

# Creating a New Concept for Mixed-Purpose Cycling Connections

Combining Utilitarian and Recreational Cycling –  
The Case Project of Roermond and Mönchengladbach

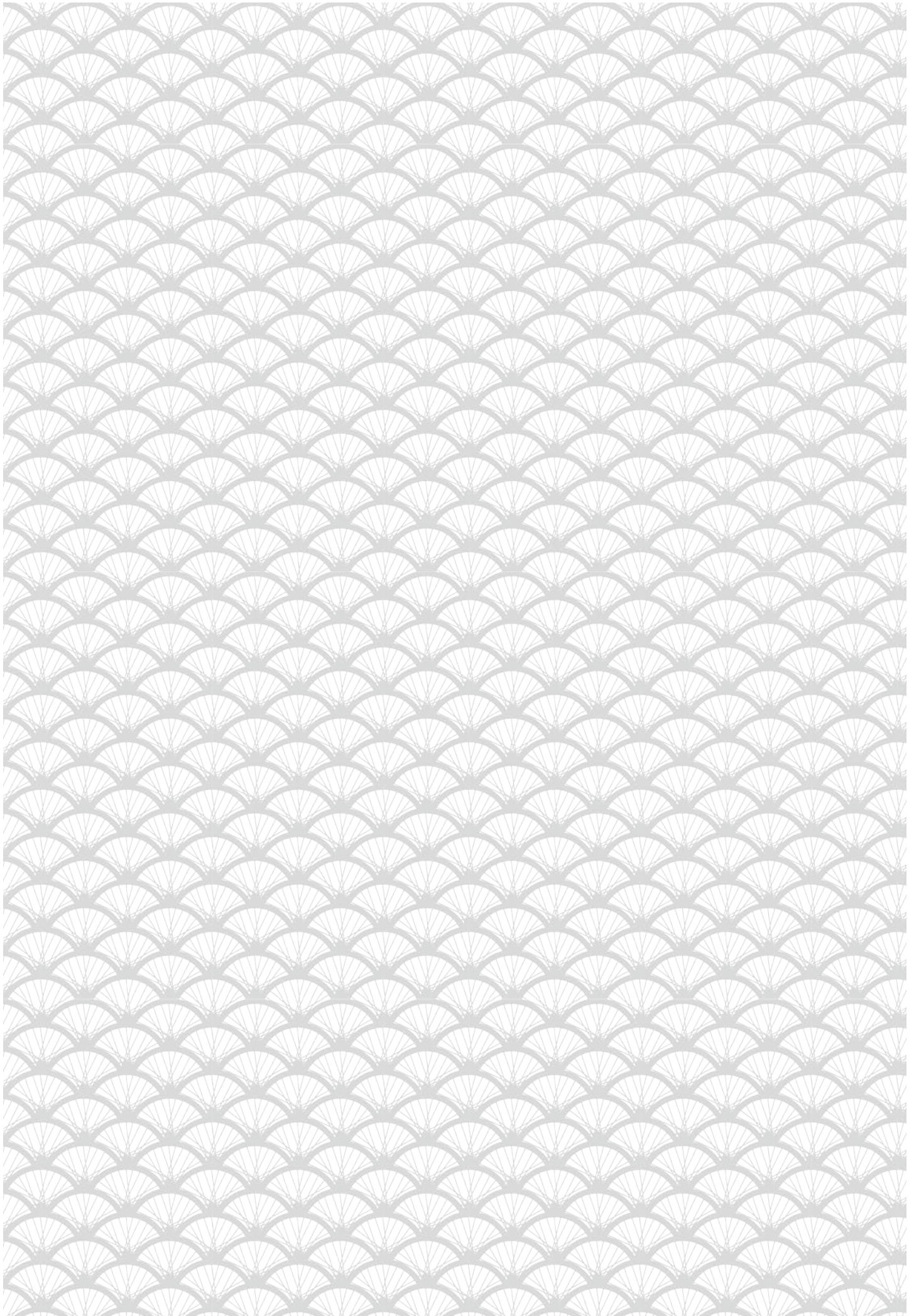


## Bachelor Thesis

As Part of a Four-Month Internship at SOAB  
for Breda University of Applied Sciences

4 June 2020





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As Part of a Four-Month Internship at SOAB  
for Breda University of Applied Sciences

by

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Breda, 4 June 2020

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# Preface

This bachelor thesis was made during the graduation internship at SOAB, Breda as part of my International Spatial Development studies at the Breda University of Applied Sciences. During the four years of living in the Netherlands, I learnt to appreciate and admire the Dutch cycling infrastructure and cycling culture in general. Therefore, it was very interesting for me to dive deeper into the Dutch approach of cycling planning.

