(RE)CONNECTING BORDERS

Functional and institutional integration in relation to the
urban pattern of the cross-border Euregio Maas-Rijn.

Annika Van Den Heuvel

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Master Thesis TU Delft
MSc Architecture, Urbanism and Building Sciences
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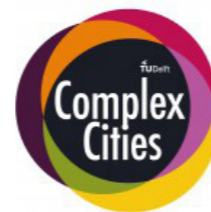
Thank you for taking the time to take a look at my graduation project, the thesis you are holding in your hands. The past year I have been working hard towards this end product. However I could not have achieved this without the help of others, to whom I would like to say thanks in this paragraph

First of all I would like to thank my mentor team from Urbanism at the TU Delft. I would like to give special thanks to my first mentor, Wil Zonneveld, who has been with me the entire journey. You always showed interest and faith in my project, and gave me confidence in myself and my abilities. Next to that, you provided me with great experience and critical questions that opened new directions for my project and made me critically assess all my decisions and motivations. As a result I always walked away from our meetings with a positive feeling, new ideas and faith in my graduation project. I would also like to thank my second mentors Rodrigo Cardoso and Gerdy Verschuure. Rodrigo, thank you for stepping in halfway through my project, and for immediately providing me with a lot of expertise and inspiring views. They have helped me to open new doors and learn about new directions of urbanism. To Gerdy, thank you for starting this journey with me and allowing me to elaborate on fields of urbanism that I had not foreseen to touch upon. Though the final subject of my project has shifted towards another direction, it has helped me gain a deeper understanding of other fields of urbanism and the area.

Next I would like to thank the 'achterblijvers' / 'soepgroep' / 'wijzittennooitopterras', my fellow graduation students at the studio of Urbanism. We shared our graduation journey together and spent most of our time together working hard towards the end of this journey. Thank you for all the teas and coffees, discussions, lunch moments, fun times and support during stressful times.

Also, many thanks to all of my other friends, in Delft, Eindhoven and throughout the country. Thank you for all of your love and support, during this graduation year, but also throughout my entire time as a student. You have surely made my time as a student a time to remember, and I enjoyed every second of it.

Last, but surely not least, I would like to thank my parents and my sister for their unconditional support and love. You have always believed in me, and though we lived on other sides of the country, I could always count on you for support and motivational words.

The history of Europe shows eras in which a European power tried to gain power of the entire continent, with the Romans as one of the first examples, and the Third Reich of Adolf Hitler as the last. After the World Wars the vision for the future was one of cooperation and peace, in which individual states were considered equal and working together was key. In 1952, the European Coal and Steel Community was founded, which led to be one of the foundation pillars for the European Union, founded in 1992. The World War era initiated a change in the power relations between European nations, in which cross-border cooperation was believed to lead to a stronger Europe. An example is Alfred Mozer, a politician whose vision was that of European integration on a large, as well as on a local scale. He states that cross-border cooperation is at the basis for a strong and unified Europe (Wissink, 2009).

Cooperation only went that far, as Europe was still seen as a collection of individual states working together. A current trend in Europe shows a new territorial reality in which territory has become a vague view, and should be reconsidered according to the new complex spaces of Europe. Europe is no longer a collection of individual states separated by borders, it has evolved into a "Europe of regions" in which the relation between spaces, borders and governance is more complex than ever (Faludi, 2014).

Another characteristic in Europe, is the urban system consisting mainly of medium and small-sized cities instead of a collection of agglomeration cities (Dijkstra et al. 2013). These networks of adjoining and connected cities, which are often historically or administratively distinct, have been identified as 'polycentric urban regions' (PURs) (Meijers, et al. 2018). Approximately a quarter of the European population live in these PURs, which may or may not be administratively divided by borders. An example is the Euregio Maas-Rijn (EMR), a territory in which the borders of the Netherlands, Belgium and Germany are connected. In these regions, cooperation and integration are of the essence to be able to organise agglomeration economies, necessary to compete internationally. The strengthening of

the network between these cities can be seen as an alternative to further concentration in a single city, and will enhance the attractiveness for agglomeration economies (Meijers, et al. 2018).

The opening up of European borders has enabled PURs divided by national administrative borders, to cooperate more intensely and more easily. They have been given the opportunity to shift from peripherical areas to cross-border region with their own economic centres. The connectedness and accessibility within this network of cities is critical, as functional integration shows to have the largest influence on the performance of urbanisation economies. Following current global trends addressing climate change, public transport is playing an increasing role in transportation. Public transport is based on connecting densified nodes, which is at contrast with the spread out urbanisation pattern in the EMR. The relation between the region's urban system and its transportation network is at the basis of this thesis, and will be researched in the case of the Euregio Maas-Rijn.

01

PROJECT DEFINITION

Project focus
Problem field
Problem statement
Aim
Research questions
Outcomes

Photo: Bus stop at Drielandenpunt.

In general the believe is that an upward cycle of economic growth is established through increasing agglomeration benefits of large cities, as those are the drivers of growth and prosperity. Polycentric urban regions (PUR's) can gain the same upward cycle by strengthening their internal network, as described briefly in the introduction. PUR's however, are often no more than 'disjointed sets of medium-sized cities' (Lambregts, 2006). Their fragmentation impedes the creation of those metropolitan environments and the efficient functioning of amenities on their accumulated scale. Increase of integration in the PUR, will increase their urban economies. Meijers et al. (2017), showed that functional integration – next to institutional and cultural integration – has the most notable positive effect on the performance of the PUR and its urban economies. In PUR's activities, functions and opportunities tend to be spread out across its cities, connections between these centres is key for integration within the region. Ullman's classical formulation (1956) states that the key trigger for demand of transportation in PUR's are the fact that functions, activities and opportunities tend to be spread out across the region and its cities, instead of being concentrated in a single city. The demand for transportation promotes further interaction and recent research has argued that for economic performance, connections enhancing functional integration within the PUR is even more important than long-distance connections with other PUR's (Sweeney, 2016). It will maximise the benefits created by the interdependent relations of the cities. Increasing connections between centres, increase the internal accessibility. Accessibility relates to the level of convenience and easiness in which one can reach a certain location from other locations. According to Meijers (2018), "accessibility is key to a successful region", in which it can provide a foundation for other structures of regional cooperation. An integrated transportation network that enhances the accessibility of the region, will increase functional integration, helping the PUR to (re)produce the advantages of agglomeration benefits otherwise only entitled to large cities. These include urbanisation economies, specialised retail and cultural, sports and leisure amenities.

The importance of accessibility in relation to the urbanisation pattern has been stressed in literature, as described above, but can also be seen in the socio-economic context of the Euregio Maas-Rijn (EMR). Mobility demand for commuters is high in the region "Image 1.", with an average of 76,3% in South-Limburg (NL), and 88% in Limburg (BE) of the residents not working in the municipality they live in (CBS, 2017; Limburg in Cijfers, 2015). Distance they travel to work is also relatively high, with an average of 30 kilometres in South-Limburg (CBS, 2017). It shows a high mobility demand in the region, and puts a lot of pressure on the existing car network, which will only increase as the population increases. The map shows that the municipalities in which the percentage of people working and living in the same place, correspond to the locations of the main cities in the region. A possible explanation for the high mobility demand, is that a large part of the residents of the EMR do not live in the direct surroundings of the main cities, but do work in these economic centres, or economic centres further land inwards.

The focus should be on both the internal and external accessibility. Interregional and international links are of large influence with respect to sources of input and the location of markets (Parr, 2003), where internal links are necessary to create balance in the region and improve critical mass without over pressuring urban centres. In theory, the most favourable area to develop public transport networks would be the densely populated centres. Besides the critical mass, major institutions and cities are usually at an ideal distance from the node. Improving large-scale transportation networks to increase accessibility between central nodes may lead to widening rather than narrowing the differences between urban centre and the periphery, and increase the gap between the best and the worst available regions. A transportation network must therefore be multi-scales, linking central areas with the periphery. Increasing accessibility between the main centres can create a network of cities, and increase agglomeration benefits. In the EMR connections between the local scale and the regional network, are as important. In the

periphery a large percentage of the critical mass of the region is located, its connections the main centres is therefore important. Next to that, decreasing the gap between centre and periphery can decrease the pressure of densification in urban centres, and create a densification process that is balanced across the region.
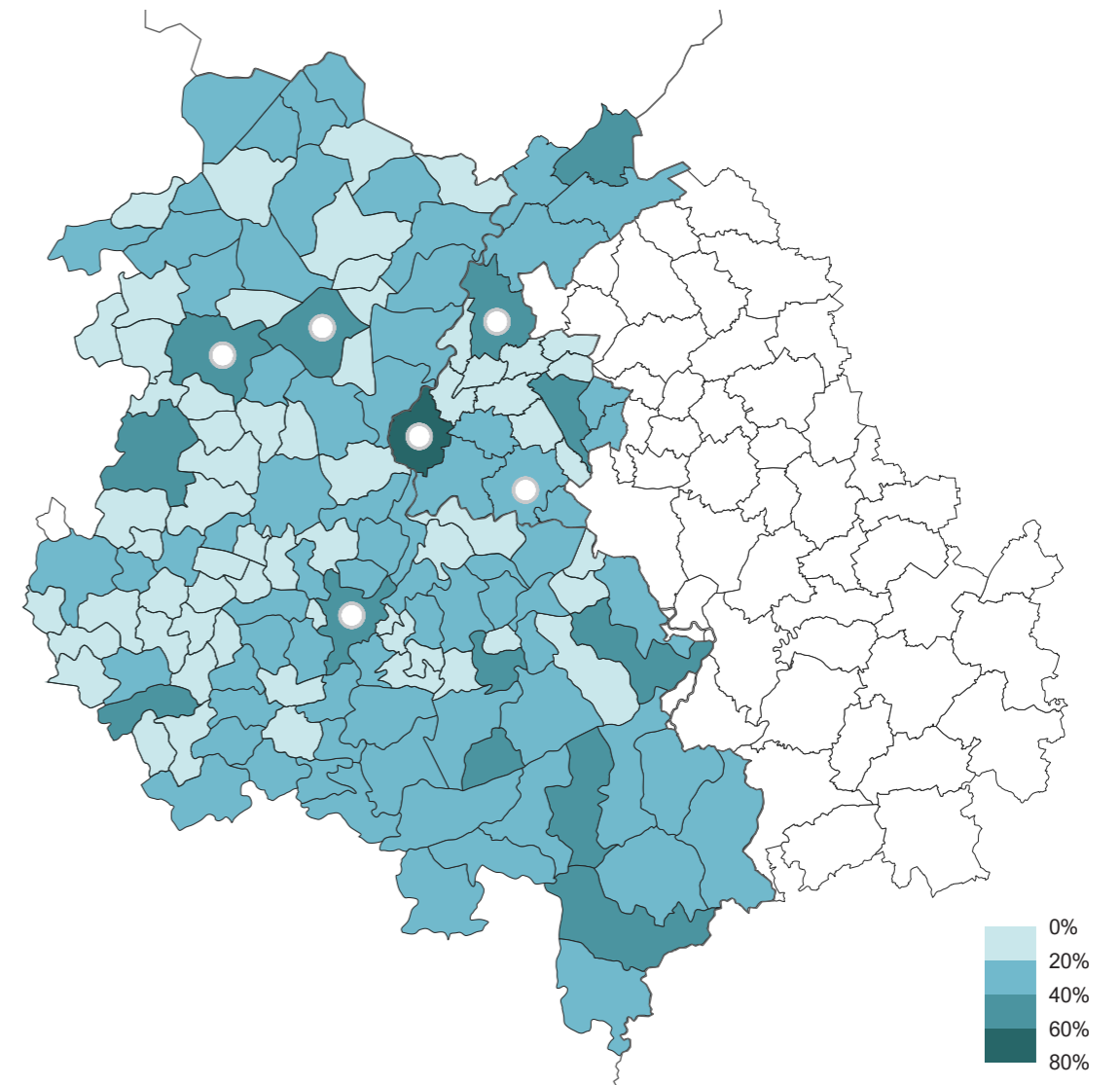

Image 1.   Percentage place of residence is place of work. Data: CBS, 2017; Census, 2011.

Focus on public transport

There is a diversity of transportation modes, however the car remains at the top of the list. The region has an extensive car network and is very car dependent, as shown in "Image 2 and 3". 84% of working people in Limburg (BE) use the car as mode of transport in 2018, a slight increase compared to 2017. In the Netherlands, the car dominates less, as approximately 50-55% of all trips was made by car. Public transport only covers 17,3% of the trips, making Limburg the province of the Netherlands in which public transport is the least used transportation mode (CBS, 2016). Trends show that congestion is increasing ("Image 4"), and more and more inner cities are changing their strategy and banning cars from their cities. Overall car use, travelled distance and car ownership keep increasing, and the prediction of traffic experts is that this trend will continue in the future if no changes are made (Rijkswaterstaat Ministerie van Infrastructuur en Milieu, 2017). The Kennisinstituut voor Mobiliteitsbeleid has predicted that traffic jams in the Netherlands will increase until 2021 with 38% in comparison to 2005. Traffic jams are also increasing in Germany, the ADAC (a German counterpart of the Dutch ANWB) saw an increase of 20% compared to 2015. Most of the traffic jams were located in the area of Nordrhein-Westfalen, the region that is also part of the EMR. The main reasons are the economic centre of the Ruhr area - located to the North of the EMR - and holiday traffic going in the direction of Switserland (ANWB, 2017). The ongoing increase in population and growth of wealth in this area, will increase pressure on the road network if no alternatives can be found.

Already in 1996 congestion was a problem, for which dr. T. Tieleman, at the time professor in economy of transport and traffic at the TU Delft, suggested that the shift to public transport is a solution. The ANWB created a vision in 2017 to solve the congestion problem, in which they asked their members - everyday car users - for their experiences and ideas triggered by practice. A large group of ANWB members indicated that public transport is considered not convenient enough. The public transport network has a relatively poor image, however people are willing to change their car for public transport if it is improved (Van Lieshout, 2016; ANWB, 2017). Changing only one aspect of public transport, for example pricing does not create enough basis for a shift as an example in Talinn, Estonia showed (Slager, 2018). The Kennisinstituut voor Mobiliteitsbeleid (KiM) researched when travellers are willing to shift from car to public transport as their main mode of transport. Their findings show that the convenience of the car need to be addressed, privacy, comfort, control and flexibility, next to tackling the inconveniences of current public transport such as difficult and long transfers and higher travel times. Besides this it also needs to be inconvenient to go by car by having difficulties in parking, high parking fees and extreme congestion, before car users are triggered to switch transportation mode (Jacobs, 2015). A large-scale change addressing a combination of issues is necessary to trigger people to make the change to public transport.

The shift to public transport has been a trend that took flight over the last decade. Increasing reports on the negative effects of climate change and greenhouse gas emissions has triggered people to take action. Transport represents almost a quarter of all Europe's greenhouse gas emissions, within which road transport is by far the biggest emitter accounting for more than 70% of all greenhouse gas emissions in 2014 (European Commission, 2014). The shift from car use to public transport can decrease these figures significantly. Public transport is more efficient as it transport more people on a single vehicle, thus reducing the number of vehicles and the level of traffic noise and pollution. Public transport runs on electrical energy, trains do fully, and pilot projects in the Netherlands show a shift to electrical powered busses. Using green energy sources reduces emissions significantly, but also improves the living conditions in cities. European strategies have adopted this trend to ensure long-term reductions of greenhouse gases (CER et al., 2018). Rail transport should be promoted as the backbone of sustainable mobility in urban, sub-urban and medium / long-distance transport. It should also be interconnected with other low-carbon modes,

Image 2.   Car network in the EMR.

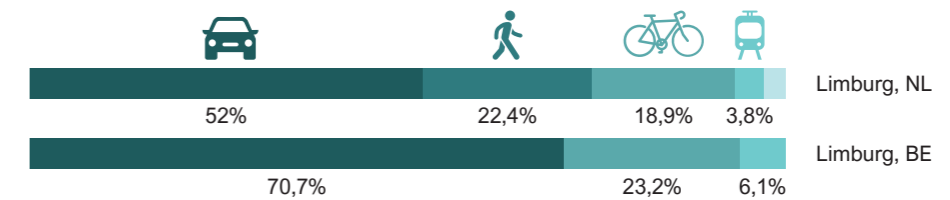|			
52%	22,4%	18,9%	3,8%	Limburg, NL
70,7%		23,2%	6,1%	Limburg, BE

Image 3.   Transportation modes used in travelling (CBS, 2016; Acerta, 2019).
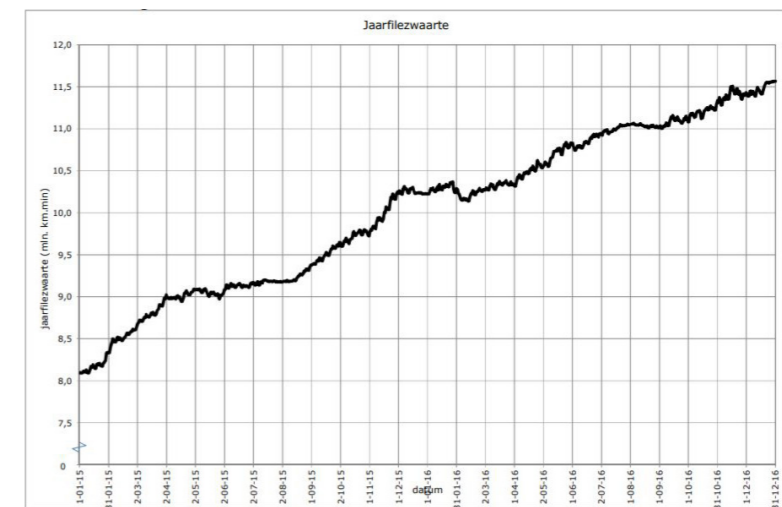
Image 4.   Congestion pressure in the Netherlands (Rljkswaterstaat, 2017).

to ensure a long-term result and allow residents to conveniently shift mode of transport.

Besides increasing car congestion and environmental pressure, the region itself shows another demand for an increase of public transport. Demographics show an increase of elderly in the region, a target group relying on other transportation modes than the car. The region is ageing (CBS, 2017; Statbel, 2017), and at the same time national policies demand elderly to live in their own homes as long as possible. At this moment almost a third of the population in Limburg is over the age of 60, and this number will only be increasing. Besides the elderly the region also is home to a lot of families, in which teenagers do not own a car yet but do want to travel throughout the region. These two target groups make up to almost 40% of the population in the region (CBS, 2019), however they are not able to use the car network in the region to access amenities. Providing an alternative transportation mode that allows convenient and long-distance travel is necessary.

An integrated public transportation network that enhances the accessibility of the region, will increase functional integration, helping the PUR to (re)produce the advantages of agglomeration benefits otherwise only entitled to large cities. It contributes to the shift from transport by car to transport by public transport to reduce climate change effects on the long-term, and includes important target groups in the EMR to ensure accessibility for everyone throughout the region.

Image 5.   Percentage of population with the age 65+ (CBS, 2017).
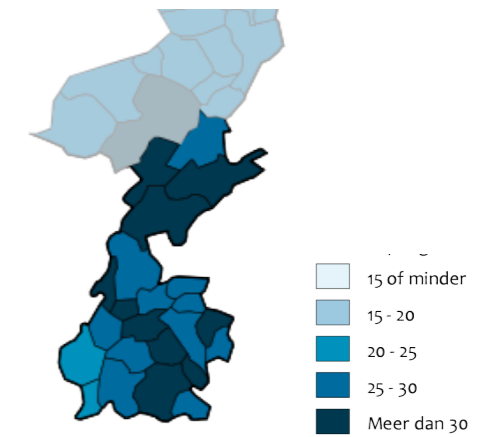
Image 6.   Prognosis percentage of population with the age of 65+ in 2047 (CBS, 2017).

15 of minder
15 - 20
20 - 25
25 - 30
Meer dan 30

Image 7.   Percentrage of population with the age 65+ (Statbel, 2017).
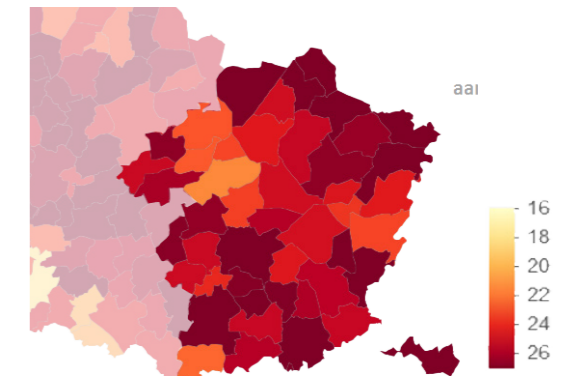
Image 8.   Prognosis percentage of population with the age 65+ in 2027 (Statbel, 2017).

16
18
20
22
24
26

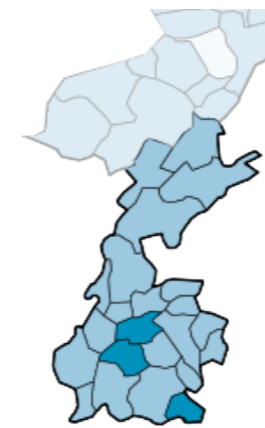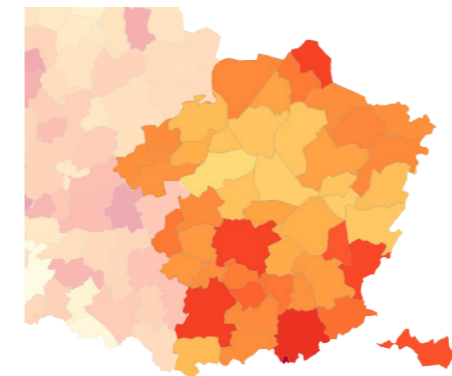The EMR is considered as a polycentric region, experiencing extra obstacles due to its crossing borders. In the following section the barriers that cause friction in creating a cross-border public transport network in the EMR will be clarified. To increase structure in the problem field, the barriers can be divided into three fields: urbanisation, transportation and governance.
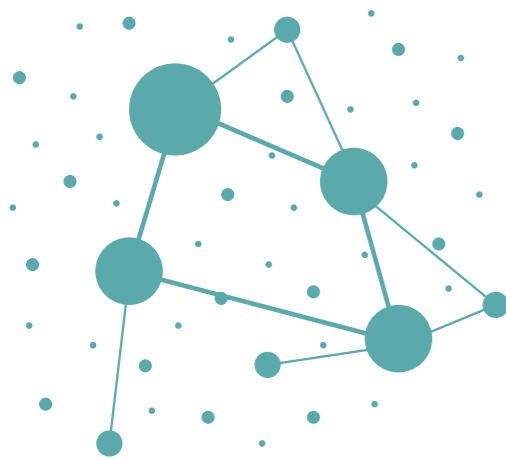
Urbanisation pattern

The urbanisation pattern of the EMR can be defined as a dispersed urban region, an area in which the population density is low and where urbanisation patterns do not seem to follow a clear planning structure. What characterises the EMR is the percentage of the population living in the dispersed urban field. The European Union (EU) has determined so-called 'Metropolitan Urban Areas' (MUA's) seen in "Image 9", these represent agglomerations of at least 250.000 inhabitants (Eurostat, 2016). Approximately 75% of the population in the EMR do not live in these Metropolitan Urban Areas (ESPON, 2000) ("Image 10"). The majority of the population lives in the so-called 'urban field' of scattered urbanisation patterns and small villages. Though the data is from 2000, a rough recalculation of current citizen figures in the determined regions came to the same number.

Public transport in its current use is focussed on densified nodes in which population densities are relatively high and functions are in the near surroundings (shown in the scheme on the left). This creates the most efficient network, as it transports as much people as possible in one location. This does not correspond well to the urbanisation pattern of the EMR, in which citizens are spread across the region. By only connecting the main centres, more than half of the citizens has access to the public transport network. It can also be seen in the vision of public transport providers in the region. Arriva is responsible for the public transport in the province of Limburg (NL), and says in its vision that it will lower the frequency but increase the amount of set bus lines trying to reach more people in 'larger' village centres (Wever, 2015).

PRINCIPLE PUBLIC TRANSPORT
based on connecting concentrations of people and functions
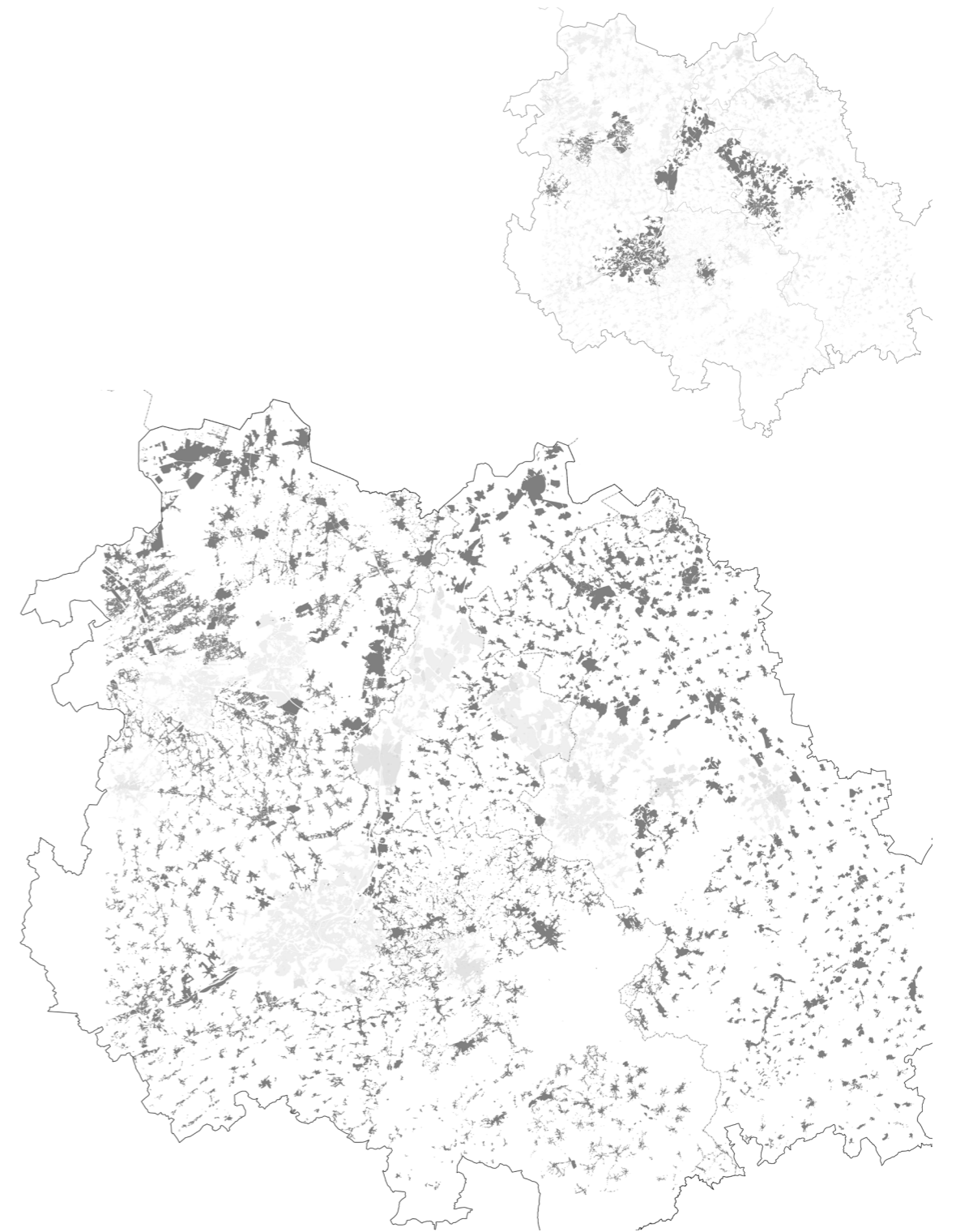
Image 9.   MUA's in the EMR. Data: Eurostat, 2017.
Image 10.   Darker areas represent the area in the EMR where 75% of the populaition lives. Data: Eurostat, 2017.

Public transport rail network

"Images 11 and 12" show a conceptual visualisation of the train network in the EMR. The top image shows the intercity connections in the region, a fast and direct connection between cities in the region. The bottom image shows the local and regional connections. It becomes clear that there are no direct and fast connections between the main cities of the EMR, especially when needing to cross a national border. An exception is a connection between Liège and Aachen, which can be explained as it is the ICE train (a European intercity train) connection. Consequently, this does not stimulate residents to travel within the region by public transport, as it is probably less convenient than travelling by car.

City
1 connection
2 connections
3 connections
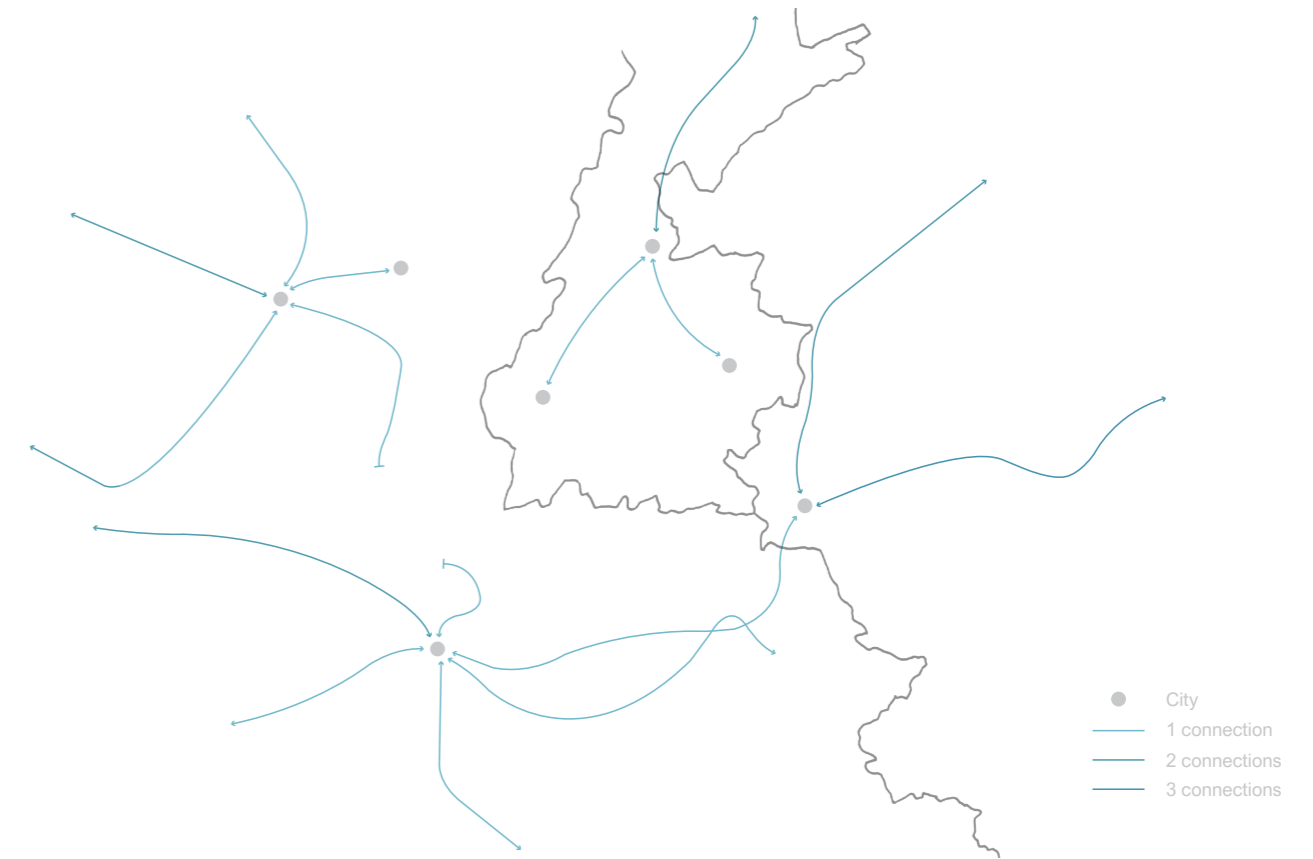
Image 11.   Intercity connections in the EMR.

City
1 connection
2 connections
3 connections
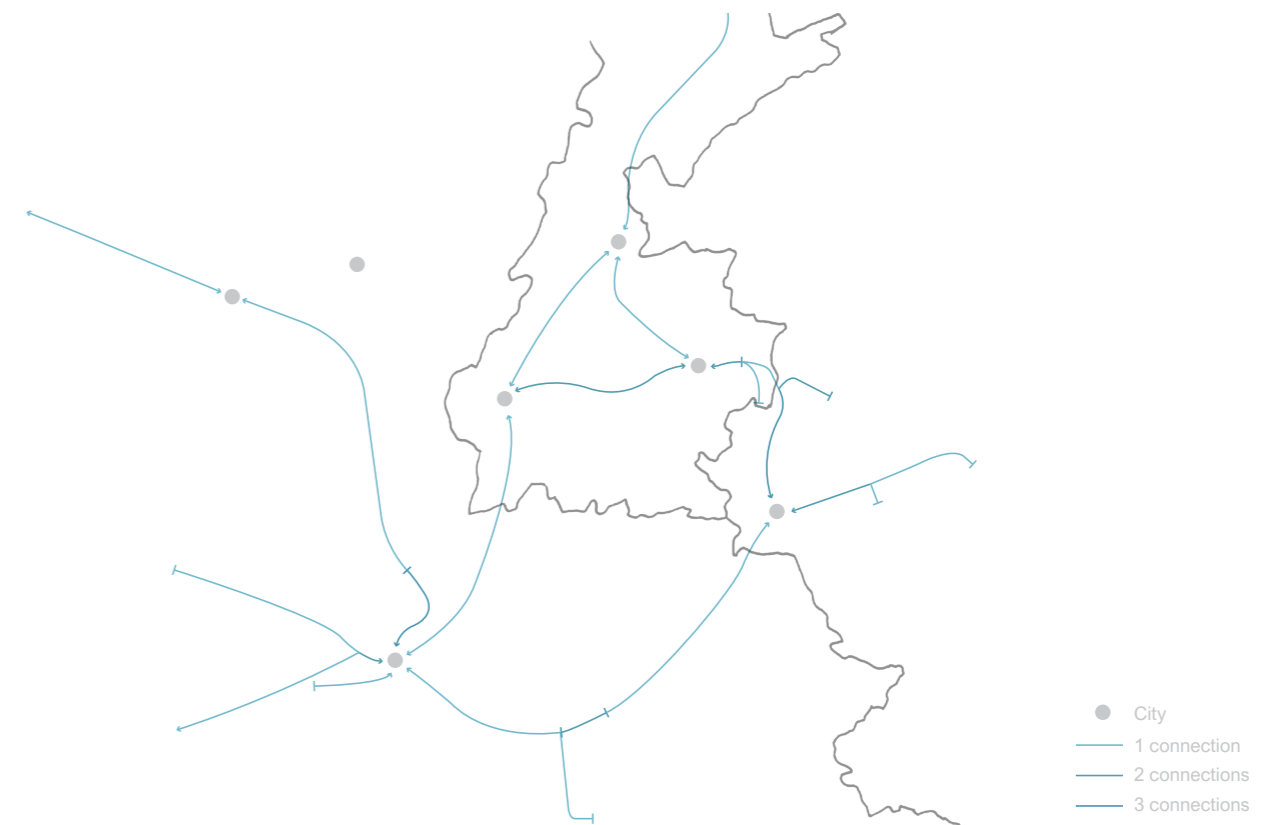
Image 12.   Local train connections in the EMR.

Public transport bus network

Another important mode of public transport are the busses travelling through the region. These ensure small-scale, more specific transport and enable smaller villages, considered too small to be included in the train network, to be connected in the public transport network. Travelling by bus gained popularity alongside the car, and replaced the extensive tram network in the region. It was considered to be cheaper, more flexible and it of course envisioned the future. In the current situation, no tram lines can be found anymore in the region, but bus lines still are an important mode of public transport. However, when looking at "Image 13", it shows that bus routes barely cross borders in the region. The bus network on a Euroregional scale shows to be a glued together network of different providers, in which they do not combine territory efficiently. The inefficiency of the network hinders residents in their travelling options and disables residents to access each centre in the euroregion as convenient as possible by public transport.

Governance structures

The EMR has known a longer period of cooperation, and many initiatives have been reaping the benefits of this. Integration of research institutions and companies across borders has been growing, along with education programs and social inclusion (Interreg Euregio Maas-Rijn, 2018). However, within the theme of territorial development difficulties still occur. Mainly due to national difference on governance level, differences between rules and regulations and execution of projects still restrain future developments (Interreg Euregio Maas-Rijn, 2018).

The EMR is the crossing of three nations, and within these four administrative regions. Cooperation between different actors implies barriers in almost every situation, as two (or more) types of visions, arguments, or principles need to be combined. In the EMR, the number of actors is high, due to the international character. The combination of different nationalities implies an increasing difficulty, as different political, juridical and institutional structures and regulations collide with each other.
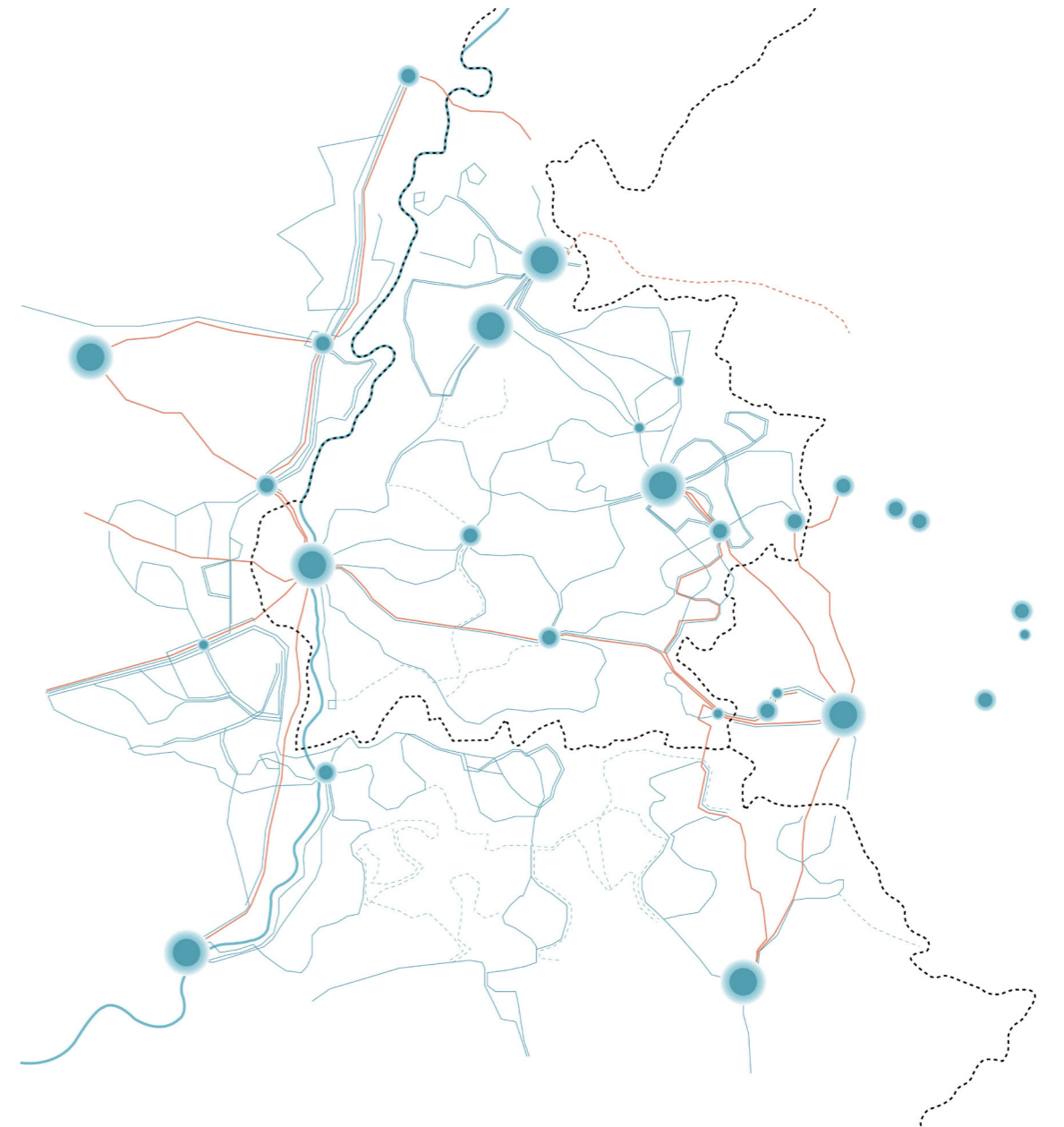
Image 13.   Bus lines in the EMR, located along the border.

The EMR faces a variety of barriers that cause friction in the creation of a cross-border public transport network that is accessible and convenient throughout the region. These barriers are related to the urbanisation pattern, the current transportation network, and the governance structures in the region. Being a cross-border region adds an interesting extra level to the table, as it opens doors to extra opportunities, but also goes hand in hand with barriers that are inevitable.

The region is characterised by its scattered urban pattern, and can be considered a polycentric urban region. Multiple middle-sized cities dominate economies within the region, and attraction points are almost completely located within or around these cities. Centralisation of functions has increased the gap between the centre and the periphery, whilst the city and its corresponding region actually depend on each other. Accessibility in these regions is of great importance to create a regional network, but also to link the centres with the rest of the

region. Links between middle-sized cities can create a network of cities that can function together as one. Connecting to this are the network of connections between the central nodes and the rest of the region. These are as important, as approximately 75% of the citizens do not live in the urban centres, but live in the 'urban field' of scattered urban patterns and small villages. Cross-border accessibility in its current form is dominated by the car, however trends of increasing traffic congestion in combination with the increase of awareness of climate change, show a shift in mindset that trades the car for public transport. Within the EMR, this shift has not yet shown great impact, especially on a regional scale the public transport network shows no signs of optimal cross-border integration. There is only one fast and direct cross-border link within the region in public transport, showing the inconsistency of the network.

The aim is to show whether a coherent, cross-border transport network can function as one of the buildings blocks for a successful region. Improving the accessibility and preserving the characteristic urban structure should both be strived for, and this research tries to find the harmony and balance between these two systems. It aims to design a public transport system that can be convenient and efficient in a dispersed polycentric urban region. And in this, striving to create a set of principles that can be transferred to other regions dealing with similar issues.

The research also aims to show whether the improvement of the public transport network can improve internal integration. To see to what extent and in what form the integration of the public transport network can create a spill-over effect that triggers or enables other fields of development or cooperation to be created.

As a large barrier in a cross-border region is the institutional integration, the influence and integration of governance structures related to these aspects is important to create a foundation for a spatial vision to be realised. This research aims to create a cohesive governance structure that incorporates different administrative territories, and harmonises urban and public transport development.

Image 15.   Disconnected borders in the EMR.

The focus of this project is on the relation of the urbanisation pattern of the EMR and the implication of public transport network across borders. Improving integration in polycentric regions can create a stronger and more competitive region. The EMR has some characteristics that create an extra challenge to further integration. The first is its polycentric network of middle-sized cities in combination with a scattered urbanisation pattern in the rest of the region. Adding to this is also the fact that it is an 'Euroregion', a cross-border region in the EU. In order to find out how these characteristics relate to each other and how they can be used for further integration in the region, the following research questions have been developed.

How can a cross-border public transport network, including the structure of governance in these networks, improve integration in the Euregio Maas-Rijn in relation to its urbanisation pattern?

How can the urbanisation pattern of the region be described, and what governance structures have an influence in this?

How does the public transport network in the region function, and what actors are related to this?

What is the relation between the urbanisation pattern and public transport in the current developments, and how have they co-evolved?

ANALYSIS
· ·
DESIGN

How can a new vision, including a spatial and governance strategy, focussed on the public transport network, increase integration in the region?

What design principle can be used on a local scale to improve access to the main public transport network in relation to the scattered urbanisation pattern?

The outcome of the research will be a cross-border regional vision, of the public transport network in the EMR in relation to the urban structure. The vision will focus on the two frameworks presented in the problem field: the relation between the urbanisation pattern, the public transport network and the influence of governance structures and socio-economic aspects on this relationship.

The vision will be organised according to tangible design principles that could be applicable in relatable regions. These design principles will create a strategy through three spatial levels, and relate to the urbanisation pattern, the cross-border region and the influence of governance structures. The intangible aspect will also be touched upon, though not as elaborate. This includes public perception and soft value branding.

The regional spatial strategy focusses on the large-scale public transport network and shows the internal and external infrastructures that are important for the agglomeration power of the region. It will include a design of a public transport network, including the important nodes that should be connected. The types of transport, related to what they should link, and how and where transfers should take place. It will also adress the spatial consequences and opportunities that new connections.
The second spatial product focusses on a smaller scale, which will result in a different approach and outcome. A spatial assignment, in which a spatial strategy and design will be created on a smaller scale. This will focus on the small-scale public transport networks, and show its relation with the fine urbanisation grid that characterises the region.

The design of a governance system is important to make sure the vision can also be realised, and to make sure that it is not just thought up and implementd top-down. It should make sure that the unique qualities of the region are involved, which starts by ensuring the right actors and stakeholders throughout the process.

02

METHODOLOGY

Approach
Method framework

Photo: Montzen train route through Sint-Martens-Voeren.

The overall approach of the thesis can be considered to be a case study approach. Case studies allow researchers to overcome the gap between theoretical knowledge and practical knowledge (Yin, 2009). Abstract theories can be related to phenomena in real-life context, and express the importance of the context in spatial issues. Especially in European transnational spatial planning and development, where the diversity of territorial context plays a large role in implementing spatial policy guidelines, and realising aims of transnational spatial strategies (Sykes, 2006). The case study approach allows the researcher to focus on specific spatial aspects and create the best approach to solve context-specific issues. This thesis researches the role of regional design and strategic spatial planning within the interrelationship of the urbanisation pattern and public transport development and the influence of governance in this.

The case that has been selected for this research is the Euregio Maas-Rijn (EMR). It is a cross-border euroregion, and is particularly interesting as three nations' borders meet in this region. It's separate regions have always been considered peripheries in relation to national economic cores, and its urbanisation pattern does not imply a good foundation for an extensive public transport network. The relation between these three aspects is at the core of this thesis, and will be researched according to the context of the EMR.

The outcomes of the research will not only be context specific, as a set of design principles will be created. These design principles could be applied in cases that cope with similar or relatable problems, and have the same contextual characteristics. The design strategy of this thesis will focus specifically on the case of the EMR, which will show how the design principles can be spatially applied.

The research is a circular process in which theoretical knowledge is combined with spatial analysis to create a design. The theoretical framework has provided input in for the analysis, to examine what spatial aspects are important to analyse. Next to that the theoretical framework also provides direct input for the design, in providing theoretical background for design decisions. A more specific set of theoretical knowledge also provides input for the design, and focusses on specific design tools for multi-scaler design strategies. These theories are not part of the main theoretical body, but are an extra input when translating the design principles in its context. After each step, reflection takes place on either the analysis or the design, which leads to new input for the theoretical framework of the analysis. These steps can take place multiple times during the process, which will result in a comprehensive design and research.

Image 16.   The EMR region in Europe, based on images from Bing Maps.

THEORY

THEORETICAL FRAMEWORK

ANALYSIS

DESIGN

THEORY

= input multi-scaler design tools
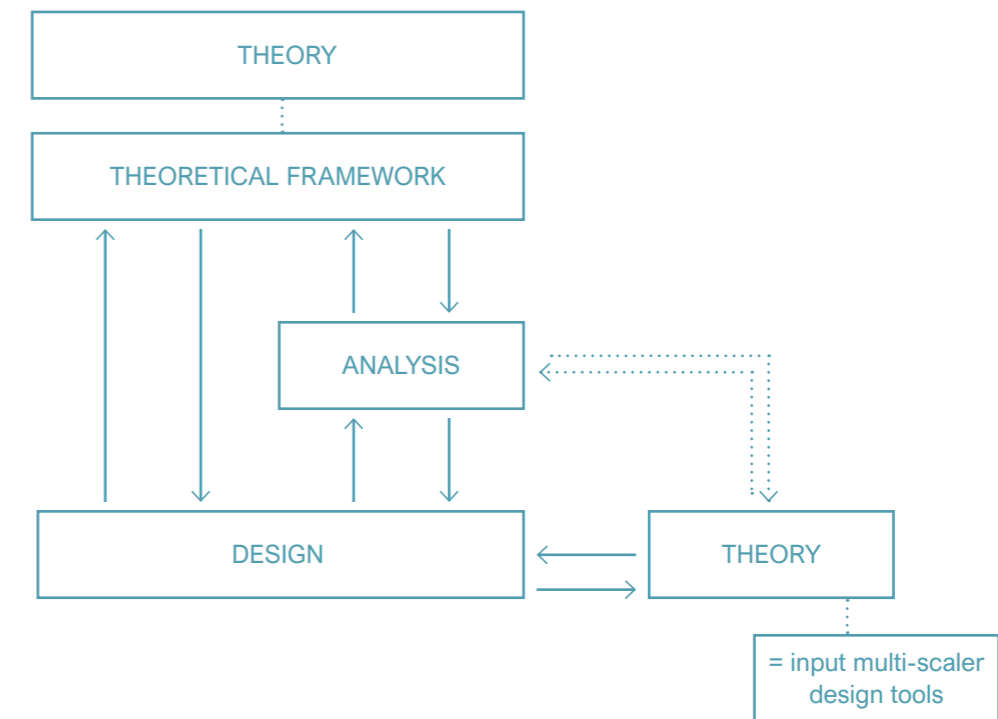
The method framework shows the different methods and approaches that have been used to answer the research questions stated in the previous chapter. The part of the scheme on the left page shows the analysis part of the research, the right page gives an insight in the methods that have contributed to the design of the thesis.

The analysis is a combination of on the one hand methods related to spatial analysis and on the other hand to governance analysis. These analysis have been done in the field of urbanisation and public transport, relating to sub questions 1 and 2.

Literature research provides the academic background for the analysis. It provides insight in the specific field of expertise, but also shows connection to new areas for further development

of the research. The theoretical framework is a combination of the separate aspects of urbanisation, transportation, the spatial aspect and the governance aspect of these, and can be found in the next chapter ("Chapter 3").

The methods related to spatial analysis focus on the physical elements and how to visualise these clearly. Spatial mapping focusses on the visualisation of the current situation, showing the current state of the urbanisation pattern or public transport network. It includes morphological maps, train and bus network maps and location maps of functions. Conceptual mapping adds the next layer to these spatial maps, by creating an abstract visualisation of them. This shows aspects that are most important, or tries to visualise certain conclusions that have been made.

Specific spatial analysis connected to the fields of urbanisation and public transport, dig deeper into the important aspects of each field. In public transport it focusses on the value of the connections, by analysing the travel time, travel routes and transport modes. In the field of urbanisation it focusses on finding data on demographics and function analysis.

Governance analysis focusses on policy analysis, reviewing existing plans and policies from various stakeholders, on power-interest analysis, analysing the relevant actors and their instruments in detail, and literature research, providing the academic background and knowledge.

The relation between these four elements determines the direction of the rest of the design process. To answer subquestion three, the separate analysis will be combined. Added to this are comparative case studies, in which regions with some similar characteristics are analysed. This can provide insights in solutions

that could be applied in the EMR. Together they form the foundation for the vision, spatial strategies and design for the EMR.

A vision is created for the region, which focusses on combining conclusion from analysis and theoretical knowledge on urban visions related to the main themes in this thesis. The translation from theory and analysis to design is done by the design principles. From this point on the design starts to diverge again. Spatial strategies are designed throughout multiple scales. The design principles are used to create these. Zooming in on a smaller, local scale, new analysis is done specfic for the chosen design location. On a local scale, detailed information is important, and should be analysed before a design can be made. This will be combined with the design principles, and analysis conclusion to create a design related to the characteristics of the EMR. On the other hand and actor network is designed according to the design principle related to governance. This allow the spatial designs to cross borders in the region.
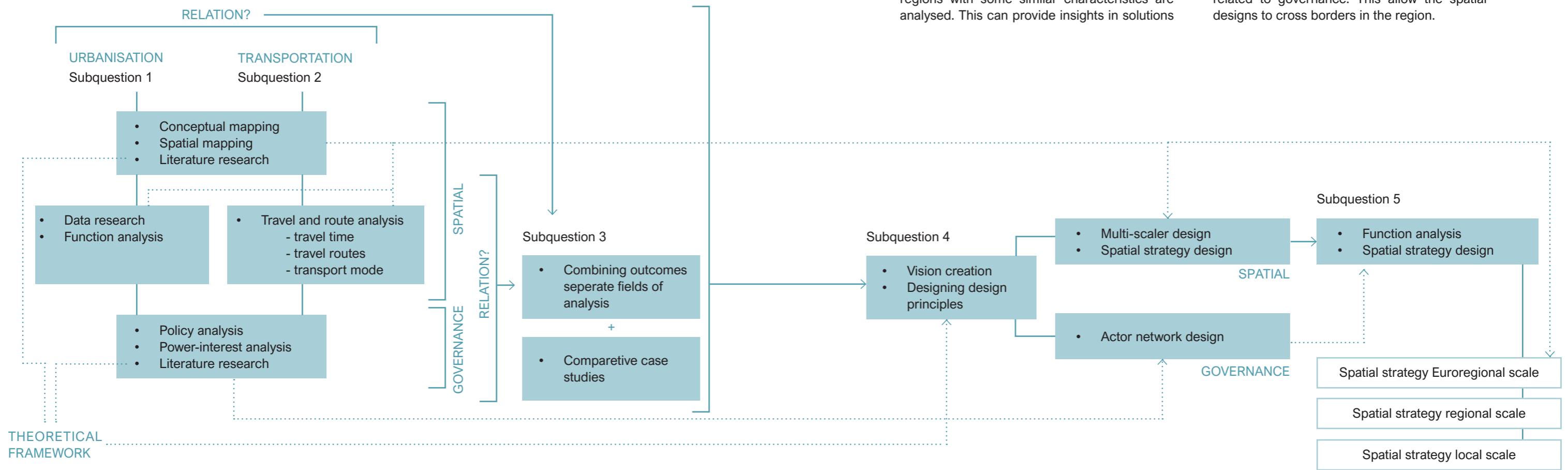
03

THEORETICAL FRAMEWORK

Literature review
Conceptual framework

Photo: Montzen train route marshalling yard at Montzen.

Existing literature provides an important foundation for current research, functioning as inspiration for existing and new ideas. The theoretical framework structures the academic knowledge that is at the basis of this thesis, and shows the relations between various concepts that have been established. It shows an overview of the concepts relevant in this thesis, and shows how they have been understood and applied in accordance to each other and the overall project. This chapter provides an insight in the relevant academic knowledge and connections that have been found between research by different scholars. As important, it presents conclusions that are the starting building blocks for the further course of the research, in providing theories for analysis and design.

Cross-border regions

The concept of a 'border' sounds as a relatively simple concept to which everyone can provide an explanation. However, these explanations vary greatly considering the field of study, scale of study, prior knowledge and own experiences. Questions that arise in the field of urbanism could include: what is a border? What does it represent? How do people react to this? Borders, as a political entity, always represent a territorial division and mark a limitation between territorial and social entities. However, they represent a different entity everywhere, according to their open or closed character (Sohn, 2017). They can be part of, indeed, differentiation, protection and control, but a more open border can also stimulate hybridisation and inventiveness. The opening up of borders has been of great importance for the development of Europe into the Europe that it represents today. Opening up its internal borders allows positional advantage to play a role, in which it can create a territorial gateway that allows exchange of international flows, people and goods and opens up doors to foreign markets, economic, labour and knowledge. 'Europe can no longer be simply viewed as a collection of nation-states that cooperate with each other, it has become a multi-levelled polity, with a borderless internal market, which can be seen as a 'Europe of regions' (Rumford, 2006). Over a longer period of time it can act as a source of stimulation and can lead to hybridisation and invention of new ways of thinking and doing. This can happen both spatially, economically, but also on an institutional level, "the confrontation over the long term of different urban planning standards, procedures and 'administrative cultures' results in the development of innovative practices and workable arrangements that combine or reinterpret aspects from the national systems" (Reitel, 2006). The border can be used as an object of recognition, and the symbolic value becomes involved in place-making strategies at local and regional levels. Shifting the impact of a barrier from a negative one into a positive advantage. In this position it refers to the establishment of public goods such as regional identity and territorial branding (OECD, 2013). It shows administrative territorial boundaries can function as a source of stimulation and provide a region with a unique characteristic in external branding to increase its competitiveness. It does however assume the full cooperation and willingness to cooperate from the included stakeholders.

Cross-border regionalism in Europe is characterised by a wide variety of initiatives and cross-border cooperation structures that have followed different trajectories since the premises of the European integration process were made explicit (Sohn, 2017). What can be seen after the WWII is the focus on national redevelopment, where peripheral border locations were put in second place. However, on a local scale cross-border cooperation is important for the development of those regions, and local initiatives have always existed. These European cross-border regions are called 'euroregion', at the time of this research, no official definition has been universally recognised, nevertheless we do acknowledge a set of common features that are widely recognised in academic contributions. Simply, it is a territorial unit that links two or more contiguous sub-national units from separate states, but does not necessarily have a political power (Perkmann, 2003). The Association of European Border Regions (AEBR) acknowledges the following criteria for the identification of Euroregions:
- An association of local and regional authorities on either side of the national border, sometimes with a parliamentary assembly;
- A trans frontier association with a permanent secretariat and a technical and administrative team with own resources;
- Of private law nature, based on non-profit-making associations or foundations on either side of the border in accordance with the respective national law in force;
- Of public law nature, based on inter-state agreements, dealing among other things, with the participation of territorial authorities.

The concept of 'euroregion' consists of two words: 'euro' and 'region'. The term Regio originates in Latin, 'regere', which means to draw a line or border (Council of Europe, 2008). The term did not have any governmental associations and was only used to demarcate an area. It did

not relate to any institutional influences. The term 'euro' is a subtraction from 'Europe' and relates to European countries cooperating. The Latin definition is still visible, as euroregions do not by definition have any institutional powers. There are different institutionalisation models, and Euroregions often assume a variety of formalised structures in combination with legal instruments to realise cross-border initiatives (Morata, 2007). Euroregions do not create a new type of governance power at cross-border level, but try and combine existing institutional powers of relating hierarchy levels. Their powers are limited to the power and competences of local and regional authorities, but face additional complications due to differences in institutional structures across borders.

