes that it is difficult for the regions to see each other as part of one system, because they are seeking their own interests. It is also a problem when requesting finance for projects, because they are all competing for a national funding.

The financing of the projects was a relevant matter discussed during the interviews. There are two concerns related to national financing: on a regional scale – the national assets

are disputed between the regions, and on an international scale – the national governments have issues in paying the project’s costs in the other country. “The Dutch were (in favor) of the link via Breda, and the Belgians for the link via Rosendaal. But the only reason was that the link via Rosendaal was running less distance on Belgium soil, so it would be cheaper for them. So, even with a project like that it was a difficult discussion. Are we ready to pay for a project in Germany to have a train running?” (Govers, 2017).

When it comes to European financing, programs like the TEN-T and Interreg, the respondents do not show high expectations. They all believe that receiving subsidy from the EU is very difficult and it takes a lot of time because there are many other areas for the EU to look at, so most of the time, this is not considered as a solution. “So, it is very difficult to reallocate instruments and money, because the last 20 years, the EU was a lot about creating equal circumstances everywhere and to do something about this direct cross-border regions (...). But it is just very rough and not specific as we want to go (...)” (Thoele, 2017).

The interviewees agree that a better collaboration between the regions is needed to overcome these issues. There is a movement already on this direction. All the respondents revealed they are currently working on improving this collaboration in their jobs. Either connecting different national layers of government, different actors from the field or also governments from international regions. The reuse of already existing Institutions, old collaborations like the Benelux or the Flemish-Dutch delta is raised as an opportunity for its development. “(...) like the Flemish-Dutch delta or the Benelux which are in my opinion at the moment on standby. (...) so you have all of this organizations but they don't do a lot of content anymore. (...) they are not fed enough with content-based discussions” (Thoele, 2017).

4.2 Discussion

It is important to raise awareness for what Gutiérrez (2011) states: cross-border projects are responsible for great integration effects, and deciding upon a major cross-border transport infrastructure corridor can be very important. This is because it potentially benefits not only areas that contains the infrastructure, but also other substantial areas in a spillover effect. Considering the results above, it is possible to observe several variables that might influence the train links’ improvement. The outcomes show some recurrent results that can point out solutions to the main purpose of this research – identify which Eurodelta passenger railway

cross-border connection has the greatest potential for immediate improvement from a spatial planning perspective.

The outcome from the “connectivity efficiency” aspect clarifies sub-question (a): *How efficient are the Eurodelta passenger railway cross-border connections when compared to Dutch national ones?* The result for the potential of improvement of the cross-border links confirms that there is a big difference between the Eurodelta connections and the Dutch national ones. All of the cross-border services studied proved to be less efficient than the Dutch nationals. The final result of potential of improvement is:

- 1- **Eindhoven – Duisburg: 77,5%**
- 2- Eindhoven – Antwerp: 60,1%
- 3- Arnhem – Duisburg: 50,5%
- 4- Rotterdam – Antwerp: 8,9%

There is a big potential of improvement for the connection service from Eindhoven-Duisburg with a result of 77,5%. In second place comes the connection Eindhoven-Antwerp with 60,1%. On the same argumentation line as stated by Donners (2016), it seems that the open market goal – infrastructure managers providing services for every operating company – does not happen in practice. In accordance with Marshall (2012) and Donners (2016), it is noticeable state-run railway tracks where the train service market is not actually opened in the passengers’ sector. In a context of open market for railways, one would expect to have many different companies of different nationalities offering the train services. However, the train operators are mainly the same and controlled by the national level. Even in this environment, it is possible to find some initiative and willingness to improve railway connections inside the Eurodelta, as demonstrated through the interviews. All the interviews conveyed a message that there is still a lot of potential to be reached.

The result of the “economic relations” aspect gives indications to sub-question (b): *What are the existing economic relations within the Eurodelta?* There is a strong potential for an important collaboration between North-Brabant and Dusseldorf, which can be considered as a rich environment for improving the Eindhoven-Duisburg link. Likewise, the link Arnhem-Duisburg finds a fertile ground for development as Gelderland and Dusseldorf have a strong opportunity for collaboration on the same economic indicator. Moreover, the train connection Eindhoven-Antwerp has a relevant background for improvement on top of the North Brabant

and Antwerp economic correspondences. It is possible to foresee opportunities for borrowing size between these above mentioned regions with further collaborations and improvement of their railway connections.