I met Ms. Ineke Spapé already during my studies in different classes as well as in my minor, which took place in the semester before the internship. Already two times during my studies, I joined the cycling-related 'Freshbrains' projects, which she is leading together with the German University of Wuppertal. As part of the Freshbrains project, we went together as a group of students and teachers to the German cities of Kassel and Bonn to develop and present different measures to stimulate cycling in these places. Also, during my minor, I worked with a group on tackling the urban sprawl and empty downtown of the Canadian city of Calgary by stimulating cycling with different measures.

These experiences – working and learning from Ms. Ineke Spapé and gaining knowledge about the planning of cycling – have led me to do my internship at SOAB in Breda.

The internship, which took place from February till June 2020, was affected by the consequences of the COVID-19 pandemic as I worked in the home office from mid-March. I am grateful that I still could accomplish this internship in such uncertain times, even though it is a pity that I could not exploit the full potential of the internship due to the complicated situation. However, especially regarding cycling, the pandemic and its consequences had an interesting influence on cycling in general, which will be also addressed later in this report.

Many thanks to Ms. Ineke Spapé and the rest of SOAB for the internship and the supervision – face-to-face or in many video calls – especially in such difficult times.

Many thanks to Ms. Zhan Goosen, my university supervisor, who supported me writing this report and was always available for any help needed.

Many thanks to the participants of the Roermond-Mönchengladbach project, the participants of the workshop, all interviewees, and everyone else, who supported me during the process of this thesis.

Wanja Schmidt-Schädel

Breda, 1 June 2020



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# Abstract

Due to globalisation and open borders in the European Union, the importance of cross-border traveling and commuting has increased. Consequently, the importance of proper international cycling connections increases. Mainly, there are concepts for recreational or utilitarian cycling connections, but as many of them approach both focal points, there is potential for a creation of a mixed-purposes cycling connection.

SOAB conducts together with Mr. Arne Blase and Mr. Jörg Thiemann-Linden a feasibility study for the implementation for a mixed-purpose cycling connection between Roermond (NL) and Mönchengladbach (D). The main research question is as follows: What is the best concept for mixed-purpose cycling connections in the Netherlands, Germany or elsewhere that contributes to the local liveability, accessibility, economy and the environment in the respective regions? The question is divided into eleven sub research question, which the report will answer. The research was mainly done by desk research with mainly qualitative and some quantitative data.

After the first introduction chapter, the second chapter Theoretical Elements of Cycling Connections looks into the theory of cycling connection starting with the history of the bicycle, which was invented as a result of a dying of horses in 1817. E-cycling seems to have the potential to become a game-changer.

The benefits of cycling, which are further explained, deals with social, technical, economic, environmental, and political benefits of cycling. It shows that cycling is healthy for the general fitness and several diseases. Also, the local economy can benefit from cycling as a cyclist spends on average €16 during a day trip and even €353 per multi-day trip. Furthermore, the differences of cycling cultures are explained. In the Netherlands, where cycling is a big part of daily mobility, the orgware measures are more established in planning than in Germany. Also, in Germany the difference of cycling in urban and in rural areas are noticeable.

Existing cycling concepts are explained. The Nordbahntrasse in Germany is a good example for a cycling connection, which did begin with orgware measures. Further interesting cycling concepts are the Knooppunten network, the LF routes, the cycling connection Breda–Etten-Leur and others. The findings of the chapter are concluded as building blocks, which will be integrated later on.

The third chapter Practical Elements – Case Project: Roermond–Mönchengladbach deals with the case project of the creation of a mixed-purpose cycling route between Roermond and Mönchengladbach. The cycling connection is planned to run from Roermond via Roerdalen and Wegberg to Mönchengladbach. In the two cities on both ends, the cycling connection will have a utilitarian focus and in the middle part, which is characterised by touristic attractions as mills, museums, parks and hotels, has a recreational focus.

A potential route between Roermond and Dalheim at the German border, could be planned on the Iron Rhine railway, which is a former rail connection between the harbour of Antwerp and the German Ruhr area. While some parts of the railway are still used, the part in this area is abandoned.