Polycentric Urban Regions (PUR's)

The typology of urban structures can depend on multiple variables. The distribution of population and employment has an influence on the centralisation factor of a region. When these are concentrated in centres, the area is considered to be centralised, a dispersed area implies the distribution over smaller non-urban places in a non-centralised pattern. The physical urban structure also knows two extremes, a polycentric structure, in which urban territory tends to cluster in several centres of activity, and a monocentric structure, clustering most urban territory in a single form (Anas et al., 1998). Combining the centralisation factor with the physical urban structure, it creates four typologies: monocentric centralised, monocentric dispersed, polycentric centralised, and polycentric dispersed (Meijer & Burger, 2010). A quick analysis of the EMR shows that the region is probably a polycentric dispersed region, where multiple middle-sized cities are present, but population is dispersed among the entire region.
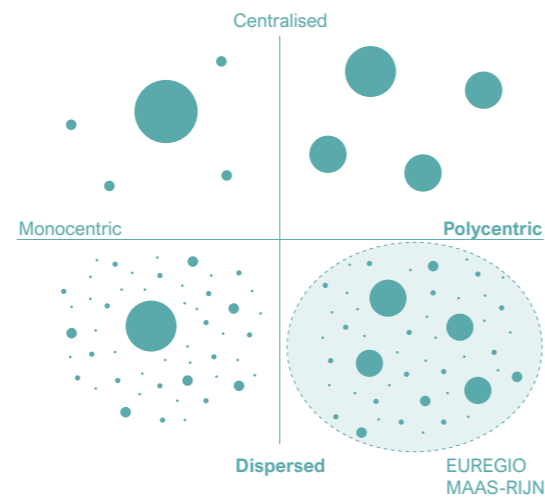
Typologies of urban structure, based on Meijer & Burger, 2010.

Further analysis of the urban structure and function distribution of the EMR can be found in chapter 5, will determine what type of region it can be considered to be. Characteristic for the EMR is the urban system of dispersed small-sized cities, combined in multiple networks. In order to determine a successful strategy for the region, an understanding of a so-called polycentric urban region (PUR) is necessary. Polycentricity as a phenomenon in urban territory in general focusses on the clustering of several centres of activity (Anas et al., 1998). The polycentric system does not function on a single scale, and the ESPON 1.1.1 project (EC, 1999) categorises three polycentric scale varieties in Europe, called the 'micro', 'meso', and 'macro'. The 'micro' scale corresponds to city-clusters at intra-regional scale, the 'meso' scale relates to the development of urban complementarities within the regional scale, and the 'macro' level describes the urban complementarities development at an inter-regional scale. In doing analysis it is important to be aware of the scale in question, as qualitative differences can be found between the scalable characteristics of polycentrism (Kloosterman & Mustard, 2001). The differences relate to different fields of study, such as physical form, political entity, functional relationships and cultural identity and representation. The scale of polycentrism influences the relevant variables within these categories, and also determines the relevance of each category in relation to the scale. This thesis focusses on the meso-scale, the polynucleated metropolitan region, in which middle-sized cities are connected through cooperation in different fields and on various levels within this scale. In chapter 4, the polycentrism scales are shown in relation to the spatial context of the EMR. In the analysis chapters (chapters 5, 6 and 7) the variables relevant - related to the urbanisation pattern and the public transport network - for the meso-scale are determined and analysed within the context of the EMR.
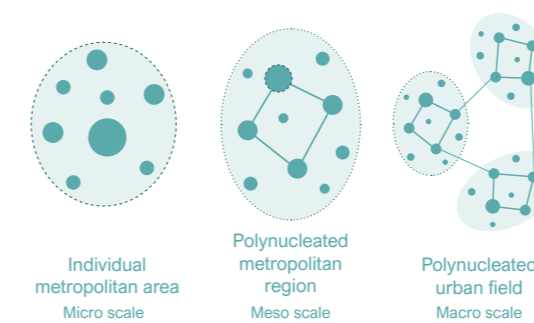
Polycentric system across scales, based on European Commission, 1999.

PUR's as European planning programmes

European planning programs have adopted PUR's as a key mechanism to achieve territorial competitiveness and cohesion, examples are the European Spatial Development Perspective (ESDP), European Spatial Planning Observatory Network (ESPON), and Interreg IIB programmes. Research by Dühr (2005) on ESPON projects identifies three interrelated but distinctive aspects of analysis. These are, as shown in the schematic drawings, morphology, relations between urban areas and governance. The distribution and (in)balance between urban areas in a given territory is described by the morphology aspect. The relations between these urban areas relates to the connections and flows between the morphological centres. The third aspect, governance, shows the (dis) connections between administratively distinct territories and institutional capacities (Pessoa, 2009). The three aspects that have been explained should be analysed in the context of the EMR. This will provide an insight in the polycentric characteristics of the region and can be used as comparison criteria with other regions. Contextual analysis will be done in chapters 5, 6 and 7, focussing on the aspects relevant in this thesis.
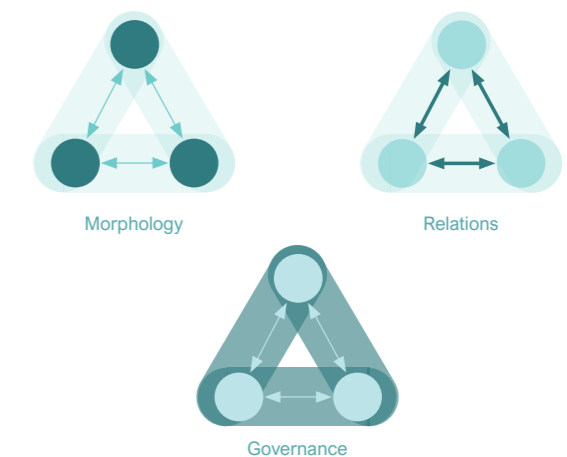
Three aspects of polycentric urban regions according to Dühr, 2005 in research on ESPON projects.

Integration within PUR's

In relation to the meso-scale of a region, it focusses on the presence of middle-sized cities instead of a single, large city in a multi-city scale region. The assumption is that combining multiple middle- or small-sized cities can create the same amount of agglomeration benefits a single large city can. However, "summing small cities does not make a large city" (Meijers, 2008, p. 2323), these regions cannot instantly provide a level of agglomeration benefits corresponding to the size of their combined cities. In terms of urbanisation economies (Meijers & Burger, 2010; Veneri & Burgalassi, 2012; Brezzi & Veneri, 2015), and specialised retail (Burger et al., 2014), but also in terms of cultural, sports, and leisure amenities (Meijers, 2008). Missing links are the critical mass of large cities (Lambooy, 1998) and the fact that circulation of travel, knowledge and commodity flows is less in a PUR than in a single large city (Parr, 2004). In these regions, cooperation and integration are of the essence to be able to organise agglomeration economies, necessary to compete internationally. The strengthening of the network between these cities can be seen as an alternative to further concentration in a single city, and will enhance the attractiveness for agglomeration economies (Meijers, et al. 2018).

Cities and regions that have been historically and administratively distinct, have these barriers to overcome in order to create a network of cities. Especially in the case of the EMR, administrative differences play a large role, as four diverse administrative regions try to create an integrated network. In order to increase agglomeration benefits for the greater region and increase their urban economies, tighter integration plays a crucial role. The fragmentation of PUR's impedes the creation of metropolitan environments and the efficient functioning of amenities on their accumulated scale. Meijers et al. (2017), showed that functional integration – next to institutional and cultural integration – has the most notable positive effect on the performance of the PUR and its urban economies. Functional integration is important for the PUR to operate as a cohesive urban system, in which "efficient and affordable transport connections between cities are essential to avoid its negative consequences" (Jenks et al., 2008). Other scholars have also stressed the economic importance of functional integration in relation to urban complementarities in PUR's (Oort et al., 2010; Pred, 1977; Jones et al., 2009). Functional integration is crucial as it enables people to experience the network as a whole. Travel time determines for a great deal the distance experience of people, and influences their spatial attachment, which will be addressed later on. The longer the travel time, the further away they spatially experience the destination to be. To enable metropolitan benefits, the cities need to create a network, in which the cores are functionally integrated as best as possible.

The creation of a network of cities presumes the commitment of all actors, who might be fragmented throughout the region. Clear organisation and cooperation of governance structures and the inclusion of local governments is necessary to minimise institutional fragmentation in the region. Fragmented city-regions have been found to indeed have lower levels of productivity (Ahrend et al, 2015). Institutional integration can minimise this fragmentation, allowing PUR's to resemble large agglomerations governed by a single institutional body (Meijers et al, 2017). Including local governments increases intra-regional organising capacities and focusses on complementarity between centres, instead of creating redundant competition. It is also an opportunity for smaller centres to join functions through institutional integration, which allows them to become a more relevant actor in negotiations with higher levels of government, and increase their influence is policy. This is relevant for higher levels of governance, as it will lead to more support of regional visions. Institutional integration leads to less fragmentation in governance structures, allowing integrated visions – connecting administrative borders, and all scales – to be created, for which regional and local support is present to enable projects.

Cooperation between cities (institutional integration) and enhancing mobility in a region (functional integration), can shape and upscaling of spatial attachments of citizens in creating a 'metropolitan identity' (Kübler, 2016). Spatial attachment is linked to the space people are familiar with and are able to identify themselves with. In the past this was reserved to individual cities, neighbourhoods or villages, but in the expansion of one's daily travel, spatial attachment has been expanding as well. The metropolitan identity does not only focus on the awareness of an inter-related space, but also implies the development of emotional ties and the sense of shared identity, increasing cultural integration in the region. Cultural integration can increase support from local scales and make institutional integration more acceptable for citizens (Kübler, 2016), and allows more durable networks to be constructed at the regional scale (Nelles, 2013). Cultural contrasts between neighbouring partners can have a negative effect on the likelihood of cooperation and building relations, mental and cultural distance can create unavoidable fragmentation in regions (Houtum, 1998; Tadesse & White, 2010). PUR's lacking cultural integration will remain fragmented in that sense, and are less willing to adhere common visions and strategies for their common territory.

Increasing cohesion and agglomeration benefits

The main goal for a PUR is to increase cohesion and integration within the region, to enable competitiveness and agglomeration benefits to increase and strengthen the region to its full potential. As described above, there are three different types of integration in PUR's. When relating them with the aspects important for cohesion on European PUR's, described in the second paragraph, similarities can be found. The scheme shows the similarities between these two fields of studies, which are combined in this thesis. The aspects of 'relations' and 'functional integration' is closely linked to the focus on transportation and will be elaborated on in the context of the EMR in chapter 6. The EMR is a cross-border region, which generates more barriers to overcome between a diversity of governance structures. The aspect of 'governance' and 'institutional integration' are therefore important in this thesis, as 4 administrative areas need to be combined in the field of transportation. The relations between centres in combination with the morphological urban structure create the foundation for the spatial aspect of the thesis. However, to create changes in spatial structures, governance structures should provide the necessary foundation for opportunities and initiatives to be implemented. Governance as a field of research will be a red line in the analysis of the spatial aspects of urbanisation and public transport. Also in the design, governance strategies will be inter-scaler and have an effect in each scale of the design.

The relation between public transport, urban development and governance is at the basis of this thesis, in which the goal is to harmonise these systems in order to increase cohesion and integration, and in doing so, increasing agglomeration benefits and competitiveness of a rural polycentric urban euroregion. Existing literature gives a start in the development of designing strategies for rural urban regions that face struggles of demographic decline, in order to realise this vision. There are three urbanisation mechanisms described by Meijers and Van der Wouw (2019) that can increase the

competitiveness of rural urban regions in the so-called age of 'urban triumph'.

1. City network integration: the integration of small and medium-sized towns based on complementary profiles or organisational cooperation and in this organising a higher level of agglomeration benefits or urban economies on the regional scale, the network of cities.

2. 'Borrowing size' in infrastructural, transport and organisational networks: establishing connections between metropolitan centres and its surrounding regions, so the latter can 'use' some of the benefits they offer and in that way 'borrow' some of their 'size' (Alonso, 1973).

3. Urban concentration: the concentration of people, jobs, functions, and investments in a single urban centre in the rural region. This centre can act as the front piece and main driving force of the entire region, and attract and retain people and economies.

City network integration   Borrowing size

Urban concentration
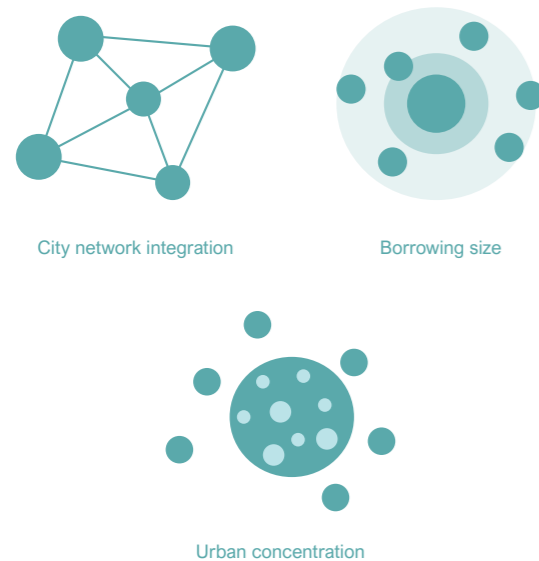
Three urbanisation mechanisms described by Meijers & Van der Wouw, 2019, to increase competitiveness of rural urban regions.

The EMR has a history of cooperation, and has been working together to create a strong region of three – nationally determined – peripherical regions. The three mechanisms described above can all play a role in the development of the region, be it at different levels of scale. In

the EMR city network integration can already be seen to a certain extent, however full implementation keeps lacking. Cities do have cooperative strategies, however often restricted to specific fields, such as economy, education or leisure. Next to this there is a difference between a verbal agreement of a network strategy and the actual implementation of it. This would imply loosing local ambitions up to a certain point, and to organise a more diverse and specialised array of urban functions on the scale of the network of cities. The already present middle-sized cities can function as urban concentrations, the driving forces of the region. They are visual urban cores that, as cities on their own, do not have enough support for a metropolitan size of diversity of amenities. If they were to profile themselves as 'one city' – a network of middle-sized cities – they could attract a higher variety of and more specialised services, urban functions and amenities. Important in this strategy are the links between the different cores, their functional integration is important to experience the network of cities as one entity.

In the EMR an important aspect is the relation between the city and its surroundings. A majority of the residents of the EMR do not live in the city itself, but in its surrounding area. This is complicated, though a significant aspect of the cities' and region's strength and functioning. The city and its corresponding region are intertwined and one cannot function without the other. In this structure, the surrounding region is able to 'borrow size' from the larger city centre. Almost 90 years ago, Mark Jefferson (1931, p. 453) already observed that "Cities do not grow up of themselves. Countrysides set them up to do tasks that must be performed in central places." The region serves the city in terms of providing critical mass for a diversity of functions, where the city serves the region in allowing it to benefit from its agglomeration influence. Cities develop as a response to demands from its surrounding region (Alexander, 1954), enabling the surrounding region to steer this development to some extent. The relation between the large and small urban centres in the region is of great importance in the EMR, as it provides the connection between residents and amenities.

Urban concentration is often seen as a urbanisation mechanism at a regional scale, concentrating amenities, people and flows in the largest urban centre within the region. However, this mechanism can also be applied on other scales. Instead of focussing solely on the main centres, concentration within villages can have a positive influence on the division of urban development. The concept of deconcentrated concentration, in which concentrations of people, amenities and flows are dispersed across the region, is relatable to the urban structure of the euroregion. Smaller concentrations can diminish the stress on urban concentration and growth in cities, and create an alternative future vision for urban development.

Conclusion

Opening up internal borders in Europe has led to a new view of territory, and can show a shift towards a 'Europe of regions'. Borders are often considered a negative aspect in cooperation and growth, however the impact of the barrier can change from a negative to positive. Territorial boundaries can function as a source of stimulation and provide unique characteristics for branding purposes of cross-border regions. In order for these positive aspects to flourish, it assumes full willingness and cooperation of included actors. The EMR is a so-called 'euroregion', a cross-border association of local and regional authorities on either side of the border that has a permanent secretariat and a technical and administrative team (further analysis can be found in chapter 5). The EMR tries to combine existing institutional powers, however these face additional complications due to the different issues related to cross-border planning.

The urban typology of the EMR can be described as a polycentric dispersed region. It includes multiple middle-sized cities and its population is dispersed across the entire region. European planning programmes, like ESPON, have adopted polycentric urban regions (PUR's) as key mechanisms to achieve territorial competitiveness and cohesion. The most important aspects are the morphology, relations and governance in the region. Combining multiple middle-sized cities can create the same level of agglomeration benefits as a single large city. However, this can only be achieved by strengthening internal networks and increasing the integration within the region. Three types of integration have been detected: cultural, functional and institutional integration. Relating these to the aspects of PUR's, it shows similarities. The relations in a PUR can be strengthened through functional integration, and improved governance structures are the result of institutional integration. These theoretical strategies need to be translated to urban planning, and in relation to the EMR, in rural urban regions. Three urbanisation mechanisms designed to increase competitiveness in rural urban regions are: city network integration,

borrowing size and urban concentration. These mechanisms will function as building blocks for the design principles of the strategy as explained earlier.

In the EMR the relation between the cities and the surrounding region is important. A majority of the residents do not live in the main cities, but live in the in-between areas. The city and its surrounding region are intertwined and their relation is a significant aspect of the cities' and region's strength and functioning. The region serves the city in providing critical mass for their diversity and scale of functions, whereas the city serves the region in providing these functions and amenities in a concentrated area. The connections between the large and small urban centres in the region is of great importance in the EMR, as they provide the links between residents and amenities in the region. Future urban development can also be influenced by these connections. Increasing the quality of these connections allows urban development to disperse within the region, instead of being pressured to concentrate in main city centres. The concept of deconcentrated concentration, in which concentrations of people, amenities and flows are dispersed across the region, can provide a solution to the pressure of urban growth in the EMR.

Conceptual framework

On the right the conceptual framework is presented, providing an insight in the relations between different theoretical concepts. The framework presents an overview of the relations that have been established in this thesis, to connect different fields of expertise and show their relationships. It shows the interpretation of academic research in relation to the research focus of this thesis. Besides that it also shows how the research and the design can be transferred to other regions. The scheme starts at the top with the Euregio Maas-Rijn (EMR), and presents two characteristics of the region that are the basis for this thesis. Regions that have the same two characteristics of a dispersed polycentric urban region and being a cross-border euroregion, are possible regions in which the same research and design could be implied.

Next to that, the scheme also shows how the theoretical background has provided a foundation for the vision and design for the region. Analysis in the region, based on theoretical knowledge from the top part of the scheme, is combined with existing urbanisation mechanisms from different literature. Combined, they provide the foundation for the design principles and the design strategies for the EMR.
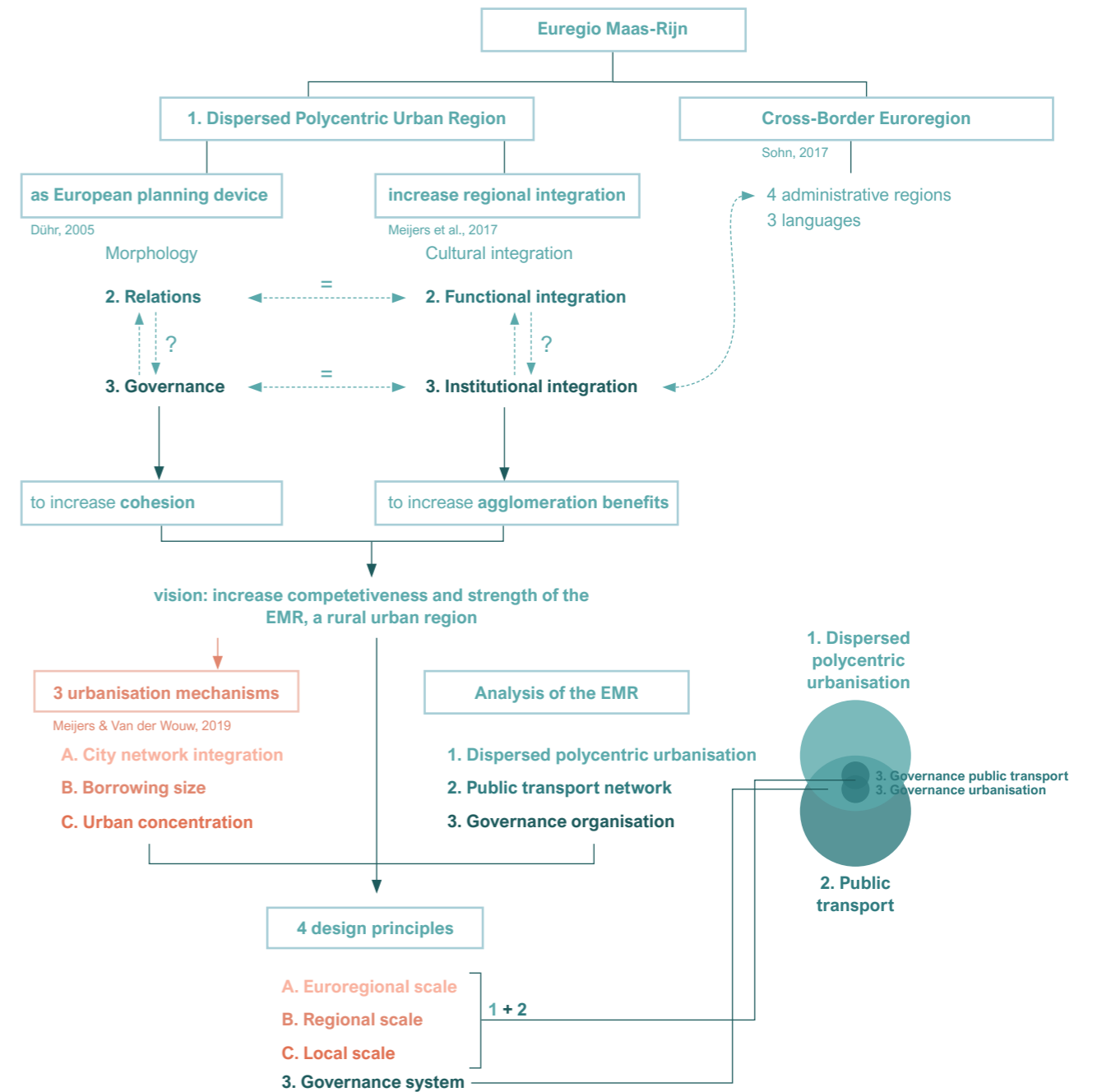
04

CONTEXT

Location
Demographics
Euroregion

Photo: Countryside at Libeek.

The location on which this research will focus, is the Euregio Maas-Rijn (EMR). It is one of the oldest cross-border cooperations of the European Union: from 1976 onwards, three nations and five partner regions have been working together. The Euroregion is unique because of its situation in the heart of (Western) Europe. The cooperation is chracterised by its diversity of languages, landscapes, and cultures. These are also acknowledged, valued and experienced across the region's borders. The region is home to approximately four milion p eople, who search for a high quality of life (Euregio Maas-Rijn, 2018). The Euroregion shares a common historical and cultural background, and has an interesting combination of urban, industrial and rural landscapes. Next to this, it has a collection of universities, colleges, academic hospitals, research institutions, and a variety of economic sectors (Interreg Euregio Maas-Rijn, 2018).

The EMR consists of five partner regions, shown in "Image 20", which are:
• Provincie Zuid-Limburg (NL)
• Provincie Limburg (BE)
• Province de Liège (BE)
• Ostbelgien / Deutschsprachige Gemeinschaft Belgien (BE)
• Zweckverband Region Aachen (DE)

The main goal of the EMR is to, regardless of borders, allow residents and visitors of the region to increase their quality of life, through information, communication, and cooperation of the five partner regions. In the year-report 2017 of Interreg V-A Euregio Maas-Rijn their ambition is stated that the EMR want to develop into a modern knowledge region and a top technological region, with a competitive economy and a high quality of live. An this all to take place in an inclusive community that creates job opportunities.

The themes that the EMR addresses in order to realise this goal are: economy and innovation, job ooportunities, education and training, culture and tourism, health care, safety, mobility and infrastructure, sustainable development, territorial analysis, and advocacy and regional marketing (Interreg Euregio Maas-Rijn, 2018).

Image 17.   View over the hills landscape at Libeek.

Image 18.   Statue 10 years EMR at the Vaalserberg.
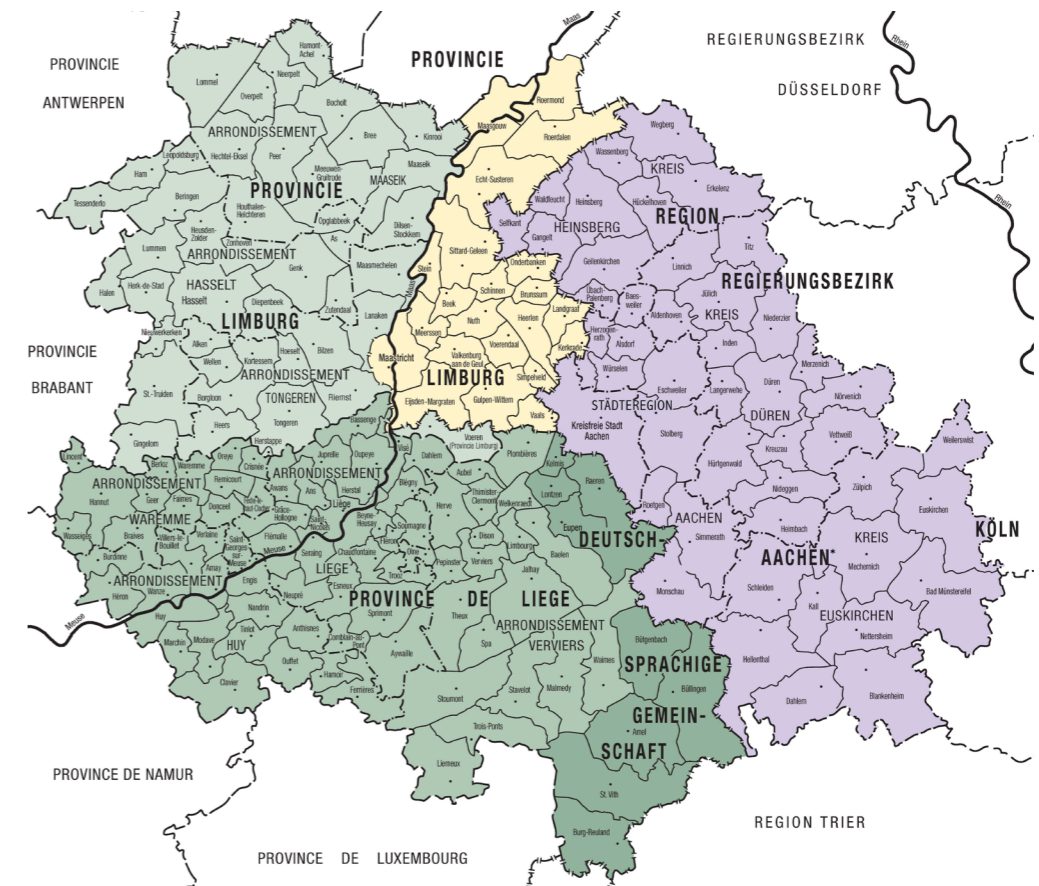

Image 19.   Castle in 's-Gravenvoeren, BE.

Image 20.   Administrative boudnaries in the EMR (Euregio Maas-Rijn, 2018).

The region has a profitable location within the Northwestern European economic core area, see "Image 21". In branding strategies it has been named 'the heart of Europe' and 'Eurostad' (Eurocity), (Stichting Hart van Europa, 2015; ZuidLimburg.nl, 2018). The map below shows the position of the EMR within the macro-scale of polycentricity, the polynucleated urban field. Shown is the relation between the EMR and the other polycentric/central metropolitan regions in Europe. It is often considered to be in the centre of other large European economic cores that, if accessibility is good, could provide the EMR with economic benefits. Its position on the macro-scale is determined by its relations with other centres, its external connections are thus as important as its internal connections.

The EMR is also known as the MAHHL-area. It is a contraction of the main cities in the region, Maastricht, Aachen, Heerlen, Hasselt and Liège, "Image 22". These present the second spatial scale of polycentrism, the polynucleated metropolitan region at meso-scale. The region does not have one centralised city, it is home to multiple middle-sized cities. The five cities all have a different history and own, unique character. However, they do share a history that goes back to the 8th and 9th century. In that time the five cities formed the heart of the empire of Charles the Great (Nelson, 1998). From the 9th century onwards, a lot has changed, most notably the change of territorial boundaries in the region. The cities have their origin far back to the Roman Empire and the Middle Ages, but some have profited greatly

from the Industrial Revolution and the Coal Mining industry. Cooperation between cities, originating in historical, economic or cultural context, can strengthen competitiveness and create a polycentric region.

MACRO SCALE

POLYNUCLEATED
URBAN FIELD

RANDSTAD

RHINE-RUHR METROPOLIS

MAAS-RIJN
EUREGIO

FLEMISH DIAMOND

PARIS AGGLOMORATION

FRANKFURT-RHINE REGION

SAAR-LOR-LUX REGION

Image 21.   The EMR in the polynucleated urban field of Western-Europe.

MESO SCALE

POLYNUCLEATED
METROPOLITAN REGION

Genk

Sittard-Geleen

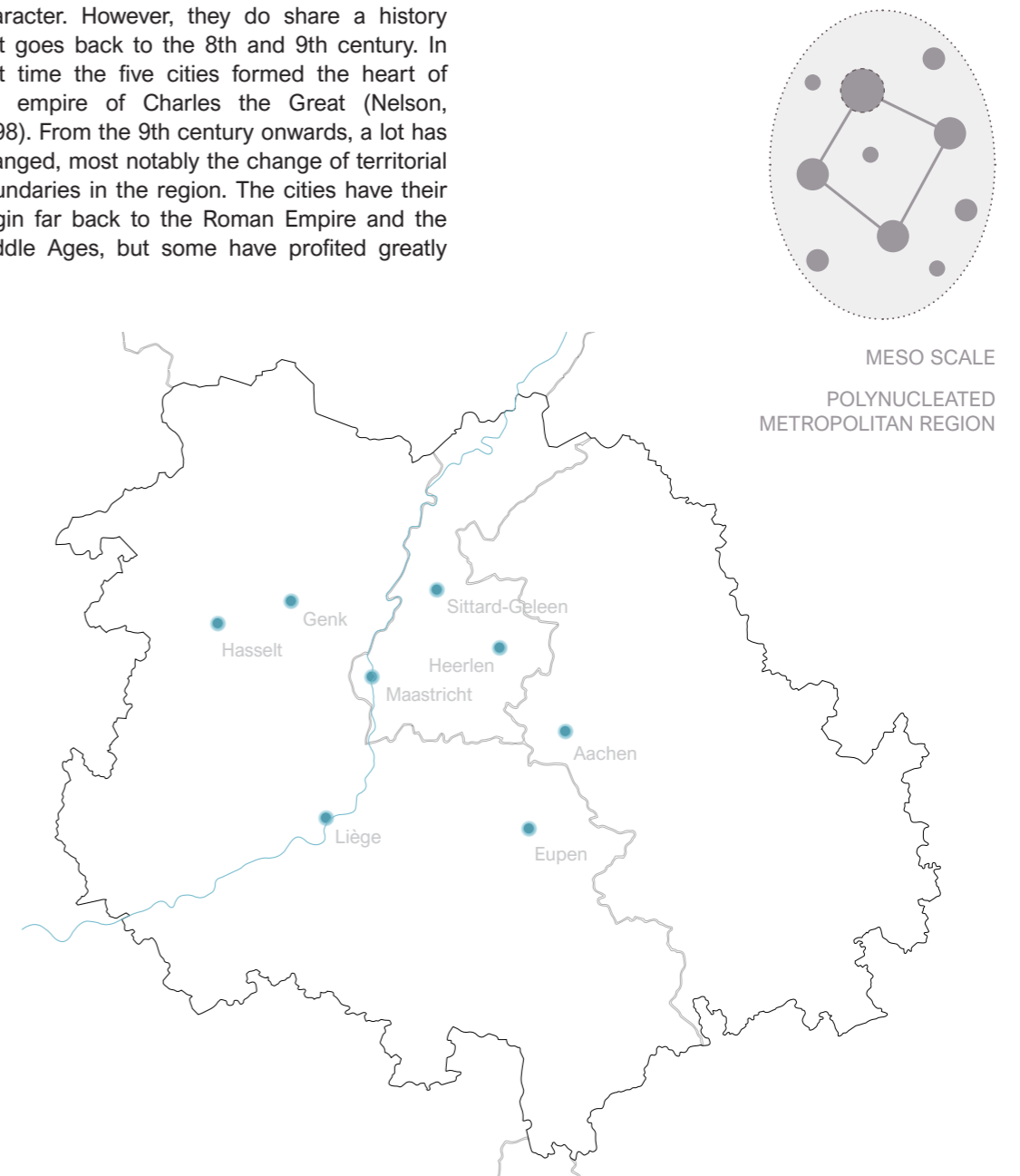Hasselt

Heerlen

Maastricht

Aachen

Liège

Eupen

Image 22.   The main cities as described bu the Euregio Maas-Rijn Stichting.

One of the characteristics of the region is its low population density in relation to the closeness of green, natural areas. In branding strategies of the EMR or of separate region within it, these are often used to express the uniqueness of the region. In comparison to the Randstad, the Netherlands' largest conurbation, the EMR indeed has a low population density. The Randstad is almost 3 times as small, but holds twice as many people. It relates to the high quality of life in the EMR where, due to the low population density, there is more space per resident.

It is also interesting to compare the region to the city of Berlin. Berlin has almost an equal number of inhabitants, and is slightly smaller than the EMR. Next to that it also has an equal number of students, even though there are less universities and colleges. However, Berlin is the second largest city of Europe, an multicultural metropolis, and one of the biggest cultural, political, and academic centres of Europe (Davies, 2010). In comparing a cross-border region with a city one must be careful, as the EMR is no metropolis city as Berlin, however it can be argued that the region could benefit from the same qualities of a metropolis and at the same time keep it green character (Smedts, 2014). Combining demographic figures from the different regions within the EMR shows that the region as a whole has much to offer. It creates a combination of green landscapes, international connections, knowledge and research institutes and an extensive education system.

RANDSTAD

INHABITANTS
8.2 million

AREA
4.300 km2

BERLIN

INHABITANTS
3.6 million

AREA
900 km2

4 UNIVERSITIES

7 COLLEGES

STUDENTS
185.000

INHABITANTS
3.9 million

AREA
11.000 km2

LANGUAGES
3 national + dialects

3 COUNTRIES
including 5 regions

TREATY OF MAASTRICHT

Eindhoven   Weeze
Brussel
Maastricht Aachen
Charleroi
Düsseldorf
Liège   Keulen

AIRPORTS
within 1h. of travel

NATURE LANDSCAPES
5 cross-border landscapes

Image 23.   [Name] ([Source])

AIRPORTS
Maastricht-Aachen Liege

6 UNIVERSITIES

16 COLLEGES

STUDENTS
170.000

HOSPITALS
3 academic

the Netherlands
4.500

RWTH Aachen
5.900

GRADUATED ENGINEERS

ULiège
Liège
Thor
Sart Tilmann
Limburg BE
Corda Campus
Forschungszentrum Jülich
Limburg NL
Aachen
Brightlands   RWTH

RESEARCH CAMPUSSES
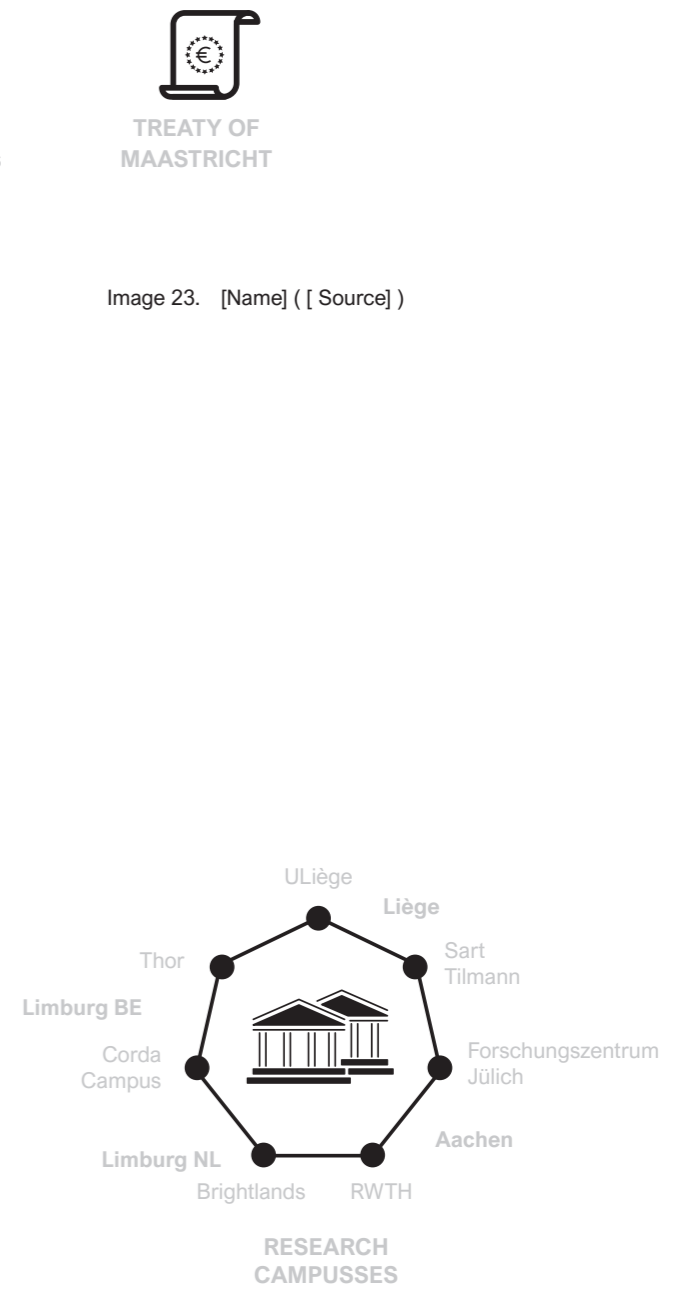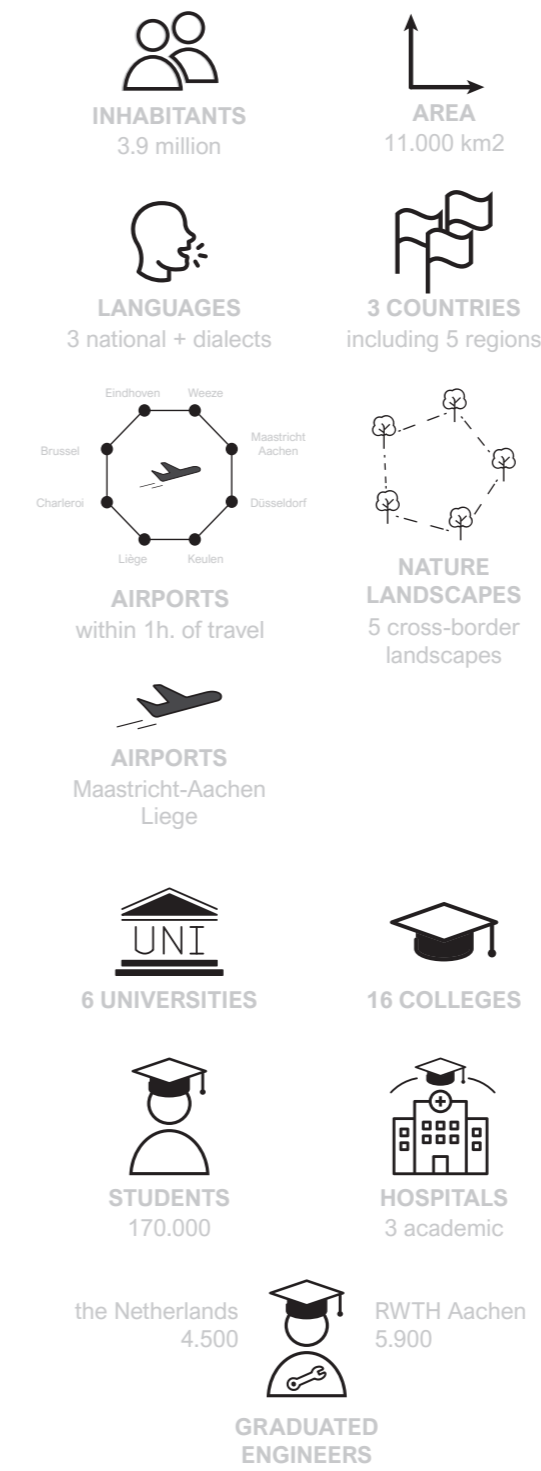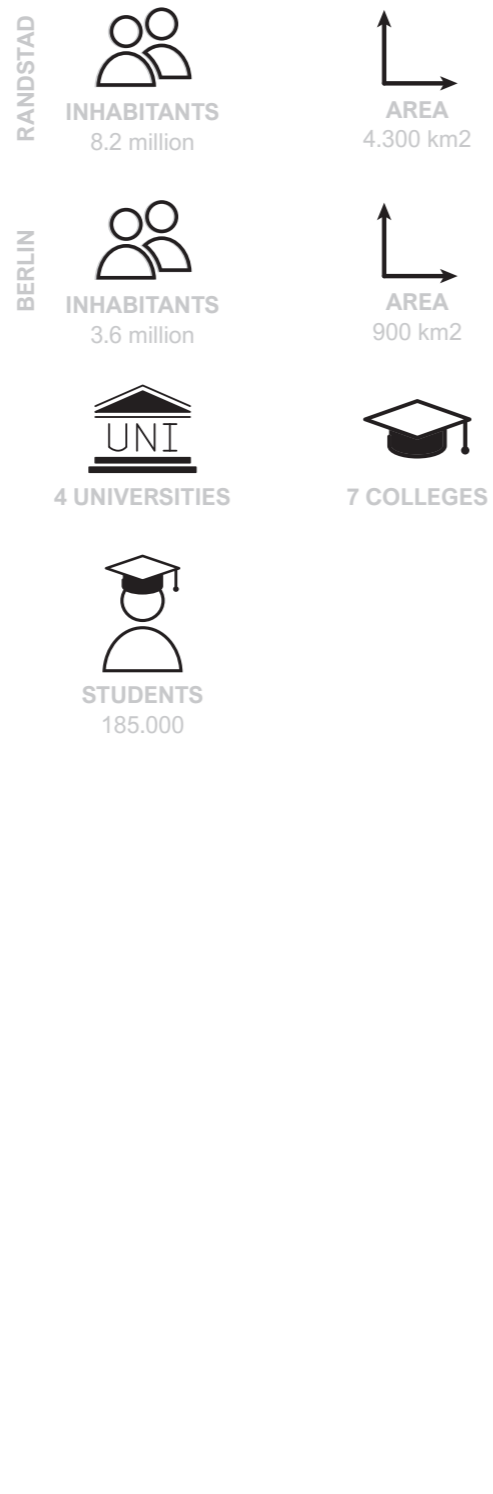
Inforgraphics EMR. Data: Interreg Euregio Maas-Rijn 2015-2017 (2017).

The EMR is an official euroregion, but is of course not the only one. European cooperation is greatly stimulated by the European Union, in the Treaty of Maastricht (1992) a 'Europe of regions' was integrated. The European Committee of the Regions holds representatives of 344 European regions (De Pater, 2011). The map above shows the large-scale Interreg transnational cooperations. These function mainly on an economic and ecological level, in creating regions that can compete in global markets. Interreg is a more familiar name for European Territorial Cooperation (ETC), and is

one of two goals to increase policy exchange between actors of different member states, it also provides a framework for joint action programmes to strengthen cross-border initiatives as can be seen in "Image 24".

An ambition of the European Union (EU) is to fight against regional inequalities, and provides regions with extra support and subsidies when nations do not provide enough (De Pater, 2011). Over the last two decades the establishment and strengthening of cross-border regions has taken a lift. Multiple regional management

structures have created their own bridges with the EU in Brussels, which can help them gain subsidies faster for regional development.

"Image 25" shows transnational cooperation in Europe along borders, so-called cross-border cooperation. The map shows regions that have been developed along national borders. They try to overcome border difficulties and provide border peripheries with opportunities for development. As the saying goes 'a good neighbour is worth more than a distant friend'. Often regions along the border are considered

a peripheral region in their own nation, and do often not include main economic centres on a national level. Across the border, a region is oftentimes struggling with the same issues. Connecting with each other, they can bundle their strengths and create a region that exceeds their individual potential.

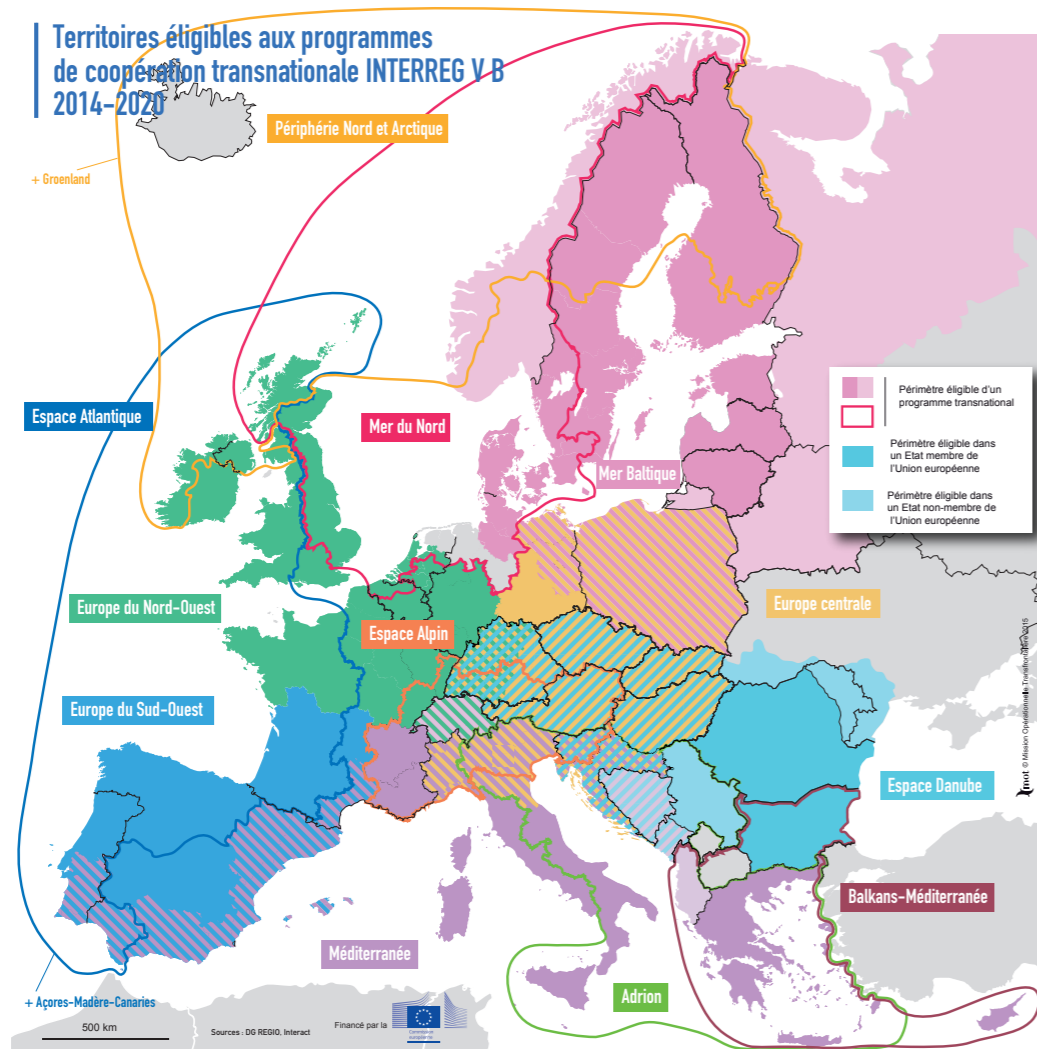Image 24.   European transnational cooperations included in the INTERREG programm 2014-2020 (The Transfrontier Operational Mission, 2015).
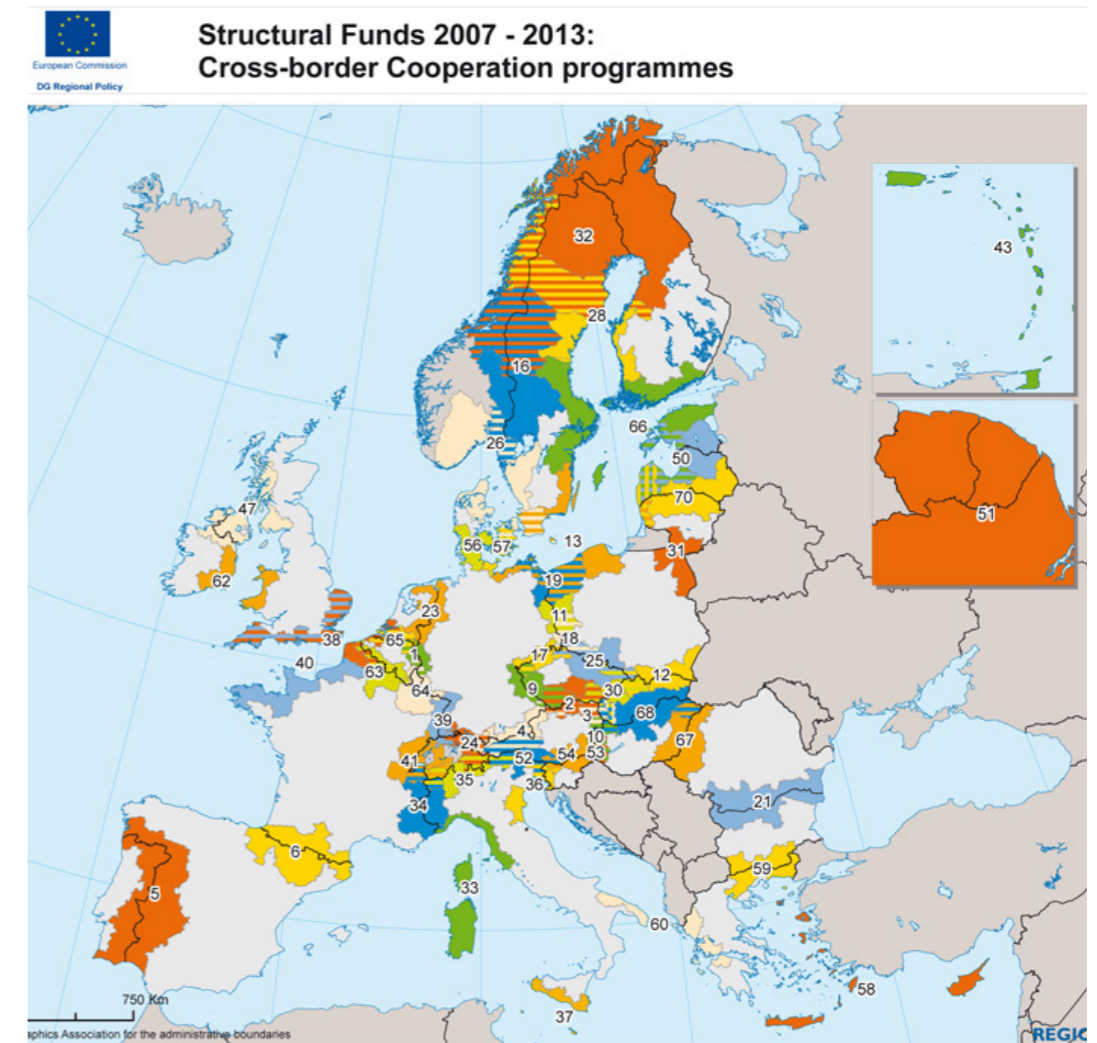

Image 25.   Cross-border cooperation programmes 2007-2013 (Consonni, 2010).

05

URBANISATION

Morphology
Population distribution
Function distribution
Urban centres in the EMR
Governance structures
EMR Foundation

Photo: Characteristic houses in Schweinberg.

The morphology of the region relates to the geographical characteristics of the region and historical events. Understanding historical developments of urbanisation can help explain the functioning of the urban system. Elements that have been of the greatest influence on the morphology are, the geographical river system, the canal waterway system, and the previous mining locations.

The Meuse and Rur river are the main rivers, as can be seen "Image 29". These have played a role in urban development from the origin of urbanisation in the region. The fertile grounds, nearby forestry and the safety of higher grounds were good conditions for farmers to settle. The Roman Empire later founded the cities of Maastricht, Aachen, Liège, but also the cities of Tongeren, Valkenburg, Heerlen. During the Middle Ages, the reign of Charles the Great and the Industrial Revolution these cities expanded further. Waterways were the main mode of transport before the introduction of the railways.

Besides the natural rivers, manmade canals also played a role in the urban development of the region, see "Image 28". Canals connected the main centres in the region, but also allowed urban development of new cities along the canals. Especially in the flat countryside of Belgium, canals allowed large expansion of urban development.

Specific for the region is the urban development from the coal mining era in the region. Coal became the main energy source in Western Europe in the 19th century, and government owned mining companies were set up from the 1900 onwards. During the 19th century, mining locations took off, resulting in a rapid population increase, as did urbanisation, see "Image 26". When the mines closed rather sudden in the 1970s, the main attraction points in the region disappeared, leaving areas with a high population density, low incomes and a relatively low number of attraction points.
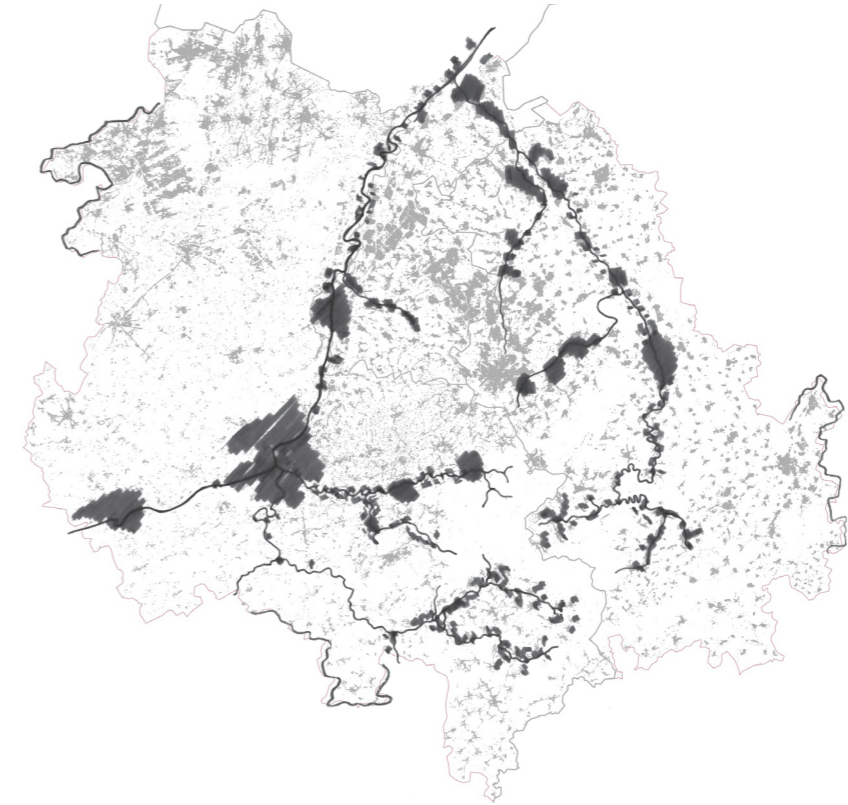

Image 27.   Morphology in relation to the rivers in the region.

Image 26.   Morhpology in relation to the mining locations in the region.

Image 28.   Morphology in relation to the canals in the region.

In chapter 4, the Euregio Maas-Rijn (EMR) was analysed to be a dispersed polycentric urban region. It implies that the urban structure consists of multiple middle-sized centres, in combination with a spread out pattern of urbanisation. Just as urban structures, the population is spread out across the region, resulting in a relatively low overall population density of 355 inh./km2. In comparison to the main economic centres in its surroundings, the Flemish Diamond has a density of 820 inh./km2, the Randstad of 1400 inh./km2, and the Ruhr-area of 1200 inh./km2. It shows one of the unique qualities of the region, it has almost 4 million residents – as many as the city of Berlin – but they are distributed across the region, increasing the amount of space per resident and in doing so increasing the quality of life.

The population density according to Eurostat Nuts 3 regions can be seen in "Image 31" It shows the relation between the EMR and its surrounding countries. National borders have been excluded from the map to focus solely on the distribution of population density. A clear relation can be seen between areas with high population densities and main economic regions as the Randstad, the Ruhr-area, the London agglomeration and the Paris agglomeration. The dashed lines show the areas with a visible increase in population density, but do not meet densities as high as the previously mentioned centres. These are the Flemish Diamond and the EMR. Their location, close to large economic centres, could be profitable for future developments.

Zooming in on the EMR itself, it shows there is an increase of population densities in the centre of the region, "Image 32". These areas correspond to the urban morphology, as the three largest cities – Maastricht, Aachen, Liège – are located in these areas. It also shows a relation to the former main industrial (mining) areas of the region. The city of Liège, the city of Aachen and its industrial expansion to the North, that connects with the large mining cites to the North and East of the city of Maastricht. The difference between the high population densities in these areas and the rest of the region are high. The other areas have a density

that is at least half as high as the three centre areas. This also relates to the morphology pattern as discussed before, and its relation can be seen in "Image 30." The concentration of urban development relates to the areas with a higher population density, where low population densities relate to areas with a highly dispersed urban pattern. However, these areas are highly important in the region as approximately 75% of all residents live in these dispersed areas. Hypothetically, this would imply that mobility is high in the region, as the dispersed areas will probably seek access to the densified areas for functions and amenities that can only be found in higher densified centres.