Sub-question (c): *How is the transportation planning coordinated between the different territories?* is elucidated by the outcome of the assessment of the third aspect – the “cross-border collaboration” aspect. It presents existing collaborations between the provinces of North Brabant and Antwerp, which could improve the train route Eindhoven-Antwerp from a commuting perspective, since it already involves different governments and stakeholders and have a similar agenda. The improvement of the link between Arnhem-Duisburg could also build up on the Euregion Rhein-Waal, and use collaboration as a facilitator for its development. Furthermore, the link Eindhoven-Duisburg could likewise benefit from the established Interreg V-A program.

Taking in consideration all the results of the three aspects, one finds the answer to the main research question: the link between Eindhoven and Duisburg presents itself as having the strongest potential for improvement when compared to the others. The link Eindhoven and Antwerp also shows a promising potential that can be considered as pertinent for this study.

Besides the complex scenario for upgrading transnational train services, as suggested by the interviews, the mayor of Eindhoven has expressed interest in better connecting Eindhoven to Dusseldorf/Duisburg. Paul Gerretsen, during the interview, argued there is need of someone to stand up and decide to improve it. The studies and directions are already presented, so it is missing someone or a group to take responsibility over the planning of the project. Other projects like the “hondkop” – an intercity service to the Benelux – have worked like this before. For Gerretsen, this person can be a politician or either an important actor from the field. The problem raised by him is that the powers of the mayor are very limited in the Netherlands, specially in a smaller city like Eindhoven, which has a limited budget for such type of project. A lot of issues like this have been found as an inconveniency for collaborations and train services progress. Thus, an imperative question takes place: How this collaboration could be further improved?

Gerretsen (interview, 2017) believes that a collaboration agreement between Eindhoven and the Rhine Ruhr area would make things easier. All of the interviewees consider that there is no need for creation of a new layer of governance, what is needed is a better collaboration. A deeper understanding of the regions’ role inside the whole system can create opportunities

for cooperation and bring out the agglomeration and borrowed size benefits. It requires a change in perspectives – from competitor to partner – and the partnership becomes stronger when other interested stakeholders are added, making the project more coherent and increasing its supporters. It is important to have an arena where actors meet and have the opportunity to understand what is being done outside their borders and outside their fields of work. There are already existing organizations that work on creating this arena, such as the Deltametropolis Association.

When there is no political motivation to develop the train connection, as stated during the interviews, a solution would be to show the area's importance from an economic perspective. If there is space to discuss and involve all the actors, it is possible to confirm and expose the continental economic importance of the area. The region's economic strength leads to political attractiveness. Thus, organizing the economic power first and subsequently the political access, can also be a way out for those collaboration issues and facilitate the improvement of the cross-border train services.

Strengthening the collaboration between regions can similarly assist on issues regarding the projects' financing. The investment in the railway service and infrastructure is most frequently done by national governments, which is likewise contested by other national regions and programs. A robust organization and collaboration might help in acquiring the necessary budget, especially when spatial-economic structures are taken into consideration. Besides the national level, this can reflect on the European level. With a greater bargain power, the project is more capable of being part of European programs, which are created for the specific topic.

Furthermore, national train companies, like the Dutch ProRail and NS, that have powerful positions when it comes to train development projects and long term concessions, would have to deal with a more flexible system. In this case, there would be other actors and other interests at stake, that are not exclusively related to capacity and demand. Possibly the railway open market could work better in a context like this, where new companies and ideas have more space to arise and take place. This would benefit the passenger who would be receiving the best service option.

Finally, it is prudent to consider that other types of transportation could profit from enhancing the Eurodelta train services. The international airports in these regions can be important stakeholders to contemplate when considering new ones for train projects. Schiphol – the main Dutch international airport, one of Europe's most important airline hubs, attracts

international flights passengers that arrive by train to get to the airplanes. If the area which is covered by train feeding the airport is larger, it is better for Schiphol that can prospect new passengers and absorb clients from a larger area. The improvement of the Eurodelta train connections could also reduce short distance flights and open space for extra long-distance flights, which is more profitable to the airports. This is when the borrowing functions become apparent. Besides that, one can also think about an airport hub, considering the important airports inside the Eurodelta, like Schiphol, Dusseldorf international airport, Brussels airport and others, connected by passengers' train services. It would also be borrowing functions from the trains.