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The STEEP analysis shows different potentials of the route such as placemaking, the big economic potentials, environmental aspects as a fire in De Meinweg in April 2020. The stakeholder analysis approaches the different stakeholders of the project and shows the estimated interest, power and attitude regarding the project. The next part is about the workshop(s) of the project. During the internship, two workshops were planned. While the first (11 March 2020) could take place, the other workshop (28 April 2020) and site visits had to be cancelled due to the COVID-19 pandemic. Nevertheless, the first workshop, which did take place was a big success and brought interesting findings and ideas for the cycling connection.

As in the previous chapter, the findings of this chapter are concluded and transferred into building blocks. The fourth chapter Integration of the Building Blocks merges the findings of the previous two chapters. The integration leads to the bow tie concept, which aims on bringing the people from the outer urban areas into the recreational heart. The last chapter Conclusions: Addressing Research Questions gives a final conclusion by addressing the research questions, and mention recommendations.

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## List of Acronyms

| ACRONYM | MEANING  |
|---------|--|
| ADFC    | Allgemeiner Deutscher Fahrrad-Club ( <i>German National Cyclists' Association</i> )                              |
| CAWI    | Computer Assisted Web Interview  |
| EP      | European Parliament  |
| EU      | European Union   |
| Horeca  | Hotel, Restaurant, Cafe ( <i>i.e. Hospitality Industry</i> )   |
| HSO     | Hardware, Software, Orgware  |
| NRW     | North Rhine-Westphalia   |
| POI     | Point of Interest  |
| RSV     | Radschnellverbindung ( <i>A specific German concept of a Cycling superhighway</i> )                              |
| STEEP   | Social, Technical, Economical, Environmental, Political  |
| USP     | Unique Selling Proposition   |
| VM NRW  | Ministerium für Verkehr des Landes Nordrhein-Westfalen ( <i>Ministry for Traffic of North Rhine-Westphalia</i> ) |

## List of Definitions

| TERM                              | DEFINITION   |
|-----------------------------------|--|
| COVID-19 pandemic                 | Also known as the <i>coronavirus pandemic</i> , is a pandemic of the <i>coronavirus disease 2019</i> (COVID-19), which caused worldwide lockdowns and shutdowns by March 2020  |
| Cycle super-high-way              | A bicycle route specialised on long-distance traffic and fast traveling with specific features such as small numbers of crossings, priority for cyclists, and high-quality surfaces (sometimes with strict requirements as in the case of the <i>RSV</i> in Germany) |
| Cycling connection, cycling route | A strong linkage of cycling infrastructure between two or more places, sometimes with high-quality surfaces and signage, higher priority at junctions, and other characteristics   |
| EU-28                             | Member states of the European Union until January 2020 (including UK)  |
| Interreg                          | A European programme to stimulate cooperation between regions in and out of the EU, which is funded by the European Regional Development Fund (ERDF)   |
| NRW                               | A federal state in western Germany, and home of Mönchengladbach and Wegberg  |



# 1

## INTRODUCTION



*Cycling path markings (CC0, 2017)*

## 1.1 Point of Departure

Europeans spend on average 1 hour and 24 minutes on daily commuting, while travelling 28.56 kilometres (SD Worx, 2018). Trips in free time and with recreational purposes come in addition to these numbers. Each transport mode has different advantages and disadvantages regarding costs, travel time, comfort, sustainability, and other aspects. In the wake of climate change awareness, high petrol prices, and clogged streets; it is important to focus on alternatives to motorised personal transport modes.

Due to globalisation and open borders in the European Union, the importance of cross-border traveling and commuting has increased. Consequently, the importance of proper international connections and sustainable traffic increases.

The current COVID-19 pandemic shows that the demand for cycling has increased dramatically. The bicycle has resulted to be, due to the pandemic, a relatively safe transport mode taking into consideration the compliance of distance regulations compared to public transport, for instance (Weißenborn, 2020). As many countries have established measures such as lockdowns, shutdowns, and quarantines, which force people to stay at home for an unprecedented amount of time, cycling has acquired greater attention as a way of exercising (van Schaik, 2020). Not least because of the positive health impact on the lungs, the blood pressure, the prevention of cardiovascular disease and other numerous health benefits, cycling is an ideal choice – during the pandemic, but also in general (Weißenborn, 2020).

As the previously mentioned points show, cycling is becoming increasingly important as a planning subject. Therefore, it is crucial to research on new cycling concepts in order to exploit the potential that cycling brings. The following presents the structure of the first chapter of this report.

The first chapter *Introduction* goes into the general framework of this report. The *Context Orientation* elaborates on the background of the research report, which is done for SOAB as part of the graduation internship as the bachelor thesis. Therefore, SOAB works together with two traffic planning offices and a collaboration of Dutch and German municipalities on a project of a cross-border cycling connection, which focuses on both utilitarian and recreational (referred to as mixed-purpose) cycling.