Typologies of urban structure, based on Meijer & Burger, 2010.
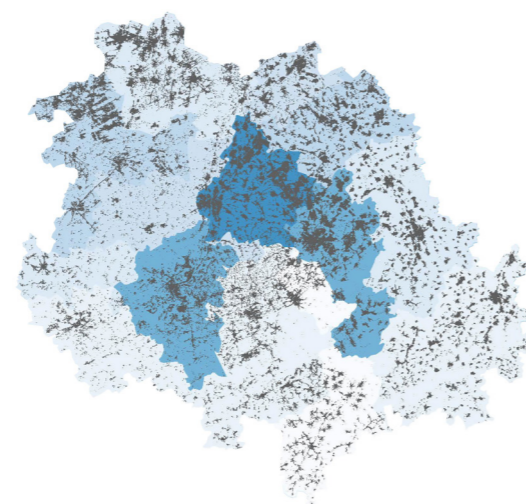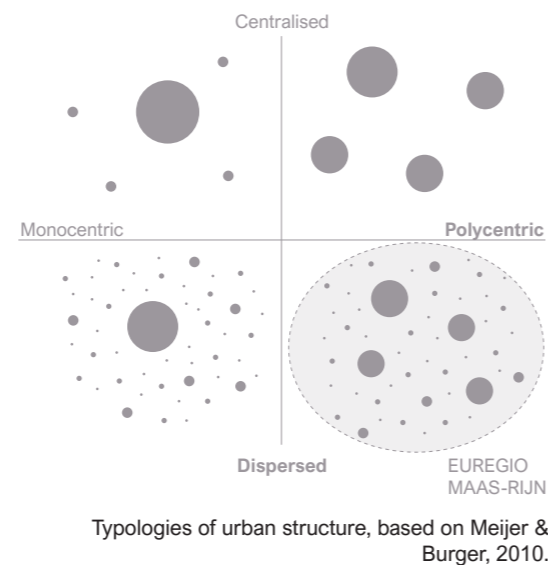
Image 29.   Population density and distribution in the EMR. Data: Eurostat, 2016; 2017; Geofrabrik, 2018.
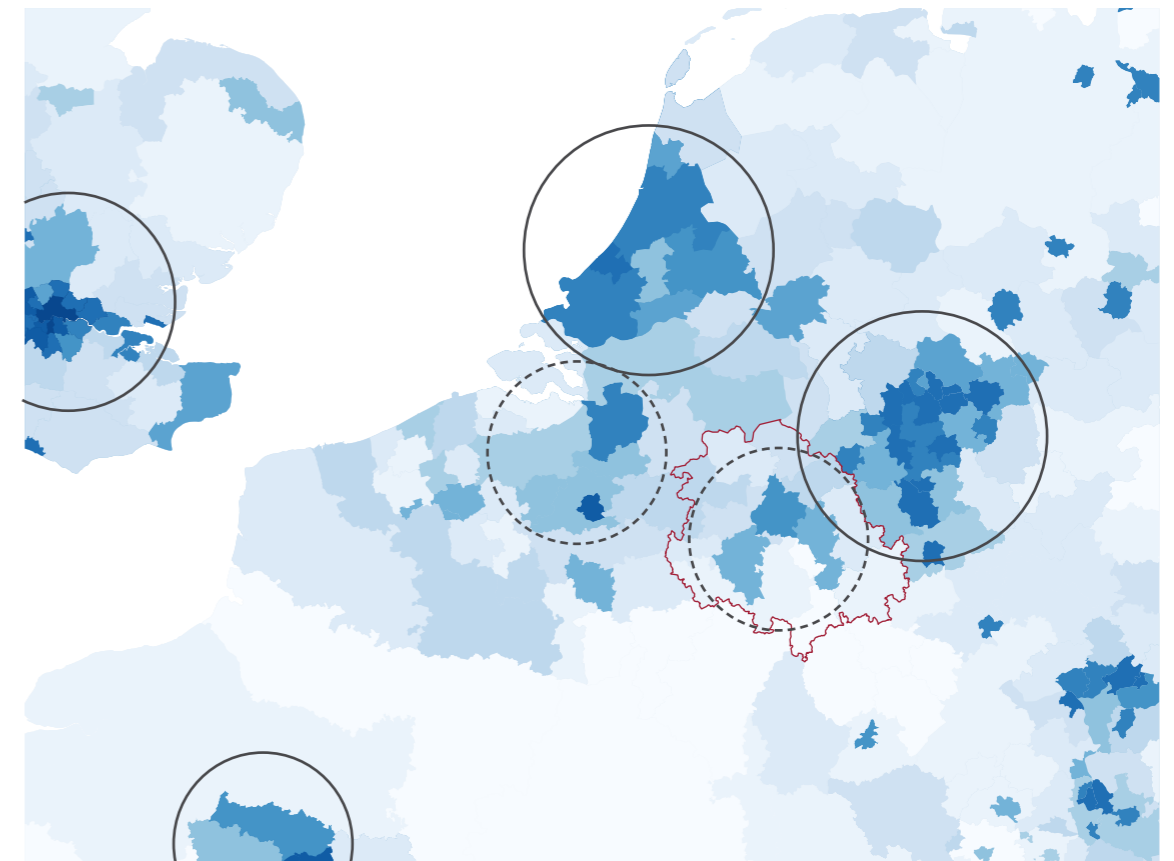
Image 30.   Population density Europe Eurostat Nuts 3 regions. Data: Eurostat, 2016; 2017.
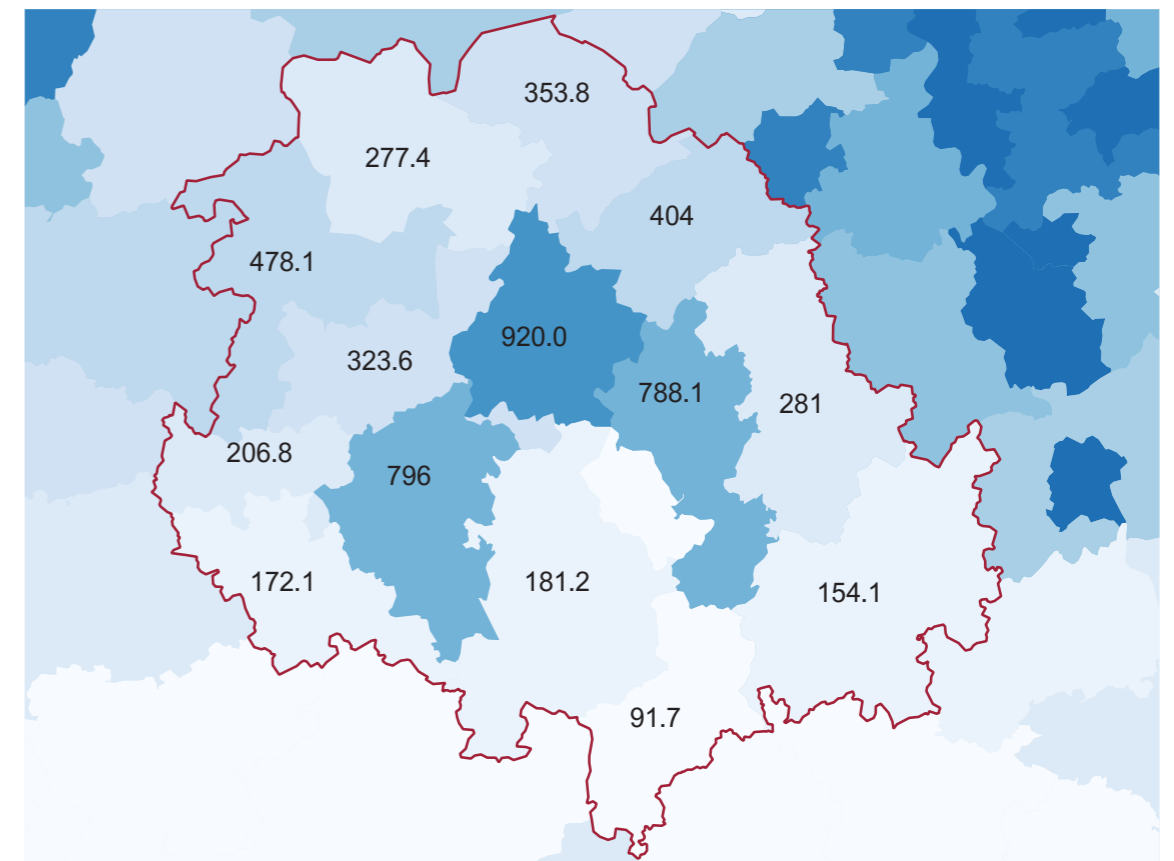
Image 31.   Population density EMR Nuts 3 regions. Data: Eurostat, 2016; 2017.

Inhabitants/m2.

1 - 100	300 - 400	600 - 700	900 - 1000	5000 - 10000
100 - 200	400 - 500	700 - 800	1000 - 2000	10000 - 20000
200 - 300	500 - 600	800 - 900	2000 - 5000	20000 - 70809
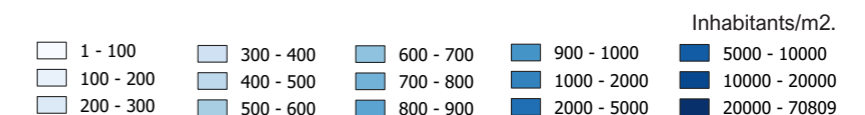
The location of functions can predict transport patterns of people, and see whether the location of high-scale functions is related to the population distribution. The type of functions are also an indicator for the level of agglomeration benefits in the area. Smaller scale functions travel together with people. Where urban settlements go, these functions tend to pop up as well. Functions that fall under this category are for example, supermarkets, apothecaries, primary schools, middle and high schools, vocational schools, playgrounds, neighbourhood parks. Fucntions that are considered to have an influence on the agglomeration strength of the region, are considered to have large-scale effect and reach. Large-scale functions can be considered as attraction points at the regional or even national level. The themes that were focussed on are: education & research, industry, retail, and recreation & landscapes.

Education

Education & research includes universities and colleges, and research campuses, see "Image 32" for the locations in the EMR. Large research campuses are always, with the exception of the Thor campus in Genk, located near or on the same area as a university. Four cities in the EMR are home to a university, Hasselt (Universiteit Hasselt – Uhasselt), Maastricht (Maastricht University – UM), Liège (Université de Liège – ULG), and Aachen (Rheinisch-Westfälische Technische Hochschule Aachen – RWTH Aachen). The RWTH Aachen is the only technical university in the region, however it is considered to be one of the biggest and most renowned technical universities of Germany and Europe. The other three universities focus more on Business & Economics, Medical, Life & Human sciences, Architecture & Art, and Social sciences. The similarities between universities have also led to cooperation, the UHasselt and UM work together closely.

The universities vary in size, but actually the two smaller universities have a larger percentage of international students. The UM even has over 50% international students. However, when looking at the amount of international students from countries in the EMR this percentage

is quiet low. The RWTH Aachen has 25% international students, of which only 2,6% are from the Netherlands, and only 3,9% are from Belgium. In total they only make up 1,4% of the total number of students at the RWTH Aachen. A possible explanation could be the language barrier, however about half of the bachelor studies are given in English. There is a considerable percentage (22%) of German students studying in Maastricht, they are one of the largest groups at the university.

Research campuses are located near the university campus, and are often closely connected. In the Netherlands the Brightlands campuses are located. These are four campuses connected through a public-private partnership of universities, colleges and leading companies of specific markets. The campuses include the Brightland Chemelot Campus, Sittard-Geleen, Brightlands Maastricht Health Campus, Brightlands Smart Services Campus, Heerlen, Brightlands Campus Greenport Venlo. The campuses are focused on a sustainable, green future in relation to the expertise of the participating universities and leading companies of the Limburg economy. In Belgium, Thor is an international technology park near the city of Genk. The park was set up as a development project for the reprogramming of the former mining site of Waterschei, it should be a hotspot for technology, energy and innovation. The focus is mostly on companies and innovation institutions.

Industry

Industry includes business parks and industry sites were raw materials are extracted, see "Image 33" for the locations in the EMR. Most of the industry concentrations are located along main lines in the region – the river Meuse, main road network or the train network.
The region hols two main extraction sites for raw material in Germany, and three large-scale business parks in combination with harbour industry alongside the canal. In the Netherlands, the main concentration is located along the Chemelot and DSM factories.
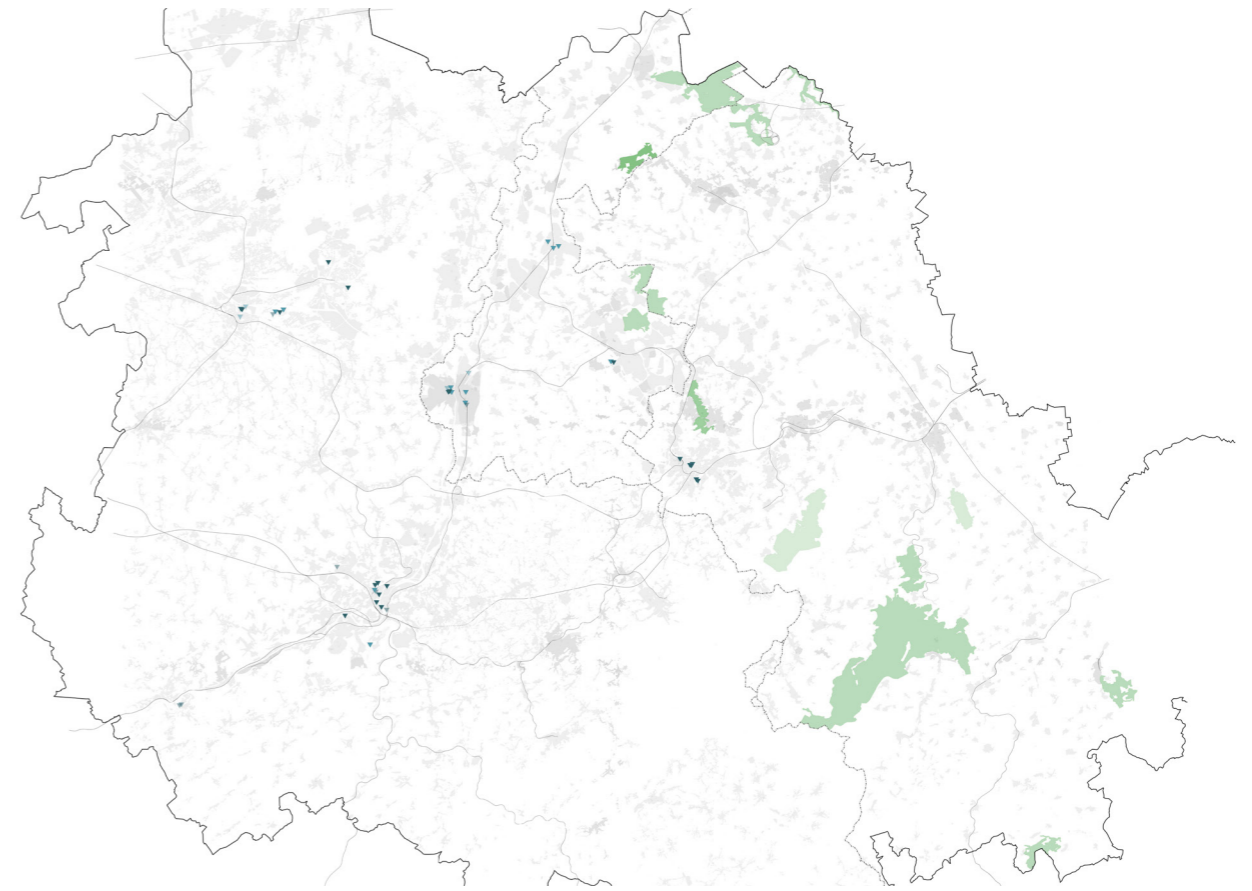

Image 32.   Location of high-scale education functions.
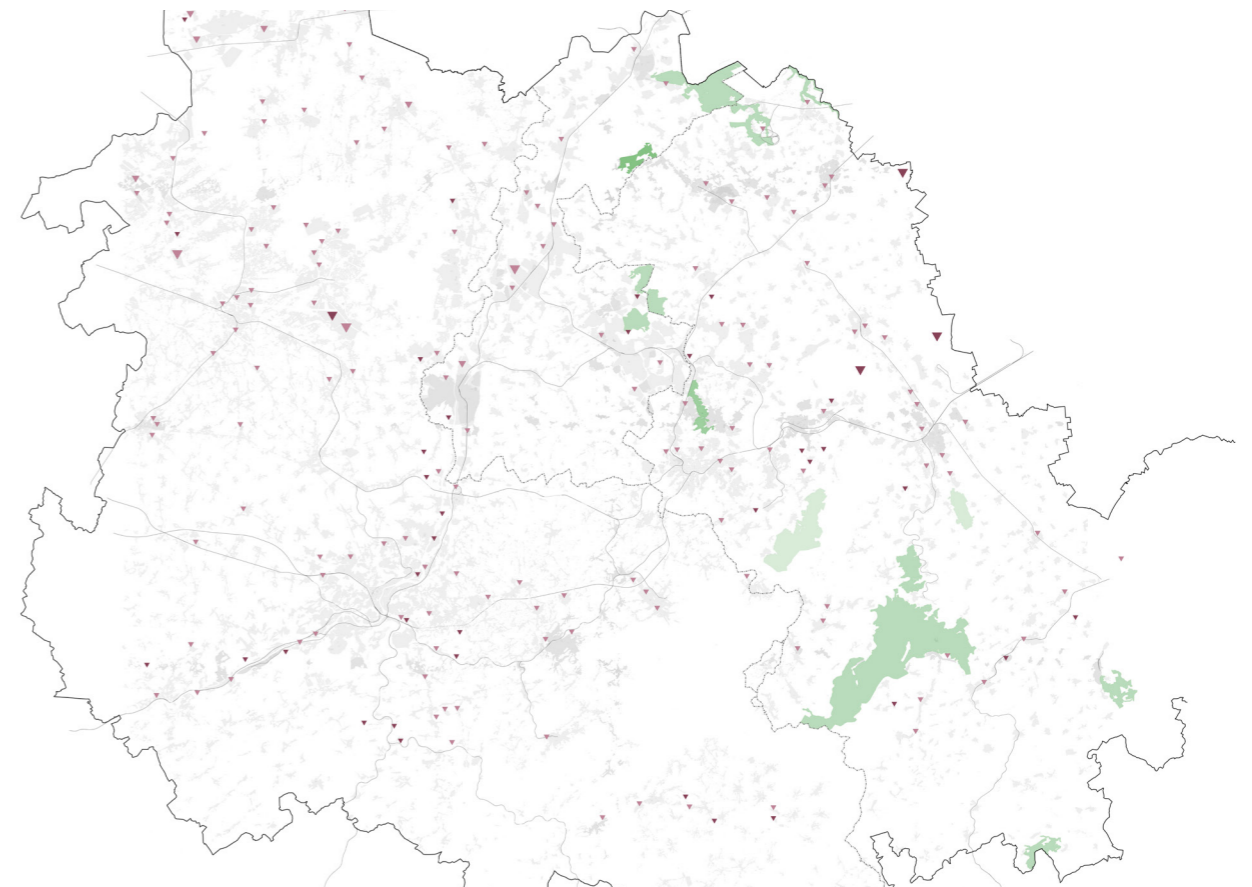
Image 33.   Location of high-scale industryl functions.

Recreation

Recreation & landscapes include amusement parks, zoo's, extreme sport facilities on the one hand, and on the other they include natural landscapes that attract visitors and tourists which are shown in the map in "Image 34".

The inner cities of the largest cities in the EMR can be considered to be a recreational attraction point. They are such large cities, that they tend to attract visitors on at least a regional level, and even attracting visitors on a national scale when special events take place.

The landscapes located in the region have also been considered as attraction points. The national landscapes as Les Hautes Fagnes, the Eifel, and the foothills of the Ardennes are well-known and popular holiday destinations. On a smaller, regional or local scale the National Park Hoge Kempen, Vaalserberg, and the Heuvelland are also popular landscapes for a day out.

Unique attraction points in the region include the race circuit of Spa-Francorchamps, amusement parks Plopsa Coo and Plopsa Indoor Hasselt, the remains of the mining sites in Flanders and Wallonia, Snowworld Landgraaf, Kerkrade Gaia Zoo and Aachen City Zoo.

Most of the recreational attraction points are located in the North of the region. This can be the case as the urban density is also larger in this area, so a higher diversity of attractions can be located here. In the South forestry and natural landscapes take up more space, which are an attraction point themselves, but lowers the diversity.

Retail

The map on "Image 35" shows locations of retail functions in the EMR. Retail includes large-scale shopping centres or city centres that are large and diverse enough to attract people from outside their direct surrounding municipalities.

In the EMR there are no large-scale shopping malls, so retail is mostly limited to the city centres of the largest cities in the region. These include, Maastricht, Aachen, Liège, Hasselt, Genk, Heerlen, Roermond, Eschweiler, Verviers, Hoei, Tongeren, and Sittard. These cities have a large diversity of shops and are home to large international brands. Next to these city centres, there are also two well-known outlet centres – Maasmechelen Village and Designer Outlet Roermond. These attract such high number of visitors that they can also be seen as a recreation attraction point. The Designer Outlet Roermond attracted 7,5 million visitors, Maasmechelen Village 2,5 million visitors in 2017. These figures can easily compete with the number of visitors in city centres.
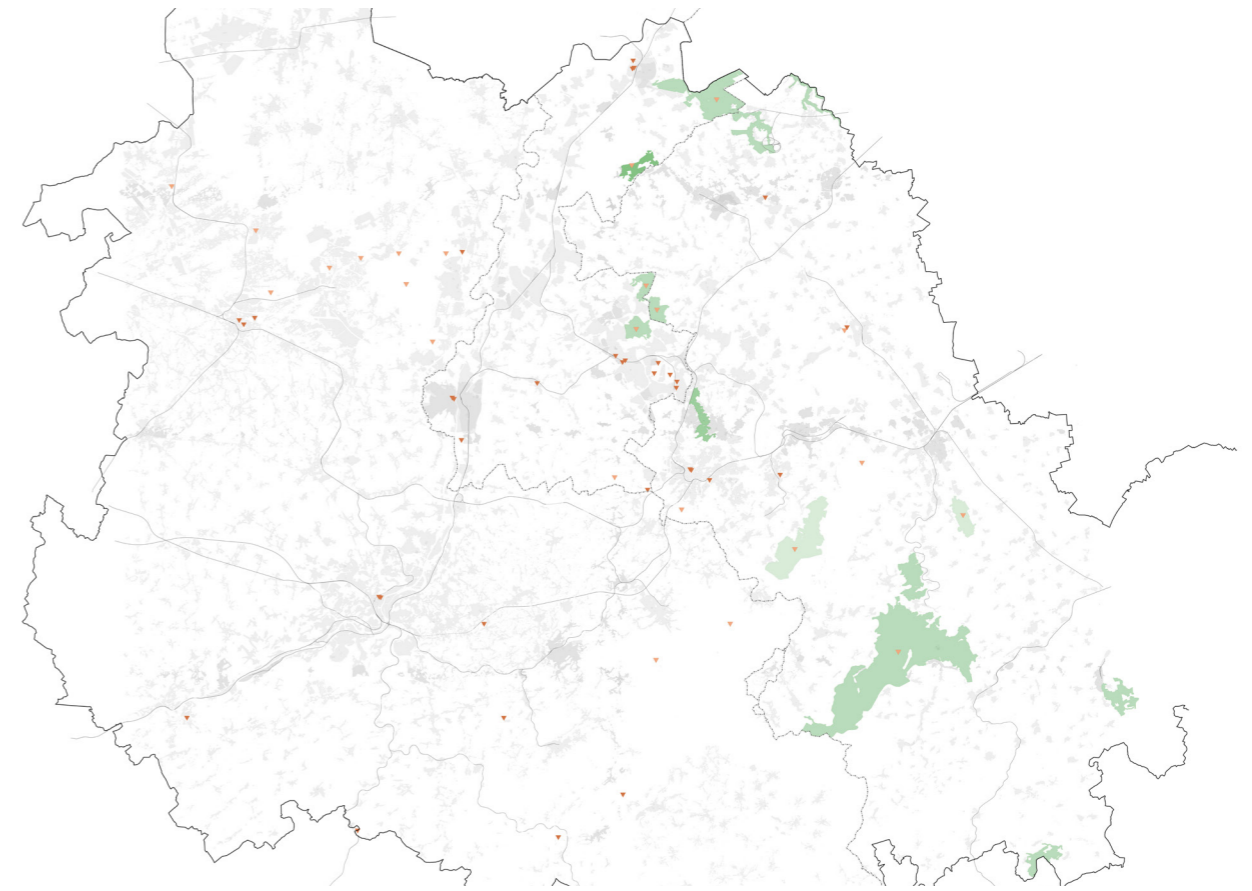
Image 34.   Location of high-scale recreation functions.
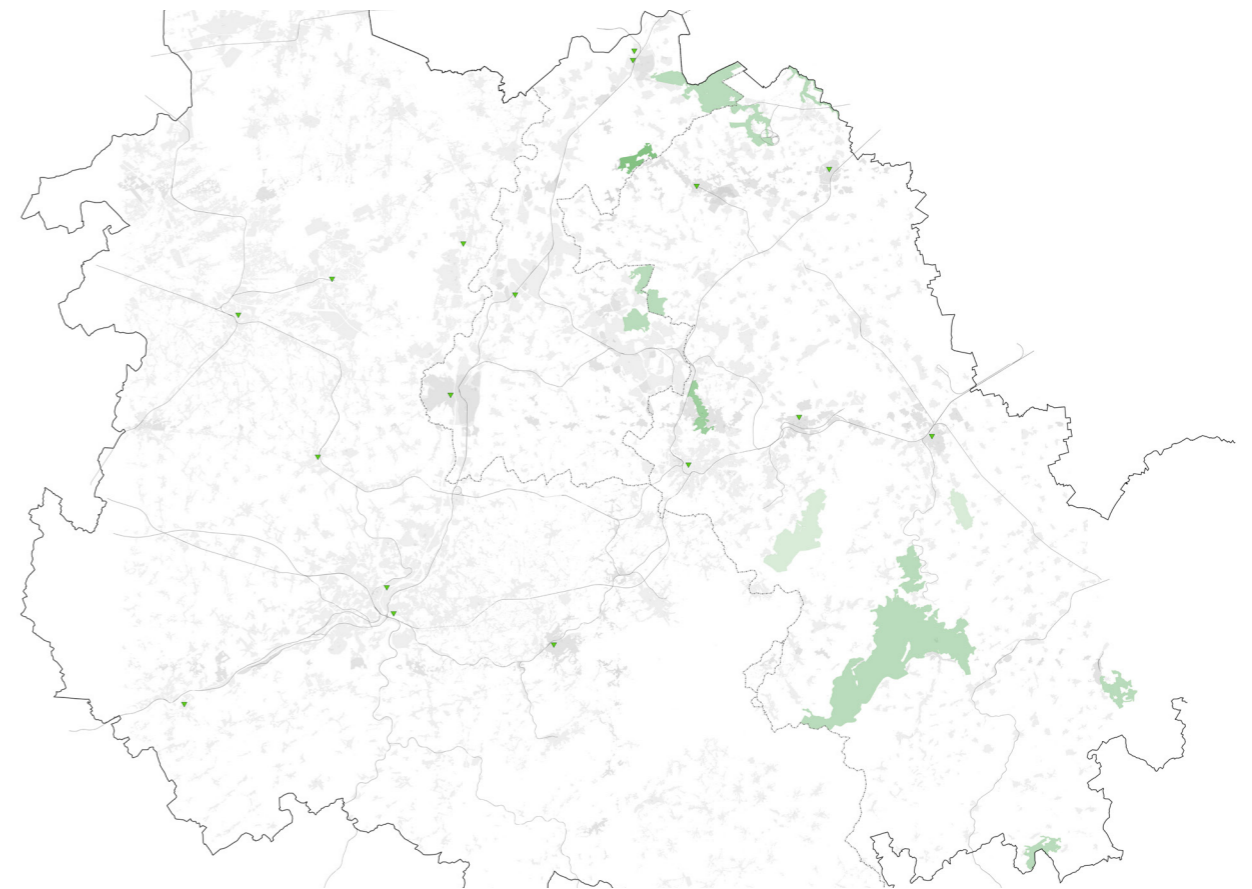
Image 35.   Location of high-scale retail functions.

The spatial analysis on urbanisation focussed on the possible relations between urban morphology, population distribution and function distribution. It shows that high population densities, high number of functions, and concentrated urban patterns are related to each other and are present in the areas that correspond to the main cities in the EMR. However the difference between these concentrated areas and the 'urban field' are substantial and at the same time of great importance. Hypothetically, mobility will be high in the region, as the bridge between the centre and the urban field needs to be closed. The main cities are concentrated in the central area of the region, relatively close to each other, but also divided by national borders. In further development the gap between the region and the central nodes should be diminished.

Urban development and the region's population is spread across the region, whit densification and concentration occurring in and around the main cities in the EMR. However, these concentrated areas only add up to 25% – 30% of the total population. 70% - 75% of the population in the EMR live in the rural areas, characterised by a dispersed urban pattern. This means that the connection between the urban centres and the 'urban field' is particularly important. This connection is also important in the distribution of attraction points. The majority of the attraction points in the EMR are located in, or in the direct surroundings of the main cities in the EMR - the urban centres. As there are not a lot of attraction points in the in-between areas, it is difficult to build a financial case for an extensive network in the in-between land. The focus should be on the fact that the region serves the city and the city serves the region, as elaborated on in the theoretical framework in chapter 4. The EMR can be considered to be a dispersed polycentric region, in morphology, population distribution and function distribution. The connection between the polycentric centres and the surrounding region is of great importance as the majority of the population does not live in the centres.
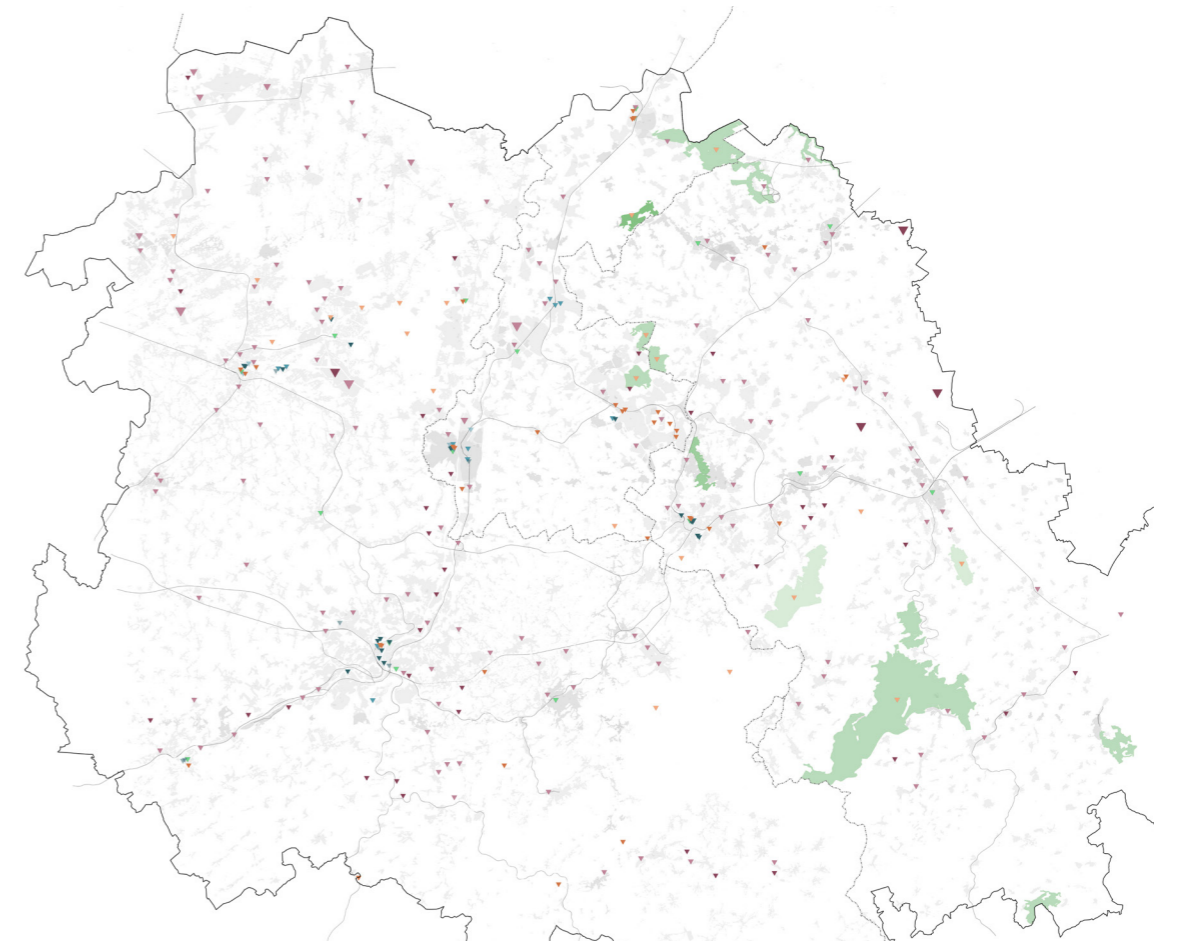
Image 36.   Functions in the EMR.

Image 37.   Conclusion location functions.

Image 38.   Conclusion scattered urbanisation.

The population distribution and function distribution are linked to each other as seen on the previous pages, and higher densities of people demand higher densities of functions and vice versa. These two aspects combined establish the urban level of the main cities in the euroregion, and determine what nodes are central in the network. The analysis focusses on the same aspects as the general analysis that can be found on the previous pages, and include population, population density, and presence of functions. There are more aspects that are of importance, such as cultural facilities, economic prosperity, and the presence of international cooperations, these should be elaborated on in further research. Combining population and functions focusses on the relations between supply and demand in the region, which is important as the relation between concentrated centres and the high number of residents in the urban field is significant in the EMR. Nodes with a high population but a low number of functions, generate mobility as residents have to travel somewhere else to have access to functions and amenities. Likewise, mobility is generated in nodes with a high number of functions, but a low number of population, as many residents from its surroundings will visit the nodeThese show the example of nodes that are not balanced in their numbers of population and functions, however most nodes have established a balance between these two aspects – either at a large or

a smaller scale. The map to the right, "Image 39", shows the most central nodes in the EMR. A division can be made in large-, middle-, and small-scale balanced nodes, with the presence of a few imbalanced nodes. These include Hasselt, Heerlen and Kerkrade.

Hasselt has a low population number, but a high presence of functions. The number of large-scale functions in the city is relatable to cities as Maastricht, Liège and Aachen. However, the amount of people living in the city is relatively low. This implies a lot of mobility flows from and to the city, as residents from surrounding areas access the functions in the city. The cities of Heerlen and Kerkrade show the opposite combination, a high number and high density of population but a low number of functions. This could be explained by the mining history in that region, as stated before on page 62. Imbalanced nodes can overcome their shortcomings by connecting with nodes that provide the aspects that they lack. Also smaller nodes could increase their scale by profiting from nearby larger nodes if their connection is good. This will be used in the regional strategy for the EMR explained in chapter 9.

	Population	Population density	Number of Functions
1. Liège	High	High	High
2. Maastricht	High	High	High
3. Aachen	High	Medium	High
4. Hasselt	Medium	Low	High
5. Heerlen	High	High	Medium
6. Kerkrade	Medium	High	Medium
7. Roermond	Medium	Medium	Medium
8. Sittard	Low	Medium	Medium
9. Geleen	Low	Medium	Medium
10. Genk	Medium	Low	Medium
11. Verviers	Medium	Medium	Low
12. Düren	Medium	Medium	Low
13. Alsdorf	Medium	Medium	Low

Population

100.000 - 230.000
70.000 - 100.000
60.000 - 70.000
50.000 - 60.000
40.000 - 50.000
30.000 - 40.000
20.000 - 30.000

Population density (inh./km2)

2500-3000
2500-3000
2500-3000
2500-3000
2500-3000
2500-3000

Number of large-scale functions

High ———————— Low

Image 39.   Central nodes in the EMR, according to number of population and functions.

Governance urban development

The urban structure in its current form is a result from different national or regional urban strategies that have evolved over time. The euroregion combines three nations, each with their own governance structure that differ from each other. Differences in structure can create barriers and misunderstandings in cooperation, which hinders further integration in the region. Urban development is organised in four different administrative regions; Flanders, Wallonia, Limburg, and Region Aachen (Bundesland Nordrhein-Westfalen). It is important to understand differences and similarities between these systems, to understand how an integrated vision can be realised with inclusion of all administrative regions.

Government in Germany

Germany is a federal state and is divided in 16 Bundesländer (states). Each of which is further divided into Stadtstaaten and Regierungsbezirken. The Regierungsbezirken are divided into 113 Kreisfreie Städte and 323 Kreisen (regions). The Kreisen are relatable to the Dutch and Belgian provinces. Kreisen are further divided into Gemeinden (municipalities). The Bundesländer hold a lot of competences and responsibilities and have own constitutional laws, parliaments and governments. In the Bundesrat they are also able to have influence on the federal governance layer. They complexity of territorial division can be related to Germany's history. Its landscape is characterised by a lot of small and medium-sized towns, which are an inheritance from the past, when Germany consisted of small and medium-sized autonomous states.

The basis of Germany's spatial planning also relates to this past, and is based on decentralised concentration, based on the concepts of central places and development axes. Agglomerations of different sizes are spread across the country, intermediate centres surrounded by smaller centres, which are connected to each other by transport axes to create a network of cities, instead of one major city.

In spatial planning, the federation is at the top,

however it holds only framework responsibilities and has no direct planning competence. The municipalities are the main spatial planning authority, but need to relate to the guidelines presented by the regions, following guidelines of the states. They follow the principle of 'mutual influence', the federation and states are obliged to take interests and plans of municipalities into considerations, and lower levels are obliged to consider the guidelines principles proposed by higher levels. Each planning level, except the federal state, can create spatial plans. Even though municipalities are autonomous in spatial planning, the federal government and the states can increase their influence by using financial programmes and subsidies to support certain development trends and activities. They can also use pilot projects or innovative programmes to initiate and support discussions in different field of spatial strategies (Ryser, Franchini, 2015).
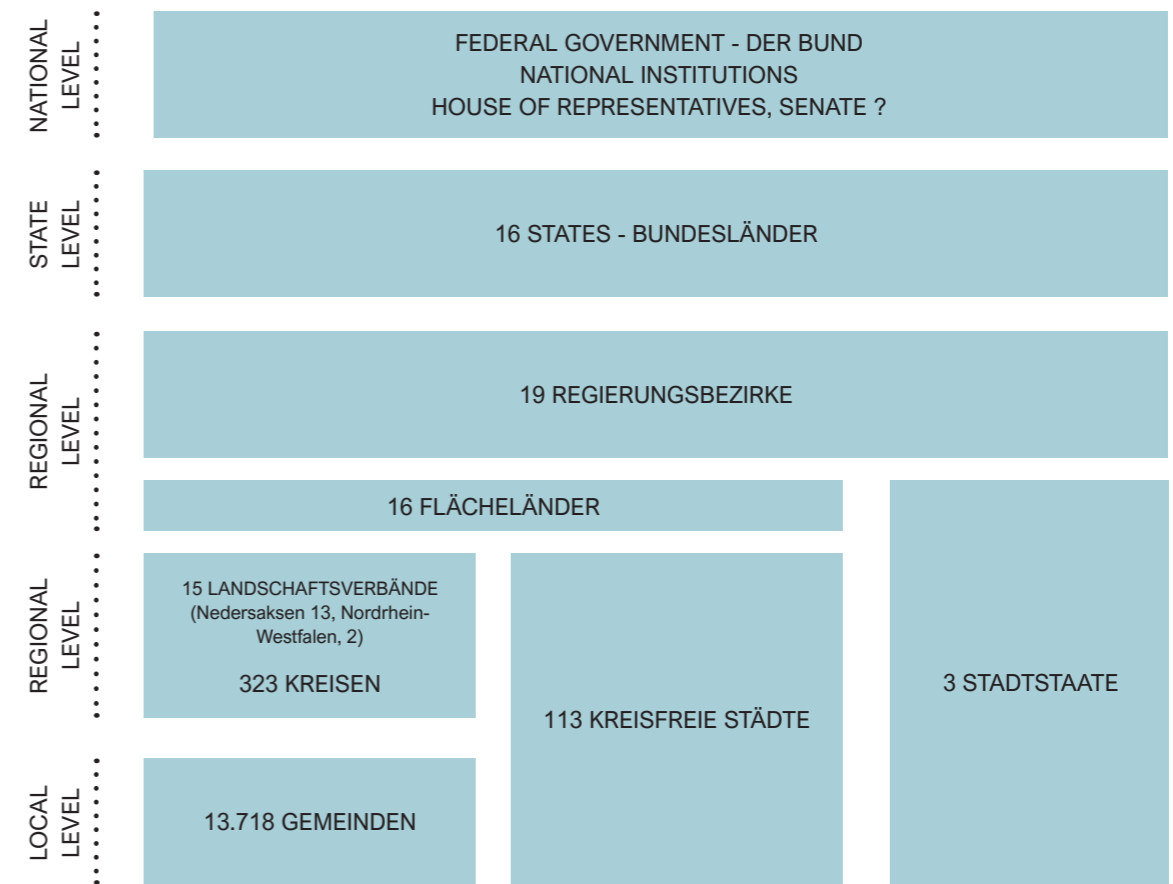

Image 40.   Organisation German government.

Government in Belgium

Belgium is a federal state, including three *gewesten* (regions) and three *gemeenschappen* (communities). The regions and communities are on the same policy level, but are responsible for different aspects. The regions are responsible for economic-related (such as public works, economy) and territory-related matters (such as environmental policy and spatial planning). The communities are responsible for person-related (such as welfare) and language-related (such as culture) matters. The division of the communities is based on the linguistic areas in Belgium, and Walloon territory is home to two communities. The federal level has limited competence in environmental planning, but has none in spatial planning. The competence and influence of the Belgian regions in the fields of spatial planning, transport policy, environmental policy, and regional aspects of economic and agricultural policy has increased since 1980. In the 1980s the existing Belgian planning legislation was inherited by the three Regions. 48 district plans were elaborated on national level, these are land-use plans on 1/25.000 scale for the whole of Belgium. These plans remain the legal instrument for the regions, untill they have replaced them by other legal plans. Additional handicaps to integrated planning are a lack of adequate platforms for consultation and disorganised levers, such as financial instruments. Result of this is a divergence in these matters between the three regions. The territory of a region does not necessarily concur with the communal territory, which can lead to complications in integration of projects.

Final decision-making and responsibility for urban and spatial planning lies with the regions. However, some aspects under communal responsibility have an influence on urban planning. To diminish the gap between governments domains of the communal and the regional level, Flanders decided in 1980 to merge the Flemish Region and the Flemish Community. As their territory was equal, it was a relatively 'easy' decision.

Government in the Netherlands

The Netherlands are a parliamentary democracy, and a constitutional monarchy. Legislative power lies with the King and the Ministry, executive powers lies with the Parliament. The territory of the Netherlands is further divided into 12 provinces, which have been divided into 393 municipalities. Around 50% of the Dutch territory is located beneath sea level, this means that water, and protection from water has always been a large part of their spatial planning policies. Therefore the nations territory has also been divided in 24 Waterschappen (water boards), responsible for water management.

The Dutch planning system is characterised by the high level of competences and responsibilities of local governments, not only competences explicitly granted to them by national government. The Dutch government structure is a decentralised unitary state with the underlying principle of self-government of provinces and municipalities. Important in this is co-government, the provinces and municipalities are involved in formulation and execution of central government policies. It is based on the fundamental philosophy that "unity cannot be imposed on the country from above, but must come from a plurality of forces working out their differences within an agreed framework" (p. 3). The key power in spatial planning lies with the municipalities, who work according to the guidelines of the province, who follow the guidelines from the national government. Guidelines on the national level are often less specific, and open to contextual interpretation.

The Netherlands has a planning system called the Omgevingswet (Environmental Planning Act). It is a combination of two former frameworks; ruimtelijke ordening (spatial planning), and milieu planning (environmental planning). Integration between different aspects has become increasingly important, and the Environmental Planning Act includes the environmental policy plan, strategic water plan, transport plans, planning policy strategy and parts of the nature policy plan.
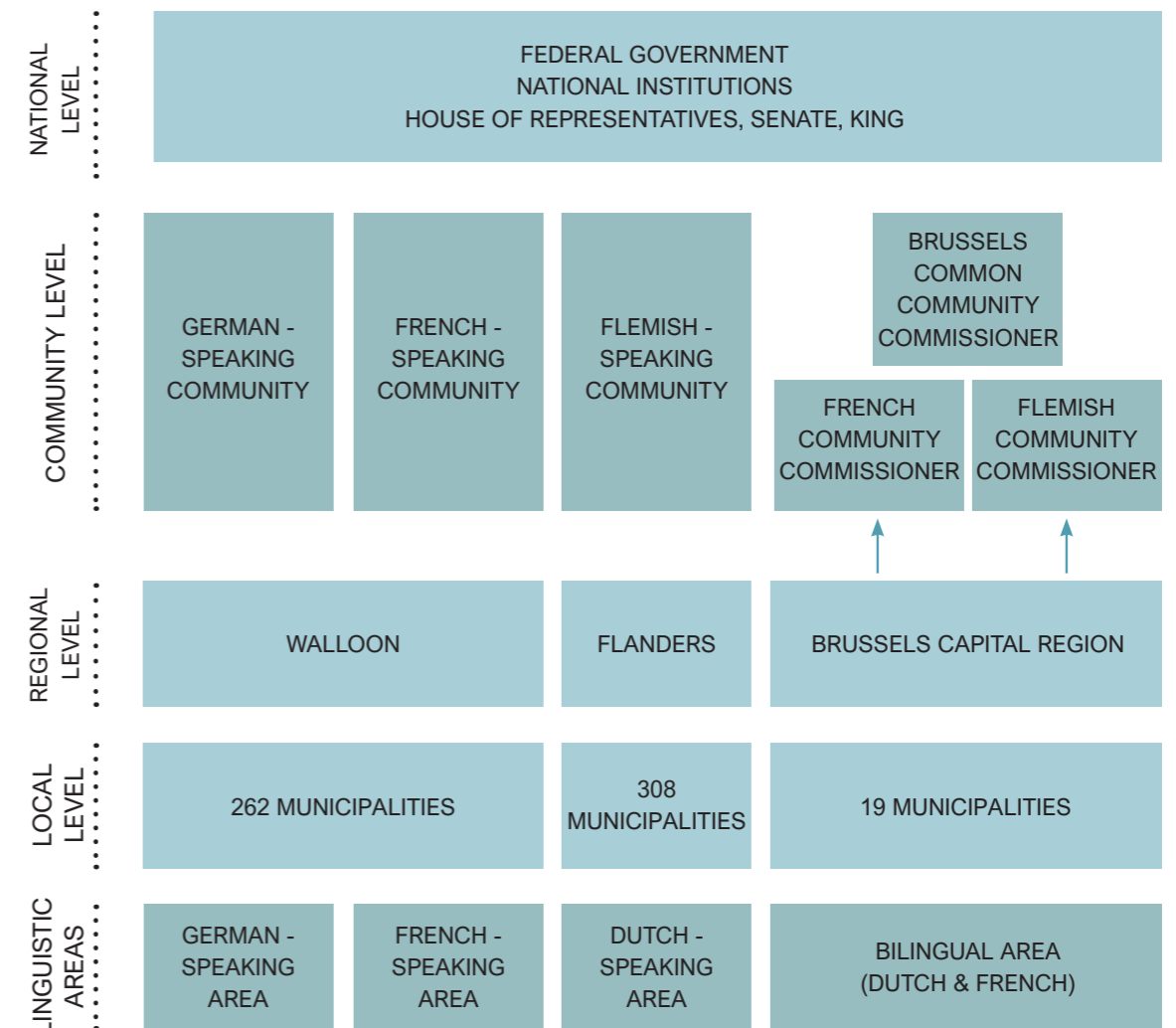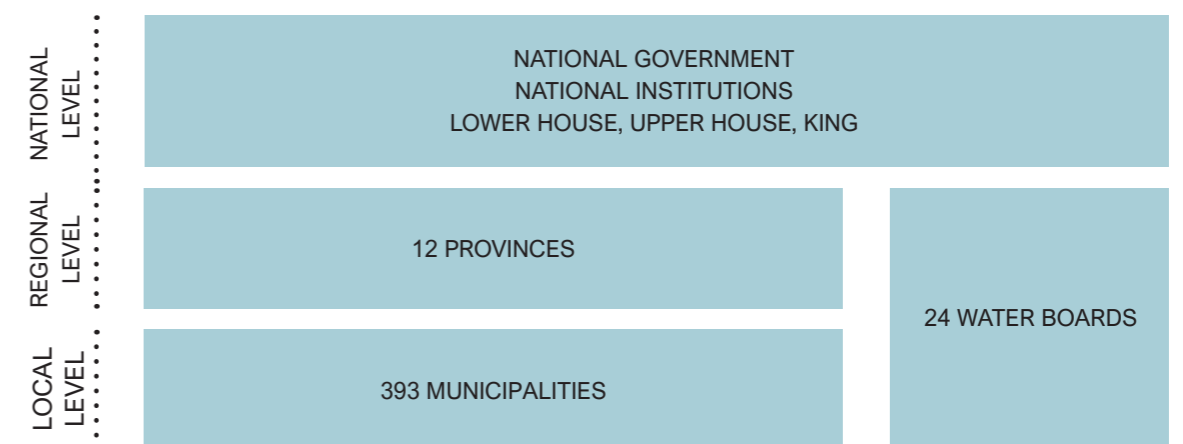

Image 42. Organisation Belgian Government.

Image 41. Organisation Dutch Government.

The original Belgian planning system of district plans, originating from 1962, was gradually replaced by a system on three policy levels; the Region, the Provinces, and the municipalities. The 'subsidiarity' principle determines the distribution of competences, it assumes that the government ought to reside at the lowest feasible level, unless the latter presents clear advantages. Each policy level should develop a Spatial Structure Plan and Implementation Plans. The plans are approved by the next policy level. Through this structure, the Region maintains the final decision power in spatial planning.

Next to these two main type of plans, there are also Spatial Planning Ordinances in place. These are aimed at the construction-physical quality of all aspect concerned in spatial planning (e.g. construction quality of buildings, maintenance of road network, thermal and acoustic qualities etc.).

The Spatial Structure Plan is a document on policy level that indicates the framework for the long-term vision on spatial development. The plan aims at creating cohesion in preparation, the making and implementation of decisions related to spatial planning. The enforcing character of the structure plan is only aimed at authorities, it does not contain concrete regulations that would influence the use of a specific parcel of land.

The Implementation Plan consists of a plan indicating for what area(s) the plan is applicable, along with regulations regarding use, layout and/or management, aimed at implementing the framework described in the Spatial Structure plan. *Use* refers to regulations allowing certain functions or activities in that area, *layout* refers to the organisation of certain functions or activities, and regulations regarding morphology, *management* refers to regulations preserving spatial conditions for proper functioning, and the spatial characteristics or properties. All types of permits, concerning the built environment, are checked against the implementation plans, not the spatial structure plan.

Regional Level

The Spatial Structure Plan in Flanders is called the *Ruimtelijke Structuurplan Vlaanderen (RSV)*. The plan selects and categorises the urban settlements, the important outer areas for nature, agriculture, forest extension, areas for economic activity, and the main infrastructure on a regional level. It also defines specific policy for these domains.

Important aspects in the Implementation Plans are the contouring of specific areas for certain functions; metropolitan and regional urban areas, industrial, seaport and airport, natural and agricultural. Next to this, the plans also define the categorisation and principles for design of the main infrastructure.

Provincial Level

Important items in the Spatial Structure Plan of the five provinces in Flanders are:
- The selection of cities and city networks, main villages
- Allocation of quantitative responsibilities for housing in different settlements
- Development perspectives for open space, natural areas, the ecological main structure
- Selection of secondary roads
- Vision for tourism and recreation
Provincial Spatial Implementation Plans (PRUP) can be created and drawn as soon as the Region has approved the Provincial Spatial Structure Plan (RSP). These will focus on implementing the RSP.

Municipal Level

The *Gemeentelijk Ruimtelijk Structuurplan* (GRS) is the Spatial Structure Plan of the municipalities in Flanders. The plan includes a development strategy for different parts of the municipality. Besides that it also contains necessary actions and measures that need to be followed in the implementation of the vision.
The implementation of the GRS is ensured by the *Gemeentelijke Ruimtelijke Uitvoeringsplannen* (GRU). It can be specific and define what function is located at each area, but also contains fixations of densities, and housing and subdivision typology. It can also contain management rules for specific areas, and design the layout of specific areas.

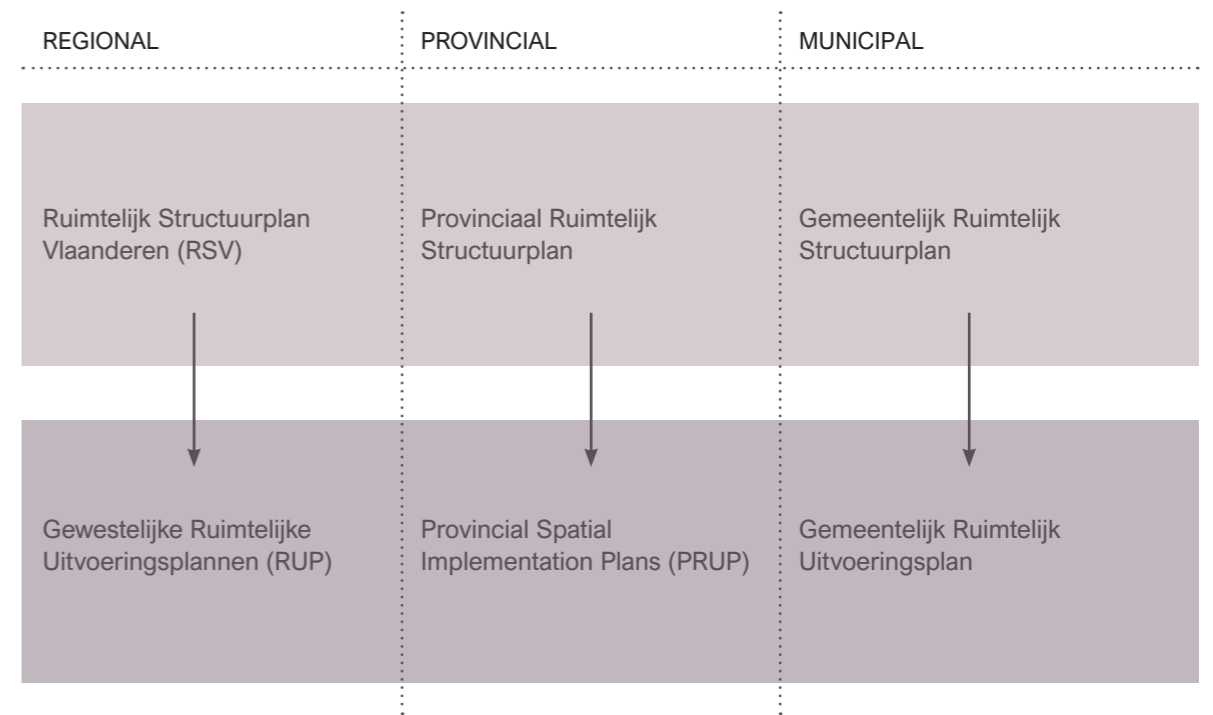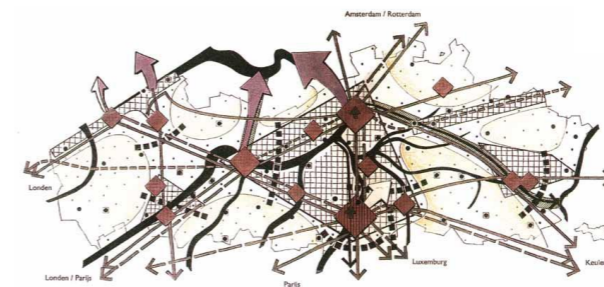| REGIONAL	PROVINCIAL	MUNICIPAL
Ruimtelijk Structuurplan Vlaanderen (RSV)	Provinciaal Ruimtelijk Structuurplan	Gemeentelijk Ruimtelijk Structuurplan
Gewestelijke Ruimtelijke Uitvoeringsplannen (RUP)	Provincial Spatial Implementation Plans (PRUP)	Gemeentelijk Ruimtelijk Uitvoeringsplan

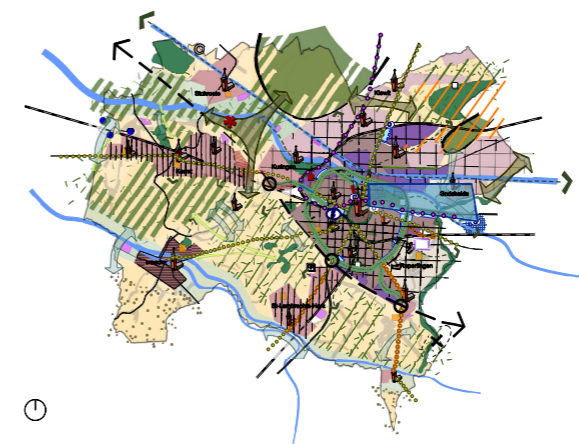Image 43.   Scheme instruments spatial planning Flanders.
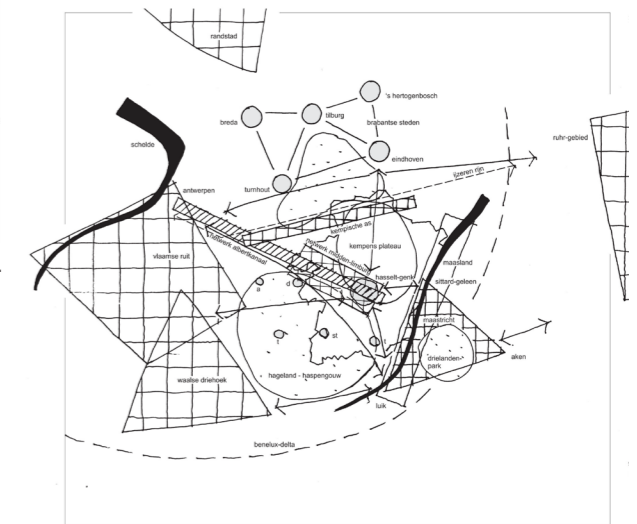
Image 44.

Image 46.

Image 44.   Spatial Structureplan Flanders 2011 (Vlaamse Overheid, 2011)

Image 45.   Municipal Spatial Structure plan Hasselt (Technum, 2009)

Image 46.   Spatial Structure plan Province of Limburg (Provincie Limburg, 2012)

Image 45.

Wallonia also replaced the original Belgian Planning Act in a different way than Flanders. The decision-making process takes place at two policy levels; the central level (Region) and the municipal level. In contrast to the past, the provincial level is no longer relevant in Walloon spatial planning. They have three main instruments in spatial planning, that are used on both policy levels. These include *schémas* (frameworks), *plans* (plans), *règlements* (regulations). Another distinction that is made in Wallonia, is between strategic/indicative policy documents and prescribing or regulatory documents. The first corresponds with the schémas, they outline the objectives to be reached and the resources to be used, and are relatable to the Spatial Structure Plans in Flanders. The plans and règlements are policy-implementing tools and correspond to the objectives in the schémas, and can be compared with the Spatial Implementation Plans in Flanders.

Regional Level

On the strategic policy level, Wallonia designs a regional spatial development scheme *'Schéma de Développement de l'Espace Régional (SDER)'.* It is an indicative strategic plan, not legally binding. The indications in the plan serve as a basis for the creation of plans, as well as forming a basis for the issuing of permits. An environmental effects report has to be drawn up, followed by a public enquiry, before the SDER can be drawn up and reviewed.

The District Plans *'Plans de Secteur'* were established between 1977 and 1987 by the Royal Decree and decision of the Walloon Regional Executive. There are 23 districts, in which the land use – a well-defined use for each area – of the whole Walloon territory is defined in plans on a scale of 1/25.000. There are two types of areas; areas for construction and areas with another use.