5. CONCLUSION

5.1 The Eurodelta connectivity problematic

Due to changes in globalization and further political agreements, sub-national and supra-national scales are progressively replacing countries as relevant spatial units. Those agreements, such as the European Union, have erased borders from European regions, which have increased the region's number of competitors. The regions now need to find a way to cope with this growing competition. One solution proposed is when regions borrow size from another and instead of competitors, they become partners. "Borrowing size" requires physical accessibility and connectivity by road and rail. The Eurodelta is an extremely important area which could benefit of borrowed size regions, although it falls short in passengers' railway connection development. The goal of this research is to determine which Eurodelta passenger railway connection has the greatest potential for immediate improvement from a spatial planning perspective.

5.2 Findings and discussion

The following four Eurodelta connections and regions were considered in this research: Rotterdam (Netherlands) \leftrightarrow Antwerp (Belgium); Eindhoven (Netherlands) \leftrightarrow Antwerp (Belgium); Eindhoven (Netherlands) \leftrightarrow Duisburg (Germany); and Arnhem (Netherlands) \leftrightarrow Duisburg (Germany). The analysis of these connections demonstrates that the link between Eindhoven and Duisburg has the strongest potential of improvement, followed by the Eindhoven and Antwerp link. The outcome also calls the attention for issues around the cross-border collaboration which can create inconveniences for developing the railway connections. This research gives some suggestions on how to improve the collaboration within the Eurodelta. Besides the changing from competitor into a partner, it is important to add new stakeholders in order to increase supporters and make the project more coherent. The creation of an arena for discussions where all of them are involved is fundamental. The consolidation of the Eurodelta as an economic power would attract more political interest, which facilitates the improvement of the train connections. Solid collaborations can assist on raising funds for these projects, as bargain powers are stronger and facilitate the resources acquisition at different levels, national and European.

5.3 Implications for people working in the field

This research is of great value for people working on spatial planning development. It presents a new methodology of evaluation of train connections that can be transposed to other connections, even in distinct areas and distinct modes of transportation. It can assist governments in understanding the region's current situation and the ones already in favor of the development of the train connections might use it as another argument to justify the investment in favor of the connections' development. Similarly, public and private companies, can also benefit by identifying which train connections should be prioritized in terms of improvement. And finally, as a repercussion, it might emphasize the topic and expand the amount of companies that actually consider this as a relevant topic.

5.4 Implications for society

In terms of societal consequences, the outcomes of this study might help in creating more travel flexibility to train passengers. If the services are actually developed, passengers will have more trains running options with less barriers and will be more willing to utilize the trains as a primary mean of transportation. This allows the users to save resources such as time and money, increases the number of train users and can potentially reduce fuel consumption and therefore reduce pollution. The increase of this number can happen either by decreasing the amount of people that do the route by car or by creating opportunity for more people to commute between one city to the other. Still considering that the train services will get better, it will facilitate the access to services, products and leisure in the Eurodelta cities and can also improve tourism.

5.5 Research direction

This Eurodelta case-study explores specific cities and provinces, related to specific train connections. According to Richard Florida, the regions are the optimal scale where agglomeration economies occur. If regions are indeed the best level, what kind of regional scale is that? How is it possible to delineate it and which political spaces, such as cities, should be considered for further Eurodelta studies? An outer boundary still needs to be provided and other cities need to be included. The studied area encompasses several other relevant cities, that were not the focus of this research.

Cross-border projects, compared to national ones, generate superior spillover effects. Benefits that an improved Eurodelta train service can bring to different outside areas require further studies. It is relevant to add analyses of broader areas in different scales, such as the infrastructure corridor as a whole, beyond the “key gateway” cities. And last, but not least, this research is especially studied from a Dutch angle. Similar studies perceived from German and Belgian perspectives would be a great addition to the results presented here.

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APPENDIX

Categories of analysis for interviews:

- 1- Quality of the current train connections
- 2- Importance of the Eurodelta
- 3- Economic development inside the Eurodelta
- 4- Political will for developing the train connections
- 5- Different planning systems from the regions
- 6- Collaboration between the regions
- 7- Financing of the projects
- 8- Lobby with other layers of governance
- 9- Private companies' power inside the system
- 10- It is necessary to offer the service in order to create demand
- 11- Railway Open Market → Does it work?
- 12- Fyra case
- 13- Multilevel governance