The *Problem Statement* explains the issue to be tackled by the research. Due to the globalisation and the open borders in Europe, travelling becomes more important and thus, a good infrastructure is required. Furthermore, due to the ongoing climate change, sustainability becomes a key element in the planning.

This problem leads to the *Objective* – the promised outcome of the research – which is the creation of a concept for mixed-purpose cycling connection, which can be used as a standard for further similar projects.

The *Research Question* for reaching this objective is: 'What is the best concept for mixed-purpose cycling connections in the Netherlands, Germany or elsewhere that contributes to the local liveability, accessibility, economy and the environment in the respective regions?'



Further *Sub Research Questions* are among others about cycling cultures in the Netherlands, Germany, and other countries, existing utilitarian, recreational, and mixed-purpose cycling concepts, and the destinations (points of interests) cycling connections servers.

Furthermore, the *Research Model* visualises the steps to be fulfilled during the research. The *Conceptual Model* is a variant of a mind map, which clusters all topic-related terms and ideas for a clear overview of the subject matter. Eventually, the *Methodology* reveals the research methods, which are used during the research, which eventually was mainly focused on desk research due to the COVID-19 pandemic, which limited the possibilities for field research for example.

## 1.2 Context Orientation

This research report is part of the graduation internship of the International Spatial Development studies at Breda University of Applied Sciences. The supervision from the university is conducted by Ms. Zhan Goosen.

The employer of the research is the urban advice company SOAB, located in the Belcrum water tower in Breda. The internship supervision from the company is conducted by Ms. Ineke Spapé.

The topic of this bachelor thesis is the creation of new concept for mixed-purpose cycling connection with example of a case project of an international cycling connection between the Dutch city of Roermond and the German city of Mönchengladbach.

The client of this case project is a Dutch-German cooperation of the city of Roermond, the municipality of Roerdalen, the town of Wegberg, and the city of Mönchengladbach. Wegberg functions as the lead partner in this "Interreg V A"-project, which aims on stimulating cooperation of regions in the European Union and is funded by the European Regional Development Fund.

Together with the German traffic planning consultancies *AB Stadtverkehr*, under the direction of Mr. Arne Blase, and *büro thiemann-linden stadt & mobilität*, under the direction of Mr. Jörg Thiemann-Linden, SOAB develops solutions for the planned cycling connection between Roermond and Mönchengladbach.

## 1.3 Problem Statement

Cycling connections usually have either a utilitarian or a recreational purpose. Depending on that purpose, different characteristics of the route vary. For instance, the speed and traffic safety aspects play a key role for utilitarian cycling connections, which focus on commuting with least possible decelerations. Recreational cycling connections, on the other hand, focus less on travel speed, but more on the experience during leisure cycling. Therefore, the (natural) surroundings, landscapes and touristic destinations are the centre of attention.

However, existing concepts of cycling connections usually focus on one main purpose – a concept for mixed-purpose cycling connections does not exist yet. Utilitarian cycling routes often have very high-quality standards – standards, which even might be excessive at some points, when considering the cost-benefit-ratio. Specifically, many inter-city cycling connections waste potential when focusing only on utilitarian cycling and not using the potential of recreational cycling in the rural areas in between.

## 1.4 Objective

The objective of this report is the creation of a concept for mixed-purpose cycling connections, which combines utilitarian and recreational cycling. Ergo, characteristics from both purposes must be considered where, it serves the advantages of a utilitarian cycling route by offering a fast, high-quality connection as well as the advantages of a recreational cycling connection by exploiting the recreational potentials. These potentials include the link to nature, the strengthening of the local economy, and the connection to several points of interest with partly utilitarian (e.g. schools and businesses) and partly recreational (e.g. parks and mills) purpose.

## 1.5 Research Questions

### 1.5.1 Main Research Question

What is the best concept for mixed-purpose cycling connections in the Netherlands, Germany or elsewhere that contributes to the local liveability, accessibility, economy and the environment in the respective regions?

### 1.5.2 Sub Research Questions

1. How is cycling part of today's culture?
2. What are the benefits of cycling?
3. Which potentials do mixed-purpose cycling connections offer?
4. Which utilitarian, recreational, and mixed-purpose cycling concepts do exist already?
5. Who are the target groups of mixed-purpose cycling connections?
6. Who are the stakeholders and what are their interests?
7. Which places/points of interest should be connected?
8. How could the new concept be branded?
9. How could a design for mixed-purpose cycling connections look like?
10. Is there a demand for mixed-purpose cycling connections?
11. Could the concept for mixed-purpose cycling connections be used in other regions?