The Regional Planning Ordinance *'Règlement Régional d'Urbanisme (RRU)'* is used to lay down rules and regulations for buildings and the organisation of parcels. It can be applied in the whole regional territory. The Walloon region

has six planning ordinances, three of which are of a planning or aesthetic nature, others have a more technical nature.

Municipal Level

The Municipal Structure Plan *'Schéma de Structure Communal (SSC)'* has the same objectives as the regional development plan, but focusses on a local scale. Important elements in the SSC are:
- The projected structure and accompanying measures
- Realisation of equipment and infrastructures
- General guidelines for harmonisation and integration of traffic flows
- Rules for implementation of spatial measures
- Environmental effect report

The municipal planning schemes *'Plans Communaux d'Aménagement (PCA)'* are base on the SSC, if this is present. The PCA relates to a part of the municipal territory, and determines in what manner specific parcels can be used. It consists of the following elements:
- Planning options
- Precise use of land
- Regulations regarding constructions, public space, etc.
- Boundaries of parcels if required
The main goal of the PCA is to ensure new constructions follows objectives in the regional plan, or to protect existing construction from deviating from the regional plan. The PCA can, if necessary and with proper arguments deviate from the regional plan, but this has to meet a specific procedure and meet specific conditions (Ryser, Franchini, 2015).

The municipal planning ordinances *'Règlement Communal d'Urbanisme (RCU)'* are a collection of regulations as described above. On this local level, the RCU is applicable to either the entire municipal territory, or to a part thereof.

REGIONAL	MUNICIPAL
Regional Spatial Development Scheme (SDER) *(Schéma de Développement de l'Espace Régional)*	Municipal Structure Plan (SSC) *(Schéma de Structure Communal)*
The District Plans *(Plans de Sectur)* The Regional Planning Ordinance (RRU) *(Règlement Régional d'Urbanisme)*	The Municipality Planning Schemes (PCA) *(Plans Communaux d'Aménagement)* The Municipal Planning Ordinance (RCU) *(Règlement Communal d'Urbanisme)*

Image 47.   Scheme instruments spatial planning Wallonia.
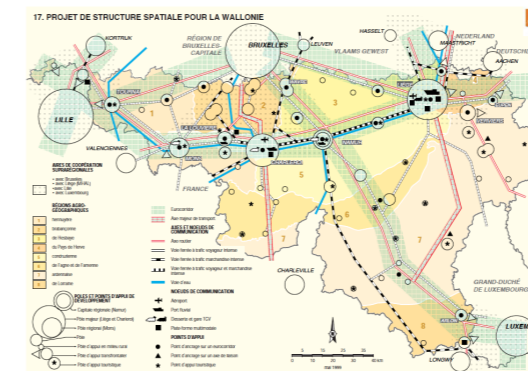
Image 48.
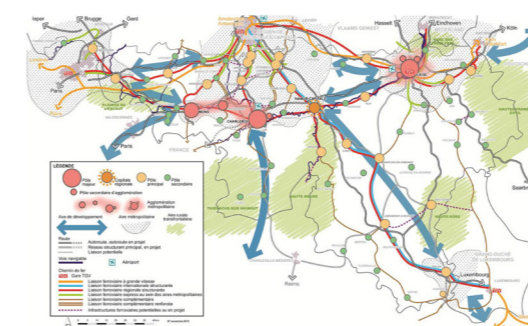
Image 49.
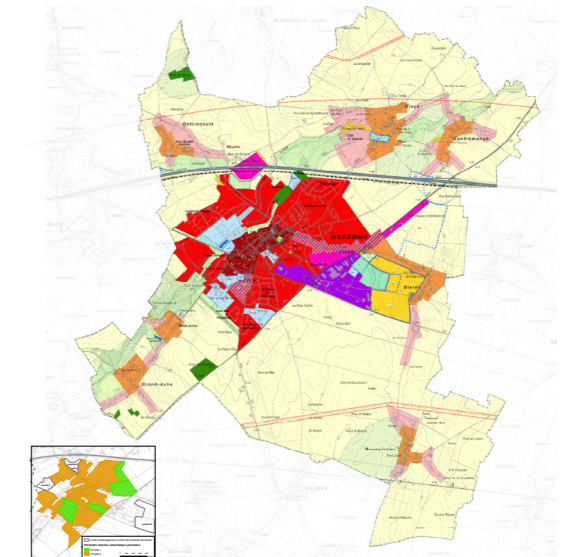
Image 50.

Image 48.   Schéma de Développement de l'Espace Régional (SDER) 2005 (Wallonie, 2005)
Image 49.   Schéma de Développement de l'Espace Régional (SDER) 2020 (Wallonie, 2013)
Image 50.   Schema de Structure Communal Waremme (Ville de Waremme, 2005)

National level

The most important task of the national government is to preserve the national interest, this is identified in the 'National policy strategy for infrastructure and spatial planning' (SVIR). It adopts the subsidiarity principle and aims to simplify the levels of responsibility for spatial planning. The central government has the overall responsibility for spatial planning, and related issues transcending provincial or municipal levels, such as; national impact such as; international obligations, reserve powers, energy supply networks, water and rail, main road, and protection of public health.

Provincial level

The 12 provinces are responsible for the translation of national guidelines in their territorial context. In this process they can develop regional policy, and create regional spatial plans. They draw up guidelines for location and expansion of residential, industrial and commercial areas within cities, town and villages. In creating these guidelines, they focus on provincial interests such as; landscape management, urbanisation, and the balance between these urban and green areas. They focus on specifying and moulding national guidelines so they fit in the provincial context (Ryser, Franchini, 2015).
Instruments that they can use to realise this are Provincial Spatial Visions and Policy Statements. The first show the territorial implications of their vision, where the latter shows the provincial policies and principles. Together they are at the basis for the municipal spatial visions.

Municipal level

The municipalities are responsible for the implementation of spatial planning policies on a local scale. Land use plans are a legal instrument used to determine the function for every square meter of land. The plans are very detailed and cover the entire area of that municipality. It defines the detailed type and use of individual land parcels or parts of the municipality. Municipalities have significant power in the planning process, as they greatly determine the constraints for urban planning.

Their land use plans do need to be in line with the spatial plannings policies and vision from the national and provincial level. These are however, not as detailled as the land use plans, and can be interpreted relatively freely.

NATIONAL	PROVINCIAL	MUNICIPAL
National Policy Strategy for Infrastructure and Spatial Planning (SVIR) Frameworks Performance agreements International agreements Financial instruments Knowledge	Provincial Spatial Visions Policy Statements	Land Use Plans (legally binding) Spatial Planning Policy Statements

Image 51.   Structure instruments spatial planning the Netherlands.

Image 52.

Image 53.
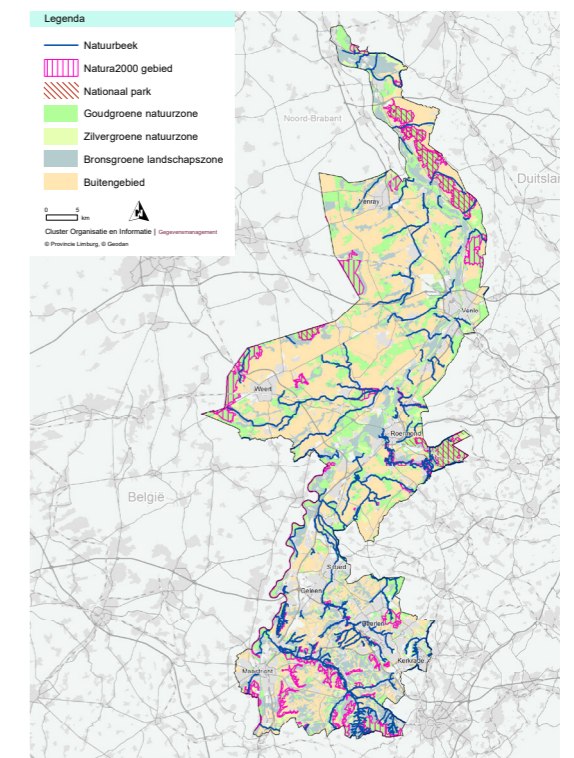
Image 54.

Image 52.   Nationale Omgevingsvisie Nederland (Rijksoverheid,)

Image 53.   Provinciaal Omgevings Plan Limburg 2014 (Provincie Limburg, 2014)

Image 54.   Landuse plan Cadier en Keer 2014 (Gemeente Eijsden-Margraten, 2014)

The hierarchic system of spatial planning in Germany is governed by two basic principles: municipal planning autonomy and mutual influence. The first principle means that the municipalities area autonomous and responsible for spatial planning in their territory according to the principles and guidelines defined by higher levels. Consequently, the federation and the states cannot withdraw this right from the municipalities.
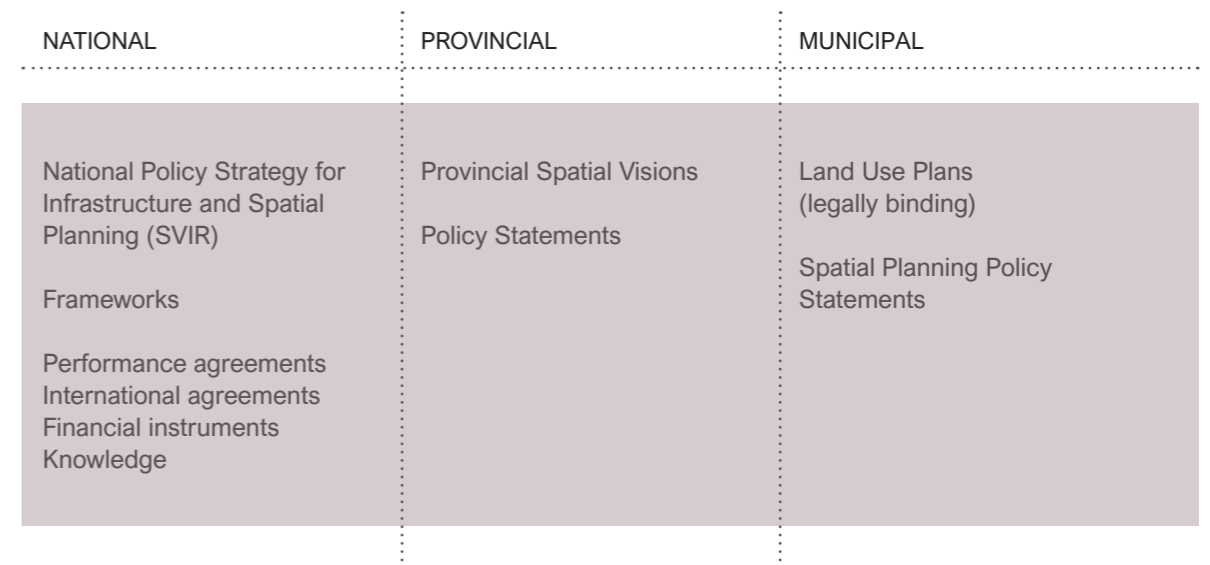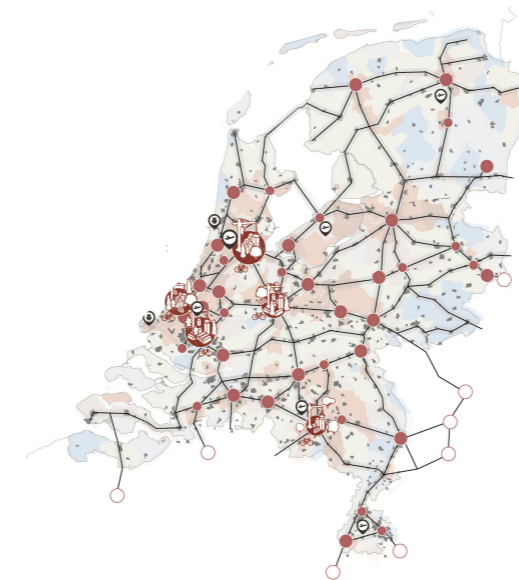
The federation and the states are obligated to take interests and plans of municipalities into consideration. Meanwhile, each lower level is obliged to consider the guidelines and principles of the higher level. This means that spatial planning authority and competence starts from the top with framework tasks and powers, while direct and detailed competence are vested in the lower levels. As a result, each planning level has different tasks, deals with a different coverage, and delivers different degrees of details in respect to both plan preparation and planning legislation. Each planning level, except the federal state, can prepare spatial plans. The federation can only give guidance and support for state and regional planning levels. Though the municipalities are considered autonomous in their planning for spatial development, both the federation and the states introduce financial programmes to guide and support specific development trends and activities. In addition, the federal level and the state level attempt to initiate and support discussions about spatial strategies through innovative programmes and pilot projects.

In the German planning system, 'change' is understood as the attempt to realise, influence or preserve a specific spatial order. Change also implies any activity that has spatial impacts (Ryser, Franchini, 2015).

Federal level

The federal level is the highest and most abstract type of change in Germany. It is concerned with preparing the spatial guidelines for the whole federation. This task is assigned to the federation by the Federal Act on Spatial Planning and is defined as preparing a comprehensive

interdisciplinary and interregional framework for the spatial goals of the European Spatial Development perspective.

State level

The main task of spatial planning at the state level is to prepare strategies for the spatial development of its territory, presented in the State Development Plan. This plan is concerned mainly with the coordination of activities that have state wide spatial significance and have to consider the special situation in different regions of the state. A ministerial conference on spatial planning is held to coordinate the development plans of the different states.

Regional level

The main function of regional planning is the interdisciplinary and inter-municipal coordination of urban development, taking account of the binding goals and principles of the State plan. In addition, regional planning is responsible for defining and allocating functions and infrastructures of regional significance. The state laws regulate regional planning, however vary from one state to another. In most cases, the municipalities form regional planning associations, and are hence participating directly in formulating the regional plans.

Municipal level

The main task for municipalities regarding urban land-use planning, is to prepare and control the use of land within the municipality. Each municipality is responsible for preparing land-use plans to the extent that is required for urban development, in accordance with the regional development policy. Urban land-use planning on the municipal level is based on a two-tier system:
- the preparatory land use plan defines the type of land use for the whole area of the municipality.
- the local development plan is the legally binding land-use plan. It defines the detailed type and use of individual land parcels or parts of the municipality.

FEDERATION	STATE	REGIONS	MUNICIPALITY
bund	land	region	gemeinde
Federal Act on Spatial Planning Federal Town Planning Act Land Use Ordinances Map Sign Ordinances Special Provisions for development and urban renewal Laws Ordinances and Statutes Programms	State Planning Act Design Guide Ordinance State Building Code State Development Program Approval of regional plans Approval of preparatory land use plans	Regional plans Regional Landscape plans	Preparatory land use plans Legally-binding land use plans

Image 55.   Scheme instruments spatial planning Germany.

Image 56.
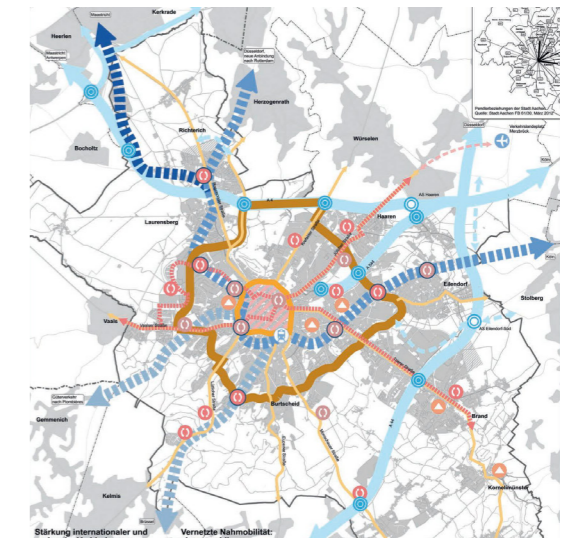
Image 57.

Image 56.   Landesentwicklungsplan Nordrhein-Westfalen (Nordrhein-Westfalen, 2018)

Image 57.   Masterplan Aachen (Aachen, 2012)

The EMR has their own governance structure, the Euregio Maas-Rijn Foundation, in which all the regions take a seat. These are the Dutch province of Limburg, the Belgian province of Limburg, the province de Liège, the German-speaking community, and the region Aachen. The EMR Foundation focusses on all fields of cooperation, not solely urban development as can be seen in the scheme "Image 66. Organisation structure EMR." Therefore the German-speaking community in Belgium is also included in this governance structure, though it has no final decision power in urban development. The governance structure of the EMR Foundation includes a general board, a council, a general EMR-bureau and four executing committees. The chosen representatives are the highest authority in the included spatial territories, and are in most cases also the same governance structure that is responsible for spatial development.

Since the 1st of April 2019, the EMR Foundation officially became a European Grouping of Territorial Cooperation (EGTC). The main difference is in the legal aspects of the change. The EGTC is an European legal instrument that facilitates and promotes cross-border, transnational and interregional cooperation. The instruments originates from 2007, and provides authorities from different member states to set up cooperation grouping with a legal personality. It enables public authorities of various member states to deliver joint services, without requiting a prior international agreement to be signed and ratified by national parliaments. Member states must agree to the participation of potential members in their respective countries (European Commission, 2018). This structure allows the EMR to join negotiations as their own legal entity, providing them with more individual decision power. Also it allows them to make decisions about their own territory faster, as international agreements do not need to be signed for every joint decision. The change in governance structure should allow the representatives of 'parliament' from the five participating region to gain more influence in decisions on cross-border projects and initiatives.
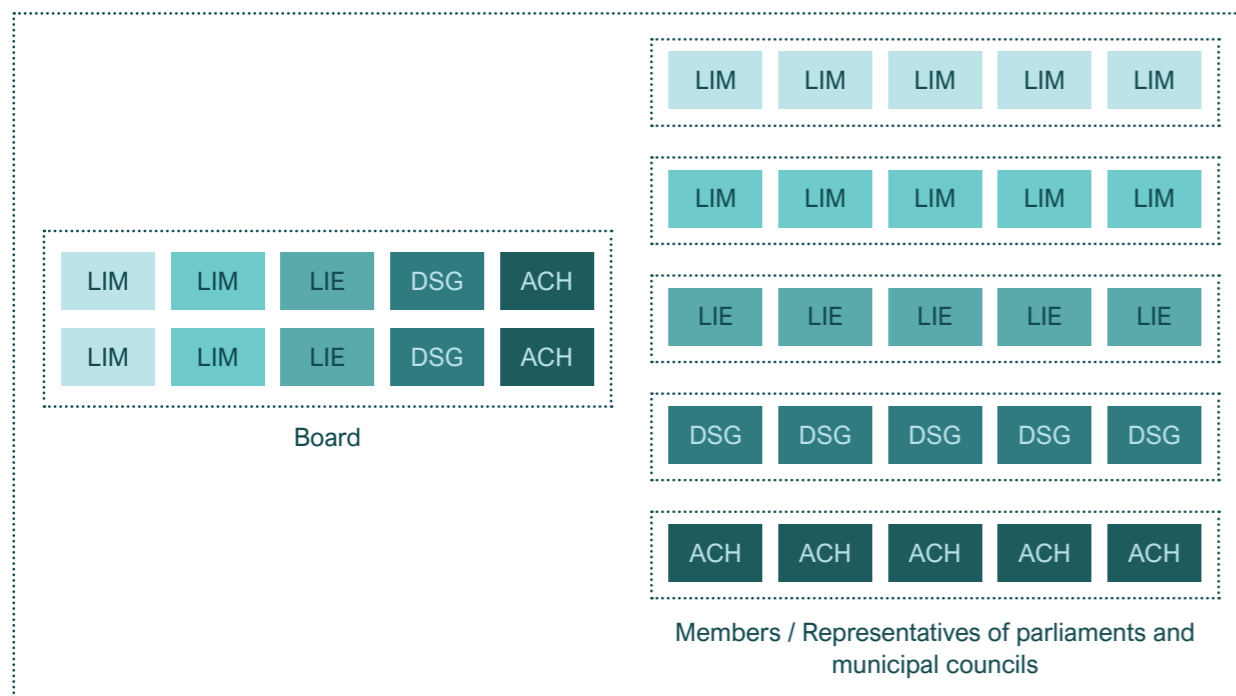
Euregio Maas-Rijn Foundation after april 2019

35 members of the General Council of the EMR Foundation as EGTC
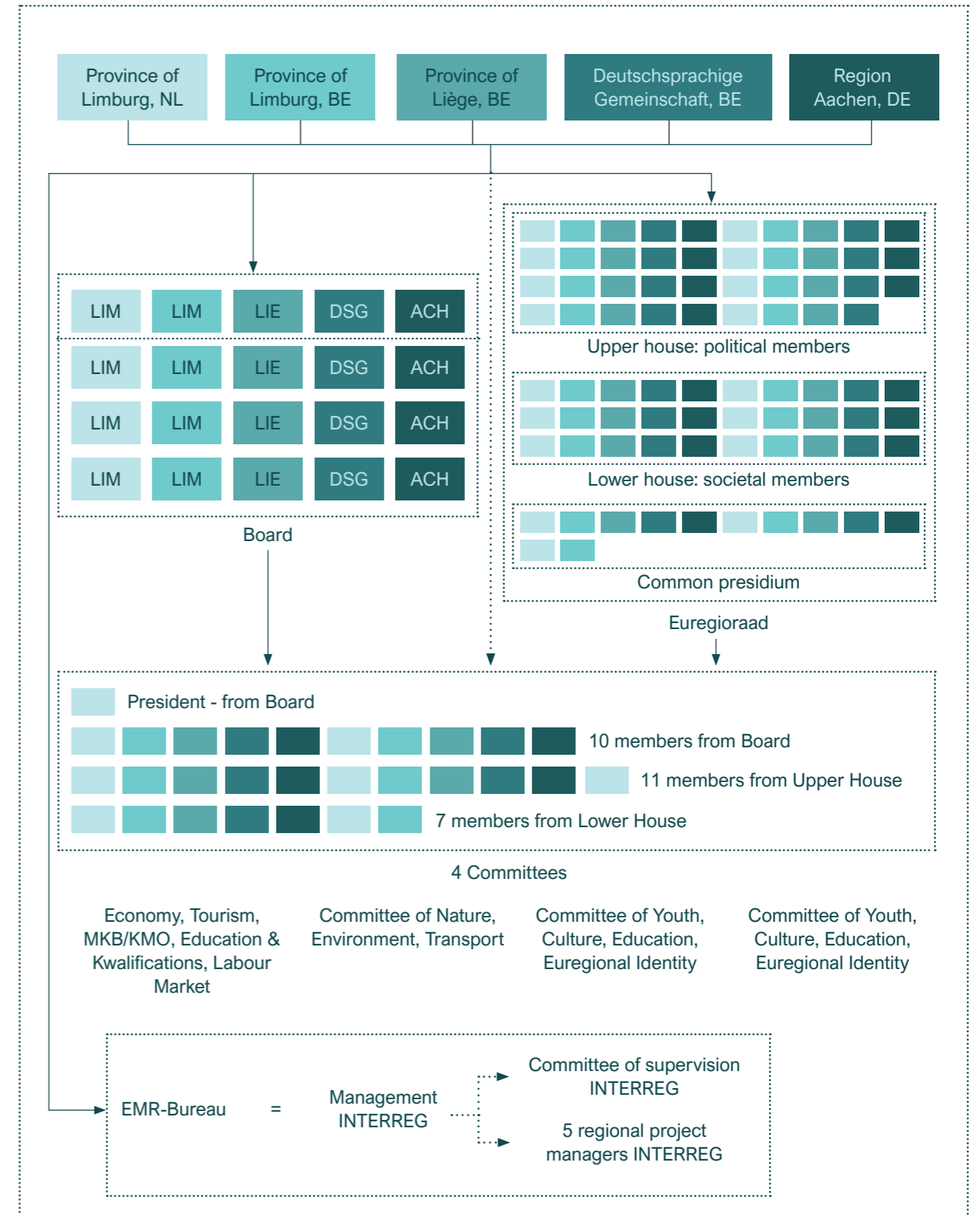
Euregio Maas-Rijn Foundation before april 2019

The governance structures of all nations work according to the subsidiarity principle, which implies that government decisions should reside at the lowest feasible level, unless the situation presents clear advantages otherwise. The Netherlands, Flanders and Germany have similar governmental levels regarding urban planning. A regional scale that is responsible for approximately the same size of territory; the Gewest, Bundesland, and the whole of the Netherlands. The next level is the provincial level, in Germany called Region. The most local governmental institution is the municipality, which is similar in all four territories. The Walloon territory does not include the provincial level in its urban planning governance.

Among the four territories, three different languages are spoken which, among other things, have led to different naming of documentation. The planning instruments vary in each territory, but even if they are relatively similar, differences in naming might cause misunderstandings. As shown in the paragraph on morphology "pages 56, 57", different geographical aspects and historical events have played a role in urban development. In combination with national urban planning of three countries combined, this has led to a mix of urban patterns in the region.

Across the region, planning already takes multiple scales into account, trying to create multi-scaler and integrated visions and strategies. However, there are no planning structures or instruments on the EMR regional level that are responsible for cross-border territory. Cross-border cooperation often takes place through separate projects in small-scale cooperation territories. These have resulted in glued together developments, that do not connect with development plans across the border.

The EMR Foundation has recently received a new legal status of a European Grouping of Territorial Cooperation (EGTC). The change in governance structure should allow the representatives of 'parliament' from the five participating region to gain more influence in decisions on cross-border projects and initiatives. It has however excluded societal groupings from having a seat in the advisory board, losing this direct link with the residents of the EMR.

06

PUBLIC TRANSPORT

Transport networks
Travel time
Actor relations

Photo: Montzen train route marshalling yard at Montzen.

Transnational connections between European countries are experienced as borderless. One can travel from one country to another without having to go past custom services. International European train services have been evolving since 1874, with the founding of the Compagnie Internationale des Wagone-Lits. Belgium was investing heavily in public transport, especially in the expansion of their rail network. It proved a success, and the idea of creating cross-border passenger train services was a logic continuation of events. Railway routes providing transnational connections for industrial reasons, could also be used for high-end passenger travelling. The first international connections were considered very high-quality travelling, and provided luxurious travel to other countries. These connections have evolved over time, and expanded greatly after more and more European borders opened up after the WWII. Cross-border transport became available for the working class as well, but is perceived a relatively expansive way of travel up to today. Technical difficulties and differences determined transnational transport in its earlier phases, as each country had its own railway system with differences in for example rail width and electricity levels. As European cooperation increased, these systems became more and more integrated which made it easier for trains to cross borders.

The Euregio Maas-Rijn (EMR) has two cities in which transnational European rail networks halt, Liège-Guillemins and Aachen Hauptbahnhof. The Thalys, TGV and Eurostar trains travel through these stations and connect the region with its neighbouring countries. As can be seen on the map "Image 58", the network of international trains contains multiple operators that together create a complete network. The EMR is only connected in an East-West

direction, which limits its access to surrounding regions as the Randstad in the North and the Saar-Lor-Lux region in the South.

Zooming in on national train routes, it shows in map "Image 59" that the EMR has a variety of train routes. The train is the first of two public transport modes in the EMR, which focuses on travelling regional distances. It combines with a bus network that provides public transport on both a regional and a local scale. The map shows all train routes, regardless whether they are intercity or local connections. This analysis shows an increase of train intensities in the direction away from the border, directed inwards into the nation. Public transport by train is focussed on connecting the rather peripheral locations with the rest of the nation, instead of connecting nearby cities with each other. Besides that, the map shows the cities that are important nodes in the network, where most train routes come together. For example the station at Liège and Aachen, but also Hasselt and Sittard show a high density of train connections.
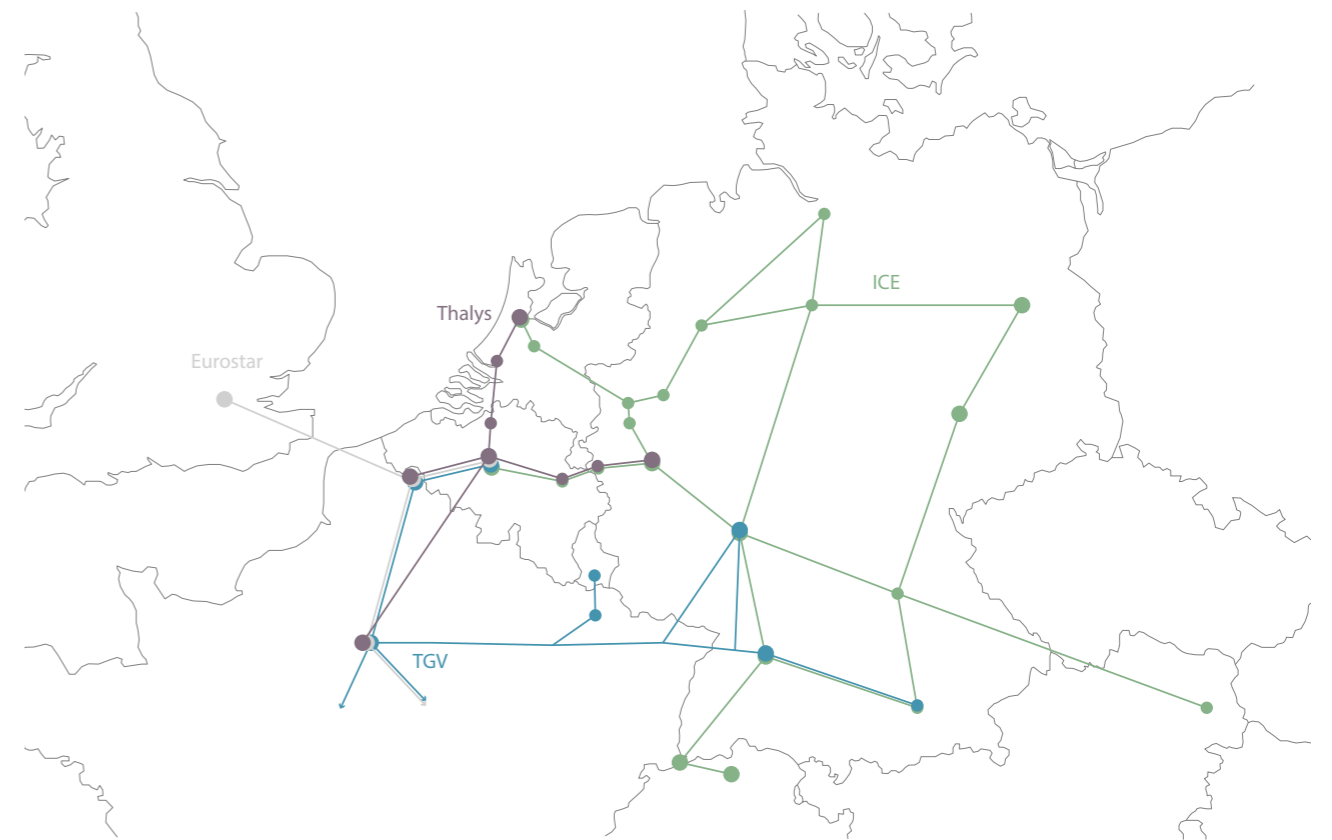
Image 58.   International cross-border trains Europe.
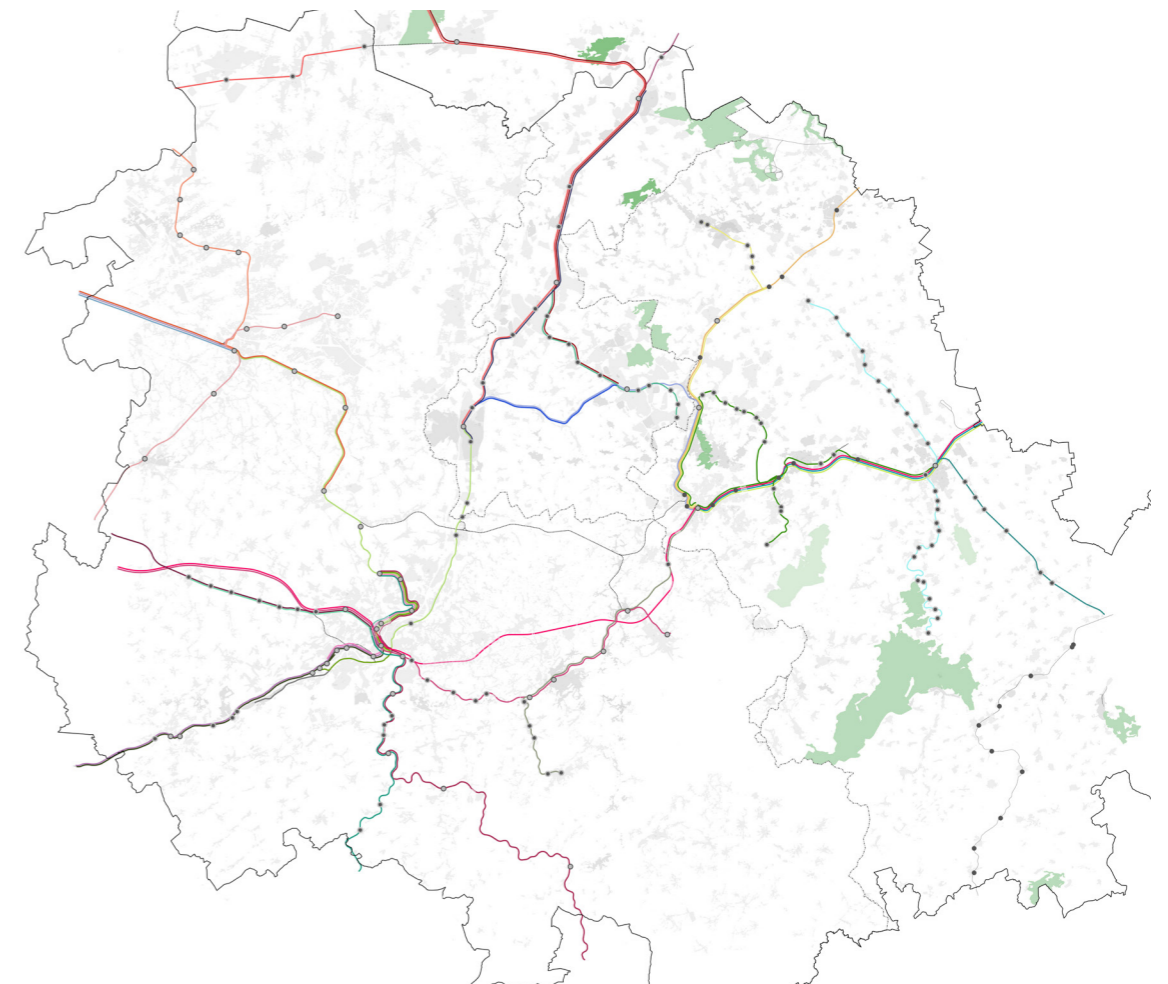
Image 59.   Train network in the EMR.

Historical analysis shows that there is a circular relationship between regional and national orientation. Before the 19th century focus was mostly on the region, mainly because transportation modes of that time did not allow further travel. The introduction of the train in the 1800's allowed further travel, and expansion of economic markets. International connections were very modern, but the focus was still on regional cooperation. It shows in the first train connections in Maastricht for example. The first connections were to Aachen (1853), Hasselt (1856) and Liège (1861), before the first national connection was created to Venlo (1865), as can be seen in "Image 62" and "Image 63". This regional interest shifted towards national interest shortly before and after the World Wars, 1914-1945. Rising nationalism is said to be one of the causes for the world wars, and rebuilding afterwards was organised on a national level. This period determined for a great deal what railway connections would be rebuilt or demolished, which had a large impact on the connections within the EMR. At the same time, international cooperation was greatly important, to ensure that the world wars would never take place again. From the 1980's onwards international cooperation took a flight with the fall of the Berlin wall in 1989, and the opening up of internal European borders. Neoliberal globalisation also became a well-known phenomenon in this decade, it describes the increasing connection between people across the world. The process is characterised by the decreasing influence of national borders in trade, investments, technology, increasing capital flows and mutual dependency of financial markets. It shows a shift from national focus towards international focus, but now on a worldwide scale instead of on a regional scale. Investments focus on connecting cities or regions internationally, but on a global level. International connections on regional levels are often initiated on a local scale, as national interest is lower, but regions can definitely profit from it. "Image 60 & 61" show some cross-border connections, however they are almost all local trains, which do not provide convenient travel.

<1900

REGION

International and cross-border relationships as important as connection to national centres

1914-1955

NATION

Connection to own nation and ints centres

>1980

GLOBAL

Worldwide international connections as important as strengthening national centres

>2019

REGION?

Role of the (cross-broder) region in a globalised world and an open Europe?
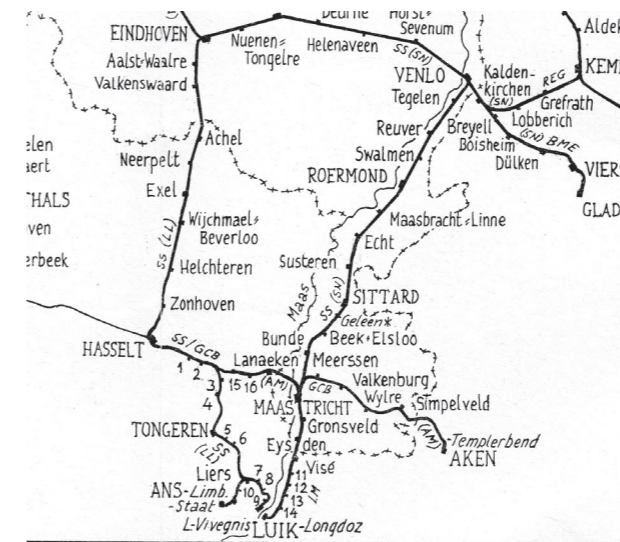
Image 62.   Train network the Netherlands, 1868 (Van den Heuvell & Van Santen, 1868)
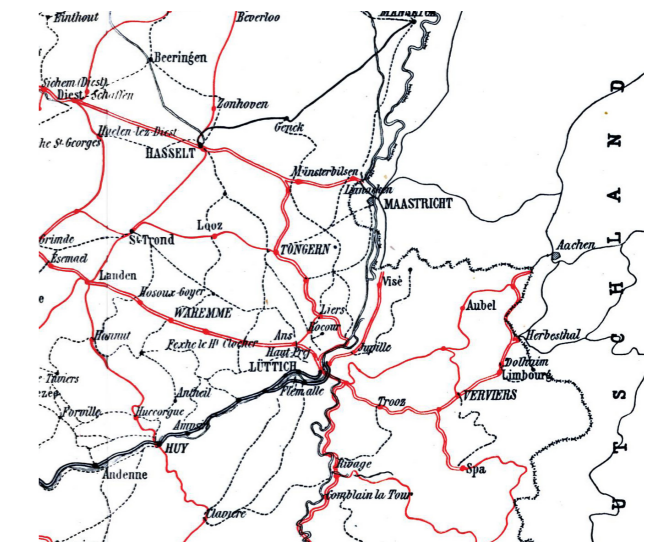
Image 63.   Train network in Belgium, 1917 (Röll, 1917).
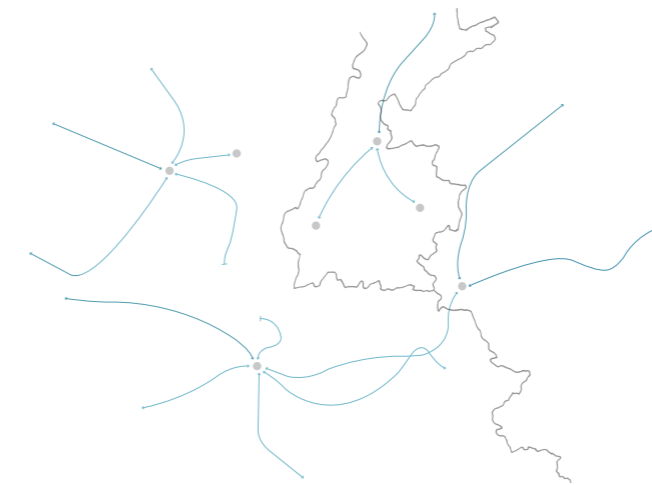
Image 60.   Intercity connections in the EMR.
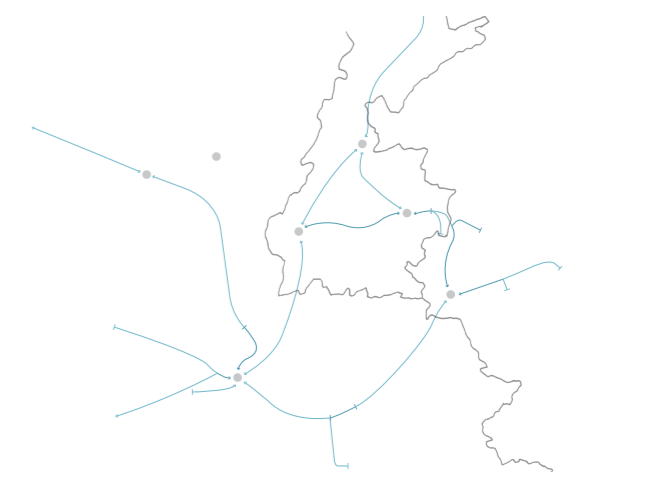
● City
— 1 connection
— 2 connections
— 3 connections

Image 61.   Local train connection in the EMR.

Bus network

The second public transport mode in the EMR is the bus. The lack of cross-border connections can also be seen in the bus network on a smaller scale. On a smaller scale bus lines are the only way of public transport available in the region as there are no metro or tram connections. Each administrative region has its own responsible bus exploiter, which will be addressed in more detail in the governance paragraph in this chapter. Flanders, Wallonia, Limburg and Zweckverband Nahverkehr Rheinland (ZV NVR) all have other bus line exploiters, resulting in four different networks shown in "Images 66 to 69" on page 92 and 93. Comparing these networks shows that the orientation is mainly national, many bus routes either stop at the border or travel along the border. Next to the routes, the destinations are also oriented nationally. For example, Belgian villages are only connected to main Belgian cities, even if this is not the closest centre to their village.

Cross-border connections are in place, often focussed on connecting the main cities with each other. These are connections either because there is no convenient connection by train, or to increase accessibility because the train connection is not fully convenient. An example of the first is the connection between the Netherlands (Maastricht) and Genk, where there is no train connection. The connection between Maastricht and Liège is an example of the second. As the train travels only once an hour, the bus provides an extra connection.

Differences in strategies of the four regions become clear in the map as well. The ZV NVR shows a very high density of bus lines on the West side of the city, and high intensities travelling away from the city in clear directions. These could be related to the presence of functions or urban development, and will be analysed in the next chapter. Wallonia and Flanders show a very elaborate bus network, in which almost every town is included in the network. However, many routes are shown to be optional, the route depends on the time of the day or the day of the week. In Limburg, NL the intensity bus routes differs across the region.

The North-Eastern part show high densities of routes, but the rest of the region shows slightly lower density. Hypothetically this relates to the high population densities and dense urban development in the old mining region, but this will be elaborated on in the next chapter.

The network shows a clash of different strategies glued together, with some cross-border squeezed in between ("Image 65"). These connection are just there to provide an international connection, but as there is no euroregional vision, they do not combine efficiently with other public transport networks. The road network is extensive, and crosses the borders. Buses could, physically, easily create cross-border connection on a regional and local scale. However, at the moment it shows four different systems that bump into each other at the national borders.
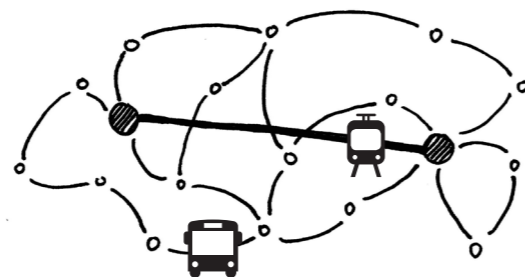
Image 64.   Bus network is important for local, flexible connections.
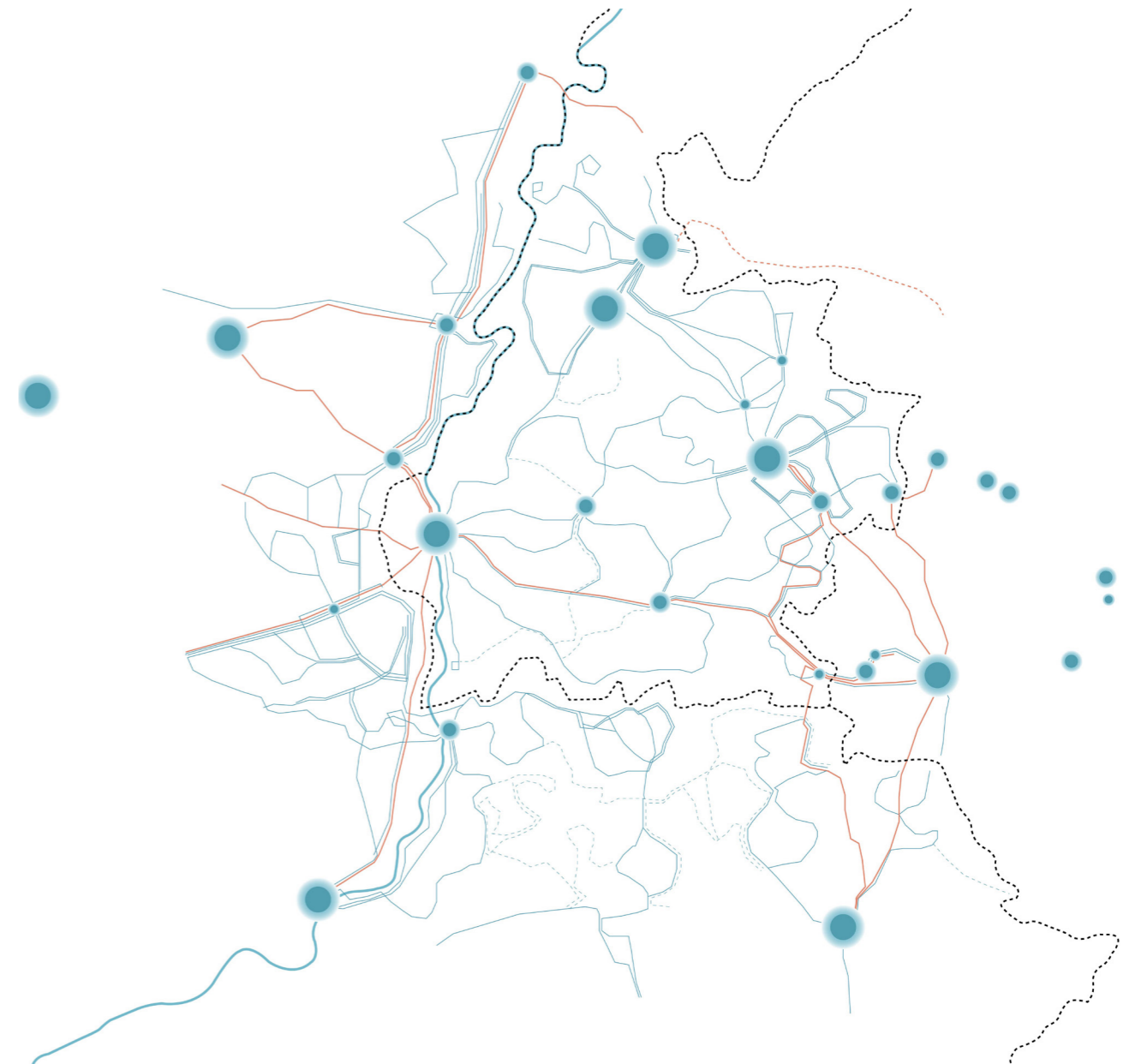
Image 65.   Bus lines in the EMR, located along the border.
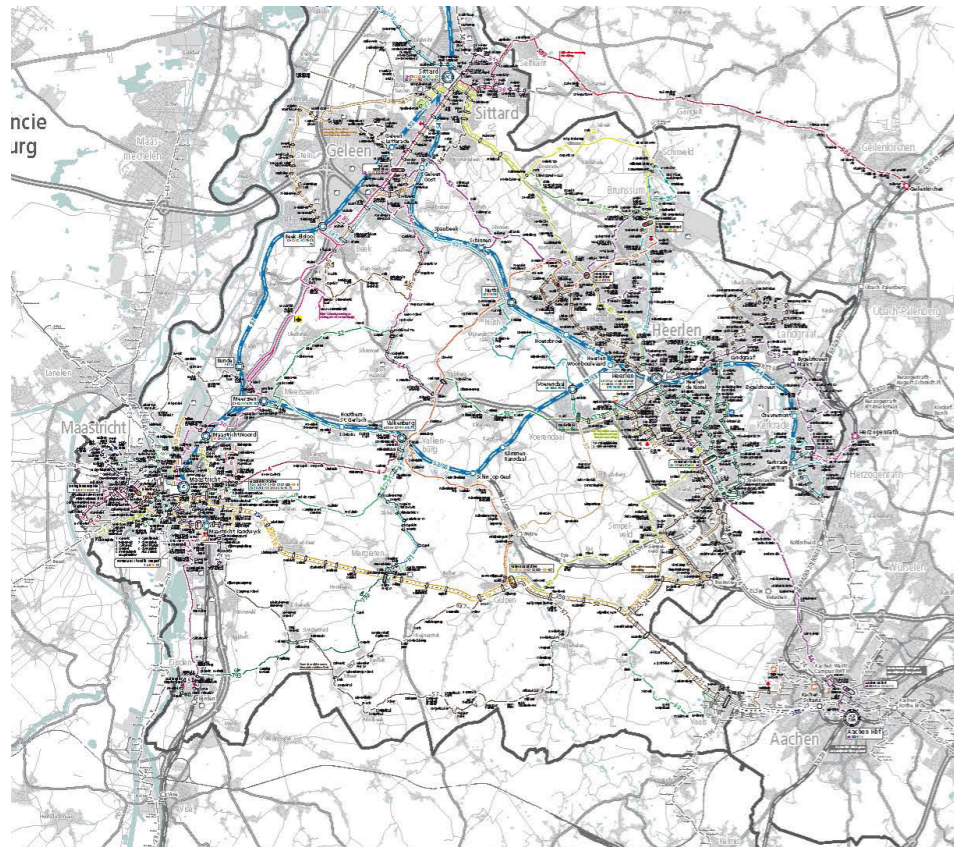
Image 66.   Bus network in Limburg, NL (Arriva, 2017).
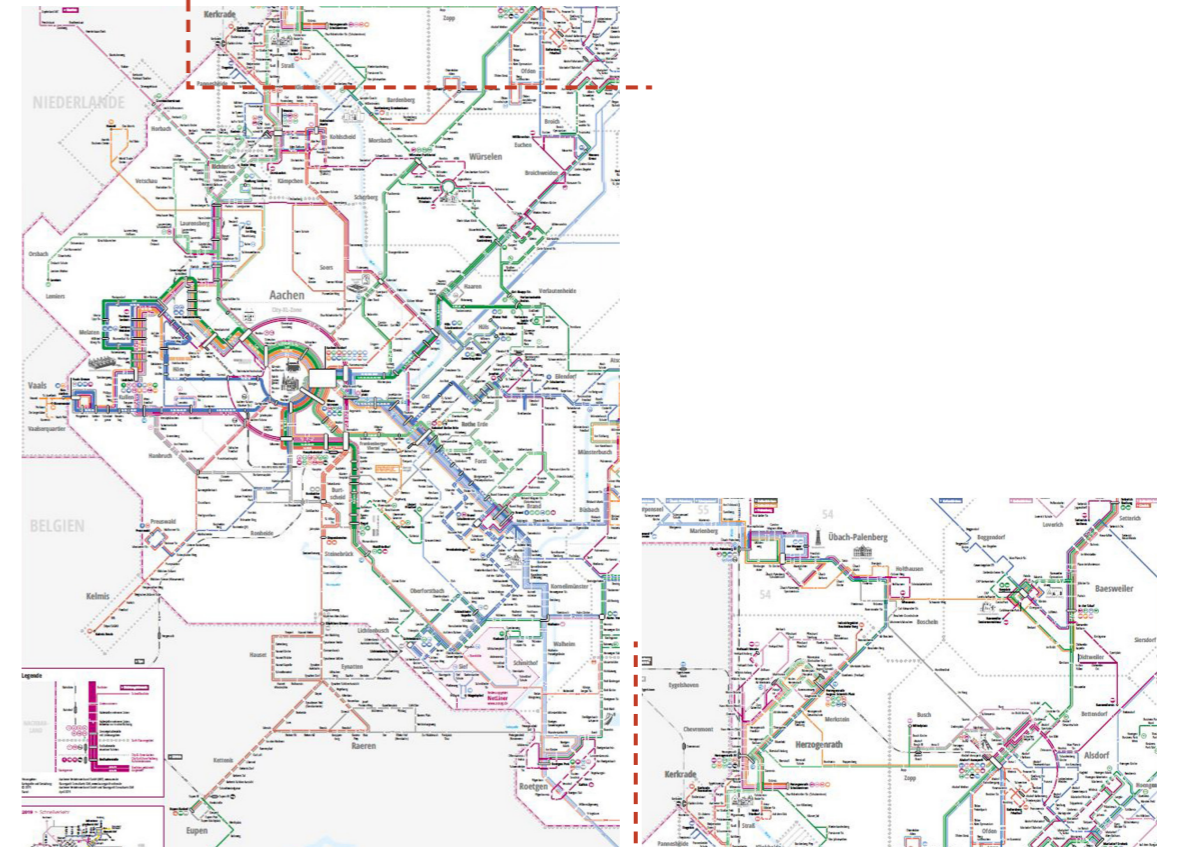
Image 68.   Bus network region Aachen (Aachener Verkehrsverbund, 2018)
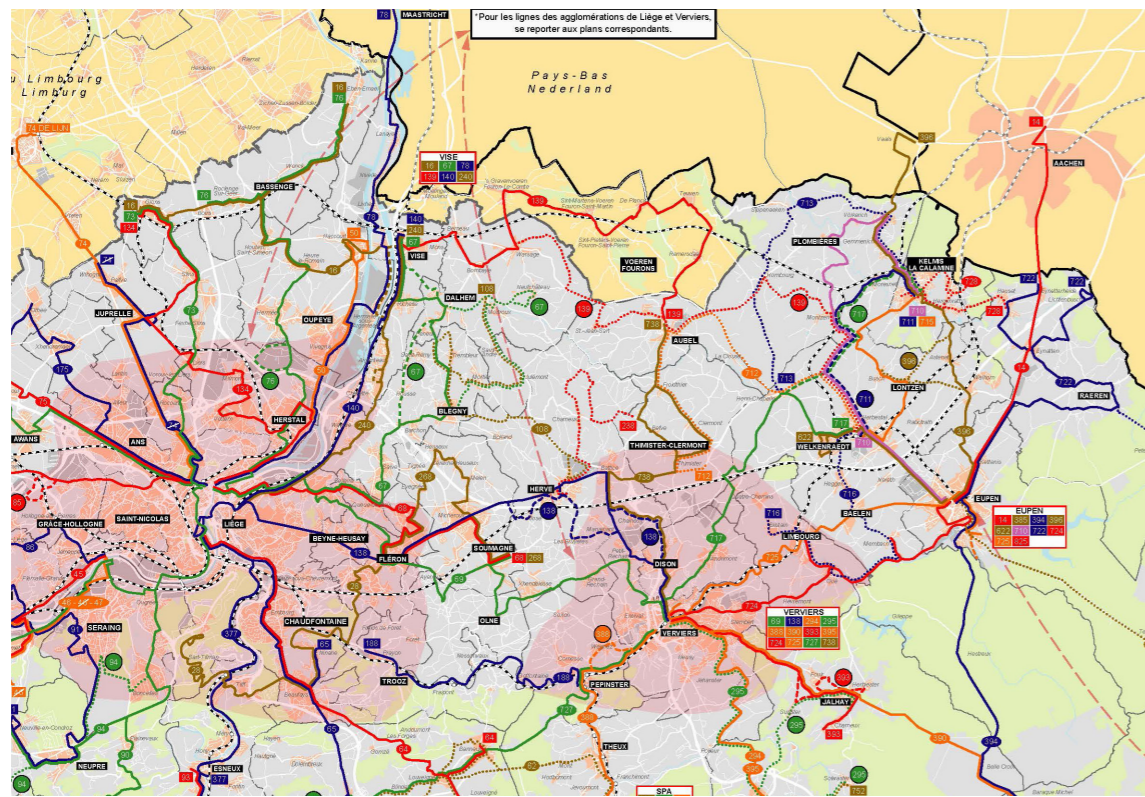
Image 67.   Bus network in Wallonia, BE (TEC Liège-Verviers, 2016).

Image 69.   Bus network Limburg in Flanders, BE (De Lijn, 2018).

Analysis travel time - distance

The travel time is one of the three aspects that determine the value of connection between cities. Research will be done to determine the value of the public transport connection. The results of travel time by public transport have been compared to travel time by car, in relation to the direct distance between two cities. The vision in the end is for residents to see public transport as a (more) convenient mode of transport than travelling by car, therefore the comparison is made with the car network. Besides that, the graph of travel time by car compared to direct distance, shows that travel time exponentially increases as the distance increases. As the travel time by car increases at approximately the same rate as the distance, it can function as a standard analyser, as can be assumed travelling by car is the most convenient transportation mode at this moment in the region. This analysis focusses on the fastest

connections between two cities, regardless of the type of public transport, the amount of connections per time duration, or the amount of transfers within a journey. These aspects should be included in further research, to create an extensive analysis of the value of connection by public transport. The fastest route was chosen, which in the car network meant calculated without any traffic delay or possible traffic jams. A positive time value for public transport was set at a time difference of maximum 15 minutes. A connection is marked as unfavourable when the time difference exceeds 30 minutes.

Travel time is significant for travel convenience, the time that you spend travelling, determines for a great deal the experience of distance for people. This implies that if there's a very long, or difficult travel time and route, the destination is experienced as further away. This will hold back people to travel there via that mode of transport on a regular basis.