## 1.6 Research Model

The research model (Figure 1) shows the steps to be taken in order to conduct the research. The first step is the addressed problem and the consequent framing of the objective through the statement of task. That part also includes the research questions, the research model, and the conceptual model.

The next step is the inventory, which is divided into two chapters. Chapter 2 deals with the theoretical part such as the research on the historical background of cycling and its benefits, existing cycling concepts in the Netherlands, Germany, and other countries. Therefore, phone-/video-interviews and literature research were conducted. Eventually, the outcomes of this chapter are concluded as building blocks.

The third step is about the practical part of the inventory – the case project of a mixed-purpose cycling connection between Roermond and Mönchengladbach. For the project's research phone- and video-interviews were conducted as well as one workshop – another workshop, which was planned in late April 2020 had to be postponed due to the circumstances of the COVID-19 pandemic. Same applies on the site visits, of which only one was possible in combination with the workshop. Further site visits could unfortunately not take place anymore.

Eventually, also these outcomes were concluded as building blocks.

The fourth part is the integration of the building blocks. Fitting building blocks of the theoretical and the practical part were therefore linked together, and general conclusions were made and incorporated into the concept of mixed-purpose cycling connections.

The final step of the research model are the conclusions and recommendations.

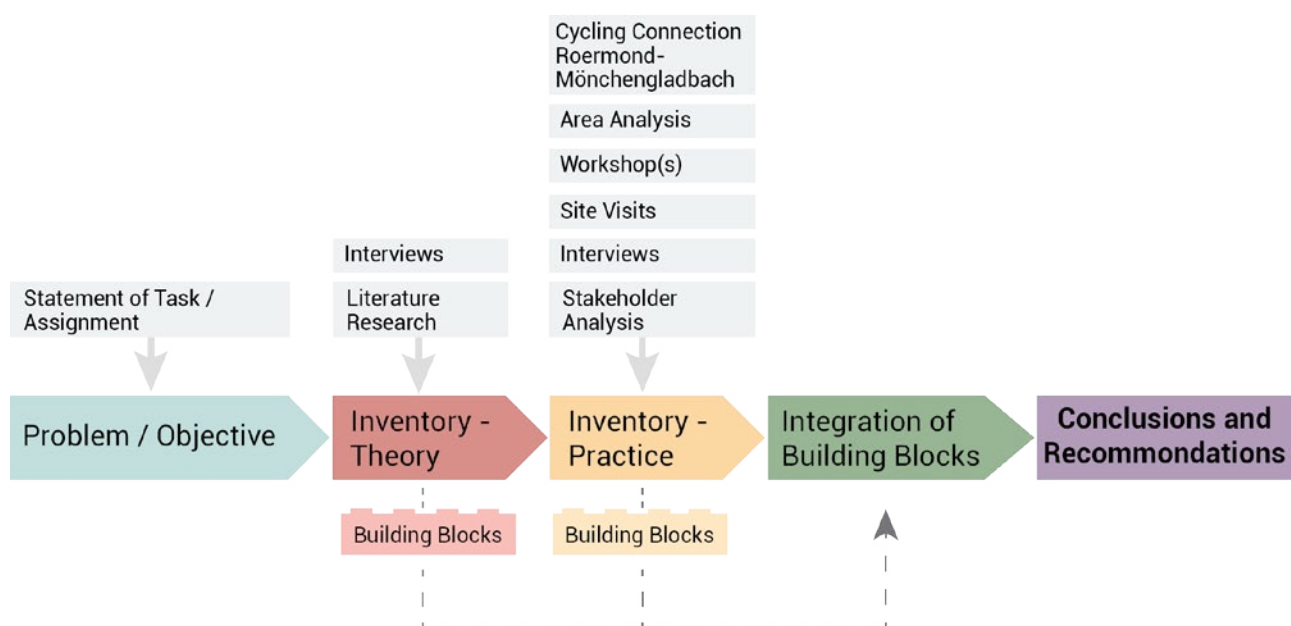


Fig. 1 – Research Model (Author's own construction, 2020)

## 1.7 Conceptual Model

The conceptual model (Figure 2) is a mind-map, which collects the elements related to the concept of mixed-purpose cycling connections. The points of the visual conceptual model overlap with the topics to be researched and it helps to keep track of the topics.