Connection Maastricht
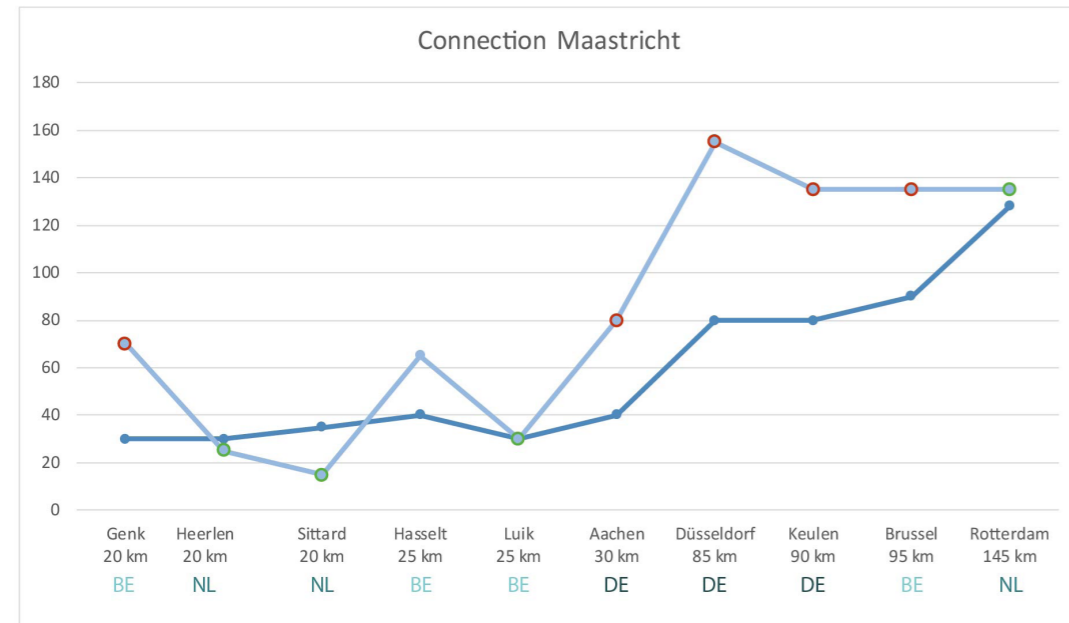
	Genk	Heerlen	Sittard	Hasselt	Liège	Aachen	Düsseldorf	Cologne	Brussel	Rotterdam
Car (min.)	30	30	35	40	30	40	80	80	90	128
Pub. trans. (min.)	70	25	15	65	30	80	155	135	135	135
Direct distance (km)	20	20	20	25	25	30	85	90	95	145

Connection Aachen
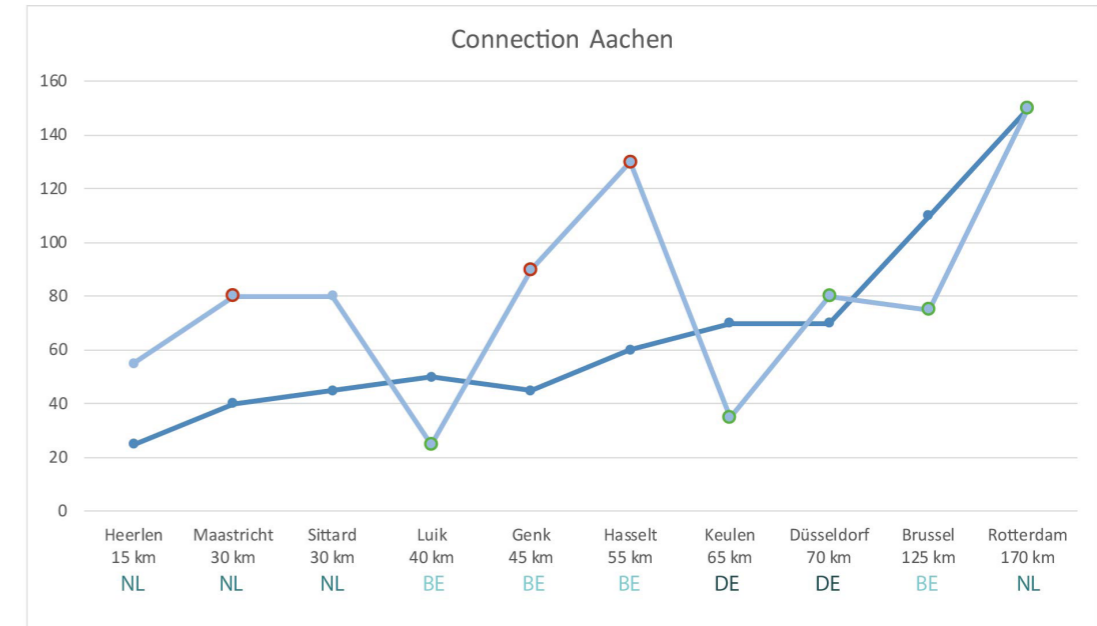
	Heerlen	Maastricht	Sittard	Liège	Genk	Hasselt	Cologne	Düsseldorf	Brussel	Rotterdam
Car (min.)	25	40	45	50	45	60	70	70	110	150
Pub. trans. (min.)	55	80	80	25	90	130	35	80	75	150
Direct distance (km)	15	30	30	40	45	55	65	70	125	170

Connection Liege
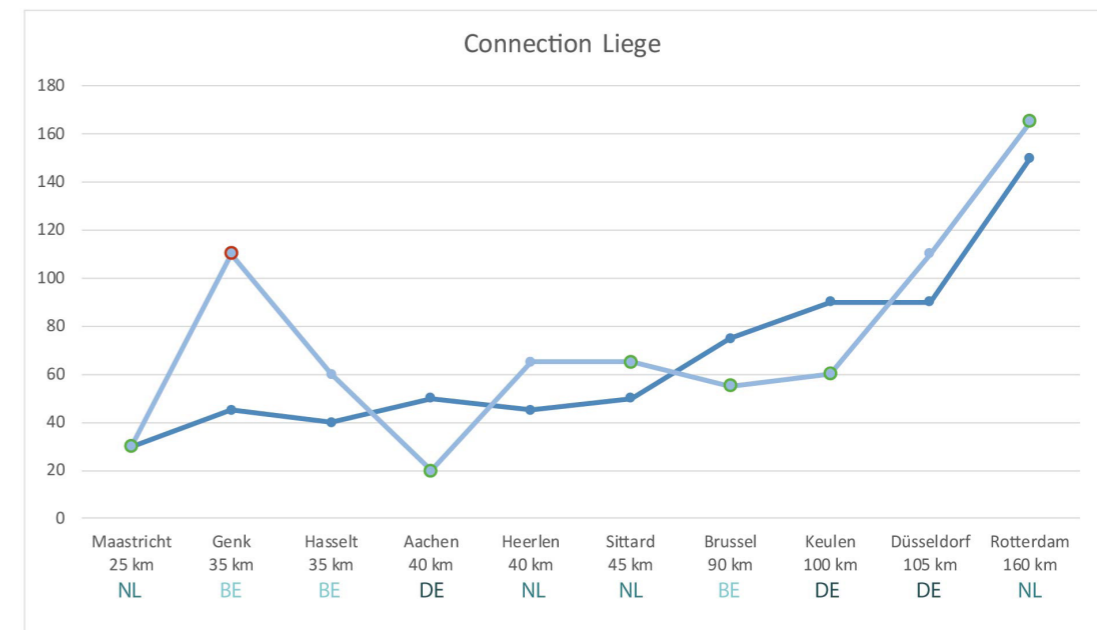
	Maastricht	Genk	Hasselt	Aachen	Heerlen	Sittard	Brussels	Cologne	Düsseldorf	Rotterdam
Car (min.)	30	45	40	50	45	50	75	90	90	150
Pub. trans. (min.)	30	110	60	20	65	65	55	60	110	165
Direct distance (km)	25	35	35	40	40	45	90	100	105	160

Connection Sittard
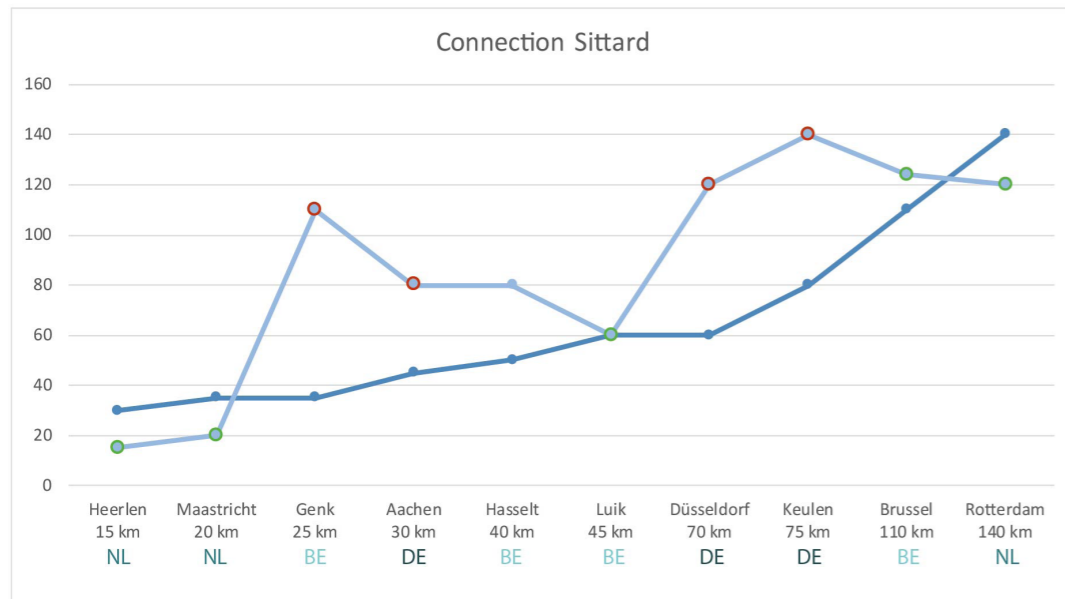
	Heerlen	Maastricht	Genk	Aachen	Hasselt	Liège	Düsseldorf	Cologne	Brussels	Rotterdam
Car (min.)	30	35	35	45	50	60	60	80	110	140
Pub. trans. (min.)	15	20	110	80	80	60	120	140	124	120
Direct distance (km)	15	20	25	30	40	45	70	75	110	140

Connection Heerlen

	Sittard	Maastricht	Genk	Aachen	Liège	Hasselt	Cologne	Düsseldorf	Brussels	Rotterdam
Car (min.)	30	25	35	25	50	50	85	65	105	150
Pub. trans. (min.)	15	20	120	55	65	105	115	125	125	150
Direct distance (km)	15	20	30	40	40	45	70	70	115	155

Connection Hasselt

	Genk	Maastricht	Liège	Sittard	Heerlen	Aachen	Brussels	Düsseldorf	Cologne	Rotterdam
Car (min.)	20	40	40	50	50	60	70	100	120	125
Pub. trans. (min.)	30	60	60	95	105	120	60	180	140	150
Direct distance (km)	15	25	35	40	45	55	70	105	115	125

Connection Genk
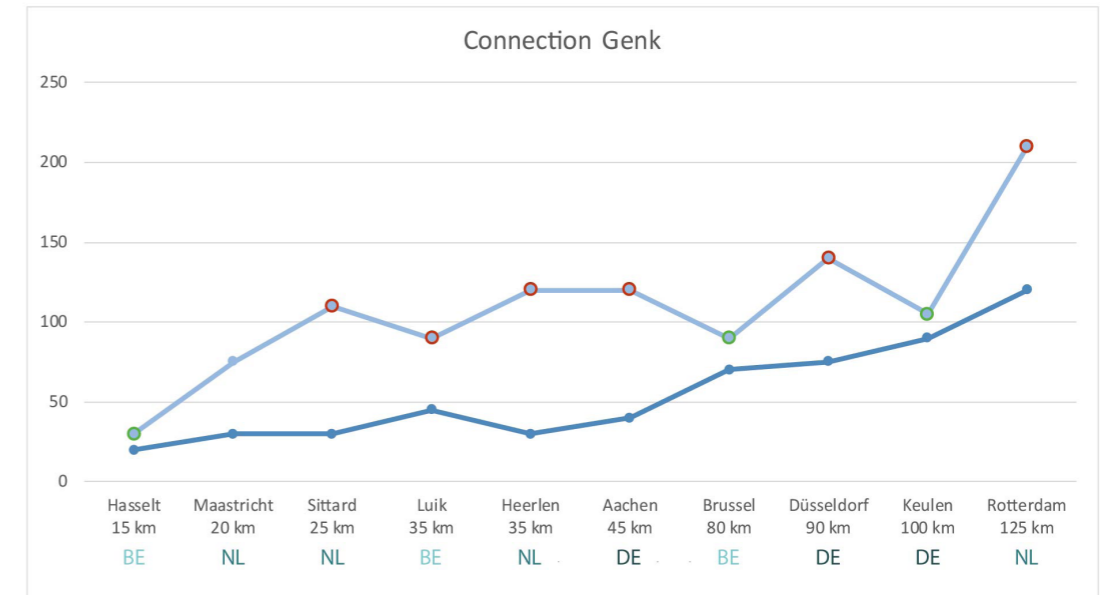
	Hasselt	Maastricht	Sittard	Liège	Heerlen	Aachen	Brussels	Düsseldorf	Cologne	Rotterdam
Car (min.)	20	30	30	45	30	40	70	75	90	120
Pub. trans. (min.)	30	75	110	90	120	120	90	140	105	210
Direct distance (km)	15	20	25	35	35	45	80	90	100	125

The results show that the travel time by public transport fluctuates. An explanation for this might be found in the analysis of type of transport or necessary transfers. Another conclusion that has been made is that travel time by public transport is longer in almost all cases. Some results that deserve attention are described below.

The connection of cities located within the Netherlands is faster by public transport than by car. However, the connection of the Netherlands with the rest of the region is quiet poor. Only an adequate connection with Liège seems to be in place. An explanation for this can again lie in the type of transportation and obligated transfers.

Liège and Aachen seem to have the best public transport networks within the region. These are also the two stations that are accessible by transnational European trains. It would imply they also provide a large number of transfer connections to cities in their surrounding areas.

Genk and Hasselt have a very poor public transport connection with other cities in the region. An explanation for this can be found in the map "Image 67. Train network in the EMR.", the train tracks stop in Genk. There is only one connection by train that connects Genk with the rest of the region, which travels through Hasselt and the rest of Belgium. In combination with the map, it can also be seen that the connection from Belgian cities (Hasselt and Genk) to Germany, travels only through Belgium. The route makes a wide circle through Liège, and has no straight connection through the Netherlands. The explanation for this can be found in the history of the train network in the region. The first and second world war greatly influenced the location of train tracks in the region, and some political treaties concerned with public transport dating back to that era, are still in place. An example is the IJzeren Rijn (Iron Rhine), a train route that would travel from Antwerp to Mönchengladbach through Roermond in the Netherlands. The plans for the route date back to 1839, however the first official opening was not until 1879. During the first world war, the route could not be used as the Netherlands were non-aligned, and the

Germans built a train route around the South of the Netherlands, the Montzenroute. The Montzenroute reached its full capacity in 1990, and ever since then discussion between the three countries have been taking place about reopening the IJzeren Rijn. Political quarrels have dictated the discussions, as there are still large differences in rules and regulations, and visions for the route diverge. An extra barrier in this case is that officially the treaty of 1839 is still in place, which may not correspond to current wishes and demands anymore.
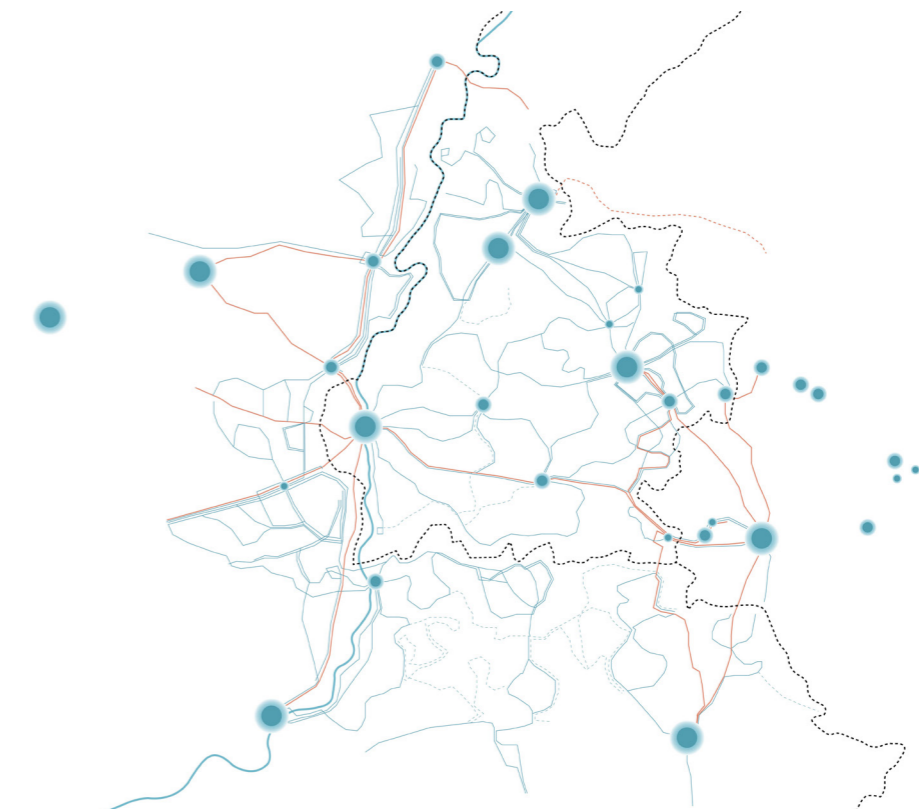
Train and bus network in the EMR.

The Netherlands

The public transport system in the Netherlands is organised in the existing governmental bodies; the nation, the province and the municipality. The national train network is organised on a national level. Officially the Dutch government exploits the rail network to any transport exploiter, however the Nederlandse Spoorwegen (NS) is the main national train exploiter of the Netherlands. They are officially an independent company, however the Dutch government owns 100% of the company's stocks. This means that in practice, the NS acts as a government owned company and the Dutch government has decision-making power of the national rail system.

The responsible government body in Limburg is the Province of Limburg. To gain input from local – municipal – governments, they have organised meetings. Cooperation between the province and the municipality is important, as the municipality is the main road authority and responsible for constraints of public transport within town zonings. Implementation of new public transport has to be agreed on by both parties. The province focusses more on the larger-scale network, and municipalities want to make sure their residents gain the best accessibility possible. The province of Limburg has decided to choose one exploiter for all their regional public transport, which is Arriva. They won the prior concession and are now responsible for the regional and local train and bus service. The municipalities have an important role in this, as they provide the supporting aspects to public transport in their urban planning policies. Arriva and the Province of Limburg have also created programms for on-demand transport for less mobile residents. Municipalities can address these projects and implement them in their policies.

Government layers

Public transport companies

100

101
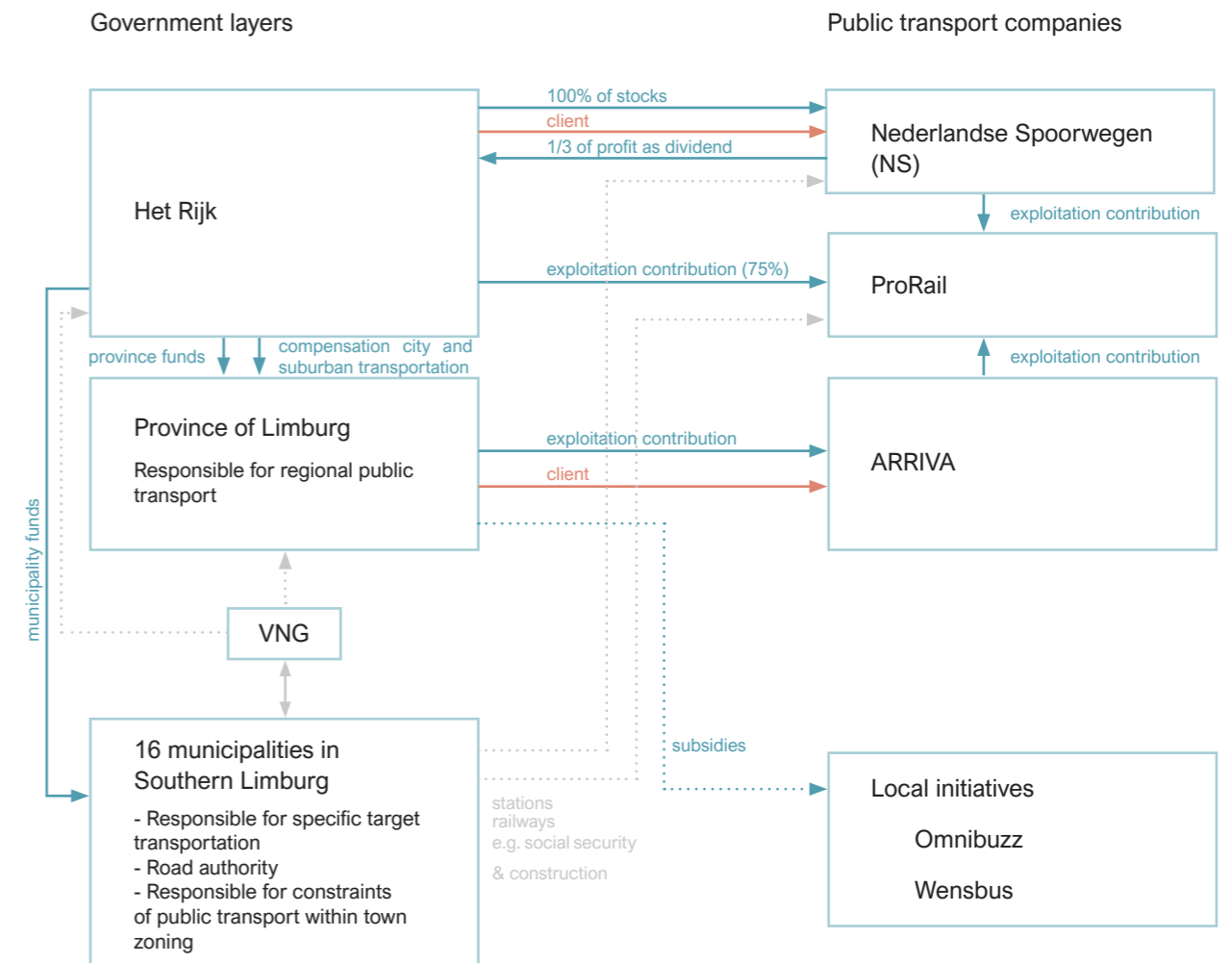
Germany

In Belgium and Germany, another level of governmental power is included between the national and provincial government level. Belgium had two 'gewesten', Germany has 16 'Bundesländer'. These governmental levels have a lot of power (compared to a province).

The Belgian 'gewesten' are responsible for territorial matters: spatial planning, environment, agriculture, energy, housing, labour market, public transport and works, economy and foreign trade, development cooperation, and supervision of municipalities and provinces.

Next to two gewesten, Belgium also has three communities based on the main language its residents speak: the Dutch-speaking community, the French-speaking community, and the German-speaking community. These communities are an official governmental level, and are at the same level as the gewesten. They are responsible for personal matters: culture, sport, education, research, health, well-being, and language-use.

The gewesten are important in the design of the public transport network, however, the communities are important in function distribution that needs the accessibility provided by the public transport network.

The Bundesländer in Germany have more power than the Belgian gewesten. They have their own constitution and some Bundesländer have a long history as dukedom or important trading city. The Bundesländer are responsible for everything but matters as the army, the national currency and taxes. Governance within each Bundesland can be different.

The Bundesland is responsible for public transport in their region, they have a choice whether they organise it themselves, or whether they create a so-called 'Zweckverband' that focusses on public transport in the Bundesland – the 'Verkehrsverbunden'. The Nordrhein-Westfalen Bundesland has four Verkehrsverbunden that focus on public transport within their own area. The governmental level below the Bundesland are the Regierungsbezirk. They are comparable with the province in the Netherlands and Belgium. The Regierungsbezirk is – in the Bundesland Nordrhein-Westfalen – responsible

for public transport on the road (bus, tram, metro). This responsibility is often combined with the designated Verkehrsverbund that covers a specific region.

The Kreise that are located within a certain Verkehrsverbund cooperate on public transport. The Aachener Verkerhsverbund (AVV) and the Verkehrsverbund Rheinsieg (VRS) have formed a coalition – Zweckverband Nahverkehr Rheinland (ZV NVR) – in which they try to create a well-integrated public transport network across their borders. Arriva has also been allowed to take seat in the ZV NVR, and is with this the first foreign public transport to be included in a German Verkehrsverbund.

The national railway companies are all, in some way, partly or completely government owned state companies. They officially are autonomous companies, and the state could also contract other railway companies. In practice, this does not happen, and the government keeps a certain, to the public unknown, level of authority over the national railway company.

Government layers — Public transport companies

Der Bund
— 100% of stocks / client →
Deutsche Bahn (DB)
Deutsche Bahn AG
Railway manager
← private operators contribution

total subsidy set for 15 years

Bundesland
Nordrhein-Westfalen responsible for public transport in their region, can do it themselves or create a Zweckverband for this purpose
— client →
Nahverkehr
S-Bahnen
Regionalverkehr
Nordrhein-Westfalen

Regierungsbezirk
Köln
responsible for public transport on the road - bus, tram, metro

Arriva NL

Zweckverband
Zweckverband Nahverkehr Rheinland (ZV NVR)

Verkehrsverbund
Responsible for public transport in their region
(AVV) Aachener Verkehrsverbund
ASEAG
West
DKB
DB Bahn
Verkehrsverbund Rheinsieg (VRS)
KVB   RGVG
RVK   RSVG
OVAG Wupsi
SWB
Verkehrsverbund Rhein-Ruhr (VRR)
Westfalen Tarif (WT)

Kreise / Region
Städteregion Aachen   Kreis Düren   Kreis Heinsberg   Stadt Aachen

Gemeinde

Belgium

In the Netherlands and Belgium the public transport on a provincial / gewestelijk level is also provided by a single company. In the Netherlands, Arriva has won the previous concession, and is now responsible for all local transport – local and regional trains, and busses in the province. The province of Limburg does not have any tram or metro systems, so these are not included.

In Flanders, De Lijn used to be the main local public transport company. Complaints from lower scale levels, mostly municipalities, have recently led to a reorganisation of the public transport system. Municipalities complained that De Lijn did not have enough knowledge of changing trends and demands, and that they did not coordinate their strategy alongside demands and needs of the lower scale level (Vanacker, 2018). Flanders has changed its public transport vision from the principle of 'basismobiliteit' (basic mobility), which entailed that all residents were entitled to a basic offering of public transport. This implied a stop no further than 750 metres from home, no more than 500 metres in urban areas, and a regular service to this stop (Vlaams Parlement, 2004). In the new vision, the principal of 'basismobiliteit' will be changed to 'basisbereikbaarheid' (basis accessibility). In stead of creating stops because they 'have to be there', according to the principle of 'basismobiliteit', they new vision focusses on locating stops where there is a demand for transport (Vlaams Parlement, 2014). The strategy to realise this vision is divided into four spatial levels:
- First layer: the core network. Urban and inter-urban connections, they will connect the largest attraction poles with each other. These include the most important train connections, these will still be designed and planned by the NMBS.
- Second layer: urban core network. Connection within and between important cities. This railway network will be designed by De Lijn.
- Third layer: additional network. The network that connects core network with suburbs and smaller urban cores. Connections outside the city will be designed by De Lijn, with active participation of the transport regions.
- Fourth layer: transport on demand. Local or private initiatives that focus on a specific demand or peril (e.g. call busses, private busses from a resting house, shuttle services from a company). This way, the local initiatives are bundled within a transport region. The transport region is responsible for the organisation of this layer.

Next to these layers, there will also be mobi-punten (mobi-nodes), nodes where different actors come together. The actor who gets to play this role is still unknown, though it is clear that he can have no direct link with De Lijn.

Government layers

Public transport companies

Federal State

100% of stocks

client

Nationale Maatschappij der Belgische Spoortwegen (NMBS)

exploitation contribution

European subsidies (2%)

federal donations (95%)

Infrabel

GEN-fund (3%)

exploitation contribution

Gewest Flanders

Mobility plan Flanders

governmental subsidies

De Lijn

private operators contribution

Province of Limburg

Transport Region Limburg

Mobility plan transport region created by the Transportation Region Board
= optimal cooperation between different modes of transport (train, tram, bus, taxi, bicycle)
= mobi-hubs, transfer of modes

Representatives all municipalities
Departement van Mobiliteit en Openbare Werken
De Lijn
Het Agentschap Wegen en Verkeer
NMBS
MAV's (Mobiliteitscentrale Aangepast Vervoer)

Municipality

Municipal mobility plan
= based on mobility plan Flanders and mobility plan of the transport region
- creates conditions on municipal level
- municipality is autonomous authorised

Governance Diagram

The organisation of public transport is connected to the various spatial levels of governance. To see possible areas of friction and find spots where miscommunication or lack of cooperation can take place, the organisational structures of the four different territories have been combined in one diagram in "Image 70". The spatial level increases towards the middle of the circle, and it becomes clear how the governmental levels relate to each other. The diagram shows that the spatial levels on which public transport is organised do not always relate between the four territories. This on its own does not necessarily have to create issues, however mutual understanding of differences in governance level is crucial. In practice these differences provide a barrier to overcome in the realisation of cross-border public transport.

The authorities highlighted in red are the authorities represented in the EMR governance structure. As becomes clear in the diagram, the authorities in the EMR are not all on the same spatial authority level, and do not have authority over the same public transport level. The authorities represented in the general EMR governance are in some way involved in the decision-making of public transport, but they are not the key actors. In order for cross-border public transport to be efficient and easily accessible, key authorities need to be combined.

Multimodality in cross-border public transport

Use of buses on electricity on cross-border routes

Creating networks in the education and research region

Digitalising ticketing and passenger information

Rates and service provision

Focus points of the EMR connect project (Interreg Euregio Maas-Rhein, 2017).

EMR Connect

Cooperation of key actors in public transport already exist in projects subsidised by European programmes that promote cross-border cooperation. A current example is the EMR Connect project, subsidised by the INTERREG programm. It focusses on improving public transport within the euroregion, by resolving issues created by national borders. The cooperation includes actors from different countries and different disciplines. It combines public transport providers, research institutes and governmental bodies. However, when comparing these governmental bodies, that have the power to implement new strategies, with the governmental bodies in the governance diagram, it also shows disconnections.

Aachener Verkehrsverbund (AVV) - Leadership
Stadt Aachen
Provincie Limburg
Stadsregio Parkstad Limburg
Deutschsprachige Gemeinschaft Belgiens
Liège Europe Métropole ASB

ASEAG
Arriva Personenvervoer Limburg
De Lijn
Nationale Maatschappij der Belgische Spoorwegen (NMBS)

RWTH Aachen University
Universiteit Hasselt

Participating actors in the EMR connect project (Interreg Euregio Maas-Rhein, 2017).

EMR connect actors
Public transport company
Actor in Euregio Maas-Rijn Foundation
Governmental body responsible for public transport
Governmental body related to spatial scales

Image 70. Relation between actors according to nationality and scale, combining public transport and government actors.

Spatial

The relation between public transport, urban development and governance is at the basis of this thesis, as explained before. In the previous chapter the urban development and the role of governance in this has been analysed. This chapter focusses on the current public transport network in the Euregio Maas-Rijn (EMR). It analyses its spatial characteristics on various scale levels and the different governance systems related to this public transport network. The existence of spatial structures of public transport – railways, bus stops, etc. – does not necessarily guarantee a convenient and accessible network. The functioning of the network determines the value of the connection and the convenience of travel. Value of connection can be measured by combining time of travel, number of connections, and type of transport (Derudder, 2016). The time of travel and the type of transport will be analysed in this chapter, the number of connections will be analysed in relation to the urbanisation pattern of the region, and will be analysed in the next chapter. The hypothesis is that the region does not provide a convenient public transport network on a euroregional scale, due to a lack of cross-border connections. In relation to the dispersed urban pattern, the car network will probably be a more convenient transportation mode for the residents. This chapter will show the value of the current public transport network, and the governance structures that are responsible in the EMR.

This part of the chapter provided an overview in the spatial characteristics of the public transport network in the EMR. Analysis combines the physical existence of the networks and adds to that an analysis of the value of the connection. Analysis of the different transportation systems, train and bus, included their development and their current state. It showed that both the train and bus network does not integrate the border into their visions. The networks are both oriented nationally, which leaves gaps in the euroregional network. There are no fast, direct – intercity – connections across the borders, disconnecting the cities from each other. The bus network is provided through four different operators, which shows in the spatial network as it looks like four glued together networks "Image 80". Some cross-border bus connections exist, however it seems they have to function as a replacement for a faster train connection.

Next to the physical spatial characteristics, the value of the connection is important to determine the convenience of transport. Overall the graphs show that travelling by public transport is certainly not a convenient option yet, with some exceptions "Image 81". Travel times are often twice (or even more) as high as travelling by car, and take more than 30 minutes longer, which can be considered as an inconvenient travel option for users. Large differences in travel time can also be seen, resulting in some cities being cut off from the network. Cross-border connections have a higher travel time than national connections, this shows the gaps in the network created by the border. It results in cities being badly connected, even though they are close to each other.

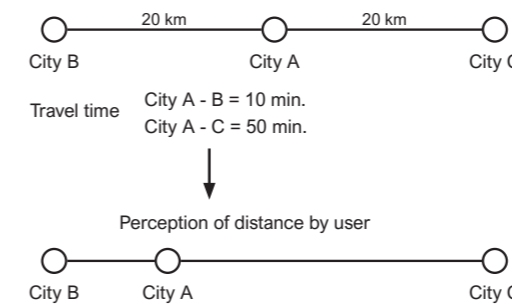Image 73.   Mobility stops at national borders.

Image 72.   Perception of time and distance.

Governance

The EMR has known a longer period of cooperation, and many initiatives have been reaping the benefits of this. Integration of research institutions and companies across borders has been growing, along with education programmes and social inclusion (Interreg Euregio Maas-Rijn, 2018). However, within the theme of territorial development difficulties still occur. Mainly due to national difference on governance level, differences between rules and regulations and execution of projects still restrain future developments (Interreg Euregio Maas-Rijn, 2018).

The comprehensive governance structure of the EMR is focussed on all areas of cooperation within the region. The key actors in this governance structure do not all correspond to the specific key actors in public transport. Which does make sense as the EMR governance structure does not focus solely on public transport, however it does increase direct cooperation within the region in this field.

Next to the general EMR governance structure, there is also the EMR Connect INTERREG program, which does focus specifically on improving cross-border connections. Actors in this project differ from the ones in the general EMR structure. However, the EMR Connect is not an official governance institution with juridical powers, it is a project where different actors have been brought together.

07

RELATION URBANISATION & PUBLIC TRANSPORT

Regional nodes
Fusion of centres
Complex routing
Comparative case studies

Photo: Bus line 57 in Sint Geertruid.

The euroregional scale shows a relation between the presence of dense urbanisation and the presence of public transport. The presence of dense urbanisation shows an increase in public transport connections. Besides concentration of population and functions in the main nodes, public transport also seems to concentrate in these nodes. This relates to the current vision on the organisation of public transport. It focusses on connecting concentrations of people, flows and functions, the higher the concentration the more profitable a connection is. In the map in "Image 74", the relation between the main cities in the region and the presence of public transport within the city is shown. It shows that the amount of train

and bus connections relates to each other in most cities. An increase in train connections shows an increase in bus connections as well. An exception is the city of Genk, which has a high level of bus connections, but the lowest number of train connections. Genk has just one connection by train, disconnecting it from the public transport network. To be able to connect to the surrounding region, other options have been developing, of which one is an extensive bus network.
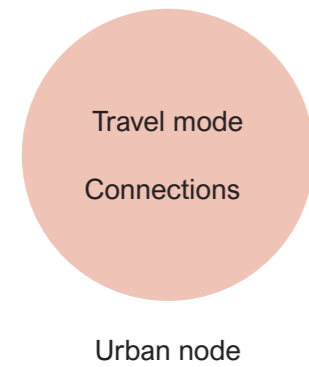
Cities	Number of train connections	Number of bus connections
Liège	12	21
Maastricht	6	22
Aachen	8	29
Hasselt	7	29
Heerlen	4	15
Kerkrade	1	10
Roermond	5	13
Sittard	5	11
Geleen	2	6
Genk	1	25
Verviers	4	12
Düren	6	21
Alsdorf	1	11

Travel mode

Connections

Urban node

Number of train connections

12   7-8   6   5-4   2   1

Number of bus connections

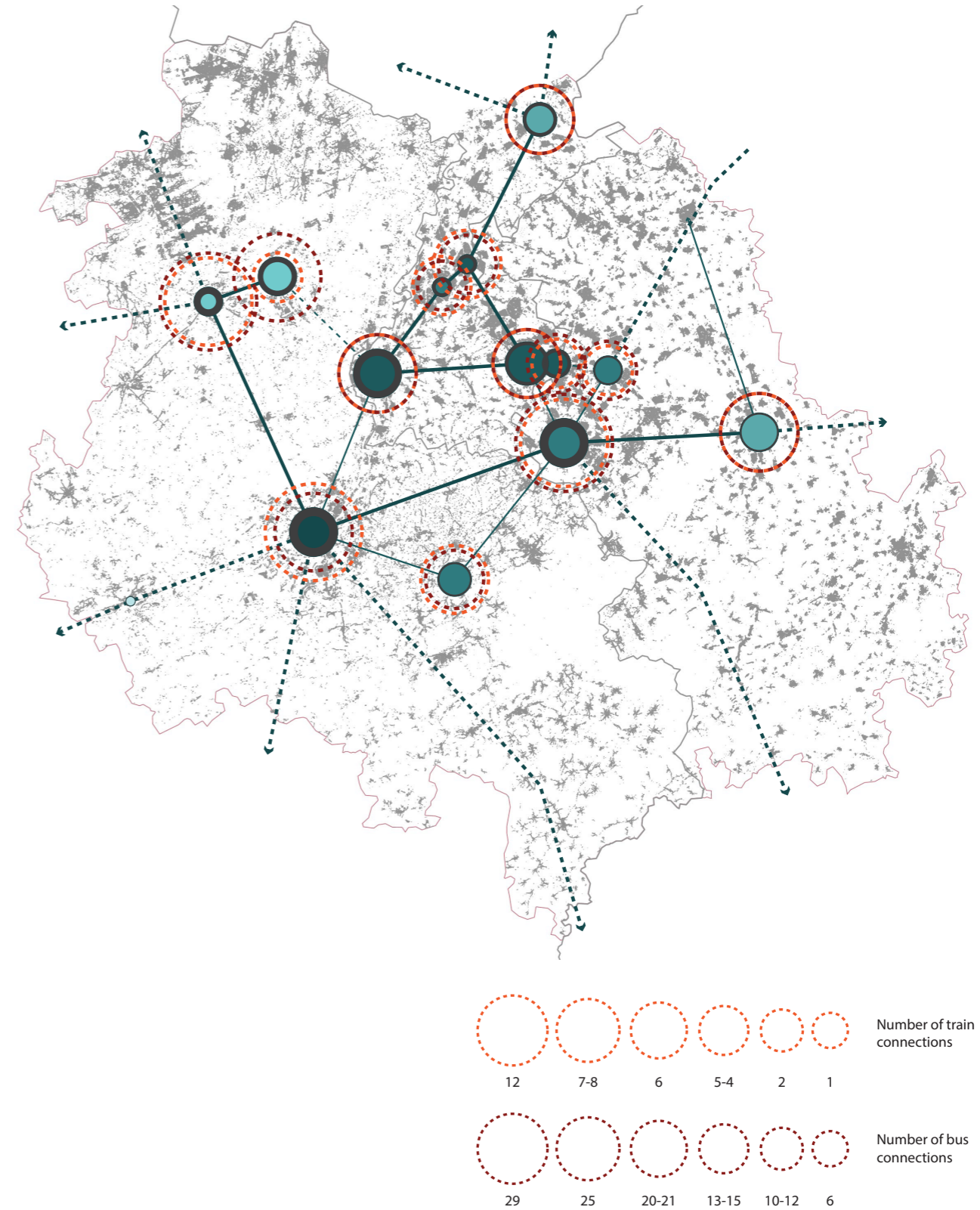29   25   20-21   13-15   10-12   6

Image 74.   Central nodes in the EMR, and the presence of public transportation modes.

Transportation and accessibility rely both on the urban pattern and the public transport network. Combining these two gives an insight in the value of the connection between cities in the Euregio Maas-Rijn (EMR). The number of connections, type of transportation mode and travel time are important aspects as explained in the previous chapter as well. Besides the separate train and bus network, travelling often requires a combination of both or transfers of the same mode. The schemes on the right show that in case there is no direct train or bus connection, a connection can be achieved by combining connections. It can be said that every city within the EMR is connected to each other. However, as the scheme shows, the travel times are extremely high. On the next page one connection is taken as example and shows the explanation for these high travel times.
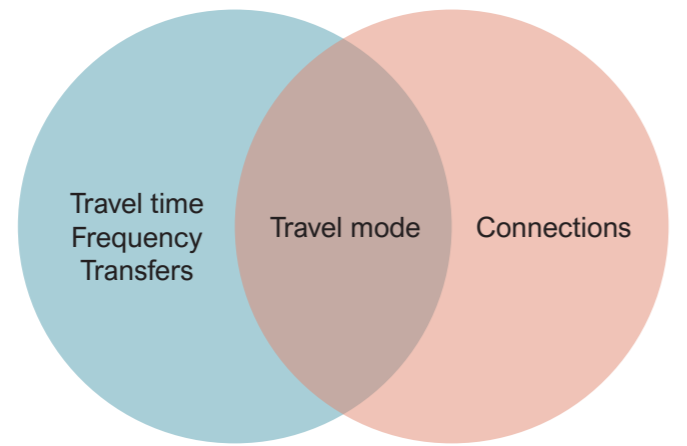
Public transport route   Urban node

Travelling between city X and city Y.
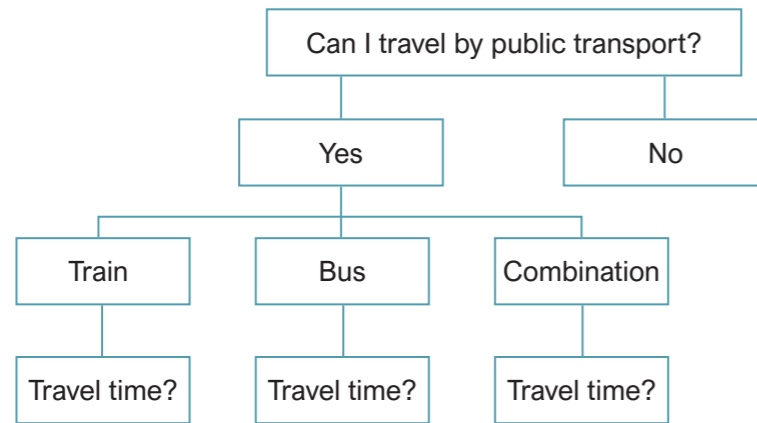
Travelling between Maastricht and city X.

City X	Direct distance (km)	Train connec- tions p.h.	Travel time (min.)	Bus connec- tions p.h.	Travel time (min.)	**Combi** connec- tions p.h.	Travel time (min.)
Geleen	15	2	16	4	65-80		
Genk	20			1	52		
Heerlen	20	4	22-30	4	62		
Sittard	20	4	20	4	71-90		
Hasselt	25	1	110	1-4	83-100		
Liège	25	1	32	2	90-150		
Kerkrade	25	2	48	5	84-170		
Aachen	30	1	56	4	64		
Verviers	30	-	-	-	-		
Alsdorf	35	-	-	-	-		
Roermond	45	1	45	-	-		
Düren	55	-	-	-	-		

Travelling between Genk and city X.

City X	Direct distance (km)	**Train** connec- tions p.h.	Travel time (min.)	**Bus** connec- tions p.h.	Travel time (min.)	**Combi** connec- tions p.h.	Travel time (min.)
Hasselt	15	2	20	4	38	-	-
Maastricht	20	-	-	1	52	-	-
Sittard	25	-	-	-	-	4	87-108
Geleen	25	-	-	-	-	7	96-172
Liège	35	1	90	2	125-150	-	-
Heerlen	35	-	-	-	-	6	90-140
Kerkrade	40	-	-	-	-	2	138-168
Roermond	40	-	-	-	-	2	93-120
Aachen	45	3	153-170	-	-	3	127-167
Alsdorf	45	-	-	-	-	2	145-180
Verviers	50	2	134-165	-	-	2	150-180
Düren	70	1	220	-	-	2	197-215

One of the connection with a high travel time is the connection between Genk and Geleen. The cities are located close to each other, 23 km, however there is no direct connection between the two cities. Analyses of a possible route shows that via a combination of connections one can travel from one city to the other, however the travel times are over one and a half hour at least. Analysing one of the possible connections ("Image 75"), shows a lot of transfers, waiting time, and inconvenient routing. In many of the other connections the same problems occur. It results in inconvenient connections, disconnecting the cities from each other.

Another contributing barrier is the fact that a lot of the routes cross national borders. Public transport planning apps provide information almost solely on their own network and terrain. As explained in the previous chapter on public transport, the EMR exists of four different bus networks. In planning ones route, one has to combine information from different companies themselves, searching for possible transfers and route possibilities. Different time schedules in combination with different pricing and ticketing, longer travel times and many transfers, these connections are not convenient and do not attract users from the EMR.

Image 75.   Route by public transport from Genk to Geleen.
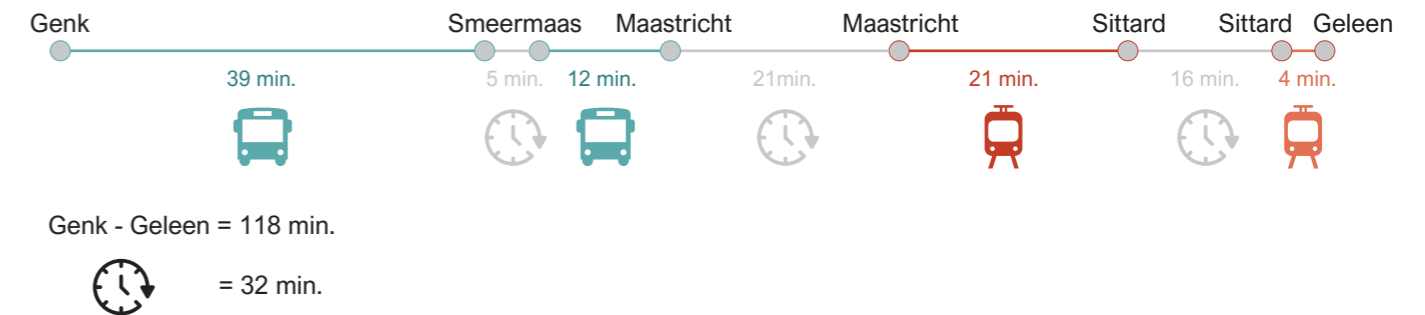

Genk - Geleen = 118 min.

= 32 min.

City X	Direct distance (km)	Train connections p.h.	Travel time (min.)	Bus connections p.h.	Travel time (min.)	Combi connections p.h.	Travel time (min.)
Geleen	25	-	-	-	-	7	96-172

Relatively smaller urban centres in the region try to increase their strength by connecting with surrounding centres. Smaller nodes can functions together as one large node. This can be best seen in the areas that were most active during the mining era. Rapid urban development glued together smaller urban centres, creating larger urban clusters. Transportation within these clusters was important to provide fast connections between living and working facilities. Some of these nodes have continued working together and intensified their cooperation after the mining era came to an end. Examples are Sittard-Geleen, the Parkstad region Heerlen and the region of Hasselt, Genk, Zonhoven and Beringen, presented in "Images 77, 78 and 79". Intensive public transport networks create fast connections between different urban centres, enabling the clusters to brand themselves as one region.
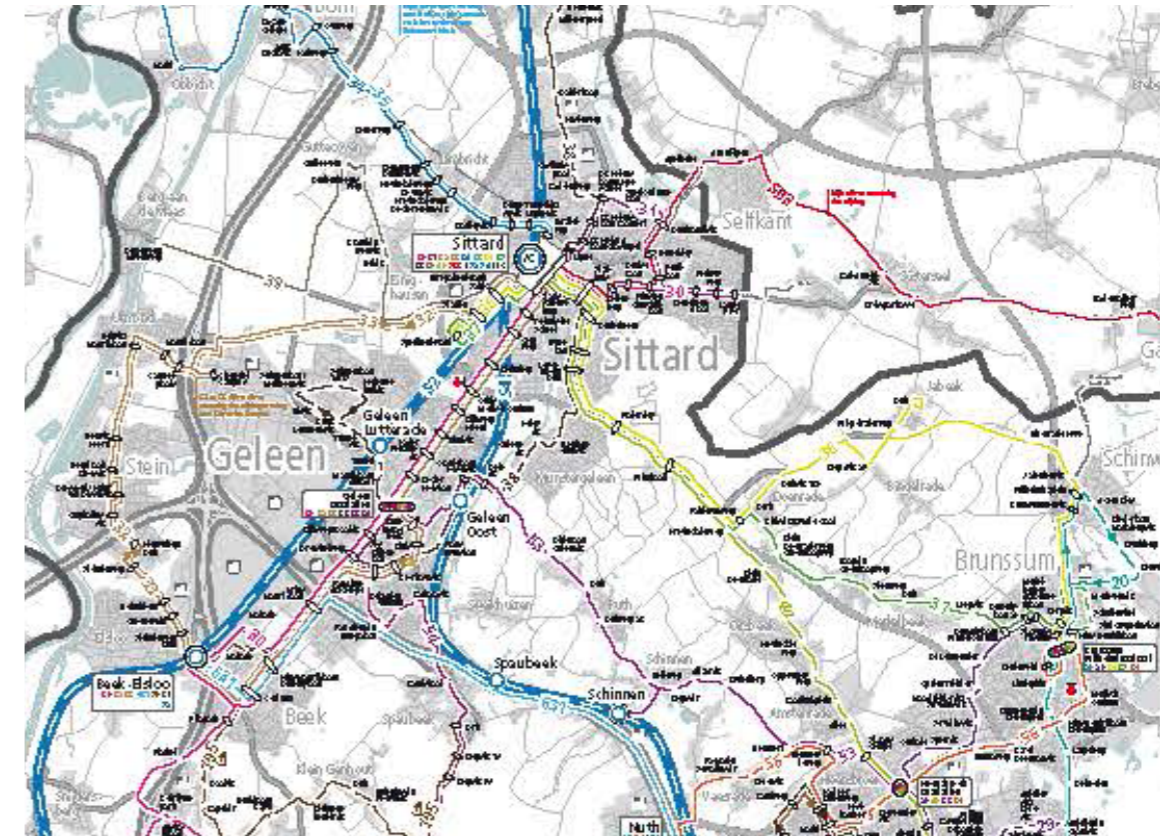

Image 77.   Public transport between Sittard and Geleen (Arriva, 2017).
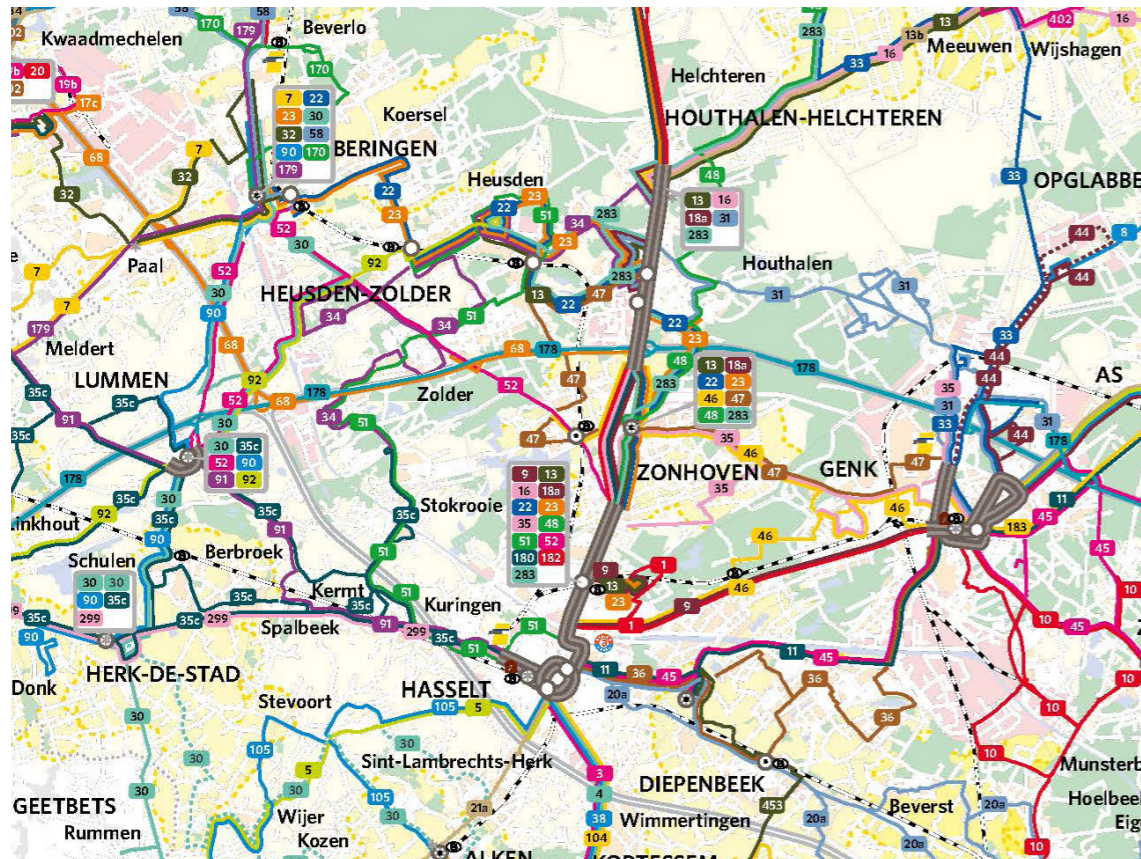

Image 76.   Public transport between Genk, Beringen, Hasselt, Zonhoven and inbetween urban settlements (De Lijn, 2018).
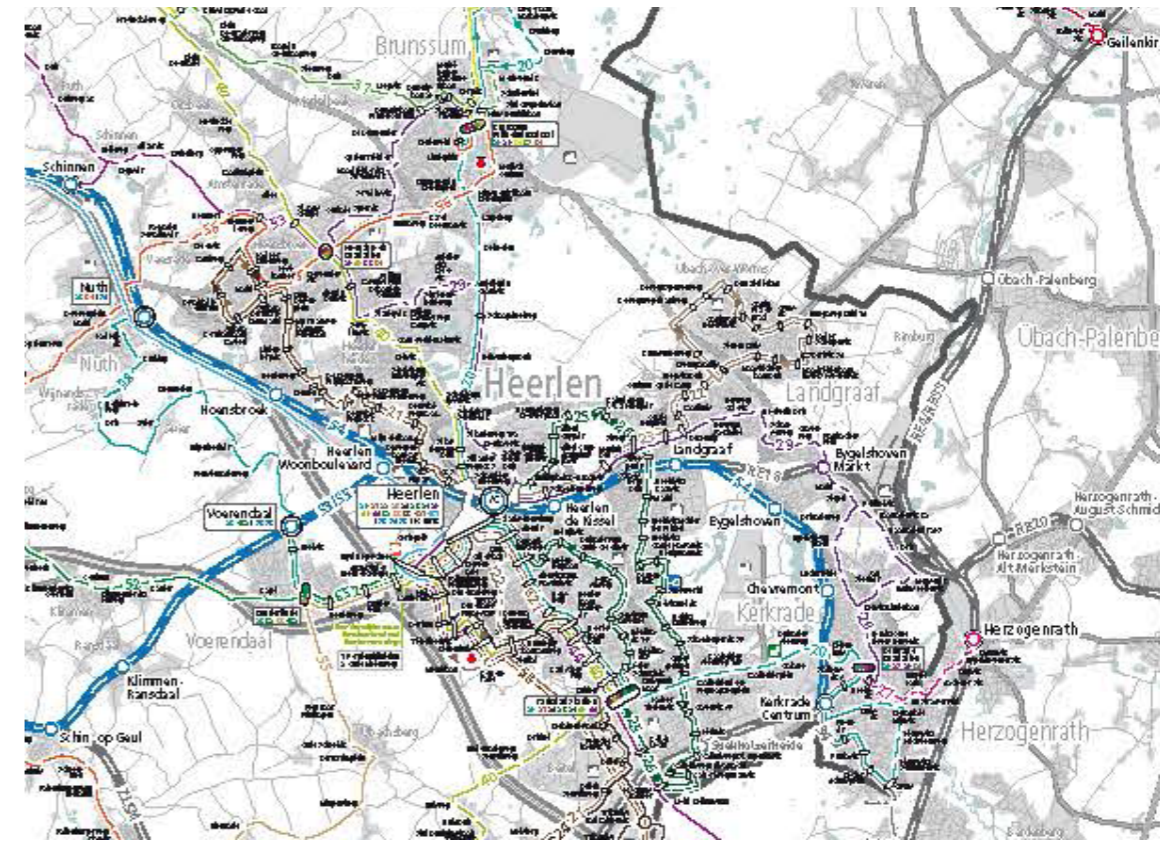

Image 78.   Public transport between Heerlen and its surrounding urban centres (Arriva, 2017).

In the beginning of the chapter the importance of the bus connections was already touched upon briefly. Due to the dispersed urban pattern, and with that a dispersed population, cities need to improve their connection with their region as they depend on each other "page 40". The local scale requires transport that is flexible and includes more specific destinations. The bus can provide this type of public transport as it is very manoeuvrable and can make use of the extensive road network in the region. The current bus network shows the flexibility of the mode, it changes according to the urban pattern in place. In the region of Aachen, the ZV NVR has a high density of bus lines within and surrounding the city. Towards the national border in the West, there is a high intensity due to the presence of the Technical University and the Hospital. The rest of the intensity can be related to the directions of urban development, towards the North – alongside the border -, towards the North-East – Würselen, Alsdorf – and towards the East – Stolberg, Eschweiler. Aachen has by far the largest population, and is home to many large-scale functions. However, the bus network does not provide access to these amenities across the border.

In Wallonia and Flanders the bus network is very elaborate, but has therefore become very complicated. The routes are set, but to answer the high demand of flexibility the routes vary according to the time of day, and the day of the week. Small-dispersed urban centres create a very changing supply and demand. The system tries to create a supply for every demand, but at the same time keep it as profitable as possible. This has resulted in complex system of public transport routes, that are not clear and user friendly anymore. An example in busline 45, Maastricht station - Hasselt station, shown in "Image 79". It is one of the cross-border buslines between the Netherlands and Belgium, and connects three main nodes in the region (Hasselt, Maastricht, Genk). It travels along many smaller urban settlements, and tries to connect as many as possible on its route.

This creates two inconveniences, increase of travel time and increase of complexity of the route. Every stop a bus has to make takes a certain amount of time, by increasing the amount of stops on a route the total travel time will increase as well. Next to that, the bus will need to travel a diverting route that leaves main roads. This increases travel time and convenience for travellers. The complexity of the route also increases, as not all destinations have the same demands. It changes between peak hours and off-peak hours, weekenddays and weekdays, and night or day times. Trying to supply public transport for every demand, has resulted in a timetable that has a large diversity of options. It does not provide users with a clear structure of public transport service.

Bus line 45 - Maastricht Station - Hasselt Station

"During the week there is a service 1x/hour between Maastricht and Hasselt with an extra service during the morning peak-hours between Maastricht and Genk station. Next to this service travels 2x/hour between Maaseik and Genk, with an extended service to Eisden 1x/hour. One of the services from and to Maaseik travels between Genk and Hasselt as well. The service from and towards Maastricht provides a half-an-hour service between Hasselt and Genk. During peak-hours extra services are provided between Hasselt and Genk, between Genk and Maaseik and between Genk and the University in Diepenbeek. Next to this there are some non-frequent service variations not included.