## 1.8 Methodology

The methodological approach for this research includes the use of existing data from publications of similar cycling projects in the Netherlands as the LF route network and Germany as the Nordbahntrasse. As the objective is about mixed-purpose cycling connections, the researched examples are mixed-purpose as well as utilitarian and recreational. Furthermore, statistical data from different reports such as the *Cycling Facts* of the *Netherlands Institute for Transport Policy Analysis* and the results of the CAWI survey *Mobility data across the EU-28 member states* were used to determine statistical data. As a qualitative method for this research, interviews with persons in authority, who have great knowledge of such projects already were conducted, namely Mr. Arne Blase and Mr. Jörg Thiemann-Linden, who are traffic consultants, and both involved in the project and have a great knowledge of cycling culture and concepts of cycling connections; Ms. Martina Hertel, research assistant at the German Institute of Urban Affairs *Difu* (Deutsches Institut für Urbanistik); and Mr. Arne Hansen, who is part of the cycling advisory board and presiding the committee for environmental, nature and climate prevention at the northern German district of Segeberg.

Also, through the frequent video calls with the company supervisor Ms. Ineke Spapé general knowledge as well as specific information of the project was gained.

Initially, field research on site including observation of the designated route with interviews were planned as well as several workshops. Due to the COVID-19 pandemic and its resulting restrictions and limitations, the research was mainly conducted via desk research. However, a first workshop took place in mid-March right before the beginning of the worldwide restrictions.

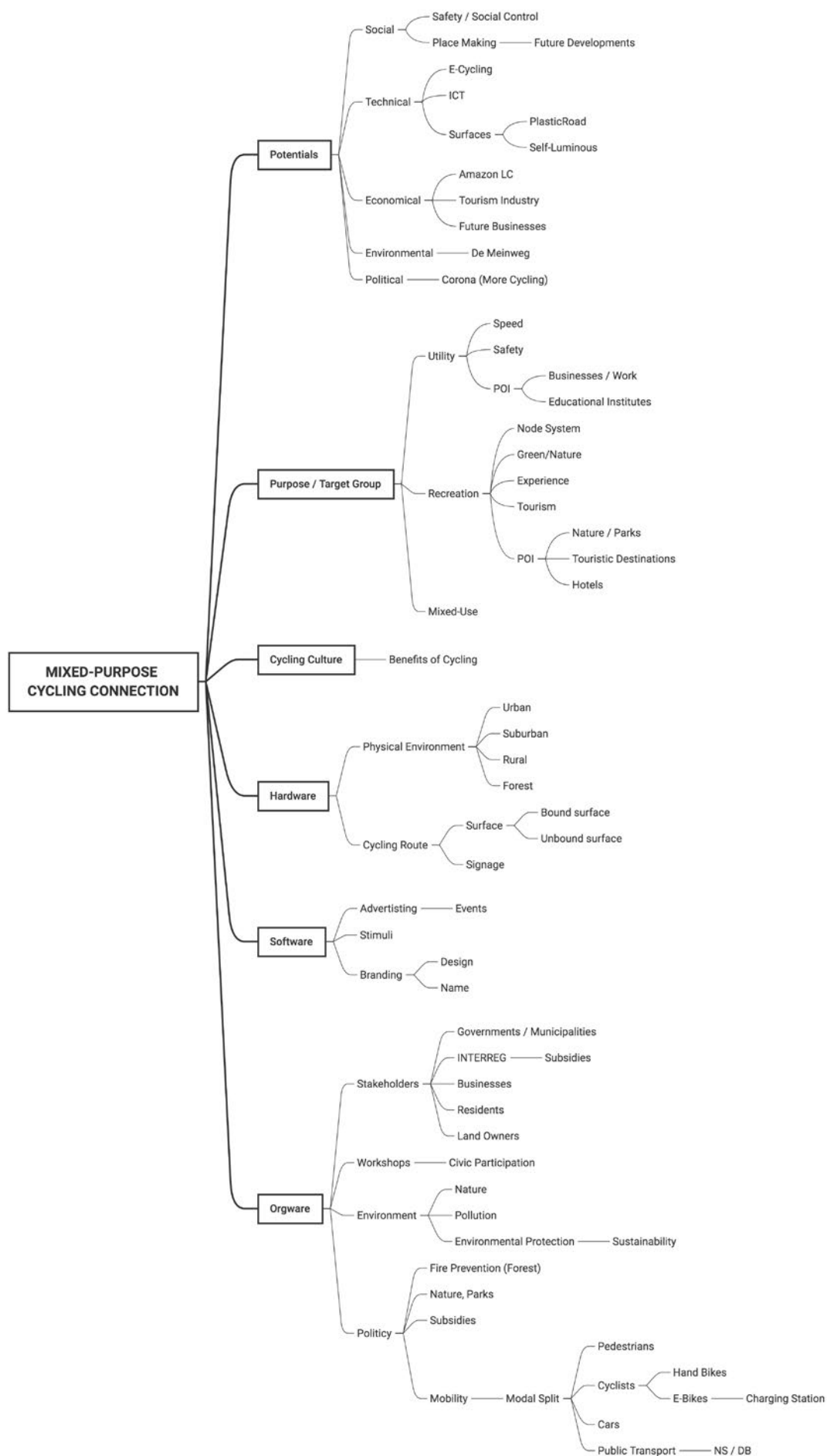


Fig. 2 – Conceptual Model (Author's own construction, 2020)



# 2

## THEORETICAL ELEMENTS OF CYCLING CONNECTIONS



*Nordbahntrasse, Kuhler viaduct (Bardolatzy, 2015)*



## 2.1 Introduction

The second chapter *Theoretical Elements of Cycling Connections* builds a foundation of required knowledge of cycling in order to fulfil a successful research. Therefore, the sub-chapter 2.2 *Background Information of Cycling* deals with cycling in general, and is divided into *History of the bicycle*, giving a brief overview about the chronicle of cycling, followed by *Benefits of Cycling*, elaborating on the advantages of the use of the bicycle, and eventually *Cycling as Part of the Culture*, exploring the commonalities and differences in the cultures of cycling in the Netherlands and Germany as well as other countries, where cycling plays a part in the culture.

The sub-chapter 2.3 *Cycling Connection Concepts* dives into existing concepts of utilitarian and recreational cycling routes. The concepts, which are categorised in the sub-divisions of *the Netherlands*, *Germany*, and *other countries*, are elaborated with the HSO-method by analysing the Hardware-, Software-, and Orgware measures, of which the integral approach of cycling planning consists of.

Eventually, 2.4 *Building Blocks of Theoretical Elements* concludes the results of the second chapter, which will later be combined with the building blocks of the third chapter in the chapter 4 *Integration of the Building Blocks*.

## 2.2 Background Information About Cycling

### 2.2.1 History of the Bicycle

The *Draisine* or *Laufmaschine* (German for *Running machine*) by German inventor Karl Drais is considered as the main forerunner of the bicycle (Figure 3). It was invented to replace horses in 1817 – one year after many of them starved due to the 'Year Without A Summer' (1816). The Draisine was powered by walking as it did not have a drive (Hadland & Lessing, 2014).

In 1866, the first cranked bicycle was invented in France, showing people that it is possible to balance on the bike while cranking. The Olivier brothers are recognised as the first, who produced cranked bicycles in significant numbers and spread them internationally. In the coming years, further inventions added up to come closer to the bicycle of today. That includes inventions as the tension-spoked wheel (1869), and the bush roller chain (1880), which is still a world standard.

John Kemp Starley invented the *Rover Safety Bicycle* in 1885 – the first rear-driving bicycle (Figure 4). With this and its other features, as the direct steering of the front wheel, wheels of similar size, and the diamond-shaped frame, it became the prototype of the modern bicycle. One year later, in 1886, the pneumatic tire was (re)invented by John Boyd Dunlop after it was firstly invented and patented by William Thomson in 1845, but soon forgotten due to lack of success.

One of the most-recent and game-changing inventions might be the e-bike (Figure 5). While there were already patents and first models of e-bikes in the late 19<sup>th</sup> century, it just got successfully established from the 1990s and especially the last few years as the e-bikes became more efficient, lightweight and affordable (Turner, 2013). In the recent years, the share of e-bike sales increased. In 2013, in the Netherlands, e-bikes had a share of over 20% in numbers, and in Germany, the sales made 10% in numbers (EPOMM, 2013). Nowadays, (in Germany) almost 30% of the sold bicycles are e-bikes (Rother, 2020). Due the restrictions of the COVID-19 pandemic (more in chapter 2.2.3.5 *Cycling Culture during the COVID-19 Pandemic*), sales of e-bikes sometimes even outpace regular bikes now, which is likely related to the over-proportional daily cycle use during the pandemic (Ricker et al., 2020).



Fig. 3 – Inventor Karl Drais on the Laufmaschine (EPD, n.d.).