Service on saturdays follows the off-peak hour schedule of weekdays. Exception are the service towards the university in Diepenbeek that now only travels 1x/hour, and there is no direct service between Maastricht and Hasselt.

Service on sunday provides a 1x/2 hour service between Maastricht and Genk, 1x/hour between Maaseik and Hasselt, and 1x/hour between Genk and Hasselt. The extensive service through Eisden is included during sunday service. The University in Diepenbeek only has service 1x/2 hours."
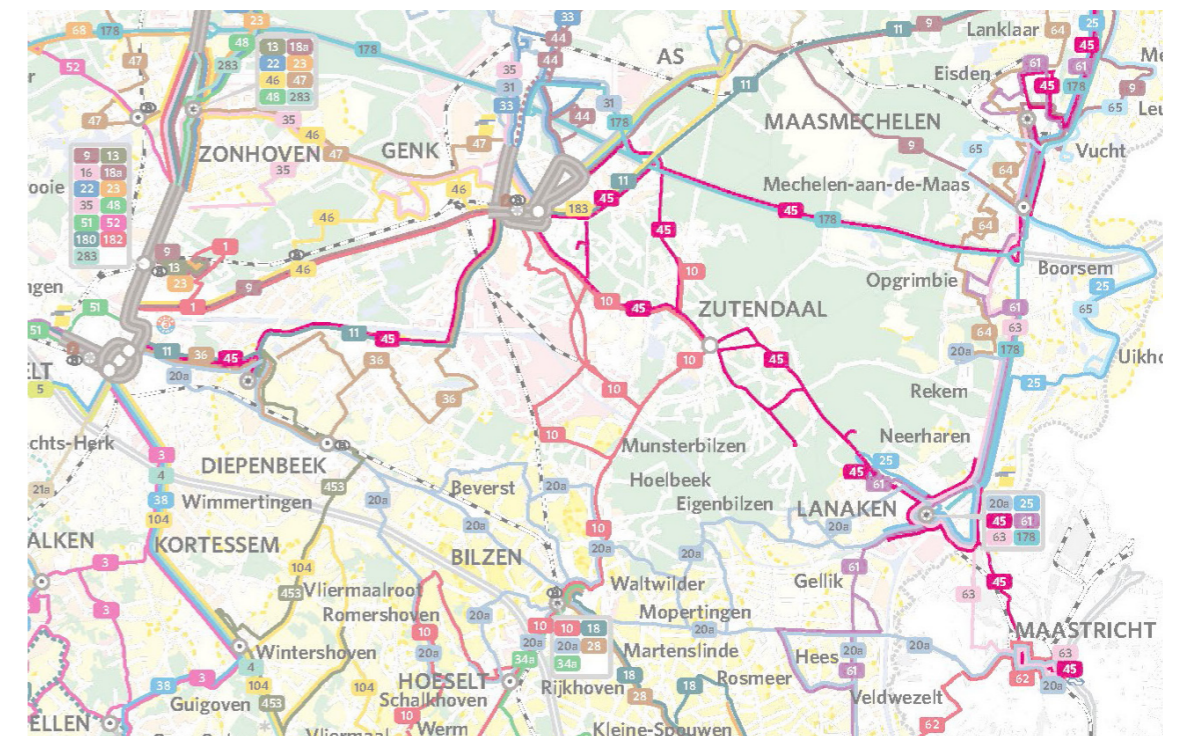

Image 79.   Bus line 45 Maastricht station - Hasselt station (De Lijn, 2018).

The focus of this project has been primarily on the EMR, however, as explained in the chapter on context REFERENCE, there are many cross-border or polycentric (euro)regions. Analysis of some of these regions can provide insights in solutions to similar problems. Two case studies will be analysed, the Randstad in the Netherlands and the Greater Copenhagen Region in Sweden and Denmark. The first is an example of an integrated polycentric region, however does not face any cross-border barriers. It can provide insight in opportunities when political differences can be put aside. The Greater Copenhagen region is a cross-border euroregion in which mobility and transportation played a large role. It shows that providing transportation and regional branding can boost integration in the region.

The Randstad

The Randstad is a polycentric urban concentration, or conurbation, in the Western part of the Netherlands. The region is home to four of the largest cities of the country and the region connecting these. The Randstad originated as a concept to control urbanisation, creating economic prosperity came second. After the WWII, a migration pattern can be seen of leaving central urban areas to live in outside villages and the countryside. A total program was conceived in the seventies, to improve the urban fabric with national support (Brandes, 2006). For the cities of Amsterdam, Utrecht, Rotterdam, and The Hague, the decision was made that in the area between the major cities a 'green-heart' should be created. Urbanisation was to be at the edges of the cities and in concentrated-deconcentrated urban settlements in between. This led to the vision of a border ('rand') city ('stad'), creating the Randstad (Lambregts, Zonneveld, 2007). In this border the urban expansion of cities started overlapping with growing villages in between the cities, thus starting to form a morphological entity.

The vision for 2040 for the Randstad is to develop itself as one of the top-regions of Europe. The visions focusses on qualitative strategies that focus on increasing quality of life, creating a sustainable region, good accessibility, efficient densification, and improving the economic position of the Randstad (Rijksoverheid, 2008). The vision aims to create a stronger entity that enables a dynamic economy in the region, which actually relates to the vision for the EMR.

The demographics of the Randstad however, do not correspond to those of the EMR. The Randstad has roughly twice as many residents, whereas its area is more than twice as small. Following this, the main focus is on qualitative densification and centre-building, which is a good foundation for an extensive public transport network. The Randstad is able to create densified centres that correspond to the public transport network, linking all centres and creating a cohesive region. The EMR has a low population density, and a dispersed urban pattern. Their vision on public transport must therefore differ from the strategy of the Randstad. However, the focus on the improvement of inter-regional connections – faster, better, more efficient – can be adopted by the EMR. The Randstad shows that an extensive and efficient inter-regional transportation network improves their economy. Improvement of inter-regional connections will increase interaction between a diversity of residential and working environments, which is at the basis of a more dynamic and strong economy (Rijksoverheid, 2008).

The second aspect that connects with the EMR, is how functional entity is formed in the Randstad. The four main cities have, next to an equal distribution of general functions, a specific focus on a type of functions. Amsterdam, for example, is the capital of the country, has the main airport, and most banks and law courts. Whereas Rotterdam for example, holds the most important trade offices and one of the largest harbour in the world. The cities need each other, and complement each other to form an entity (Brandes, 2006). The cities have their own specialties, pushing them to work together but also allowing a larger 'network' city to arise in which residents and visitor experience a network of cities that exceeds just the sum of four cities. This network of cities could also be created in the EMR, allowing a functional entity to arise in the region.
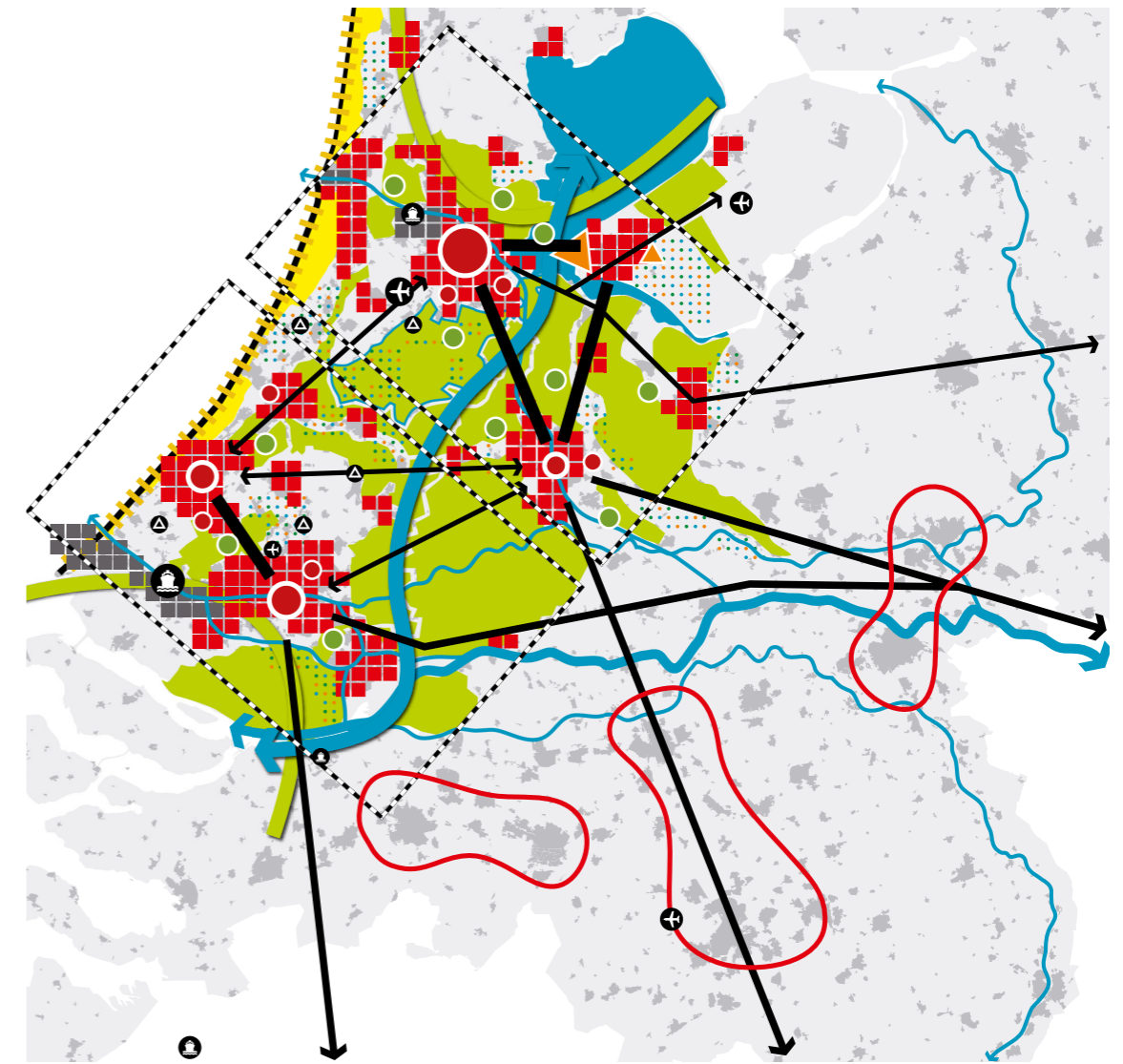

Image 81.   Spatial Development vision Randstad 2040 (Rijksoverheid, 2008).
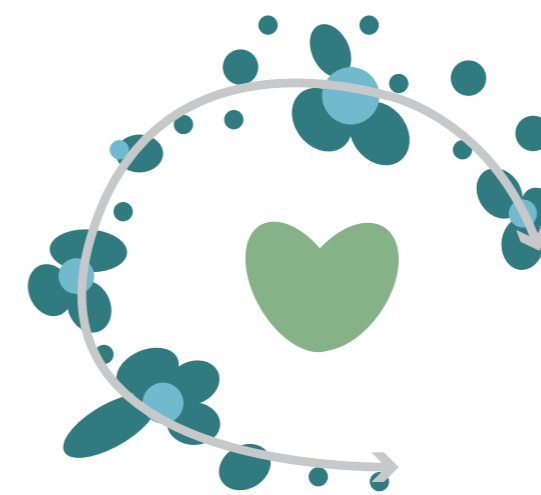

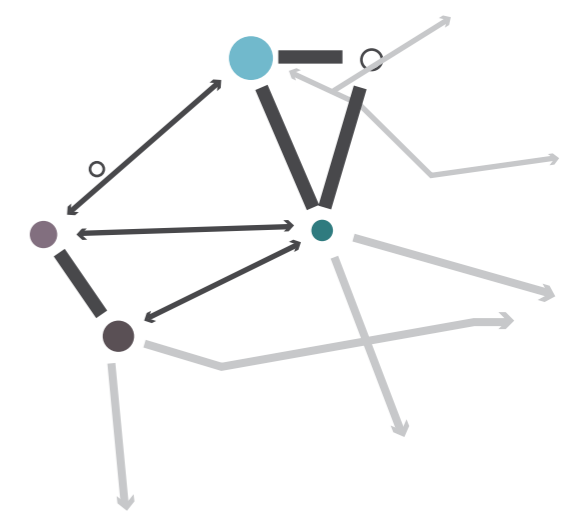Image 82.   Urbanisation structure - morphological entity.

Image 83.   Inter-regional connection in the Randstad.

The Greater Copenhagen Region

The Copenhagen Greater Region was founded in 1993 under the name Øresund Region, it combined the main metropolitan areas of Copenhagen and Malmö. The name was chosen after the name of the water that divided the region, the Øresund, which would not favour one of the two cities. In 2013 however, the choice was made to change the name of the region to Greater Copenhagen Region for branding purposes (Sydsvenskan, 2013). The region has almost the same amount of residents, approximately 4 million, however the region is almost twice as large which results in a lower population density. The regions are comparable in terms of population spread. Population density is highest in the city areas, Copenhagen and Malmö Metropolitan Regions, where the periphery of the regions are rural areas and have very low population densities.

In this region the realisation of a large transportation construction was necessary, the bridge connecting both countries. In 2018, approximately 19 million people travelled across the bridge, 60% of which travelled by train (Øresundbron, 2019). Residents of the region also make use of the different advantages that a cross-border region brings. People have migrated to Sweden for the lower real estate prices, but the other way around, migration to Denmark is also popular due to higher salary rates (Öresundsdatabassen, 2011). In this way residents can fully benefit from the benefits a cross-border region provides. Another aspect that strengthens the integration is the establishment of a consortium of universities, opening all facilities and courses to all students, teacher, and researchers (Streijffert, n.d.). The EMR is also home to a collection of universities, but not all of them are working together at the moment. A consortium in combination with an efficient transportation network, could give education and research a boost in the region.

The change of name for the region to Greater Copenhagen Region was mostly because 'Copenhagen' was considered to have more *power* and was more recognised internationally (Sydsvenskan, 2013). The branding of

the region was very important, as it was a relatively new region that needed to compete with other large metropolitan areas that had longer historical foundations. Their branding strategy focusses on using soft brand values, as happiness, freedom, and quality of life. They were redefined so they could be perceived as competitive factors. The branding strategy has been showing off successful results, and they were named 'Place Brand of the Year' 2017 by City Nation Place Global Awards (Copenhagen Capacity, 2017). The focus on the importance of regional branding is lacking at the moment in the EMR. Most branding is focussed on a provincial or city scale, whereas in the case of the Greater Copenhagen Region regional branding is most important. Their strategy is built on the belief that areas are stronger together, and uniting municipalities and individual regions will create a metropolis that can have great international impact (Copenhagen Capacity, 2017). This relates to the view of Meijers that integration is more than just the sum of two cities (Meijers, 2008). The EMR should focus their branding more on the whole regional scale, in order to be able to focus on the dynamics of cities, functions, and economies, which is important to be able to compete internationally. Another aspect in branding that can be learnt, is the focus on soft brand values. A few of the EMR's highest rated values are the landscape, the quality of life, and the historic-cultural heritage. These could be at the foundation of the branding strategy to show the uniqueness of the EMR.

Image 84.   Greater Copenhagen Region (Greater Copenhagen, 2018).

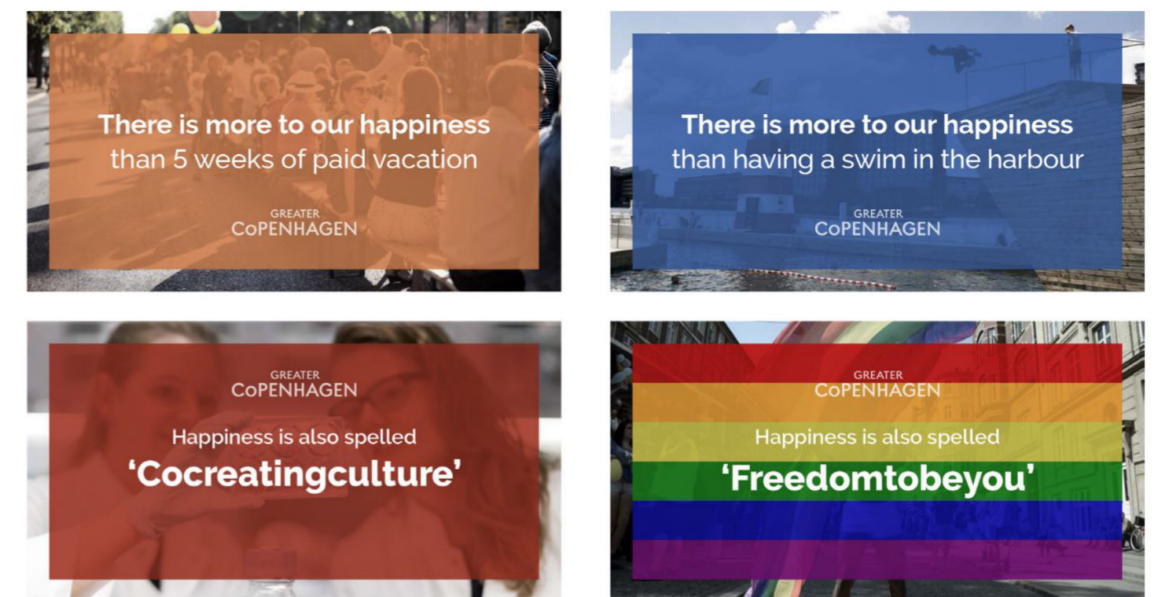Image 85.   Vision Greater Copenhagen 2020 (The Capital Region of Denmark, 2015).

Image 86.   Branding strategy Greater Copenhagen (Copenhagen Capacity, 2017).

Euroregional scale

Public transport and urban development show correlations in different ways according to different scales. These can either be positive or negative correlations. On the euroregional scale it shows that densification of the public transport network relates to the level of urban densification. The most important modes of public transport are the train and bus, which are also related to each other in most cities.

Accessibility relies on the urban pattern and the public transport network. Combining these two gives an insight in the value of the connection between cities in the EMR. The number of connections, type of transportation mode and travel time are important aspects in this. Besides the separate train and bus network, travelling often requires a combination of both or transfers of the same mode. It shows that if there is no direct connection, the journey can exist by combining modes, but is complicated, has a long travel time and is not convenient to plan. This disconnects cities and restrains accessibility in the region.

Another contributing barrier is the fact that a lot of the routes cross national borders. Public transport planning apps provide information almost solely on their own network and terrain. Different time schedules in combination with different pricing and ticketing, longer travel times and many transfers, these connections are not convenient and do not attract users from the EMR.

Regional and local scale

Adequate public transport connections can play an important role in the integration of two or more neighbouring urban centres. This is escpecially visible in the old mining areas. Intensive public transport networks create fast connections between different urban centres, enabling the clusters to brand themselves as one region.

The bus network is an important network in the EMR due to the dispersed urban pattern and population. The local scale requires transport that is flexible, which the bus can provide. It aims to provide transport for as many residents as possible, by trying to create a service for every demand, whilst at the same time exploiting a profitable service. Further and further expansion to answer the demand has led to overcomplicated service networks, which are not user friendly anymore. These complications increase travel time and complexity of the route, and does not provide a clear structure of public transport service.

Comparative case studies

Analysing other polycentric or cross-border (euro)regions has provided insights in strategies and solutions to problems that can also be seen in the EMR. They are focussed on accessibility, urban development and perception and branding.

In both the regions the improvement of inter-regional connections as a foundation for a strong and more dynamic economy was a key aspects of their regional strategy. As the regions differ in geographical and urban characteristics, the implementation of this strategy showed different results in its spatial approach. However the focus on inter-regional connections proved to be successful for the strength of the region in both cases. The Randstad shows a polycentric region in which the main centres are connected through a well-organised public transport system, improving functional integration and therefore increasing the strength of the region. The focus on the importance of inter-regional connections should be a main focus point in the EMR.

Besides internal connections, the external accessibility of the region is also important. Better embedment in international transportation routes will improve the accessibility of the region itself. The international character of the EMR is a beneficial factor in this, as it can create connections to three countries rather easily. The region already has a European connection in the East-West direction, by improving its external connection to the North (the Randstad) and South (the Saar-Lor-Lux region), it could become a key player in international routes.

Besides accessibility, the regions also show integration in other aspects. The cohesion and division of functions and amenities across the region. The Randstad shows that each city, to some extent, had their unique role in the regional network. This implies that on a regional scale there is a vision on function distribution in the region. In the EMR the cities' future spatial visions do not necessarily correspond to other cities'. Cooperation and shared future visions can be seen in the private and research sector,
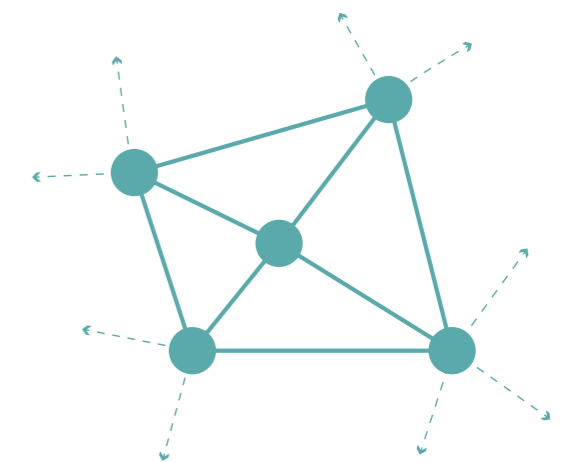
Internal connections.
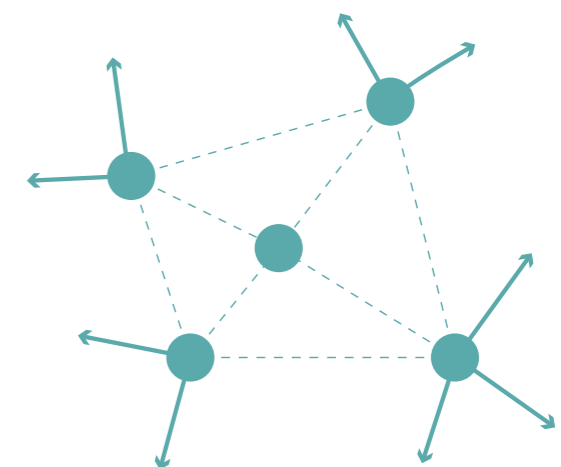
External connections.
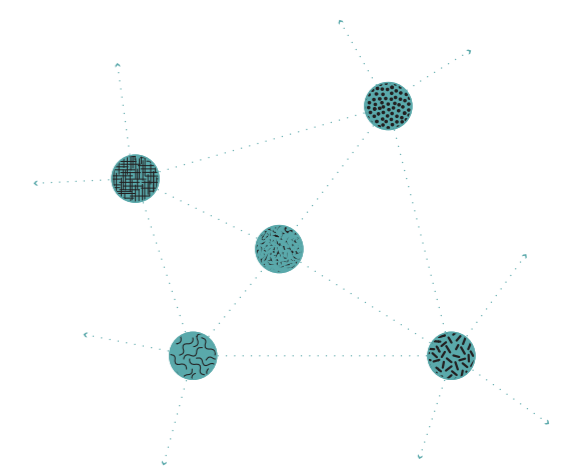
Functional entity.

for example the University of Hasselt is cooperating with the University of Maastricht (Maastricht University, 2018), and in the cultural sector the Impact Project Cross (CrossCurrents, 2019) shows how art, technology and science come together and can create a foundation for cross-border and cross-sector cooperation in the region. Spatial developments could be used to strengthen these cross-border and cross-sector initiatives, by providing them with the right spatial building blocks. The cities need to work together, and in combination with good accessibility can function as one functional entity. In the Greater Copenhagen region a consortium of universities has been established to bundle research and education throughout the region. The EMR could also benefit from regional collaborations in various fields. Creating regional consortiums increases the awareness of the region and can contribute to a sense of regional identity and cultural integration. Besides that, it also creates extra demand for a regional public transport network, as mobility between centres will increase.
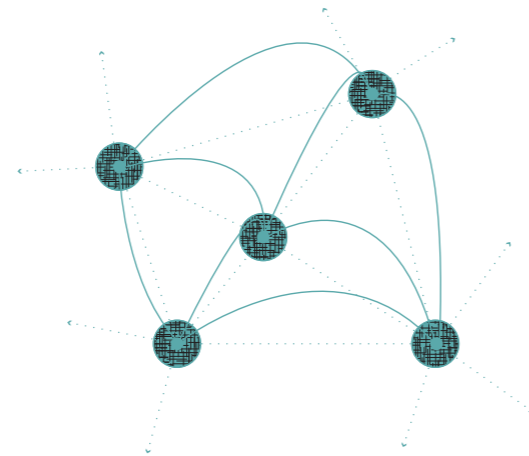
An important aspect that has come forward in the case studies, relates to perception and branding. These are not part of this research and design, but are a substantial aspect to create a strong and integrated region. Branding on an euroregional scale should be focussed on primarily by the regions involved. In stead of promoting single regions or cities, a combined branding strategy can strengthen the perception of the region as a whole. If a region is perceived as one region, it will be used and develop as one region. This is important as integration of multiple centres can enhance the competitiveness of the region, as explained in chapter 3. The Greater Copenhagen region focusses on soft value branding, a strategy that could be used in the EMR. Focussing on aspects that are characteristic for the region as quality of life, happiness, and healthy living environments, can create the basis for a regional branding strategy. Further research on these aspects should be combined with conclusions from this thesis, to create an integrated vision for the EMR.

Consortium of universities.

08

VISION

Vision
Design principles

Photo: Eijsden seen from Ternaaien.

Urban development is spread across the region, in which 75% of the citizens live in the urban field of scattered urban development and small villages. Public transport networks are generally based on a node-network, where higher density and a concentration of attraction points determine the central nodes. In the EMR the attraction points are all concentrated in the main cities, which in combination with higher population densities in these locations, create the main urban centres in the region. These nodes depend on the critical mass of its surrounding region, and the region depends on the agglomeration influence of the nodes, making good accessibility between them essential. An euroregional vision should be multi-scaler, creating the relation between the regional network and its connection with the local scale. In the current situation, public transport routes stop at borders, especially in areas where no urban centre is close by. There are some cross-border connections that focus on a nearby, cross-border urban centre, however these are often not convenient. Fast, direct connections, for example intercity trains, are (for one exception) not present in the EMR. Besides that, travel time varies greatly in the region, creating different perceptions of distance and accessibility of areas. The vision focusses on creating convenient, cross-border connections for all citizens in the EMR, allowing a stronger and more competitive region to grow.

The regional vision should include a tangible and intangible side that complement each other. The tangible side is elaborated on in this thesis, and structured through multi-scaler design strategies. These are based on design principles, showing the relation between theoretical and spatial analysis. It will create a cohesive public transport network in the EMR that crosses its internal and external borders, and travels through scales, connecting the regional to the local. The intangible side relates to public experience and perception of the region. The importance of regional branding, and how this can influence the integration of the region positively. Recommendations for further research are given at the end of the thesis.

Design principles

The design principles on the following pages show the relation between the theoretical knowledge, the analysis of the region and the combination with existing urbanisation mechanisms from different literature (see chapter 3 for more elaboration on the urbanisation mechanisms). They combine the theoretical and the spatial aspects of this thesis, and create the foundation for a multi-scaler design strategy for the EMR. Within the spatial aspects they focus on the interrelationship of the urban pattern and public transport related to the two main characteristics of the EMR: the dispersed polycentric urban region, and being a cross-border euroregion. They shows opportunities for the general question of applying public transport networks in areas characterised by low densities and dispersed urban patterns.

Besides that, the design principles also show the transferability of the design as they could be used in any region that relates to the two main characteristics of the EMR described above. A region with the same characteristics and dealing with the same issues, could apply the design principles in their specific context. How the design principles are applied in the EMR, is described in the next three chapters (chapter 9, 10, 11), which will show the spatial and social implications of the design principle.

*The vision will **open up borders** in the EMR, allowing further cooperation and integration between cross-border cities and regions. **Cohesion** and **integration** will be improved and functions as one of the building blocks for a successful region.*

*By creating a **multi-scaler** relationship between the public transport network and the dispersed polycentric urbanisation pattern, the region has the opportunity to grow as **'one city'** and create a **competitive** and **sustainabale cross-border region** in the future.*
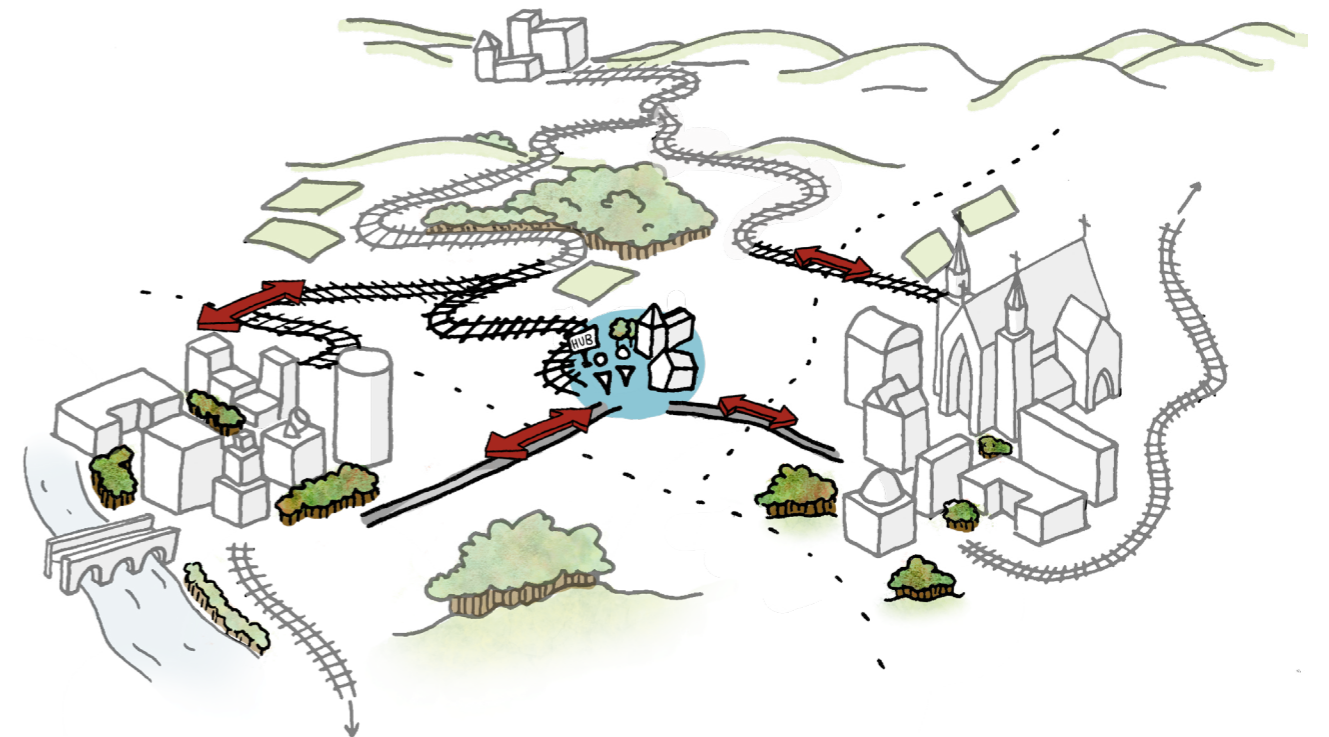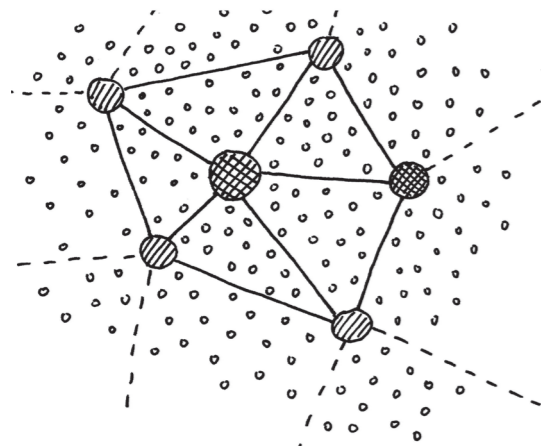
Design principle 1

The focus is on the euroregional scale, creating a network of cities that can functions as 'one city' (Meijers & Van der Wouw, 2019; Meijers, 2008). It relates to the first urbanisation mechanism or 'city network integration', which focusses on the integration of small and medium-sized towns, and in this organising a higher level of agglomeration benefits on the euroregional scale. The urban centres that have the highest levels of population and functions, become the most important nodes in the regional network. These nodes should be well accessible, externally and internally, as these generate the most movement and therefore demand high mobility. The network will provide fast and efficient public transportation connections, which allows citizens to travel conveniently throughout the region.

Design principle 2

Zooming in on an urban centre and its surroundings, this principle focusses on the connection between the centre and the urban field. The city and its surrounding region are interconnected and depend on each other. The region serves the city and the city serves the region (Alexander, 1954). The design principles builds upon the urbanisation mechanism of 'borrowing size', that can take place in infrastructural, transport and organisational networks. It establishes connections between urban centres and their 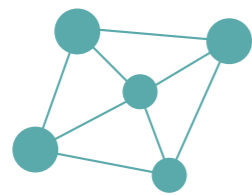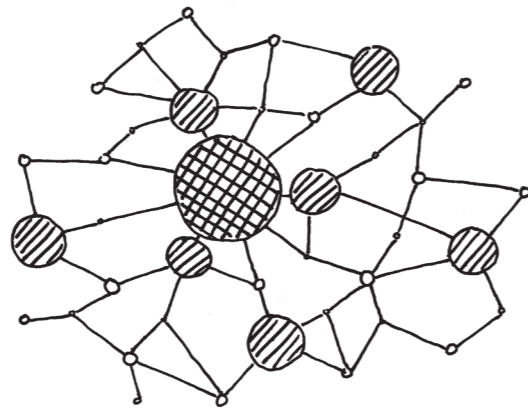surrounding region, in which the latter can 'use' the benefits offered by the larger size of the urban centre. Accessibility between the two is therefore of great importance in strengthening both city and region. Urbanisation and population distribution are scattered throughout the region, making a fine-maze grid and flexible connections necessary. Analysis on a smaller scale is necessary when a specific location has been determined. The smaller-scale network of nodes and connections must be clear, before design strategies can attempt to strengthen them.
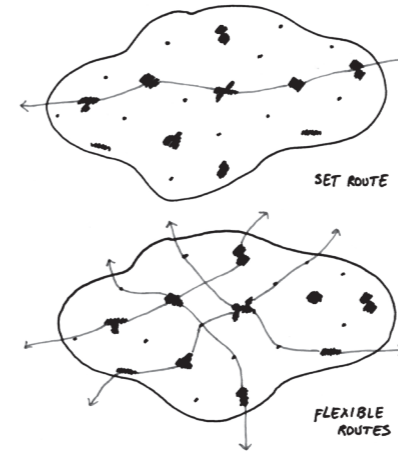
Design principle 3

The local scale is characterised by its urban sprawl and low population densities. Providing extensive public transport according to current principles is difficult, which calls for another approach. Flexible and on demand public transport is necessary to enable accessibility throughout the region, whilst keeping it financially realistic. Demand responsive transport will prevent empty busses and enable all citizens to use public transport again conveniently. These interventions in the public transport network can generate a boost in local communities and provide villages with the convenience of urban centres. The tool of demand responsive transport is combined with the urbanisation mechanism of 'urban concentration' on a small scale. In this case urban concentration will not tend to create a frontrunner for the region, but create a concentration of daily urban facilities in small urban settlements. In combination with the on demand public transport network, small villages will become more attractive living places creating opportunities for urban growth in the EMR.
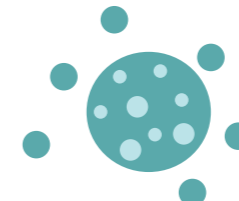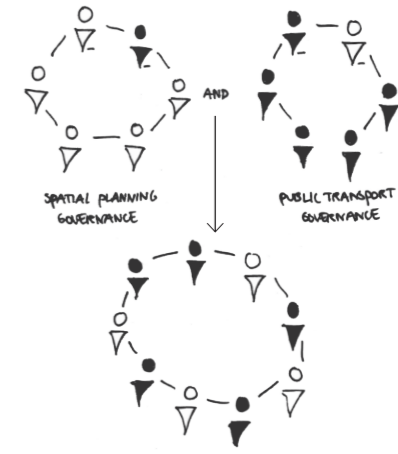
Design principle 4

When crossing national borders within this public transport network, governance and regulatory issues occur. In order to create a favourable environment in which the proposed public transport network can be implemented, governance systems in the region need to be redesigned as well. In the region various cooperation structures are already present, however spatial planning and public transport development should be interconnected more. An acupunctural approach of design will include the important actors in already existing structures, efficiently improving governance systems in the region.

City network integration

Borrowing size

Urban concentration

09

EURO-REGIONAL STRATEGY

Strategy and design

Photo: Countryside at top of the hill at Schweinberg.

Implementation of design principle 1, creates a network of main centres in the EMR that crosses borders and has a regional instead of national focuss. The principle focusses on the integration of small and medium-sized towns, and in this orgniasing a higher level of agglomeration benefits on the euroregional scale. This thesis focusses on creating a network through public transport, by integrating multiple scales and modes of transportation. On the euroregional scale, the focus is on the railway network, as distances are far and the travel time should be as fast as possible. By creating fast connections, the accessibiltiy increases, allowing residents to benefit from the diverse offer of functions, leisure, jobs and amenities. The perception of distance decreases as the travel time decreases. To create a region which people perceive as 'one city', these fast and convenient connections are key. Technical differences between countries should be addressed as well as creating regulations on a euroregional level that are in line with national policies.

The main centres have been determined according to the population distribution and presence of functions, as these determine the level of mobility that is generated and the level of accessibility required. There are three types of centres. The largest nodes are the ones with a high number of population in combination with a high diversity of large-scale functions. The second level are the centres with either a high number of population and a low number of fucntions, or the other way around. These are also important to include, as they influence the transportation flows in the region to a large extent. Separate concentrations of people and functions, create more movements than an urban centre where both are balanced.

The integration of centres allows cities to attract a higher variety of, and more specialised services, urban functions, and amenities. The integration of urban centres can increase the competitiveness of the entire rural urban region. Important in this strategy are fast and convenient links between different centres, they determine whether society also perceives the network as 'one city'.

Design principle 1

One city

Regional network of cities
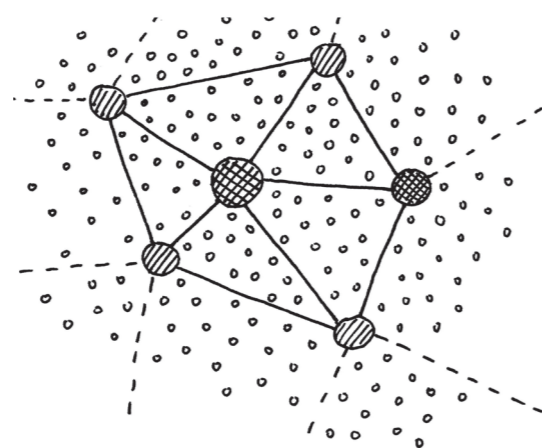
URBAN PATTERN

PUBLIC TRANSPORT

CROSS-BORDER

GOVERNANCE
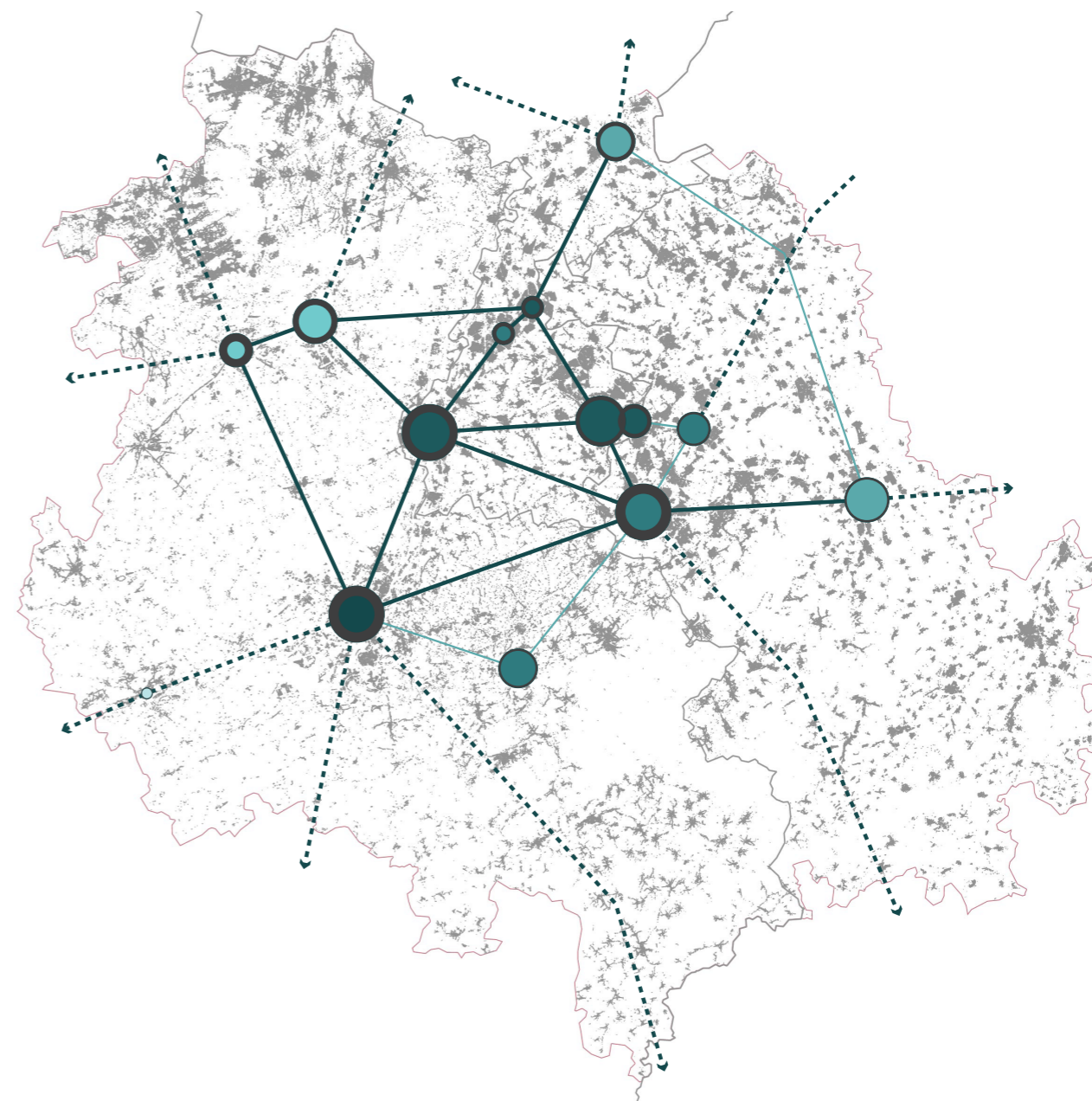
Effects on urban centres

The creation of a euroregional public transport network, allowing cities to integrate and function as 'one city', can also have effect on other aspects of urban development. The shift from car to public transport as the main transportation mode, decreases the amount of cars in and around cities. This opens up space for slow traffic in cities, as pedestrians and bicyclists. Next to that, it also creates more space for green environments in cities, improving the quality of life and the urban health.

The integration of urban centres combines their strengths and allows them to function as a larger entity. It creates opportunities for attracting higher-scale functions that require a higher critical mass than each individual city can offer. This also allows them to attract a higher diversity of functions.
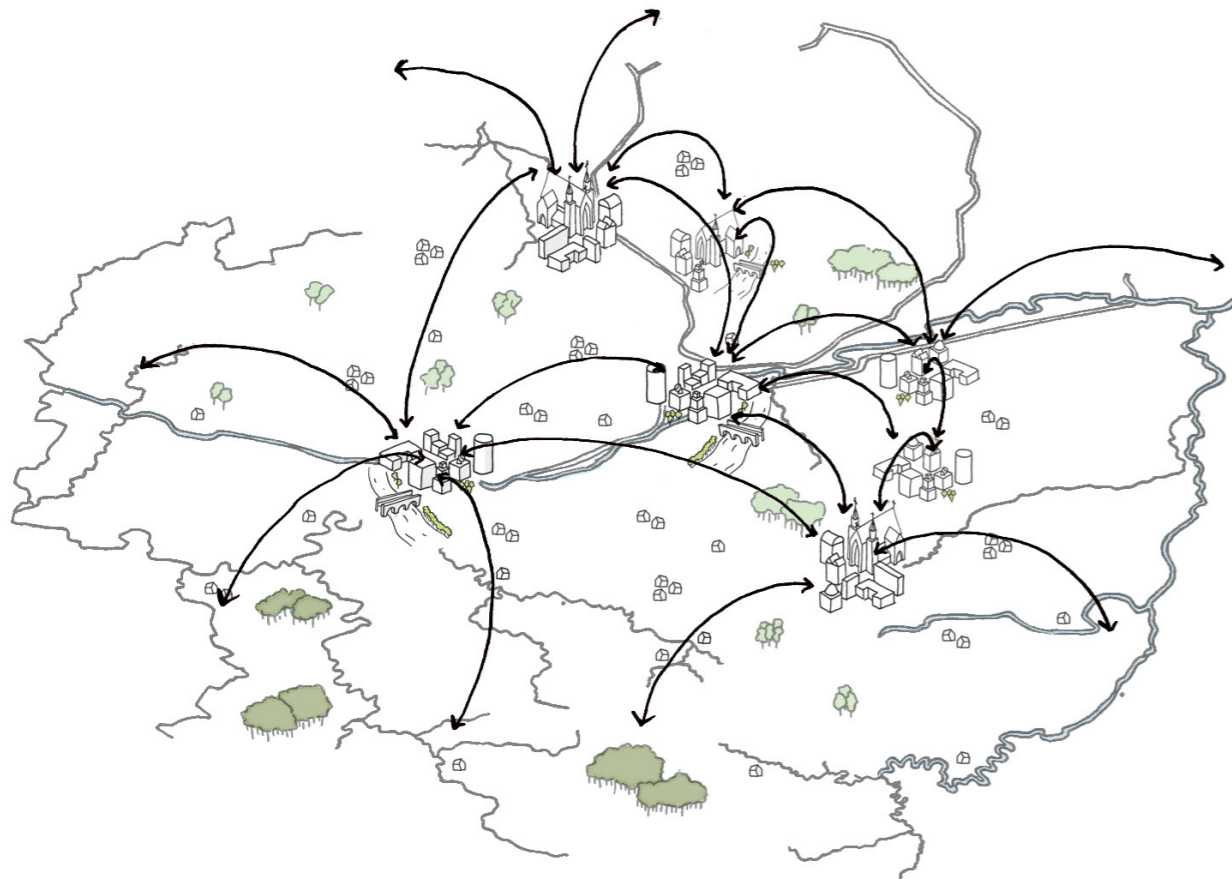
Spill-over effect

Cooperation on a eureoregional network in the field of public transport can create a spill-over effect on other fields of development. It can trigger actors in, for example, in the fields of retail and leisure, culture, education, research and business, and tourism to create networks on a euroregional level.

Image 89. Space for green, slow traffic and public transport in Rotterdam (West 8, 2018).
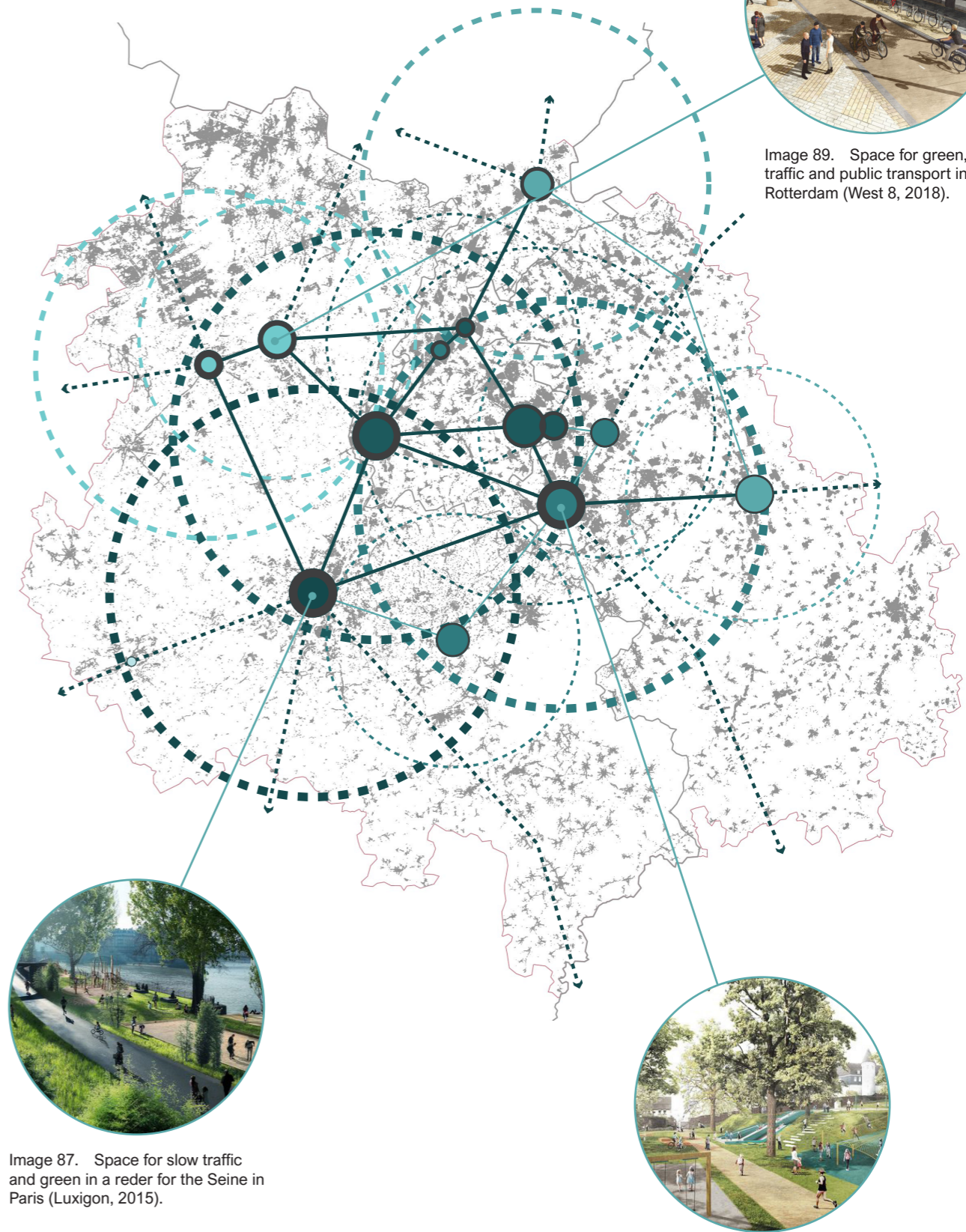
Image 87. Space for slow traffic and green in a reder for the Seine in Paris (Luxigon, 2015).

Image 88. Space for green and leisure, a render for Siegen (A24 Landschaft, 2017).

10

REGIONAL
STRATEGY

Strategy and design

Photo: Gare de Liège-Guillemins (Journées de Patrimoine, 2018).

The regional scale zooms in on a smaller region within the Euregio Maas-Rijn (EMR). In this case it focusses on an area around the border of the province of Limburg, BE and Limburg, NL. The map to the right shows where the region is located in the EMR, and the map below ("Image 90") shows an overview of the region. It is a region with many different aspects, which makes it interesting to analyse. Sittard, Geleen and Genk are cities that represent nodes in the euroregional network, and are located in this region.

The region has some characteristics that are named below. Two small-scale airports are located in the region, in the East a large-scale industrial site can be seen next to the main road junction. In the West, there is a natural landscape, which is also home to one of the old coal mines of Belgium. In the North, to the East of the natural landscape, there is also a large leisure centre. It combines a large shopping centre, cinema, the art academy of Maasmechelen, entrance to the coal mine area, and Connecterra, entrance to the national natural park the Hoge Kempen.

The cities of Geleen and Sittard have a high number of population and a high population density (see analysis in chapter 5). And could provide the critical mass demanded by the leisure facilities in the West. However, the river Meuse that splits the region in two, is also the border of Belgium and the Netherlands. This splits the region in two, resulting in a lack of integration between the two sides of the region. There are two connections across the river, but these are not used by public transport. Resulting in no public transport connections that cross the border in the region.
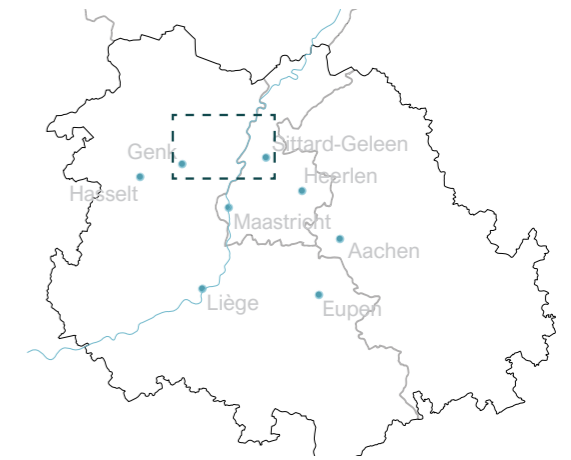
Image 90.   Region surrounding Sittard, Geleen and Genk.
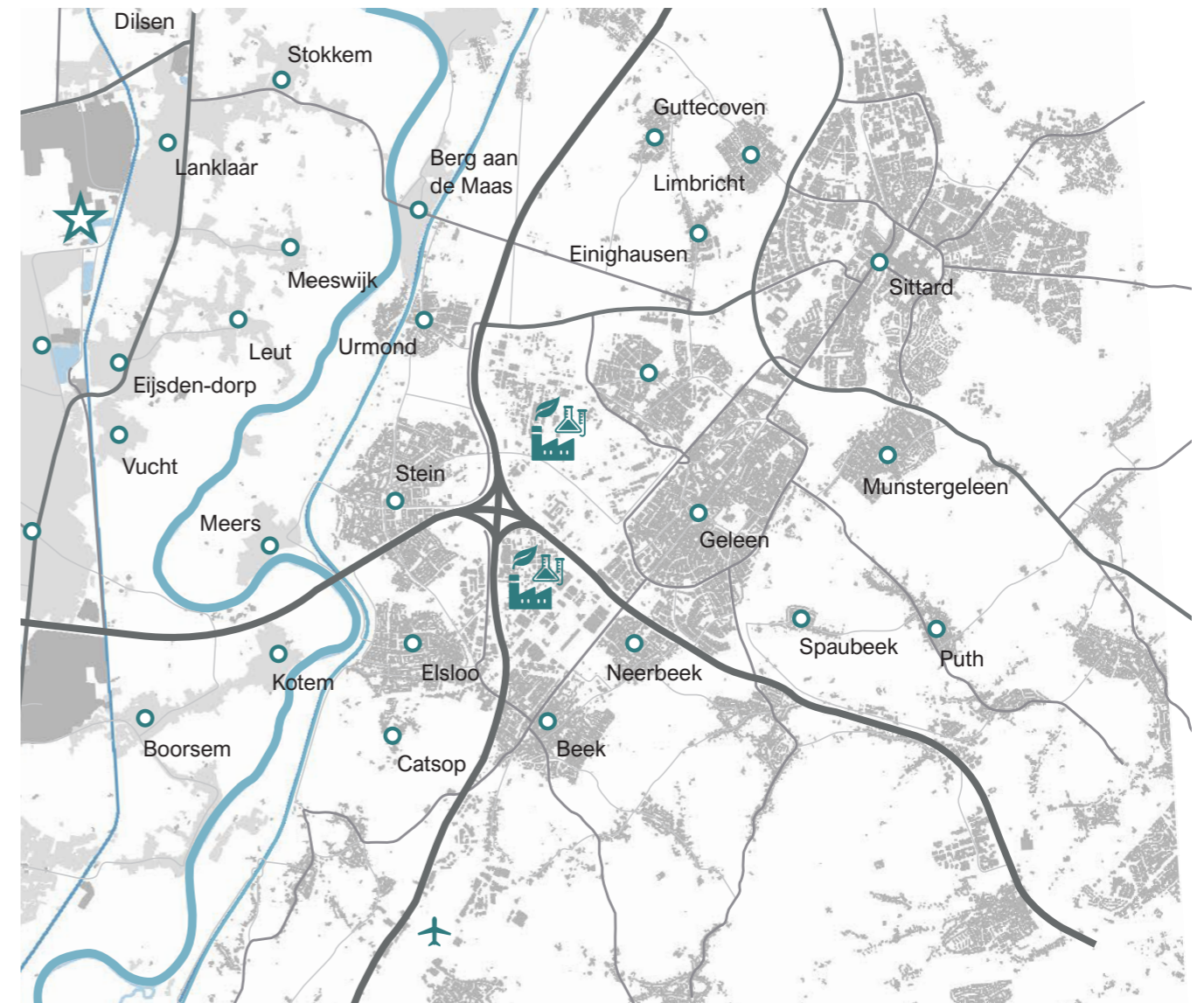
The prior mentioned urban centres are the most important centres in the region. However, the connection between the regional network and the local scales is also essential. It allows smaller urban settlements to grow with the help of the size of nearby large urban centres. For this to be successful, mobility between the centres is important.

In order to determine what nodes should be connected by what scale of public transport, the characteristics of the nodes should be analysed. In this research the focus is on the attraction qualities of a node, determined by the presence of a variety of functions in relation to the travel distance. The chart on the right "Image 91" has been designed to help classify towns and villages as comparable types of urban centres. Functions are attraction points and generate mobility in the region. By analysing what urban centres generate what type of mobility, an integrated network can be designed.

It shows there is a variety of urban sizes, mobility demands will differ for each individual resident. The transportation network should enable a large diversity of transportation options, that relate to each resident's demand.

Node analysis

The urban nodes that are located in the chosen region have been analysed and show a variety of urban levels. Best represented is the peri-urban scale, in which crucial day-to-day functions are still present, but a trip to a higher scale urban node is necessary almost every day. These nodes are important as they generate much mobility in the region. In "Image 92" it shows that the along the border almost no large scale urban nodes are present and the smaller scale urban nodes are oriented away from the border. Connecting these centres across the border increases the range of accessibility from each centre.

Design principle 2

Connecting urban centre and its surroundings

URBAN PATTERN

PUBLIC TRANSPORT

CROSS-BORDER

GOVERNANCE

URBAN	SUBURBAN		PERI-URBAN	RURAL
Sittard	Geleen	Mechelen a.d. Maas	Urmond	Boorsem	Guttecoven	Catsop
Genk	Beek	Elsloo		Kotem	Einighausen	
		Stein		Opgrimbie		
		Eisden-Tuinwijk /		Meers		
		Maasmechelen		Neerbeek		
		Dilsen		Vucht		
				Eisden Dorp		
				Puth		
				Munstergeleen		
				Leut		
				Meeswijk		
				Berg aan de Maas		
				Lanklaar		
				Stokkem		
				Limbricht		
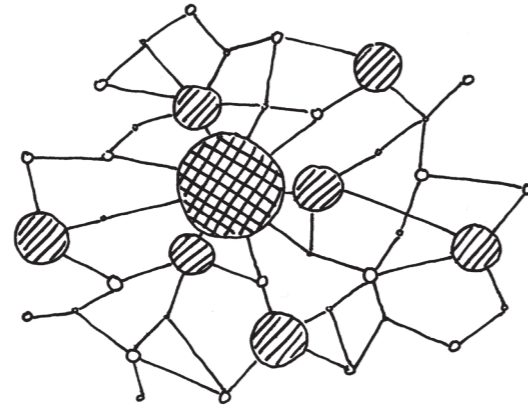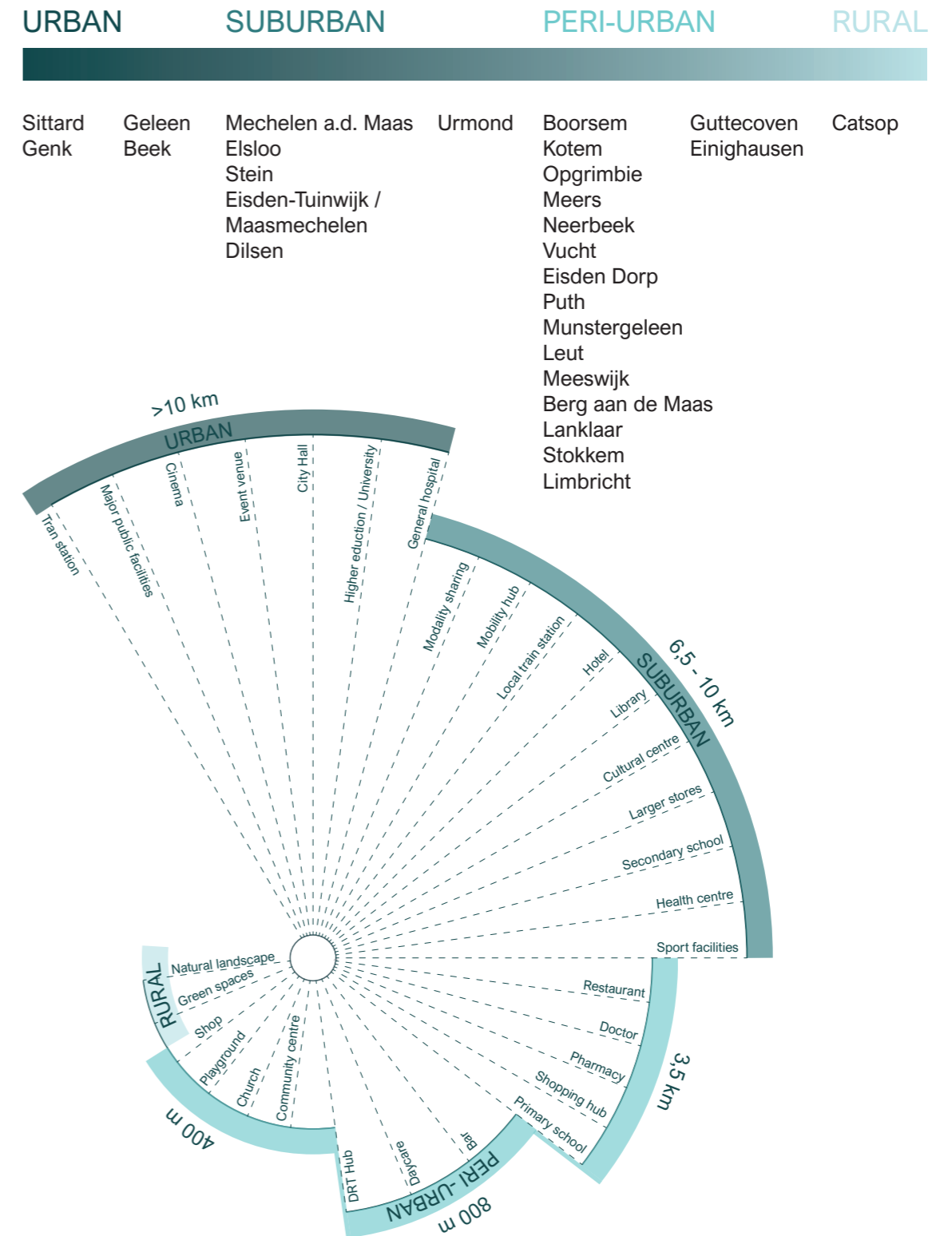
Image 91.   Chart to help classify typologies of urban centres. Inspired by Andrew Wright Association, Urban Policy, and adapted to the context of the EMR.

Image 92.   Urban centres represented according to their urban scale, in combination with the most important connections of influence.

Internal connections are diverse, as they include relations between four different types of functions. The scheme shows the variety of transportation options and adding to this, shows the links between different modes. It allows users to switch transportation modes easily to provide individual, on-demand public transport mobility. These locations where modes meet, are designed to be mobility hubs. Mobility hubs will provide centres for easy modality transfers, and will be combined with attraction centres within the suburban classification.

Image 93.   Station Lansingerland, Zoetermeer (Arcadis, 2019).

Image 94.   Render mobility hubs Germany (Wittowsky, 2017).
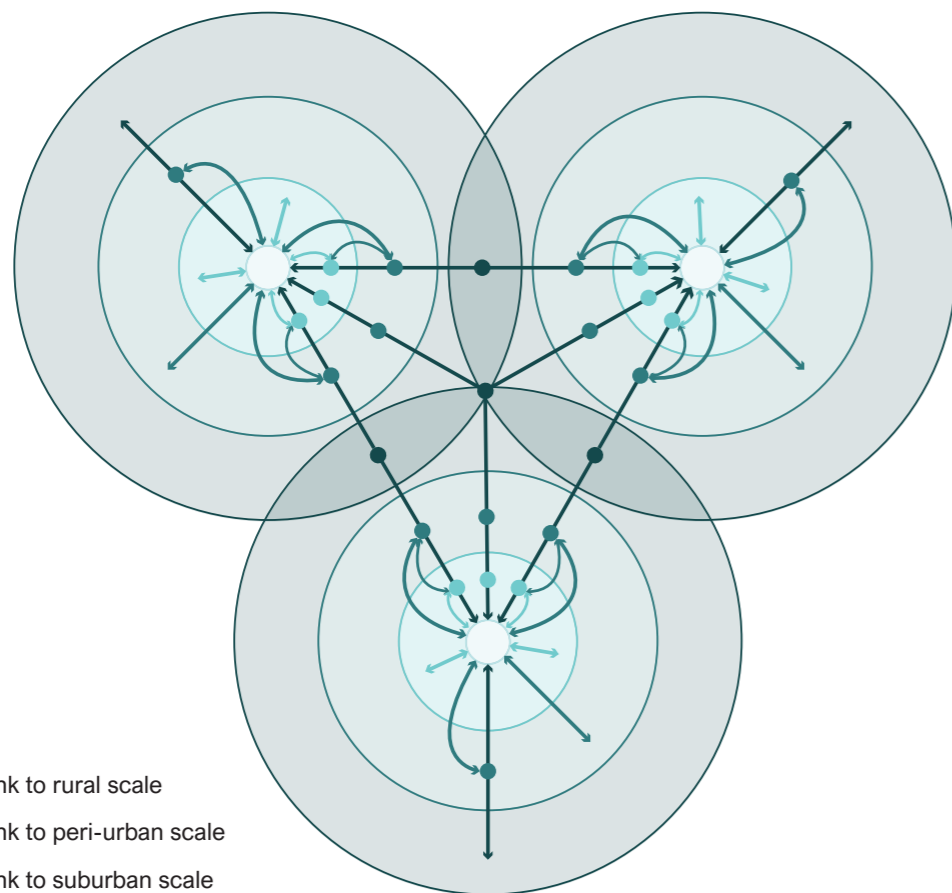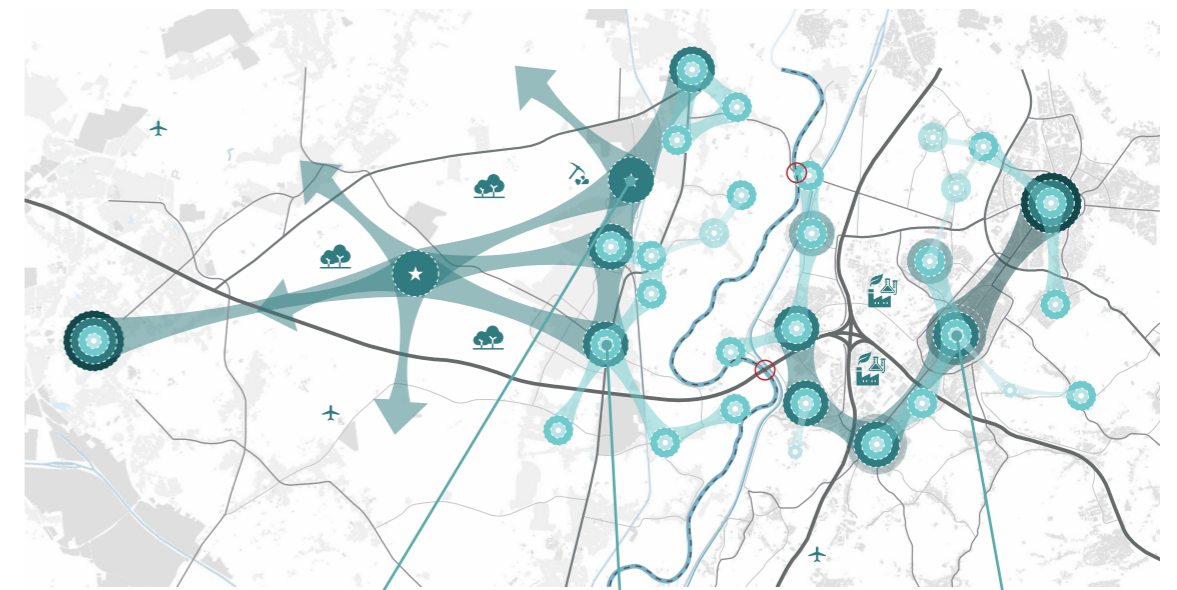
→ Link to rural scale

→ Link to peri-urban scale

→ Link to suburban scale

● Local mobility hub DRT

● Urban mobility hub

Image 95.   Render mobility hubs Leuven (Ripa, 2019).

Designing cross-border connections can increase the connection between the different urban centres. It creates the link between the high number of population in Sittard and Geleen in the East, and the high-scale functions in the East. Each connection should be analysed individually, to see what type of public transport connections is best suited. This should be based on the distribution of functions and population, to analyse the supply and demand system in that particular connection.

The image on the right shows the cross-border changes of interaction between urban centres. These nodes could all benefit from more accessibility, as it allows them to access opportunities and amenities from nearby urban centres, that cannot be provided by the node itself. The picture below shows the system of integration between the urban nodes within the region, when cross-border public transport connections are improved. Connections between concentrations of functions and population are improved, as well as accessibility to urban centres for villages nearby the border.
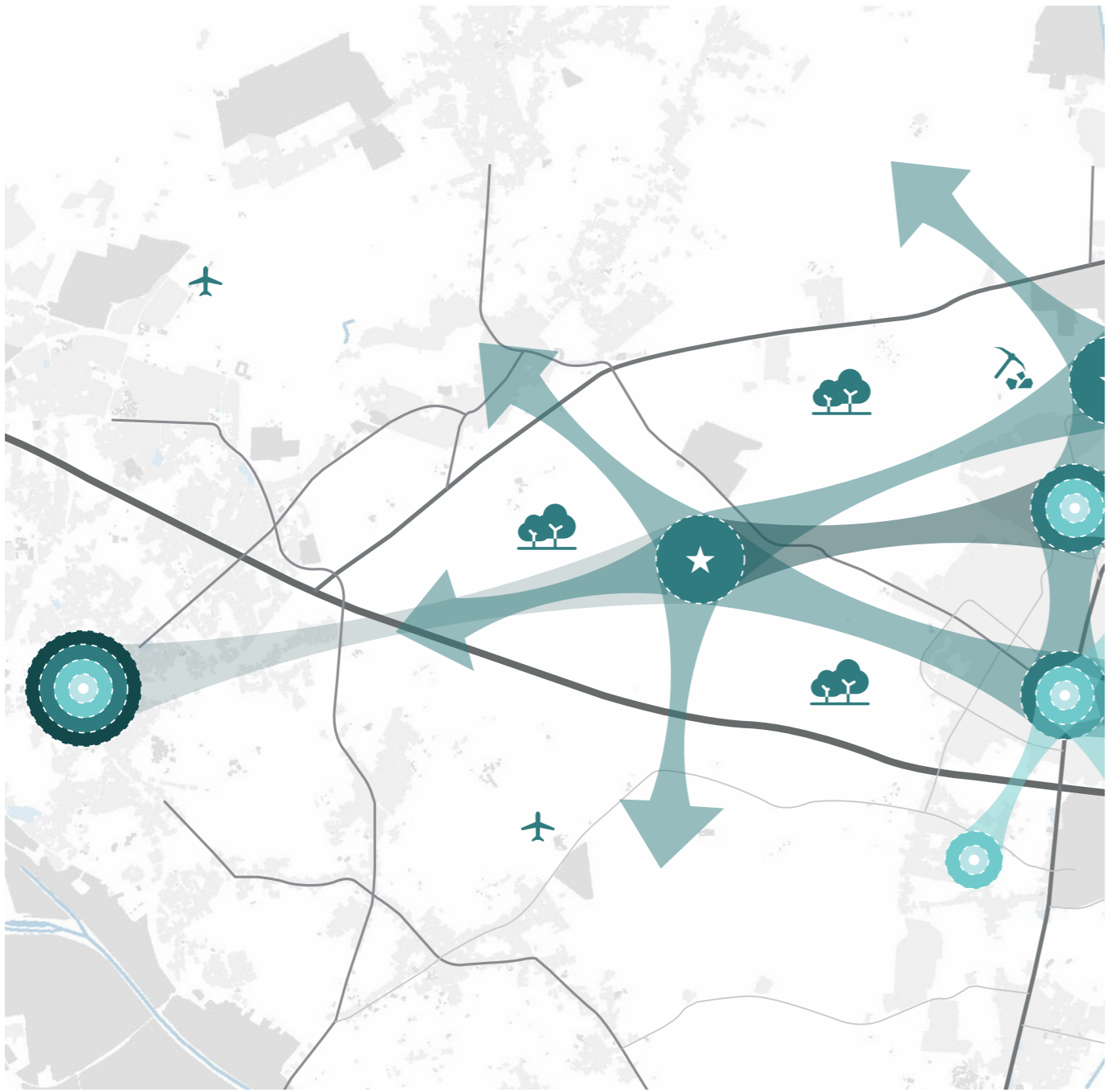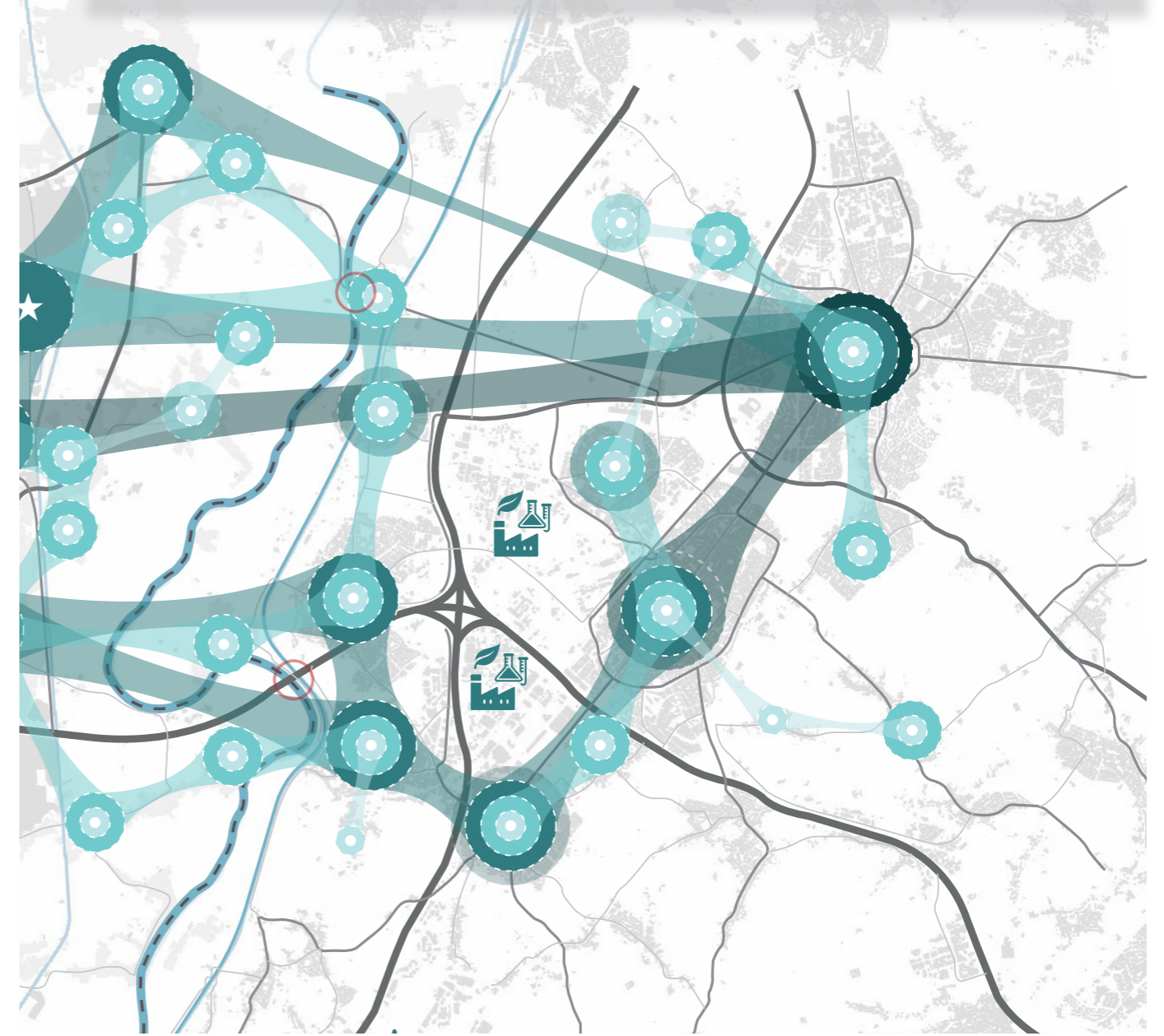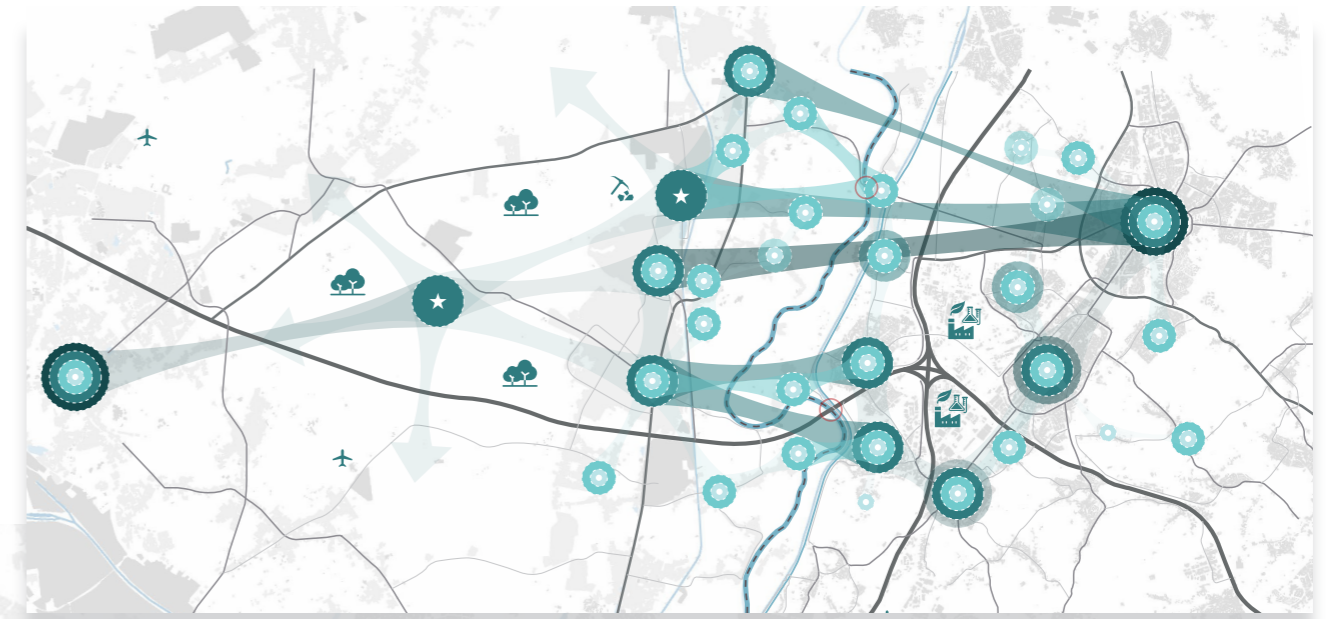
11

LOCAL STRATEGY

Local strategy
Demand responsive
transport
Design

Photo: Village of Noorbeek, NL.

Characteristic for the Euregio Maas-Rijn (EMR) is its dispersed urban pattern. Zooming in to a more local scale shows the pattern in more detail. Between the urban centres, urban development is dispersed across the entire region and has a molded feeling. Residents living in these in-between areas would theoretically be living in the best locations. "Image 96" shows that these locations are at the same distance from three urban centres, providing access to a large diversity of functions and amenities. Though direct distance to these urban centres is the same, the accessibility differs.

On a local scale the bus network is the most important public transport mode, and as shown in "Image 97", bus routes almost never cross national borders. This disconnects villages from nearby urban centres. Besides that, routes are also complex, and still do not cover all villages in the area, due to their fixed routes and service system (elaboration on this can be found in chapter 7). A local scale strategy will address these issues and design a new public transport network.

Image 96.   Location local scale area in the EMR.
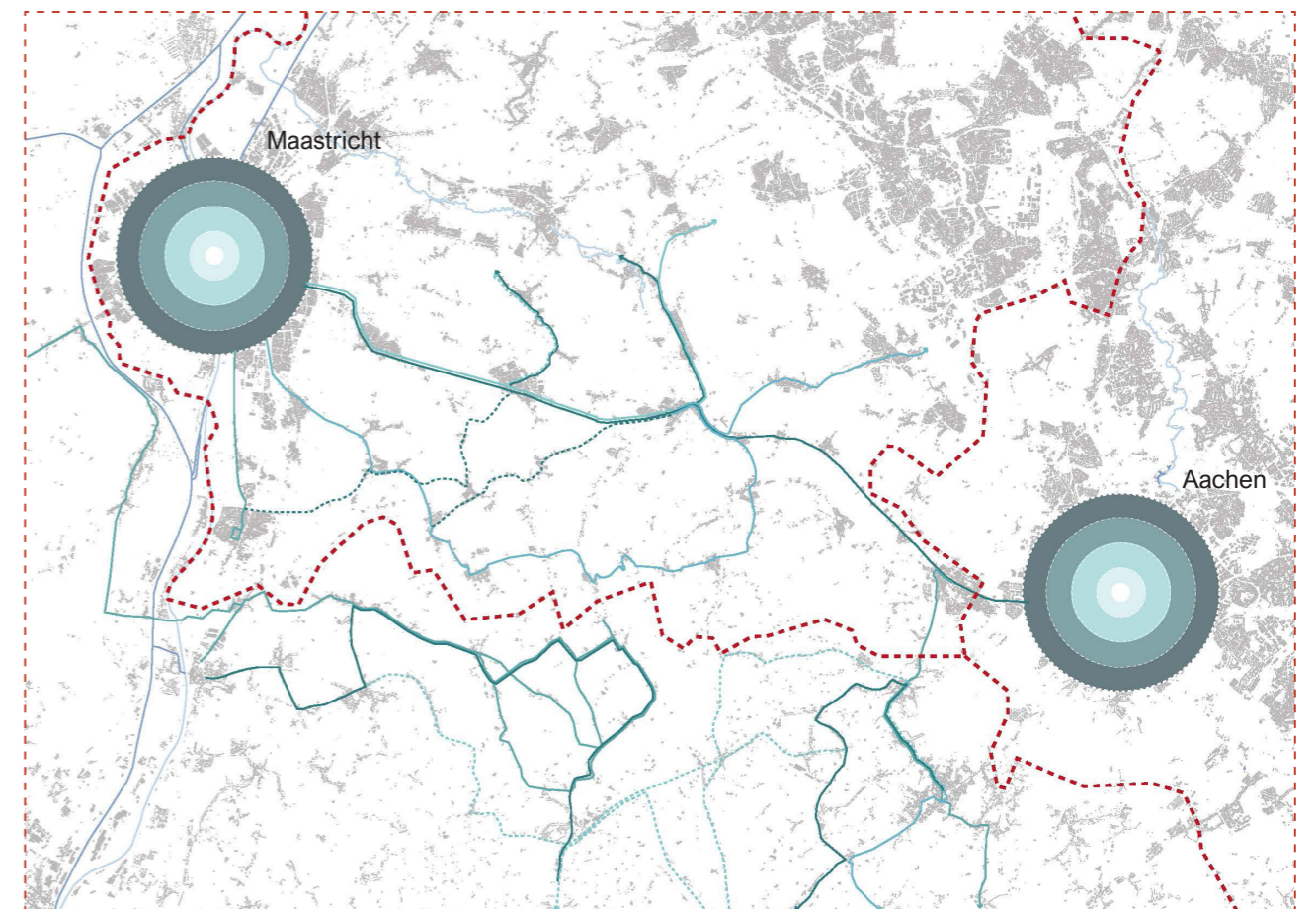
Image 97.   Bus routes on a local scale on the border of Belgium and the Netherlands.

The efficiency of the current public transport network is based on connecting concentraded centres of high population and functional densities. Applying this principle in the dispersed urbanisation pattern in the EMR, creates an inefficient network. A different approach to public transport should be found to correspond to the characteristics of the urbanisation pattern. The introduction of more flexible routes, instead off one set route could create another efficient and convenient model in the region.

The design principle has its foundation in a design tool called 'demand responsive transport'. It focusses on creating an intermediate form of public transport, somewhere between a regular service route, that is variably routed and offers highly personalised transport services. Services are routed according to the needs of the customers, only stopping where passengers request collection or drop off. It allows people to create an on-demand and individual journey, that is not limited in destination or time.

Design principle 3

Local public transport

SET ROUTE

FLEXIBLE ROUTES

URBAN PATTERN

PUBLIC TRANSPORT

CROSS-BORDER

GOVERNANCE

STANDARD

OPTIMIZED
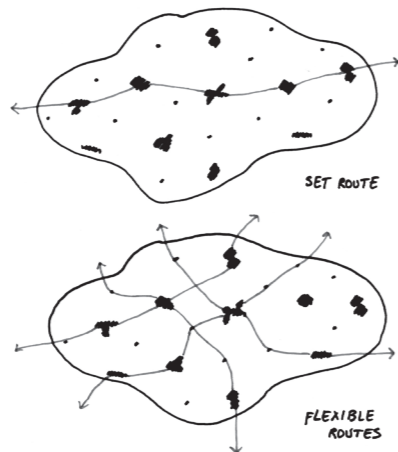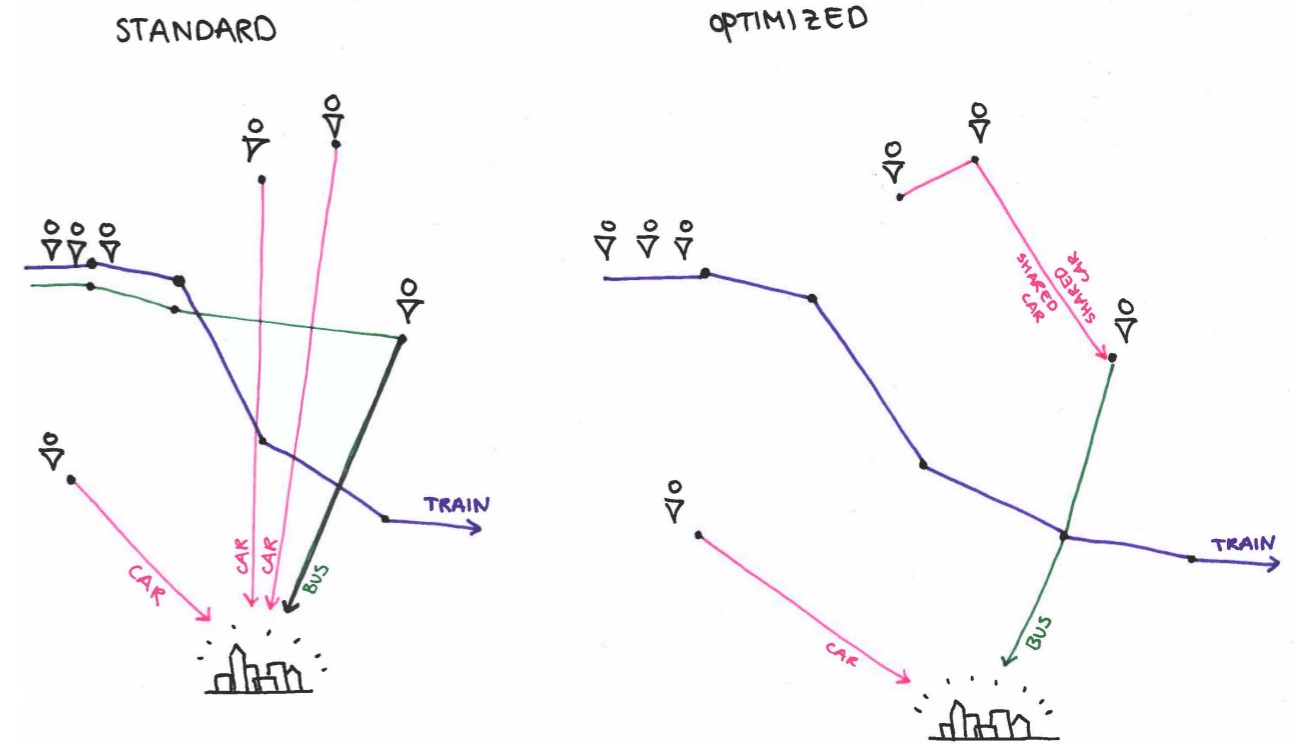
Image 98.   Principle of Demand Responsive Transport.
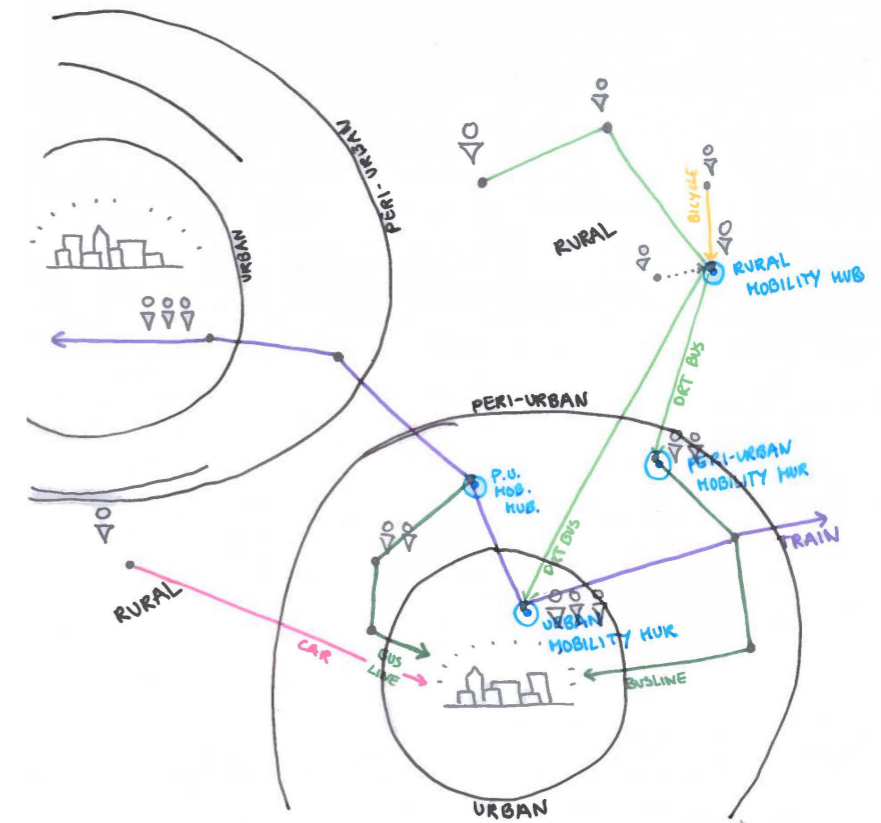
Image 99.   DRT implemented in urban structures.

The principle of demand responsive transport is to increase the efficiency of public transport in areas with lower population densities and/or a higher level of dispersed urban structure. Its services are in direct response to the wishes of its customers. The efficiency of the system is incerased by this, as network efficiency in rural and peri-urban areas is best achieved by delaying the decision about the route, the vehicle and the transport provider as close as possible to the time of travel. There are three main sets of aspects that are important when using this sytem in a design.

Routing

Routing and stop points can be fixed, semi-fixed or flexible, and stand in relation to one another. Flexible stop points indicates that a user can choose their own location entirely freely. Users could in this case also be picked up at home. Increasing the flexibility of stop points, decreases the flexibility of routes and the other way around. In the EMR, flexible routing is more important than flexible stop points. Urban development is dispersed, but still concentrated in small urban villages. Designing fixed stop points in these villages, can increase the flexibility of the route and provide residents with easy access to all urban centres in the region.

The routes can create single routes from destination to destination, or link to conventional services. Flexibility is prioritised in the design for the EMR, as public transport needs to provide a more convenient option than travelling by car. By decreasing the amount of transfers, the journey's convenience increases. Direct routes are therefore important in the design. Users can however decide to choose a mobility hub - where interchange with other mobility modes is possible - as their destination, because they want to travel further.

Passengers

Important in the design is the target group. The main target groups in the EMR are elderly, teenagers and the working class commuters, see the scheme in "Image 100". Elderly and teenagers are important, as they do not have access to transport by car themselves. The focus for the commuters is on creating a public transport network that exceeds the convenience of the current car network. The decision for these target groups is explained in more detail on "page 14". These target groups have different demands and capabilities, which will be explained in the next two pages. Within the system it is important to determine whether passengers can join at the moment, or whether that is not possible. In the design, there will be three ways to book a journey: via phone, via a smartphone app and via the pick-up point in the community hub, see "Image 101".

The telephone option relates to the eldery target group, who are not familiar yet with modern devices and like interaction and immediate response. The smartphone app attracts teenagers to use this mode of transport, as it enables a high level of individual influence and flexibility. The app gives an overview of existing journeys you are able to join according to yout chosen pick-up point. If none of these are related to the demand, a request for a new journeys can be created. If already present at the pick-up point, there is also the option to include that pick-up point in an existing or new journey.

Elderly

DEMANDS
 Pick-up / drop-off close to home
 Meeting people
 Resting places

DESTINATIONS
 Medical centres / hospital
 Local shops
 Caring homes

FLEXIBILITY DEMAND
 Low

ONLINE COMPETENCE
 Low

Commuters

DEMANDS
 Efficient system
 Combining work & children
 Safe parking stations car / bike

DESTINATIONS
 City centre / Business district in city
 Train station
 University / reserach centre

FLEXIBILITY DEMAND
 Medium / Low

ONLINE COMPETENCE
 Medium - High

Teenagers

DEMANDS
 Night-time service
 Cheap service
 Flexible schedules

DESTINATIONS
 City centre
 High school
 Shopping area

FLEXIBILITY DEMAND
 High

ONLINE COMPETENCE
 High

Image 100. Target groups demand responsive transport in the EMR.

Phone

REAL-TIME UPDATES

IMMEDIATE RESPONSE

TIME AND LOCATION FLEXIBLE

App

REAL-TIME UPDATES

IMMEDIATE RESPONSE

TIME AND LOCATION FLEXIBLE

Community hub

REAL-TIME UPDATES

IMMEDIATE RESPONSE

TIME AND LOCATION FLEXIBLE
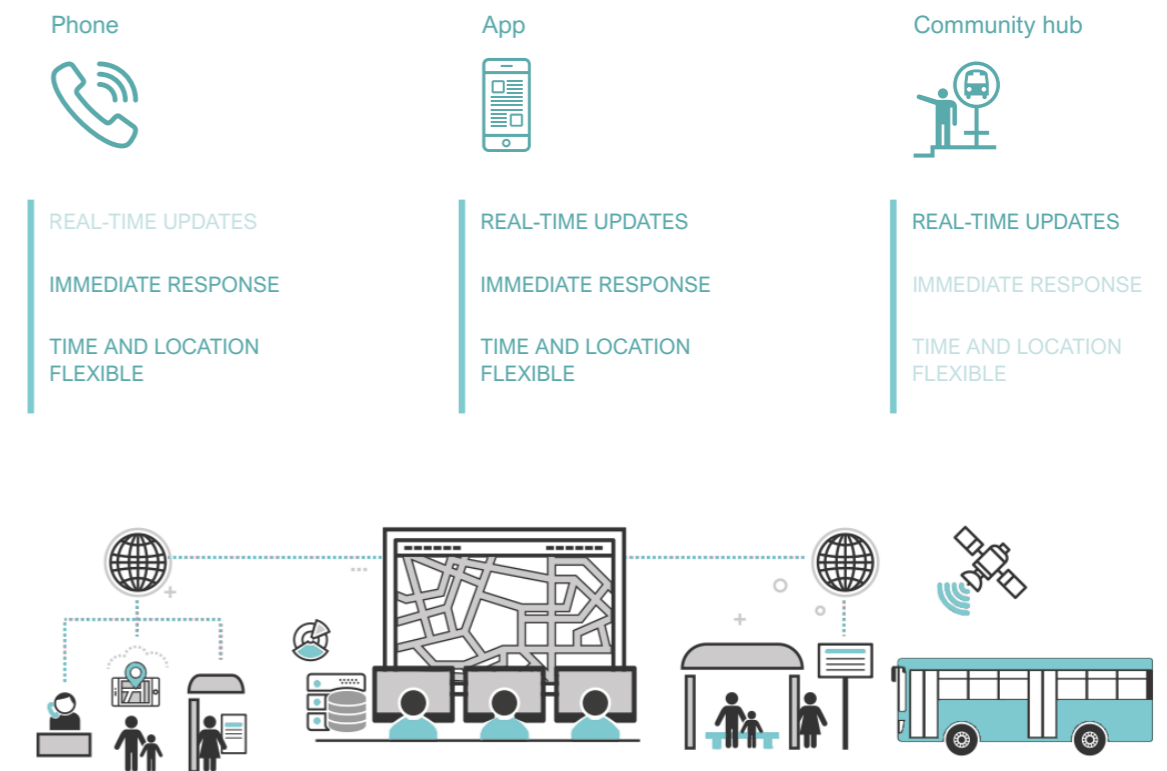
Image 101. Functioning of the demand responsive transport system.

The pick-up points locates in the villages generate new community life. The distribution of hubs can be seen in "Image 102". As transportation is no longer focussed on individuality, created by car transport from home, these village pick-up points create meeting places for residents. They become part of the 'new' village centres. In the past, the church, the pub and the post office where in the heart of the village, and where the locations where residents would meet. The importance of the church has decrease enormously over the past years, as well as the presence of a post office or other similar functions. By combining the new pick-up points with village functions, and new functions that relate to the demands of the main target groups, these areas can become the new centres of community life, see "Image 103". Functions can include a pub or café, where elderly could rest, teenager could meet friends and parents could meet up for a coffee. Also a childcare centre, where commuters can pick up their children when they arrive home after work. Playground facilities can also be located here, connected to the childcare centre and creating social control by the café visitors. Combined with this could also be a package delivery hub, where people can pick-up their ordered packages when they arrive home, and will also increase efficiency for delivery companies. Besides the addition of functions, the decrease in car use also increases the space for pedestrians and meetings places in the village. The combination of these functions with transportation hubs creates spaces for interaction and a new boost in community life.

New community centres in villages
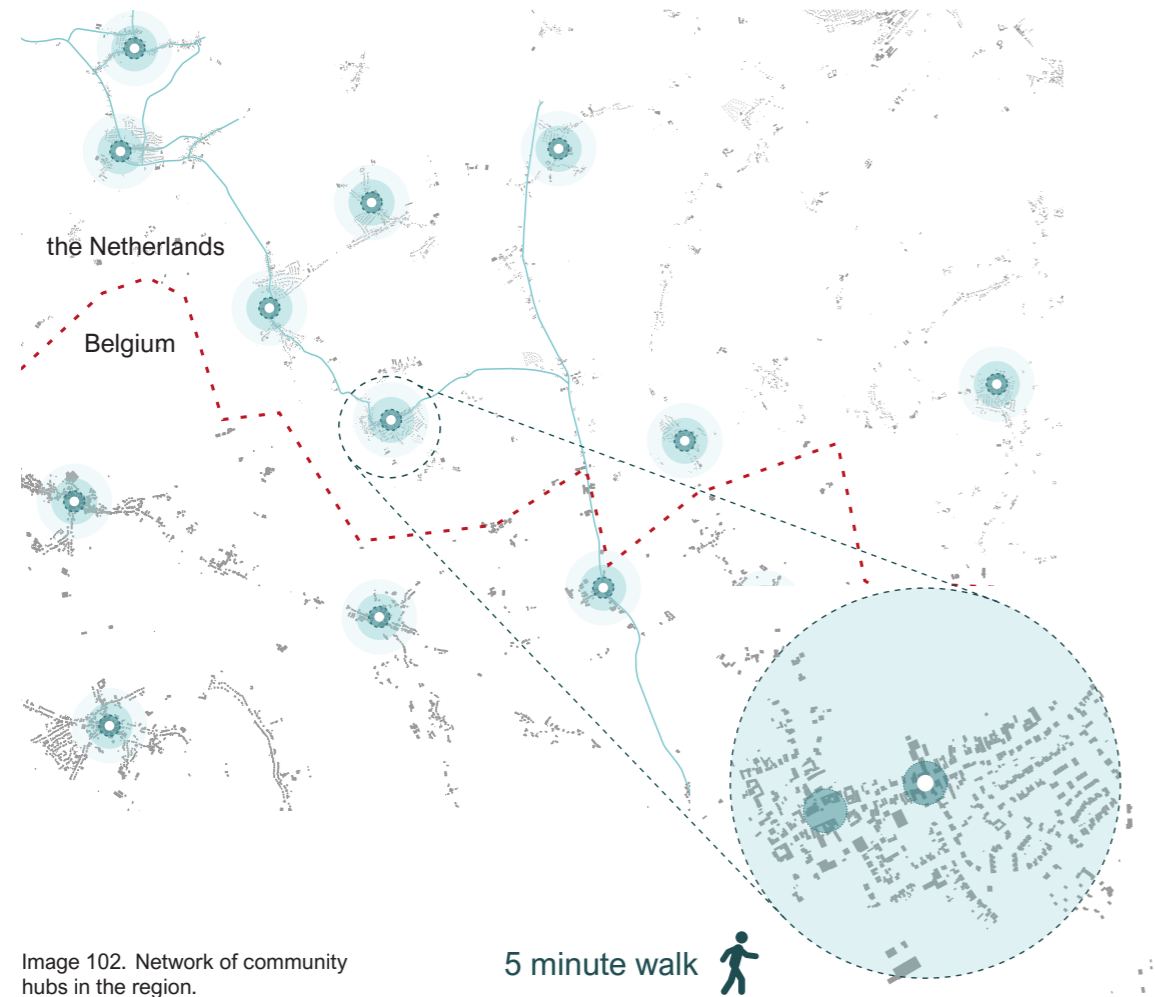
Image 102. Network of community hubs in the region.

the Netherlands

Belgium

5 minute walk

Pick-up points for DRT include:
- real-time updates on passing services
- dry and comfortable waiting area
- option to include the pick-up point in a new journey

Community centre for activities

Childcare and package delivery point

Restaurant and pub

Image 103. Impression of community and transportation hub.

12

GOVERNANCE STRATEGY

Photo: Drielandenpunt at Vaals.

The strategies described in the previous chapter focus on the multi-scaler integration of the dispersed urban pattern and the public transport network. Hence, in the EMR one of the main issues that was concluded after analysis was the barrier created by national borders in the region. The four different territories, three languages, different governmental organisations and varying laws and regulations, have created misunderstandings and development gaps on an euroregional scale. Analysis shows that in urban development the decision-making actors relate to each other relatively well and are also all represented in the official Euregio Maas-Rijn foundation (the euroregional cooperation). However, no planning structures or instruments exist on this level. This implies that integration of cross-border governance bodies is increasingly important to ensure integrated urban development.

The Euregio Maas-Rijn creates a platform and a network to enable, subsidise and initiate cross-border cooperation. Important decision-making actors in public transport are not included in this cross-border governance structure. The lack of governance in public transport on a euroregional scale can clearly be seen in the spatial analysis of the public transport networks in the EMR (see chapter 6). For public transport to become the connecting factor in the euroregional network, actor should start looking across the borders.

Governance structures are the silver thread in enabling cross-border urban and public transport strategies to be designed and realised.

Design principle 4

Integrating actors

URBAN PATTERN

PUBLIC TRANSPORT

CROSS-BORDER

GOVERNANCE

DECISION-MAKERS

SPATIAL PLANNING

Infrastructure
Urban development
Function

MOBILITY

Accessibility
Transportation
Infrastructure

PRIVATE PARTNERS

Facilitating role
Behaviour change

KNOWLEDGE INSTITUTES

Innovations
Student integration
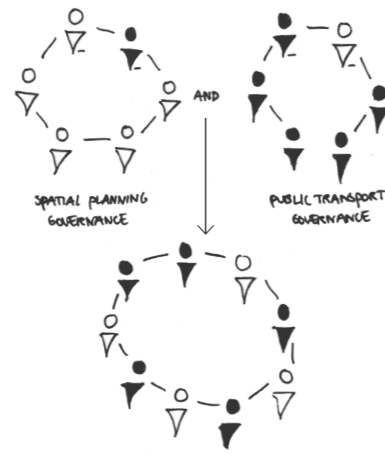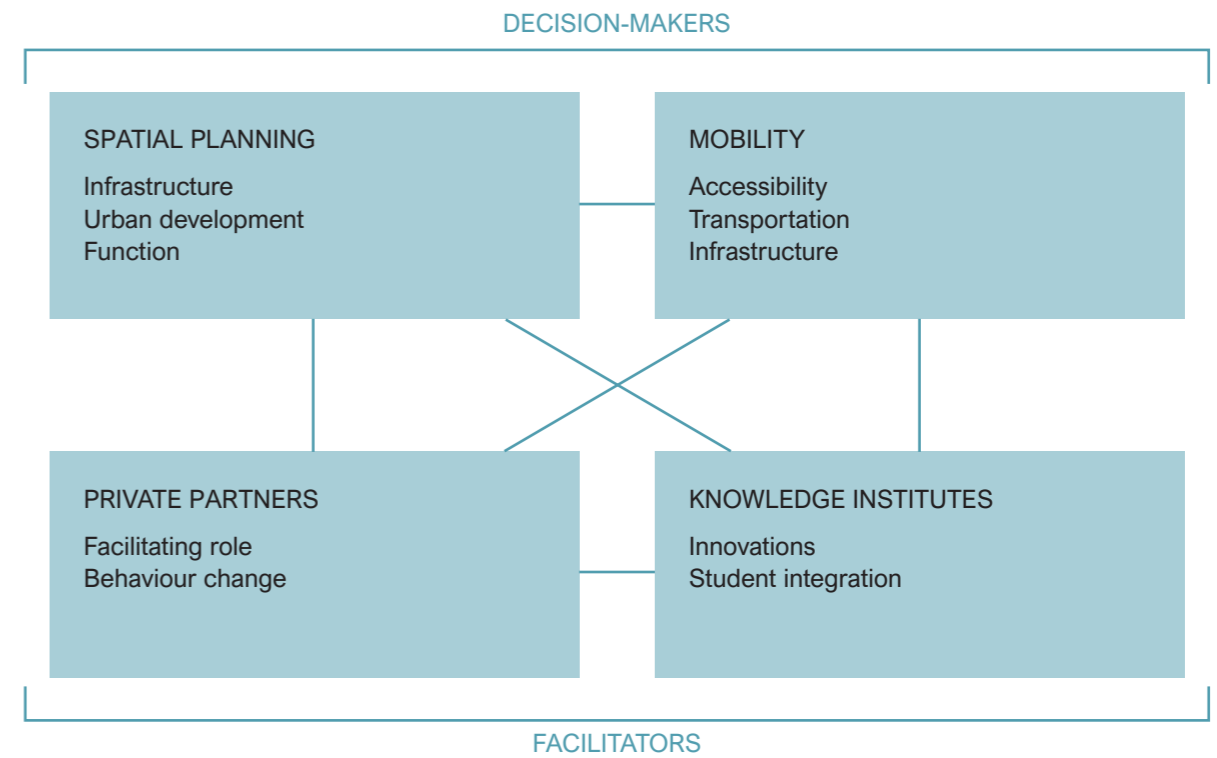
FACILITATORS

Image 104. Integration of decision-makers and facilitators.

In the current governance structure, there is no regional vision in relation to urban planning and public transport development. One of the reasons is most likely, the absence of a euroregional governance structure that combines both fields. Integration of public transport and urban development actors is crucial for the implementation of the city network strategy. The strategy focusses on an integrated network of urban centres through an extensive public transport network. It combines urban development with public transport, in which integration of these empowers regional integration and therefore enhances the level of agglomeration benefits and competitiveness of the region. Realisation of this network needs a strong and integrated governance structure in the same fields of development. The scheme on the right shows the planning instruments that the actors with decision-power can use to design an integrated vision on urban and public transport development.

The integration between urban development and public transport is also key in the regional and local strategy and design. A multi-scaler approach of governance structures is designed to ensure implementation of the design strategies in the EMR.

Besides actors involved in decision-making, facilitating actors should also be included. These are institutions that provide new insights, or have large influence in mobility systems. On a smaller scale more specific actors become involved, that also relate to other disciplines than urban development and public transport. An actor who's influence also increases as the scale decreases is the resident. On a smaller scale the public transport network becomes more flexible and specific, to answer the specific demands from residents. Their demands should be included in the planning process, creating a network that is most convenient for all actors involved. On the next two pages, an overview of involved actors is presented, related to the scales and locations of the design strategies of the previous chapters. It shows the establishment of a governance body that integrates urban development and public transport. The dotted square shows the inclusion of facilitators or actors with a high level of interest.

	Planning instruments	Involved actors
EUROREGIONAL	• Regional vision • Regional spatial strategy (conditions)	• Governments provincial scale • Public transport providors
		Knowledge institutions Private partners
REGIONAL	• Multi-municipal spatial strategy • Transportation plan across municiapl borders	• Governments municipal scale • Public transport providors • Non-profit organisations • Citizens
MUNICIPALITY / LOCAL	• Local spatial strategy • Local transportation plan in relation to the land use plan	• Governments municipal scale • Public transport providors • Local non-profit organisations • Citizens

Image 105. Planning instruments avaiable to actors in urban and public transport development.

EUROREGIONAL

Urban planning	Public transport
• Province of Limburg (NL) • Province of Limburg (BE) • Province de Liège • Region Aachen	• Arriva • De Lijn • TEC group • ZV NVR (Zweckverband Nahverkehr Rheinland)
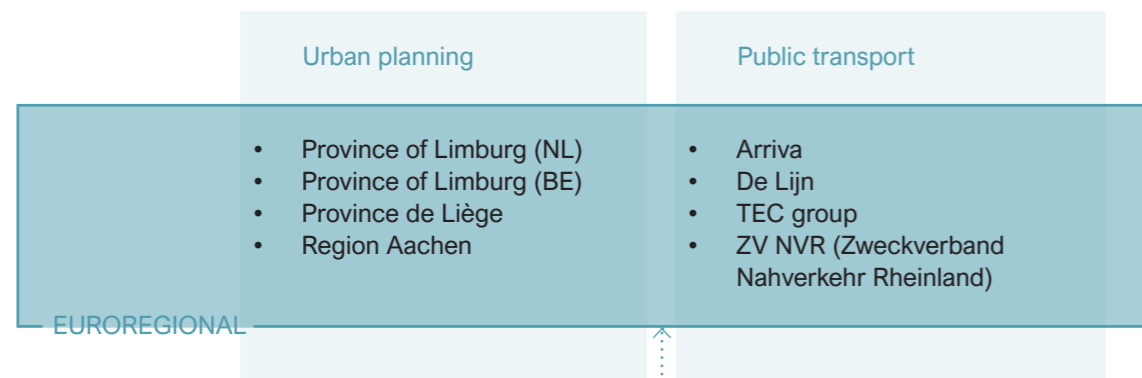
University of Hasselt
University of Maastricht
University of Liège
RWTH Aachen University

DSM
Chemelot
Maastricht-Aachen Airport
ASL Airlines Belgium

REGIONAL

Urban planning	Public transport
• Province of Limburg (NL) • Province of Limburg (BE) • Province de Liège • Region Aachen • • Municipality Sittard-Geleen • Municipality Stein • Municipality Beek • Municipality Schinnen • Municipality Maasmechelen • Municipality Genk • Municipality Dilsem-Stokkem	• Arriva • De Lijn
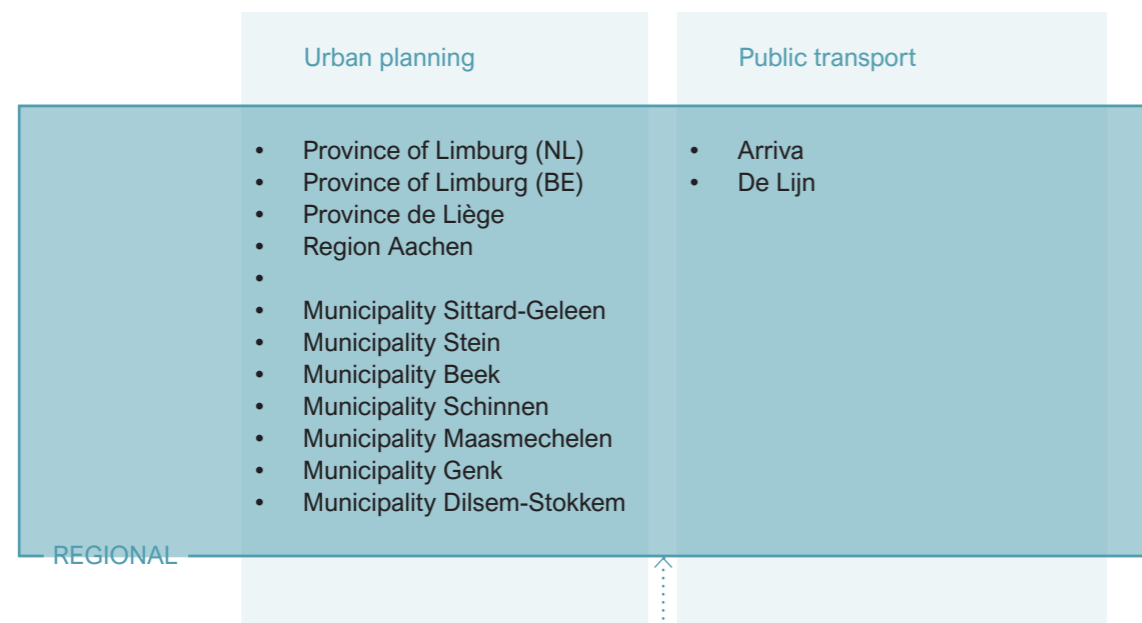
Maasmechelen Village
DSM
Chemelot
National park Hoge Kempen
Maastricht-Aachen Airport
Zutendaal Airport
Limburg Economic Development
Samenwerkingsverband
Westelijke Mijnstreek

LOCAL NETWORK

Urban planning	Public transport
• Municipality Eijsden-Margraten • Municipality Gulpen-Wittem • Municipality Vaals • Municipality Maastricht • Municipality Voeren • Städte Aachen • Arrondissement Eupen • Arrondissement Verviers • Arrondissement Liège	• Arriva • De Lijn • TEC group • AVV (Aachener Verkehrsverbund)

Regional businesses
Residents - via community platforms
Educational institutions and cooperations (primary, secondary, high scool)
Other cooperations and institutions considered relevant

LOCAL

Urban planning	Public transport
• Municipality Eijsden-Margraten	• Arriva
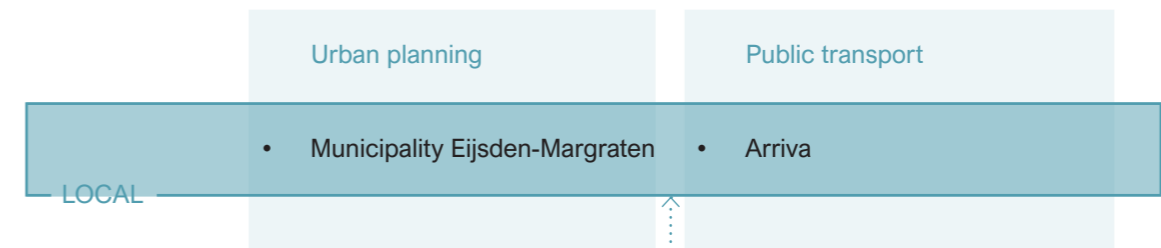
Local shops
Residents
Community groups (e.g. on landscape, education, activities etc.)

13

CONCLUSIONS

Future urbanisation
Conclusion
Further research
Reflection

Photo: Aachen from Vaalserberg

The vision focusses on increasing regional integration to develop a more competitive region which increases agglomeration benefits. This is important as it is a general believe that an upward cycle of economic growth is established through increasing agglomeration benefits. Research shows that these benefits are often only entitled to large cities, as those are the drivers of growth and prosperity. However, the pressure on large (agglomeration) cities is increasing, and the negative effects of ever increasing urban centres are showing. There is high pressure to locate more inhabitants, next to having to deal with negative effects as congestion, saturation of job market, air and noise pollution, rocketing housing markets (Meijers & Burger, 2015). The United Nations (2007) have predicted that by 2050, 70% of the people are expected to live in urban areas. In order to reduce the pressure on the increasing densification of urban centres, distribution of economic centres and urban densification can be the answer (Villamil, 2010). Interest in clusters of medium and small-sized cities as possible foundations for economic urban centres, has been increasing. Scholars have been studying the productivity advantages of cities and urban clusters over time, creating concepts to name and understand these benefits obtained from large and diverse cities as 'urbanisation economies' or 'agglomoration benefits' (Smith, 1776; Marshall, 1890; Jacobs, 1969; Henderson, 1997). Increasing the integration of polycentric urban regions (PUR's) can increase its agglomeration benefits, creating a solid alternative to large urban cities.

The Euregio Maas-Rijn (EMR) has the potential to function as such an alternative for urban growth. The vision and strategies presented in this thesis show the increase in accessibility throughout the region. People are migrating to urban centres to gain the best access to functions, leisure, jobs, retail and the economic market. Enlarging the area that has a convenient accessibility to these aspects, allows people to distribute more evenly throughout the area. Distance on the map is not the most significant matter, travel time and convenience accessibility determine the perception of distance for people. By providing high accessibility throughout the region, people can distribute themselves among smaller settlement. Small urban settlements are provided with convenient and fast access to urban centres with high-scale functions and amenities in the design. The high internal accessibility does not pressure people to live inside an urban centre, but actually provides access to several urban centres through its high flexibility. The new network allows urban densification to be distributed evenly across the entire region, reducing the pressure on the increasing densification of urban centres. It creates opportunities for higher living qualities in urban centres, with more space for green, slow traffic and diverse environments.

Small-scale urban expansion can develop according to the transport oriented development (TOD) mechanism. It attempts to create a land-use pattern that facilitates transportation choice and provides a sustainable solution to urban mobility trends (Bertolini et al., 2009). It shows a way of urban development that focusses on building within walking / cycling distance of a public transport node, instead of the current compact city policy that builds in or next to existing cities. TOD combines urban development with accessibility, which is a crucial factor in a dispersed urban region. The community / transportation hubs on the local scale can be considered transportation nodes, and can functions as the basis for urban development. It allows distribution of urbanisation, whilst retaining high accessibility in the region. This strategy preserves the dispersed urban pattern, one of the qualities of the EMR. Its high quality of life is created by the combination of low population densities, high population distribution and its close relationship between urban and green landscapes. The dispersed urban pattern and the middle-sized cities contribute to these qualities and should be preserved in further urban growth of the region.
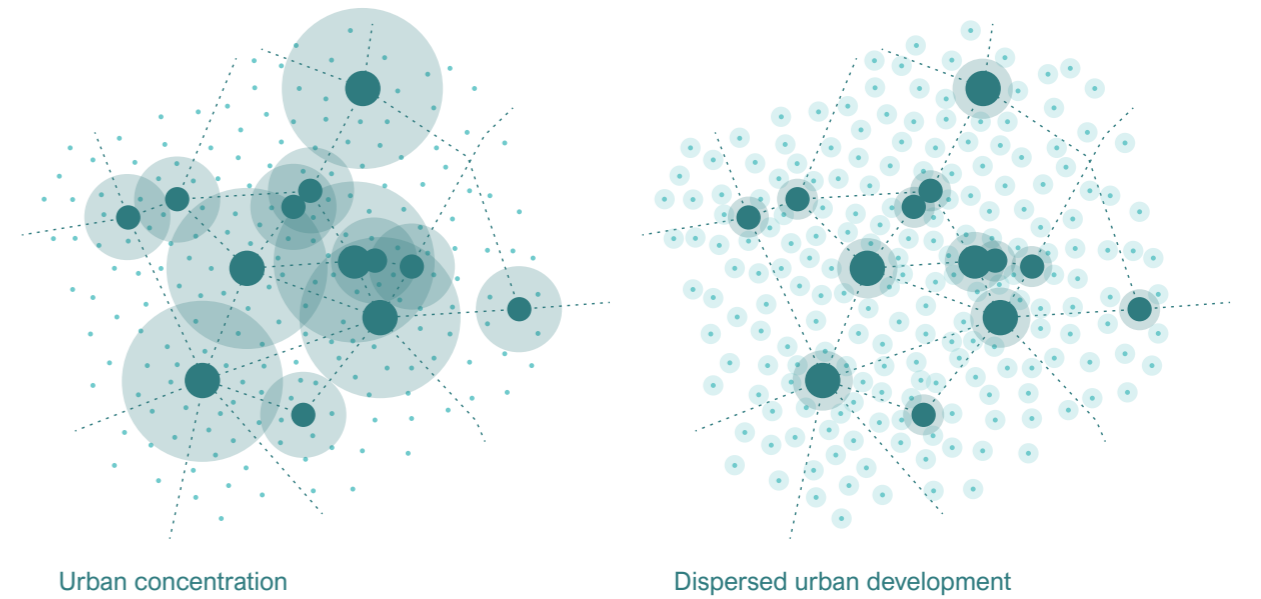
Urban concentration

Dispersed urban development

Future opportunities Euregio Maas-Rijn

Image 106. Groene loper Maastricht (LExCie1011).

Europe can no longer be considered as a collection of individual states, divided by borders. Europe is evolving towards a 'Europe of regions', in which the relation between spaces, borders and governance is more complex than ever. Cross-border cooperation and integration of cross-border regions is important in creating successful regions, in which they are able to lose their peripheral image. In the Euregio Maas-Rijn (EMR) three national borders, three languages and various cultures meet, and cooperation has existed in the region in different forms since its first settlements.

The relation between the urbanisation pattern and the public transport network in the EMR is at the basis of this thesis. The polycentric nature of the region, that expresses itself in a diversity of middle-sized cities and a scattered urban pattern, in combination with its international nature, that increases complexity in governance structures, create the field of tension in which this research and design are positioned.

The vision designs a strategy for reconnection within the region, focussing on the urban and governance characteristics, and pursues the growing trend of public transport use. The vision increases functional and institutional integration in the region, whilst relating to the spatial, governance and socio-economic characteristics of the region. The design principles allow the transferability of the design and in allowing this, contribute to the general question of applying public transport networks in areas characterised by low densities and scattered urban patterns. They bridge the gap between theoretical and spatial analysis of the relation between urbanisation and public transport, and characteristics of the specific context of cross-border European regions. The vision shows the importance of multi-scaler design, the integration of urban and public transport development, and proposes a solution for (local) public transport in low urban density regions.

The spatial strategy on the regional scale network focusses on creating a network of cities, in which the urban centres of the region are connected regardless of national borders. The integration of centres allows cities to attract a higher variety of, and more specialised services, urban functions, and amenities. The centres have been determined according to the population distribution and presence of functions, as these determine the level of mobility that is generated and the level of accessibility required. The integration of this network of urban centres can increase the competitiveness of the entire rural urban region. Important in this strategy are fast and convenient links between the largest centres, they determine whether society also perceives the network as 'one city'.

The connection between the network of urban centres and their surrounding region is, as said before, essential. The second spatial strategy scale shows the differences in system per scale, how these different systems relate to each other and how the transportation network connects them. The connection between centre and region is of great importance, as it allows cities the access of necessary critical mass, and allows the region to 'borrow size' from the centres. The designed strategy shows the relation between types of centres and their corresponding connections. A network presenting different types of connections based on the relations between the diversity of centres, ensures a context-specific transportation network. Mobility hubs in the network provide spaces of modality interchange. They are the connecting factor between the regional and local scale transportation network, and provide convenient, flexible and on-demand transportation for all citizens in the region.

The flexibility of the new network also shows in the local scale strategy. The transportation system of Demand Responsive Transport focusses on creating flexible routes, that supply for the specific demand at that time. This allows efficient transportation and maximises the profitability of the service, whilst at the same time providing a convenient service to all residents in the peri-urban and rural areas. The strategy corresponds to the dispersed urban pattern, which is not suitable for the current public transport system. Pick-up / drop-off points are located in the centre of urban settlements, which can be combined with relevant functions to the main target groups. It provides local transportation/community hubs in the centre of small urban settlements, providing a new heart of the community in which access to the regional and euroregional network is convenient to everyone.

The research focusses on the relation between institutional and functional integration, in relation to the urbanisation pattern of the EMR. The third category of integration is cultural integration, focussing on the scale of spatial attachment of people and how this can allow more durable networks. Developing emotional ties and a sense of shared identity increases support from local scales and can contribute to the acceptance of institutional integration. Further research should be done on the inclusion of cultural integration and its relation to functional and institutional integration, in the context of the EMR.

Institutional integration is an important aspect in the EMR as the region is home to three nations, each with their own governance systems. Cooperation is already present, but increasing integration to ensure regional action is hindered by these differences. Besides governance structures, that have been addressed in this research, legal and regulatory issues also play a large role in cross-border public transport development. Further research should elaborate on these issues, to ensure the legal foundations are present for further regional integration.

For public transport to take over the car in transport, much needs to change. Society shows a willingness to make the shift, but show that for this to happen, public transport needs to be more convenient than car use. In further research these aspects of improving the public transport network and decreasing convenience of car use, should be analysed more thoroughly. Making public transport the number one mobility mode, implies not only a spatial but also a societal change. A different way of life will develop, its opportunities and frictions it can create should be researched.

Societal relevance

In the last couple of years, nationalism has been a rising threat to the EU and European integration. It shows that a reasonable group of people is not satisfied with European cooperation in its current form. Improving cross-border integration by focussing on the unique context of each territorial region, can help raise awareness of advantages of European cooperation. Especially in cross-border areas, that are often considered as peripheral regions in regards to national economic and urban centres, cross-border integration can have benefits for these regions. By creating stronger cross-border regions, expertise and strengths of one region can be implemented not only on a national level, but also be used to strengthen neighbouring countries. This will help overcome physical and mental barriers, which will increase free flows of people, capital, goods and services, thus strengthening the international position of the region. By creating a well-integrated strategy of governance and ensuring spatial implication of mobility and spatial design, it will improve quality of life and ensure a strong region in which society can enjoy a strong economy, free and easy mobility and exchange of expertise. This can enable shrinking or less developed areas to connect to the network and benefit from this regional strength.

Scientific relevance

The research will show an approach to strengthening European regions that have been underdeveloped due to their location near a border. The research will focus on cross-border cooperation and improving the public transport network in relation to the existing urban form, following up on current trends in the shift from car use to public transport use. It also explores the possibilities for future urban development alongside this network. The research finds itself in the field of tension between a fine grid of urbanisation and a public transport network that requires a certain level of density. Research has been done on the impact of transit oriented development, but its relevance and possible impact in a fine grid urbanisation pattern have often shown to be unsuccessful. This research has examined the influence of other design tools that relate more to the spread out urban pattern in many European regions.

Next to that it has focussed on the integration of this mobility network with relevant governance structures. To ensure the success of a cross-border network, a diversity of actors and stakeholders should be working side-by-side and trying to achieve the same goal via the same strategy.

Role as urban designer

An urban designer is celebrated for being able to take on different positions in an urban design project. The first year of the urbanism masters shows different roles an urban designer can have in a project, and the different type of urban related projects there are. The aspect less touched upon is the influence of relevant actors in the process. Outside of the academic context, the urban designer is seldom the final decision-maker in a design project. The influence of actors that have power in implementing design visions or strategies, and how they can be included in the design process is not often elaborated on. In Europe governmental institutions often hold the decision-power regarding spatial change, in combination with public or private parties experienced in a certain sector. These governance structures are the building blocks for spatial innovation, and can also ensure cohesion in spatial visions on a larger scale. This does not mean that other actor do not have any influence, but these structures are the ones to gain support from in order to create a large and long-lasting impact.

In this project the urban designer has taken on different roles, that changed over time, but were also taken on similarly. The start of a project is doing research and analysing present issues. In this step the urban designer is an unbiased collector and analyst. For the urban designer there are no personal gains, which makes sure that in analysing and addressing issues no aspects are left out or remain untouched. In the next step the urban designer has two main roles, the designer of a future vision, and being a catalysator in actor relations structures. The first role focusses on the comprehensive nature of the urban designer. A future vision tries to combine all expertise, interests and contextual research, and create a comprehensive vision that finds the balance between spatial characteristics and specific actor interests. In this the latter role is important, as it focusses on combining the right actors in a cooperation structure. These structures are key in creating support for the project and ensuring the realisation of the vision. The urban designer has gained contextual knowledge - during his first

role as collector and analyst - which allows him to point the correct actors and combine them. This ensures efficient cooperation structures in which actors waste no time in creating and finding relevant actors, which often leaves out important actors. These structures are open to debate with included stakeholders, ensuring an open cooperation atmosphere and allowing actors to jump into new opportunities and trends. The urban designer will then have more of an advisory role, to guide actor cooperation efficiently.

The urban designer can have many roles in design processes, and as each project is unique, so is the role of the urban designer in this. What I remember best from the first year of the master is a workshop in which we drew the urban designer as an octopus in the middle and attached all relevant sectors in urbanism to its tentacles. Showing the urban designer in a central position, combining all aspects and creating one comprehensive vision, in which all comes together. The urban designer can be the creator or initiator, but also the catalysator to ensure certain processes are initiated, or designed more efficiently.

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15

APPENDIX

Photo: City of Aachen (Toerisme Voerstreek, 2015).

50AD Roman Empire
0

Region part of the Roman province 'Gallia Belgica'.
Numerable cities and villages of today emerged on crossroads of important roads.
Large increase of population.

100
200
300

400 Middle Ages & Francia (Frankish Empire)
Roman authority is lost when the Franks invaded the land from the East of the Rhine.

Start Roman-German language border.

500

600 Religious conversion to catholicism.

700: Establishment first abbeys.
700 718: Diocese from Maastricht to
718 Liège: foundation Diocese of Liège

768 - 814
Charles the Great rules the Frankish Empire with Aachen as its capital city.

800

900 Viking invasions
882, end of plunderings.
Imperial power was weak - countermeasures against the Vikings were left in the hands of the local Lords.

1000
1000 - 1500: Heritage wars.
1000: 1 Lord
1500: 7 Dukes and Lords

1100 Catholic institutions gained temporal power in the region. Until +/- 1800.

1200
1300

Image 107. Roman Empire. (SOURCE)

Image 108. Growth of Frankish Empire. (SOURCE)

Image 109. Treaty of Verdun 843. (SOURCE)

1350 Dukedom of Brabant reigns over Dukedom of Limburg and Landen van Overmaas.
1400

1464 First Staten Generaal of the
1477 Netherlands.
The delegates of the estates of the realm (17 provinces) called together by the Duke of Burgund, and later the Lord of Habsburg.
1500 1477: Dukedom of Burgund divided in France and the Austrian
1525 Habsburg dynasty.

1543 1543: Treaty of Venlo.
1548 Seventeen provinces of the
1559 Habsburg Netherlands.
1548: Transaction of Augsburg.
17 provinces separated from
1568 the Roman-German empire.
Connection to the Holy Roman
1570 Empire drastically limited.
Centralisation of power moved to
1580 Brussels.
1559: Super Universas.
1590 Prince Diocese of Liège. Their bishops were offspring of royal
1600 families, to maintain power in the region.

1610

1620 1568 - 1648: Eighty Years War.

1630

Image 110. Reign Dukedom of Brabant. (SOURCE)

Image 111. Dukedom of Burgund. (SOURCE)

Image 112. Treaty of Venlo. (SOURCE)

Impact:
Religion played a large role, it even held temporal power in the region. Because of the Super Universas, the Catholic church tried to maintain their power in the region. The separation from the Holy Roman Empire slightly opened the door to other religions, such as Protestantism.

Imperial power of the whole region changed fast, therefore local lords held more power. During the threat of the Vikings, Lords gained more personal power, which they maintained when the threat was gone. This led to a fragmentation of dukedoms in the regions. A result of this was that the region was often in the middle of multiple wars between lordships, battles that were fought in the countryside in the middle of the citizens.

1648

1650

1568 - 1648: Eighty Years War.
The Duke of Alva was situated in Brussels, William of Orange came from the North towards Brussels. The current region of the EMR was in the middle of the battlefield. The Diocese of Liège still reign their own land.

1648: Peace of Münster.
North in hands of Republic of the Netherlands, South is of Spain.

1661 'Praktagetraktraat'
Division of Landen van Overmaas between Spain and the Staten.

1700

1713

1713: Peace of Utrecht
Radical new division of the South, between the Staten, the Habsburgs (now Austrian, not Spanish anymore), and Prussia.

18th century = century of war.
Spanish succession war (1702 - 1713)
'Bokkenrijders' (1743 - 1794)
Jozef II (1780 - 1790) Austrian Emperor who closed lots of dioceses.
Revolutions of Brabant and Liège (1789 - 1791).

1795

1800

1795 - 1806: French Era
Rules and regulations of the French reign. These inlcuded: the institutionalisation of the civil status and military service, the construction of 'routes impériales', the division of land in departments (at its head a prefect, with direct connection to Paris), arrondissements, cantons, and municipalities (at its head a mayor).

1803

1806

1803: Definite end of the Holy Roman Empire.

Image 113. Peace of Münster. SOURCE)
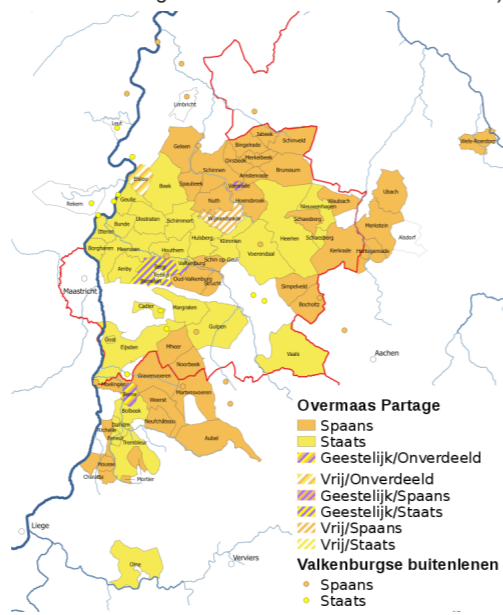
Image 114. Praktagetraktraat. SOURCE)

Impact:
Constant war and changing reigns left the region scattered and without large-scale connections or relations. The French reign changed this, the current division and naming of land is even still based on this French influence.

1815

1820

Congress of Vienna.
United Kingdom of the Netherlands lost the Eastern lands to Prussia.

1825 1815 - 1974 Private Mining in the region and its surroundings.

1830
1831

Belgian Rebellion
Background:
The Southern parts of the Netherlands were not content with the politics of William I.
- The Catholics were afraid for their dominant position of power.
- Liberal elites wished for a constitutional monarchy.
- William I pursued Dutch as the national language, which was disliked by the French elite in the South of the Netherlands.

1838

1840

1831: Treaty of London.
Leopold becomes first Belgian King. Definite borders of the new Belgian State are officially recorded. William I did not recognise the treaty, so Limburg - except the city of Maastricht - was still under Dutch reign.

1838: William I accepts the Treaty of London.
Limburg and Luxembourg could now be officially divided. This proved difficult in Limburg as inhabitant of 'Limburg' did not want to be divided.

1848
1850

March Revolution in Germany.
German Confederation longed for political unity. Wanted to join the Dukedom of Limburg in their new German State. The Netherlands did not want a war with the Germans, so they 'gave' Limburg to the Germans.

1850: Germand state-building failed. Limburg regained it former position in the United Kingdom of the Netherlands.
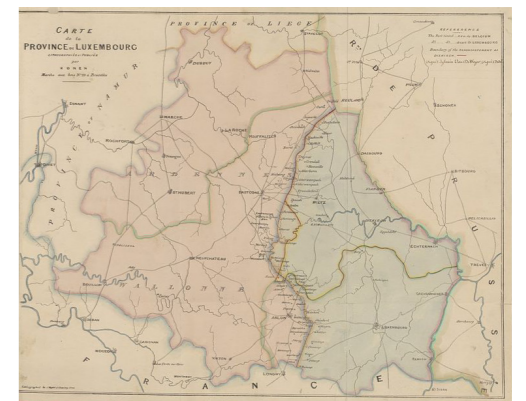
Image 115. Division Luxembourg Treaty of London. (SOURCE)
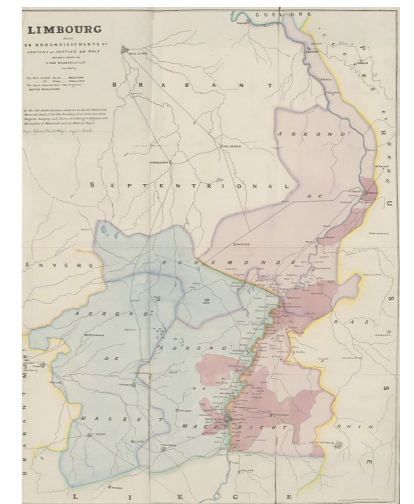
Image 116. Division Limburg Treaty of London. (SOURCE)

Image 117. 'New' border after German Revolution. (SOURCE)

1860   1860 - 1965: 'Rijke Roomse Leven'
Effect of 'Kulturkampf' in Germany - increase of Catholic religious institutions in Limburg. Catholic church had a dominant and pressing influence on the social and cultural life. Sixties: social control disappeared, increase secularisation.

1867   Limburg officially became the 11th province of the Netherlands.
Lost its special position as Dukedom of Limburg.

1902   State mines start mining in Limburg.

1914   Start WWI.
1917   The Germans built the 'Grenzhochspannungshindernis' on the border between the Netherlands and Belgium.
1918
1918: End WWI.
Belgium gains control over Eupen-Malmedy again.

1917: start mining in the Kempense Bekken, Belgium.

1940   Start WWII.
Eupen-Malmedy is annexed to Germany again.
1945   1945: End WWII.
Allied front was located in Limburg, a lot of damage caused.

1959   Discovery of natural gas in Groningen.
The mines became redundant.
1965   1965: Closure of the mines was announced.
This led to a lot of protest, as the mines were at the heart of the economy in these regions.

1974

1992   End of mining in Belgium.

Image 118. Mining areas in Germany, Belgium and the Netherlands. (SOURCE)

Image 119. Allied front during the WWII. (SOURCE)

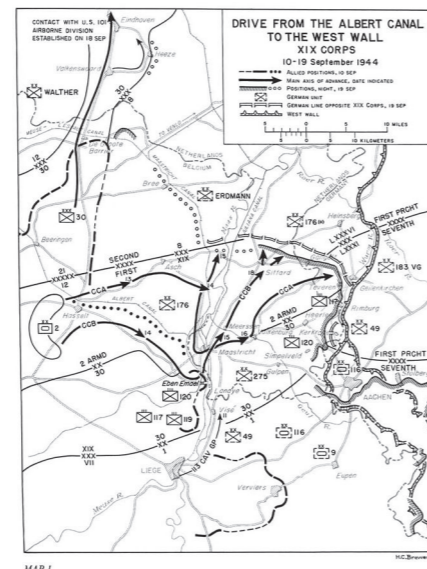|		
BE	1830	Belgian rebellion.
		Cut off from the Dutch waterways and roads. Antwerp and its harbour (crucial for Belgian economy) were cut off from Germany (industrial mainland).
BE	1834	Political decision to invest in transportation by train.
BE	1835	may 5: 1st train in Belgium and on European mainland - only passengers.
DE		dec. 7: 1st train in Germany
BE	1838	1st freight train in Belgium
NL	1839	1st train in the Netherlands
NL		Treaty of London acknowledged by the Netherlands
BE/DE	1843	First cross-border connection in the region - Aachen - Antwerp.
		Train route travels only through Belgium, due to the late acknowledgement of the Treaty of London by the Netherlands. The Belgians started building their train network as fast as possible, as this was crucial for their economy. As the Netherlands did not acknowledge the treaty, Belgium could not make agreements with the Netherlands, and could not build on Dutch land.
BE	1844	State started the search for private investors.
		Fast expansion of the train network was necessary to rebuild their economy, but the government could not pay for all the investments.
BE	1847	Start of 'Steenkoollijnen' (coal mining routes).
		Wallonia was rich of mining and industry, and the lines had two purposes. The first was to enable commute transport for working people from Flanders. The second was to be able to transport the coal freight to Flanders and further to the German mainland.
NL/DE	1853	Train connection Maastricht - Aachen.
		German initiative. German industry wanted access to Dutch waterways and harbours.
NL/BE	1856	Train connection Maastricht - Hasselt.
NL/BE	1861	Train connection Maastricht - Liège.
		Constructed and exploited by Belgian rail operators.
NL	1865	Train connection Maastricht - Venlo.
		First connection from Maastricht to the rest of the Netherlands.
NL/DE/BE	1869	Start construction IJzeren Rijn route.
BE	1870	Private investors exceed government-owned railways - 2300km vs. 860km.
	1873	IJzeren Rijn Treaty with a concession of 99 jaar.
BE/EU	1874	Foundation Compagnie Internationale des Wagons-Lits.
		First cooperation to invest in high-end, cross-border, long distance travelling across Europe.
NL/DE/BE	1879	IJzeren Rijn route in operation.
NL	1882	First plan light rail Maastricht - Vaals.
		Province and municipalities do not want to pay the investment.
NL	1884	Public transport in the city of Maastricht - horse-drawn carriages.
BE	1885	Foundation NMVB - Nationale Maatschappij Van Buurtspoorwegen (National Company of Local railways).
		The NMVB controls all the local railways and tram railways. Its original job was to realise tram networks in areas that could not be accessed through the train network. The first trams all were steam trams.

NL	1889	Second request light rail turned down as well.
		Plans were said to be too vague, eventhough research proved the plans to be realistic.
BE	1893	First tram based on electricity in the city of Liège.
NL/BE	1895	Steam tramline Maastricht - Liège.
NL	1896	Tram based on gas introduced in the city of Maastricht - first in Europe.
NL/BE	1897	Steam tramline Maastricht - Maaseik
NL	1904	Gas trams changed for horse-drawn trams again.
		The gas trams did not have enough power to manage the slopes and birdges in the city. On the foot of a slope an extra horse was attached to the tram to make sure the tram would make it to the top.
DE	1905	Relocation of the train station in Aachen - from the centre of the inner city to the edge of the centre.
NL/BE	1909	Steam tramline Maastricht - Tongeren.
BE	1912	Government-owned railways exceed private companies again - 5000km vs. 300km.
NL	1914	End of steam and horse-drawn trams in Maastricht. Plans for electrical trams and trolley buses (German plans).
		With the start of WWI these plans were put to a halt.
NL/BE/DE		Invasion of Belgium by Germany = Start of WWI (4-8-1914)
	1915	*Dutch part of the IJzeren Rijn line was cut off during WWI (1914-1918).*
BE/DE	1916	Construction 'Montzenline' by the Germans - from Antwerp - Aachen.
	1917	*From 1915-1917. To enable transport by train between Germany and*
	1918	*Belgium, without entering Dutch land. Transport by train was very important during war, as it enabled fast transport of people and goods.*
NL		After WWI, a dozen tramlines were designed by the National government.
		The National Government realised that they had been neglecting the province of Limburg in investing and constructing transport connections.
NL	1919	The Gemeentelijke Autobussen Dienst (GAD) *'municipal autobus service'* was set up in Maastricht.
NL	1920	Railway station in Maastricht finally on Maastricht soil, because of a juridical change.
NL	1921	Limburgse Tram Maatschappij (LTM) *'Limburg Tram Company'* set up.
NL	1922	Steam tramline Maastricht - Vaals = drama
NL	1925	M-V Tramline open from Maastricht to Gulpen.
		Troubles over the location of the tram railway in Keer caused the tramline to only travel between Maastricht and Gulpen.
BE	1926	Foundation NMBS - Nationale Maatschappij der Belgische Spoorwegen
NL	1929	M-V Tramline: compromise buses and trams between Maastricht and Vaals.
		As transport was demanded for between Gulpen and Vaals, privately owned bus companies started a service through the villages on the original tram route. The compromise was that the buses were allowed to travel to Vaals,
	1930	*but only with a detour.*
BE	1931	First use of electricity on the main train network. Further expansion was slow however.
NL	1932	LTM starts their own bus service.
NL	1937	LTM stops transport of passengers between Maastricht - Vaals
		Introduction trains on diesel engines and on electricity.
	1940	

NL/BE/DE **1945** End of WWII.
A majority of railway materials have been destroyed and lost during the war.
After the WWII the majority of the local railways (train and tram) were closed
instead of rebuild in Belgium.

BE **1950** The majority of the mining and local railway lines are closed.
BE **1954** Railway Ostend - Liège is electrified.
NL **1955** GAD becomes part of the Dienst Gemeente Bedrijven (Municiapl Company
Service)
BE **1958** All private railway companies have been acquired by the NMBS.

BE **1966** Last ride of a steam train.
DE The station of Aachen is completely electrified.
Two tracks have overhead lines that can switch between Belgian and
Germand trains.

BE **1970**

NL **1986** Stadbus Maastricht becomes an independent company again.

NL/DE/BE **1991** No more trains between Roermond and the German border on the IJzeren
Rijn route. From Antwerp to Budel the line is still in use.
NL/DE **1992** Train route Maastricht - Aachen is closed.
NL **1994** Stadsbus Maastricht NV - company has been privatised.

Late 90's: ideas to bring the IJzeren Rijn route back in operation.
Late 90's: the Netherlands start building the Betuwelijn.
Belgium later blames the Netherlands that the Betuwelijn is why
the Netherlands do not cooperate to take the IJzeren Rijn line in
operation again..

NL **2002** Connex buys Stadbus Maastricht NV.
Connex is a subsidiary company from Veolia and drives with their subsidiary
company LIMEX.
NL **2006** Privatising Stadsbus-group to Veolia.

NL/DE **2013** Idea of Avantis line - Kerkrade - Aachen.
The line will be built on the tracks of the former Miljoenenlijn. It is supposed
to connect Heerlen, Kerkrade, Aachen and the new industrial concentration
Avantis.
NL **2016** Arriva wins concession for all bus transport, and local and regional train
transport in Limburg.
Arriva is a subsidiary company of Deutsche Bahn.

Integration Urban and Rail Development

The general view of the Belgian diffuse landscape relates to an unplanned urban sprawl, dominated by the highway network. However, behind this messy sprawl lies a history of concern for efficient operation and the focus on an integrated and well-functioning system of urbanisation and transportation, that relates to work and quality of life. The early urbanisation of the countryside was already associated with Belgians dense and cheap railway network in the 1900s. This network encouraged a high worker mobility between the industrial centres and the countryside, where most workers lived due to their background in agriculture. As the Belgian sociologist Vandervelde stated in 1900 "The worker could stay in the healthy countryside … near a light railway stop in the fields or close to the railway station bordering the villages, where land was affordable. By 1900, more than 78% of the Belgian parcels were smaller than 2ha." His analysis shows two important aspect of Belgian urban development, the close interrelationship between urbanisation and public transport, and the unique pattern of individual and spread out private parcels along roads. Both of which will be explained more in detail further in this chapter.

The first railways in Belgian were part of a pioneering large-scale public work of the Belgian government. Shortly after the Belgian independence, the Belgian government took a change and invested largely in a coherent, public infrastructure frame. They tried to copy the success of railway transport in the UK, in finding a way to figuratively and literally build their nation (De Block, 2011). The first national

design for the railway network presented a frame that tried to cover the whole territory of Belgium, "in the shape of a cross with perpendicular branches to intermediate areas, intimately linked Belgian industrial regions to one another as well as to international markets" (De Block, 2014). The original design already tried to integrate multiple aspects related to urbanisation, transport and economy. It entailed both connector and collector, line and network, and urban and rural nodes in one vision. The vision relates to Stilgoe's 'metropolitan corridor', which focusses on connecting technology with space and society. It shows how the railway knits together locations of diverse natures into a hybrid landscape that goes beyond traditional spatial categories. It combines "part environments, part experience, a combination perhaps best called *metropolitan*" (Stilgoe, 1983, p. ix). The developing new arrangements created a landscape that knitted together opposites – rural and urban, traditional and modern, and centrality and periphery – , but also included different types of urban settlements as countryside villages, cities, industrial cites and small farms, into a system of experience and environment (De Block, 2014). The vision focusses on creating a cohesive system, but the main driving force behind the large-scale investments, is the growing industrial economy. The Industrial Revolution dominated the economy in Western Europe, pushing agriculture from the main economic source of income. The investments in railway were primarily to create a strong basis for a strong economy in Belgium that should build the new state. The government quickly, after a decade, involved private companies in the development of the rails, to be able to develop a "fine-grained

Image 120. The railway landscape showing views of cities and villages along the 'metropolitan corridor'.(Alphonse Wauters, 1840).

railway network as quickly as possible to inject the entire territory with the Industrial Revolution" (*Moniteur belge*, 18 March 1834). The increase of density took off after 1860, when municipal custom duties were abolished and the privileged position of cities diminished consequently. The import of products was no longer taxed, so the only prerequisite for location of factories was a first-rate connection to the national and local (light) railway network (De Block, 2014). This further intensified the integration of space and production, and set off a new intensive process of further expansion of the railway network and opening up new stations.

Effect on Urban Form

The new technology of railways transformed cities and villages from a confined, walled landscape to an open hub of transportation, from tradition to circulation and space of flows. Consequently, the urban planning profession had to be reoriented from a static perception that pursued perfection, towards a more flexible attitude that resituated the town in a space of flows, and took into account that the future is not entirely controllable (Foucault, 2007). Large urban extensions or redesigns next to the stations were drawn up to create spaces that related to the 'modern city'. These new urban landscapes often showed to host streams of the most diverse classes, all brought together in the new technologies.

Infrastructure design was strongly determined by industrialisation, however passengers most frequently used the railways. The original engineers of the first national infrastructure plan and the Prime Minister, had emphasised the importance of passenger travel from the beginning of the 1830s, but prices only became cheap enough to allow daily travel for the working class in 1869 (De Block & Polasky, 2011; Polasky, 2010). In the 1870s high subsidies from the national government, complementing the abolition of custom duties, encouraged the development of so-called 'communal feeder roads'. New urban development initiated next to the new (light) railway stations, where land was affordable, but those locations were often not located within the village centres. People started building houses within and next to new

urban development plans connected to the new stations. This development expanded in ribbon development along the main connecting roads, which received the calling of communal feeder roads. Municipalities were the initiators, but the large subsidies guaranteed a forceful implementation of creating these new road types. The urban core no longer was the pre-eminent factor to determine urbanisation, the railway was (De Block, 2014). These measures lead to the further densification of lines and stations and ensured the dispersal of the Industrial Revolution throughout the Belgian finegrained landscape.

Although the new technology in a way re-invigorated the traditional intricate spatial pattern of small-scaled landscape transformations, the new urbanity and architecture following these local station streets contrasted with the existing landscape. The 'feeder routes' were often perpendicular to the old inter-urban roads, and an urban division between historical cores and modern extensions became visible. The traditional structure of the village square along a main road was disturbed, "new nuclei typically sprang up by these rudimentary – even rustic – stations, which in turn led to the fragmentation of the traditional structure of the villages around their church tower" (De Block, 2014, p. 553).

The diffuse spatial pattern of Flanders was reinforced by the combination of a dense railway network that aimed to connect all significant centres, and the policies enabling the working class to make use of the rail network to full extent. The most significant difference to other European countries is that villages were not drained by large, nearby cities, but that the historical patchwork of the countryside was to some extent enhanced by new technologies and modern infrastructure. However, the railway network also facilitated the urbanisation of the countryside, which cause boundaries between rural and urban environments to slowly fade away.

Following the railway network, is the lightrail network from 1884 onwards, the "unification of the space of production, the integration of the labour market and the opening up of the countryside received additional support through the establishment of the *Société*
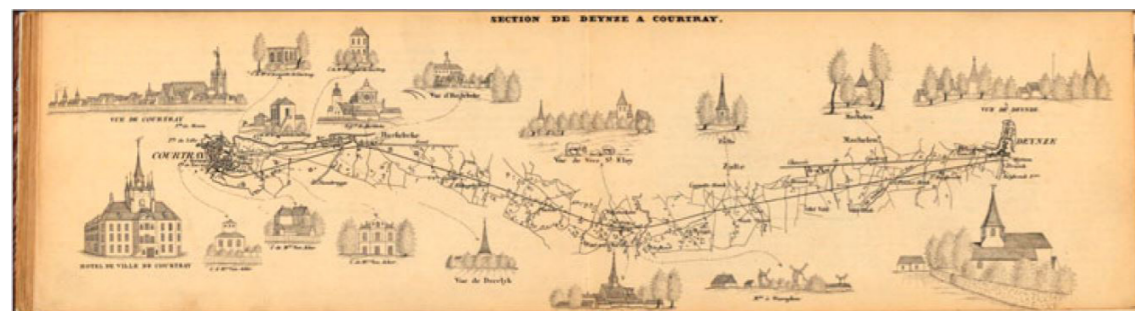
national des chemins de fer vicinaux (SNCV: national light railway company)" (De Block, 2014, p. 556). Governance systems were well integrated at that time, and the state, the provinces and the municipalities worked together to promote, construct and run the light railways. The lightrail was seen as an expansion of the railway network, the railway network enabled economic centres to be connected, the lightrail network enabled all areas of Belgium to be connected to those. The total rail network aimed at urbanising the countryside, to create space for their worker's housing. This would lead to development in which "the inhabitant of the most remote village is placed on relatively equal terms with the city-dweller or the resident of a location situated on major railways", which will result in "the necessity to emigrate to cities and population centres to find regular work will decrease"(Constitution d'une Société national pour la construction et l'exploitation de chemins de fer vicinaux, 22 January 1884, pp. 14-15). National urban planning focussed on preventing mass migration to large cities, resulting in overcrowding, which proved to be troublesome in other European countries. Increase of power of local partners of the SNVC due to legal changes, enabled quick development, and in the shortest of time, the most remote villages were connected to the regional and national economic development. The decentralisation had reduced the rural flight that took place elsewhere in Europe, population densities in Belgian villages remained constant, or even rose, because of daily migrations (Vandervelde, 1903).

The urban typology of single houses that characterises Belgium, is the result of a combination of the Belgian transport policy, and the (Catholic) Housing Act of 1889 (De Block, 2014). The last made it possible to borrow 90% of one's building costs at a low rate of interest from the national government. It added to the other subsidies pushing for decentralisation. This interplay of policies allowed workers to build a decent house with a garden in the countryside, where land was also relatively inexpensive (Vandervelde, 1900; Rowntree, 1910).

The rise of motorised transport lead to a gradual loss of significance for the railways, however, the commuter culture continued untouched (Polasky, 2010). It even experienced a substantial increase, thanks to the advent of bus transport. The main advantage of bus transport was its spatial flexibility, it was not dependent upon tracks, so it could penetrate the countryside even further. After the World Wars, most of the lightrail network had been demolished and in combination with the rise of individual car transport, the choice was made to not rebuilt these rail networks again. In many European countries a trend of decentralisation can be seen in urban development as a result of the increase of car dominance in transport. The Belgian urbanisation was already highly decentralised and its urban structure already fitted this new transportation mode.

Image Building in European Regions: Regional Identity as a Foundation for Regional Branding

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Abstract

Globalisation and regionalisation seem to go hand in hand, the process of integration and increasing uniformity has raised opposing processes of accentuating regional differences. Regions face an increasing competition and region branding is used to expose the unique qualities of a specific region. One of the key aspects of regional branding, is regional identity. Yet, regional identity is often mistaken for regional branding, or exploited for wrong purposes. A significant concept in both regional identity and region branding, is image building. It is used to visualise a region, by introducing the subjective level next to the technical level of space in perceiving at a place. The paper introduces a complex layering in which multiple perspectives (regional identification, the influence of actors involved, and the perception of the perceiver) overlap and have an effect on image building and the perceived reality. The identity of the region concerns the image of the region, and can be divided in two parts, the insider's and the outsider's view. In region branding, the image is often focussed on constructing a positive image that is attractive to outsiders. Only when one has an extensive knowledge and experience of the specific region, can one try and create a truthful identity. Yet in regional branding, often political and economic gains are the main driving forces behind image creation for the region. This paper will discuss the link between regional identity and regional branding, the influence of image building in this process, and the pitfalls when exploiting

these concepts instead of using them in the rightful way.

Key words: Regional Identity – Regional Branding – Image Building – Regionalisation – Europe

Introduction

In the recent past of the world, stories on the increasing uniformity of the world are frequently heard of. Regional differences are erased and regions and cities are becoming copies of one another. The critique on this process has enhanced since the increasing influence of globalisation and the so-called McDonaldization of the world (Bornman, 2010; De Pater, 2011a; Schwinn, 2012). However, it is not a new phenomenon. Even in the nineteenth century, the century of the industrial revolution, colonisation, urbanisation, the railways, and telegraphy, critique was already emerging on how all cities started to look similar. "Wie over vijftig jaar ééne stad heft gezien, heeft ze allen gezien", commented the preacher Jacobus Craandijk from Rotterdam in 1875.

The process of integration and increasing uniformity has raised opposing processes. Globalisation and regionalisation seem to go hand in hand (Bornman, 2010; De Pater, 2011a). Regionalisation in this context being the accentuating of regional differences. This can be seen in the economy, the personal life of people, and politics and governance; local initiatives instead of global chains taking power, residents having an emotional connection to their immediate living context, and the attempt to decrease regional inequalities in politics. The region now has an essential role in social, political, and economical life, understanding the role of the region in these different aspects of life is important for the durability of a region. The role of the region becomes visible in, respectively, the identity, the border, and the branding of the region (Hague & Jenkins, 2005; Paasi, 2009; Faludi, 2014).

Regions have been particularly

significant in the European Union where both the making of the Union itself and the 'Europe of regions' are concrete manifestations of the re-scaling of state spaces and the assignment of new meanings to territory (Faludi, 2014). This phenomenon of re-scaling and the question to the new meaning of territory have also led to an increase in competition between regions and nations. Regions face an increasing competition for attention and money from supra-regional governments, but also from transregional and transnational companies (De Pater, 2011a). Bringing in investments increases regional competition and has led to a need for positive exposing of the region. Region and city branding are used to expose the unique qualities of the area, and large numbers are spend on this (Riza et al., 2012).

Regional identity is one of the significant aspects of regional branding. The aim of regional branding is to construct a positive image, which makes people want to attach themselves to this particular region (Kavaratzis, 2007). Regional identity, as a part of region branding, emphasises the intangible values of a region and its connection to the spatial context in which they have been developing (Paasi, 2001). Regional identity has not gone by unnoticed by the EU, as it has been identified in the EU's cohesion policy as an important element for regional development (Faludi, 2007; De Pater, 2011a). However, regional branding is often, though wrongfully, presented as regional identity. Top-down institutions, political or economic, have created an aspired image of a region, but present it as 'the identity of the region', even though it might barely poses local identities (Ji, 2018).

As regional identity is often mistaken for regional branding, this paper tries to research the link between regional identity and regional branding. Regionalisation is an important process in today's Europe and will be in its future. In order for European regions to grow and compete, the way they present themselves is important. One way to do this is through regional branding, in which a region tries to emphasise its unique characteristics and show its distinctiveness.

As each region is unique, they all have an own identity, created through a complex and never-ending process (Hague & Jenkins, 2005). The concept of region branding is still less well-known than city-marketing, which has been acknowledged and used worldwide (Kavaratzis, 2007; Riza et al., 2011; Brabazon, 2013). As regions do not always have clearly defined borders or governance structures, and often hold a collection of characteristics or identities, it is complex but important to analyse and clarify the difference and the relation between region branding and regional identity. This paper tries to do this, by discussing the relevance and role of regional identity in regional branding. The structure of the paper is as follows, first the relevant concepts – region, regional identity, region branding – will be explained and clarified in relation to the field of science of urbanism and urban planning. Their background, role in current processes, relation to Europe, and their hazards will be addressed. A significant aspect in both regional identity and region branding is 'image building'. It is a crucial element in these processes, but must be used with caution. This paragraph will address these issues and explain why. In the discussion and conclusion, the difference between regional identity and region branding will be analysed, and concluded on.

The Region

The phenomenon of globalisation in modern literature usually refers to the trend that arose after the 1989 revolutions, in which the division between East and West diminished (Kochanowicz, 2006). This phenomenon is still a trend and relates to the fast growing interconnectedness of economies throughout the world. Due to technological advances, communication and transport networks could rapidly expand across the whole world, enabling nations to enlarge their horizons (Lechner&Boli, 2011). Modern globalisation however, has also led to processes of integration and increasing uniformity, which have raised opposing processes, such as regionalisation. Globalisation and regionalisation seem to go hand in hand,

globalised uniformity versus regionalisation, the accentuating of regional differences (De Pater, 2011a). This can be seen in processes in economy, politics, and the personal life of people. Parallel to the globalisation of the economy, initiatives can be seen from local groups and institutions that focus on the uniqueness of a region. An example is the concept of Slow Food, founded in 1986 by culinary Italians in Bra (Piemonte), as a reaction to the global advance of fast-food chains. Slow Food strives for the use of traditional, regional products and has grown to 1300 local division in numerous countries. Regions are not only important in economy, but also play a large role in the personal life of people. The modern man seems to be no cosmopolitan, but actually a person who is emotionally attached to their own region. Through all scale levels the upscaling of governance systems evokes negative reactions (De Pater, 2011a). The population, who wants to retain their own power, is afraid to lose its identity. This phenomenon can also be seen on a European level, the increase of the power on a European level, has led to the rise of successful nationalist parties (Techau, 2016). On the other side of the scale, the introduction of enlarging municipalities evokes resistance as well. New names for regions, when created by new authorities are seldom adopted by the people, showing that political influence does not necessarily touch ground in the region. The other way around, governments can be confronted with regional 'rebellion' when governance is oriented too much to the main region of power in a country, or when political leaders all represent only a certain region of a country (De Pater, 2011a).

Regional inequalities are also on the agenda on a European level. The Treaty of Rome 1957, the base of the foundation of the European Economic Community – the forerunner of the EU – formulates the ideal of decreasing the deprivation of less fortunate regions. The EU is not aversive of the region, next to upscaling, transferring decision-making towards Brussels, there is also downscaling, the principle of subsidiarity (De Pater, 2011a). The aim to keep decision-making at the lowest possible scale does not

always work out in practice, which results in Brussels being blamed of meddlesomeness. The Treaty of Maastricht in 1992, includes the 'Europe of regions', which has led to the establishment of the Committee of the Regions. No less than 344 regions have a representative in this Committee, of which some regions have or aspire a certain level of autonomous power. This ambition can rely on sympathy from the EU, as they benefit from a good affiliation with regions. The relation between Brussels and the national capitals is not always cordial, as is the relation between the region and the national capital as a result, regions can ignore the national level and go directly to Brussels for support (De Pater, 2011b). The spaces in Europe are complex as they interweave and cannot always be clearly defined, according to Rumford (2006). Europe can no longer be seen as just a 'Europe of nations', it has created a borderless internal market, alongside a multi-levelled and networked polity. Paasi (2003) adds identity as a significant process in this complex system called 'European space', next to it economy and politics. The question of territory in Europe depends on governance structures, and economic networks, but also on identification levels of Europeans. The results of the World Values survey data, referred to by Castells (2004), show that identification with local and regional scales is most common for people. It could be the start of a future for Europe as a 'Europe of regions'. The relationship between borders, identities and governance is complex, but is at the basis of the modern Europe.

Regional Identity

Identity plays a significant role in the future of Europe, and has been a major concept in regionalism since the 1980s. Territorialisation battles over political issues and wealth have shifted to battles over multiculturalism, recognition and an economy characterised by marketing of images (Isin & Wood, 1999; du Gay et al., 2000; Lash & Featherstone, 2002). Defining the distinctiveness of a place based on its identity has become a complex process. The increasing globalisation has, particularly

in the western world, led to an increase in individualisation. People have increasing opportunities to create their personal lives and identities, rather than being forced into a characterisation of nationality, class, occupation or home region (Beck & Beck-Gernsheim, 2001). Contrary to this process of individualisation, the awareness of being part in a globalised system has actually generated the search for new points of orientation and increased their sense of belonging to former boundaries (Meyer & Geschiere, 1999). Alongside this, a search for creating new boundaries, resulting from resistance to existing or top-down implemented identities also occurs (Castells, 1997). People are more unrestrained in creating their own identities, and are creating new, but often unacknowledged boundaries. This makes it increasingly difficult to define distinctions between places, and increases the complexity of specifying regional identities.

Identity has for long been an important concept in social sciences, whereas the region has been a major concept in geography sciences. In the recent past scholars have started to consider the links between these two concepts. Humanistic geographers have started to examine the emotional links between humans and their spatial context (Tuan, 1975), where social geographers have showed interest in regional identities, with a focus on Europe. As these scolars realised, the link between identity and space is important and it emphasises the importance of a spatially sensitive approach. Since the meaning of elements such as history, ideologies, or social transformations – which are constitutive of social distinctions and identities – vary for each territorial case (Paasi, 1986a; Gilbert, 1988; Dirven et al., 1993; Rose, 1995). Regional identity embodies the essence of a specific region, the extent to which a person can recognize or recall the distinctiveness of a region (Lynch, 1960), and the sense of belonging and attachment to a region (Faludi, 2007).

According to Paasi (1986) regional identity consists of two aspects; the identity of the region and regional consciousness. This last concept describes the regional identity

of the inhabitants and relates for a great deal to the social side of regional identity. As this paper is focussing on the spatial relation of identity, it will not be elaborated on, but as it is a significant aspect in regional identity, further research is necessary for a complete overview. The identity of the region concerns the image of the region, and can be divided in two parts, the insider's an the outsider's view. The first refers to images created by the inhabitants of the region, the latter to those living outside the region. The process of selecting what to represent always includes subjectivity, as each individual looks at the reality through a certain perspective (De Pater, 2011b). One's perspective consists of values, experiences and knowledge, which are unique for everyone. If others would look at the same reality, they would construct a different image. It raises the question how big the distance is between reality and the 'real' reality (De Pater, 2011). It is therefore important, in the concept of regional identity, to consider through who's glasses is being looked at the region (Groote & Druijven, 2011). The difference between an insider's and an outsider's view is important to understand and acknowledge. "Only those who intensively experience the landscapes of their region can change or recreate their images of those landscapes", this quote by Stein & Schultz (2008, p.148) expresses the importance of local influence in regional identity. Only when one has an extensive knowledge and experience of the specific region, can one try and create a truthful identity.

Regional identity has been integrating in society, for example, a Google search of 'regional identity' finds 958.000 results (loaded 27th November 2018). This shows the worldwide acceptance of the concept and indicates the importance of the resurgence of the region. However, a large amount of web-pages understand the concept of regional identity as a significant aspect of economic competition and tourist promotion of regions (Paasi, 2009). These aspects relate to regional branding, instead of regional identity, in promoting a positive and attractive image of the region that is used to attract a certain

target group, and not primarily focussing on representing the unique characteristics of the region.

Regional branding

Regional branding focusses on constructing a positive image which makes people want to attach themselves to this particular region (Kavaratzis, 2007). Regional branding actually relates to the strategy of place marketing, which was inspired by marketing strategies in business (Kearns & Philo, 1993; Kotler et al., 1993; Margarisová & Vokáčová, 2016). Various scholars have also confirmed that general marketing principles can be applied in the enhancing of regions competitiveness and branding (Ashworth & Kavaratzis, 2009; Kemp et al., 2012; Zemla, 2013). An important factor in marketing is satisfying the set target group(s). Knowing the target group(s) for region branding is important, as this determines the type of image that ought to be constructed (Hospers, 2004). In an analysis of existing campaigns of region branding in Europe, three main target groups are important in regional branding: visitors, companies, and inhabitants (Stadt Aachen, 2012; Economische Samenwerking Zuid-Limburg, 2014; Stad Gent, 2017; Maastricht Marketing, 2017; Be Berlin, 2018; etc.). These relate to regional branding's three main purposes, which respectively are tourism, economy, and liveability. Visitors who seek leisure activities, are focussed predominantly on cultural and entertainment facilities. They are looking for an experience that can be found nowhere else, and are not familiar with the place yet. Attracting companies calls for a different approach, as they are focussing on accessibility and connection to various markets. The quality of life in a region is important for maintaining current residents, and attracting possible new residents. These three purposes are interrelated and have effect on each other, which can often be found in region branding strategies. As said before, each region has a unique set of characteristics and will therefore focus on a specific type of target group(s). For example in the Zuid-Limburg region in the Netherlands, the main

slogan of the campaign was "Zuid-Limburg, je zal er maar wonen!" (Zuid-Limburg, you could be living there!) It could be easily changed in "Zuid-Limburg, je zal er maar werken!" (Zuid-Limburg, you could be working there!) This example shows the integration of branding for economy and liveability, which need to be tackled in this region.

Within Europe, region branding has heightened over the last decades. European Regions are competing increasingly over these residents, companies and visitors (Hague & Jenkins, 2005; De Pater, 2011a). In order for a region to be attractive, European regions wish to be a 'high profile' region. This has led to most of the regions – especially in Western Europe – developing a rich supply of infrastructure networks, universities, high-quality shops, museums and theatres. However, the result of this is contradictory, as all regions end up looking relatively similar in physical aspects (Margarisová & Vokáčová, 2016). This spatial result is particularly seen in the 'Blue Banana', one of Europe's metropolitan zones. It has become a relatively homogeneous and prosperous area, in which regions resemble one another, the trend of McDonaldization is now also observed in the geo-economic landscape of Europe (Hospers, 2004). As the spatial context does no longer determine the behaviour of targeted groups – residents, companies, visitors – other factors have become increasingly important, the so-called 'soft location factors'. In addition to investing in local amenities, places must use their unique elements to be able to create an image for their place (Hospers, 2014; Riza et al., 2012). The image based on soft factors of a region is about the relation between the people and the physical land, the regional identity. It focusses on the positive, unique factors of the region and tries to represent these understandably and attractively for outsider's. An essential role of place marketing is the creation of a positive comprehensive image of the place (Medway & Warnaby, 2008). When used correctly, it will acknowledge the region's identity and use this in region branding. However, one of the most occurring pitfalls of region branding is the tendency to lose sight of the actual citizens

and local identity of the area (Ji, 2018). Political gains and economic advantages become the main driving force behind image creation for the region, in which achieving goals is more important than truthfully representing a region. This diminishes the position or regional identity as the foundation of regional branding.

Image Building

Region branding and region identity both address the issue of 'image building' or 'image construction', the attempt to make a region visible and create an understandable and attractive image of something, or in this case, a region (Collins English Dictionary, 2018). To be able to 'make a region visible', it implies that the physical level of regional space can be experienced in different ways (Stein & Schultz, 2008). It includes both the technical side of the landscape and the psychological side of experience and emotional focus. The influence of experience and emotional focus leads to a subjective level in image building. It creates a pair of glasses through which one sees reality. Construction of a regional image includes different levels, which will be explained below, these include regional identification, the influence of actors involved, and the perception of the perceiver. These have an effect on the perception of reality, and determine how big the difference is between reality and 'real' reality (Groote & Druijven, 2011).

Regional identification is actually a type of categorisation, including personal influences, with the goal to construct an image of the region (Paasi, 2003). The constructed image can be used for regional branding. An image of a region is created with a certain goal, to attract tourists, companies or families, to stimulate growth in the region, or to put a new region on the map. The image is influenced through the perception of both the target group and the actors creating the image (Groote & Druijven, 2011). The aim of the image determines the target group, and with this the focus of the image creation. The image should address their demands and wishes and should be appealing to

their specific visions. This is the first layer of subjectivity that plays a role in the creation of the image.

The second layer is created by the actors involved in the process, resulting in their visions and experience being included as explained in the previous paragraph. It is therefore important to carefully examine what actors are involved in the creation of a regional image. Influential actors who maintain an adequate amount of power in the process, might lead to a distorted image in which the reliability of the image should be questioned, as it has probably been influenced to create the goal they want to achieve (Groote & Druijven, 2011).

The constructed image has a foundation of regional identity, and should be influenced as least as possible by the actors involved in the process of image building. Yet, the success of the constructed image is mostly determined by the people's perception. People construct an image of a place themselves, based on existing memories of resembling and alternative places. As they cannot know all alternatives, their perception is limited to marketed knowledge (e.g. statements in the media, advertisements), with addition of their own base of knowledge and experience. Therefore they construct their personal image of reality, and is the knowledge they have of a place influenced by previously visited places and external sources (Hospers, 2004). This shows that another level of image building adds to the equation, the image the perceiver creates of the already constructed image of a place or region.

It is important to be careful when creating visualisations of a region, whether this be images, words or feelings, to not fall prey to clichés and lose sight of the identity of the region (Stein & Schultz, 2008). This could lead to an imbalance between the 'real' reality and the reality that is depicted through the constructed image. Next to that, it also proves difficult to visualise a type of area that has been ignored up until now, and for which no adequate images or concepts exist (Sieverts, 1997). Prior experience and knowledge play a significant role in image building, when no existing imagery exists, this complicates the

process.

The SAUL project in the Southern Region of Luxembourg is an example of a project focussing on regional identity as foundation of regional planning. The projects tends to transform a former industrial area to a location for modern services (Stein & Schultz, 2008). The project is sponsored by the EU and by the Luxembourg Ministry from 2004 to 2006. The project explored how regional identity could be created through a planning culture based on partnership building. Municipalities, associations and citizens were included in the process, which enabled an integration of different points of view. This integration has led to a shared experience of space, creating new perspectives for each actor. In the example of Luxembourg the pitfall of

Conclusion

Regional identity is often mistaken for regional branding, or exploited for wrong purposes. This paper has discussed the link between regional identity and regional branding and the influence of image building in this process. As regional identity is a crucial aspect in regional branding, and regional branding is significant in representing a region to outsiders, the relation should be clear. It is important to discuss the role of regional identity in region branding, as European regions have become a key role in the European network of space. The new question of territory has led to the introduction of a 'Europe of regions', for which the complex relationship between borders, governance, and identity is its foundation. The influence of regional identity is important as it embodies the essence of a specific region, the extent to which a person can recognize or recall the distinctiveness of a region, and the sense of belonging and attachment to a region.

Image building is a significant concept in both regional identity and region branding, used to visualise a region. It includes the influence of experience and emotional focus, next to the technical side of the landscape. It introduces a subjective level in image building, by creating a pair of glasses through which one sees reality. Construction of a regional image includes different levels of subjectivity: regional identification, the influence of actors involved, and the perception of the perceiver. This shows that it is a complex layering in which multiple perspectives overlap and have an effect on the perceived reality.

The identity of the region concerns the image of the region, and can be divided in two parts the insider's and the outsider's view. The first refers to images created by the inhabitants of the region, the latter to those living outside the region. In region branding, the image is often focussed on constructing a positive image which makes people want to attach themselves to this particular region, it focusses on the positive, unique factors of the region and tries to represent these understandably and attractively for outsiders through the creation of a regional identity. Only when one has an extensive knowledge and experience of the specific region, can one try and create a truthful identity. Yet in regional branding, often political and economic gains are the main driving forces behind image creation for the region. This results in the exploiting the concept of 'regional identity' for personal gains, in which achieving goals is more important than truthfully representing a region. An imbalance between the 'real' reality and the reality that is depicted through the constructed image is created, diminishing the position of regional identity as the foundation of regional branding. It is important to be careful when creating visualisations of a region, to not fall prey to clichés and lose sight of the identity of the region. Regional identity embodies the unique essence of a region, is important in creating a sense of belonging and attachment for inhabitants, and in defining the distinctiveness of the regions as recognized by outsiders. It should be used in a spatially sensitive approach, to prevent misuse and generalisation.

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