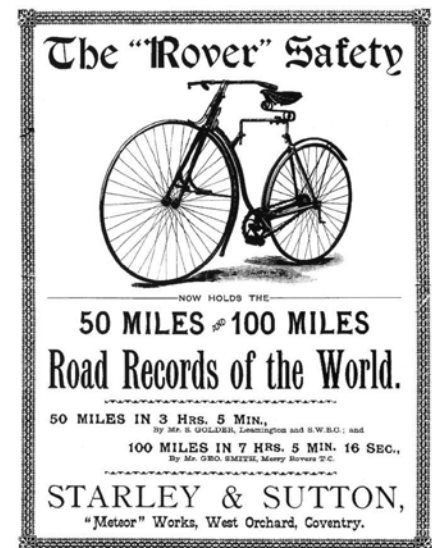


Fig. 4 – Advertising for the Rover Safety Bicycle (MIT Press, 2014)



Fig. 5 – The 2020 electric bike Gazelle Arroyo C7+ HMB Elite (Gazelle, 2020)

## 2.2.2 Benefits of Cycling

### 2.2.2.1 Social Benefits

An important category of benefits – and maybe the most relatable category for many people – are personal benefits such as health aspects. Cycling can prevent several chronic diseases such as cardiovascular diseases, or diabetes (Panter et al., 2016). Also, cycling is very effective against obesity and frequent cycling improves the general physical fitness. Employees that cycle regularly have on average 1.3 days less absence due to sickness every year (Hendriksen et al., 2010).

However, the social benefits not only include health benefits, but also safety aspects. Generally, it can be said that the more people use a public space, the higher is the social safety (Gehl, 2010). Thus, an increase of cyclists (and pedestrians) can help to decrease crime rates and increase the safety. This improved social environment can then again have an impact on the number of cyclist users as it was shown that e.g. children rather take the bike to school in environments, which perceive high social control in the environment (McDonald et al., 2009).

### 2.2.2.2 Technical Benefits

Cycling does not only save costs directly for the user as it has very low acquisition- and running costs compared to individual car use or public transport, it also saves a lot of money for the municipalities as the cycling infrastructure is cheaper and needs much less maintenance. On average, a kilometre of a cycle superhighway costs €0.9 M, a kilometre of main road €4 M, and a kilometre of highway €18.6 M (Difu, 2019).

Cycling ways have the advantage over car infrastructure by requiring less space by surface as cars are wider than bicycles. Hence, cycling infrastructure can save space, which can be used for other purposes, as well as it can save materials, which are used.

Usually, the surface of cycle routes consists of bound materials as tarmac or asphalt, or unbound surfaces as granite dust (Paths for All, 2018). Additional to those materials, there are other innovative projects for (cycling) surfacing, such as the *Plastic Roads*, which is a surface made of recycled plastic and saves 50-70% of CO<sub>2</sub> emissions compared to concrete or asphalt paths. In 2018, two pilot cycling paths have been opened in the Dutch cities of Zwolle and Giethoorn, and in May 2020, the producers KWS, Wavin and Total Oil announced that the 18-month pilot phase was successful and the PlasticRoad can be launched on the market in the first quarter of 2021, beginning on Dutch market and in neighbouring countries (DutchNews, 2020).

Other pilot projects were made for solar panel cycling surfaces, and self-luminous surfaces as for example in Poland and the Netherlands (Finger, 2017).

### 2.2.2.3 Economic Benefits

Furthermore, cycling plays an important role for the economy with its economic value as for example cycling tourism creates approximately 525,000 jobs in the EU, and creates an economic value of around €44 B per year. In comparison, cruise tourism 'only' creates 326,000 jobs and an economic value of €38 B (EP, 2012). On average, cycling day trippers spend €16 per day, and multi-day cycling tourists, like touring and regional cyclists, spend daily €76.50 (including around €43 for accommodation (ADFC, 2018)).

In 2017, around 10% of the sold bicycles were e-bikes (CONEBI, 2018). Nowadays, it is almost 30%, and now even increasing more due to the COVID-19 pandemic (Rother, 2020; Ricker et al., 2020). That big growth shows the potential of the e-bike and its big advantage compared to normal bikes: Proportional to a growing number of e-bike users, the average cycling distance is expected to grow, which leads to more potential for (especially longer-distance) cycling connections. Also, the e-bike does not only increase the distance, but it makes cycling more attractive for many people, which could result in people taking the e-bike, who did not cycle before at all.

### 2.2.2.4 Environmental Benefits

Some of the major benefits of choosing the bicycle as a transport mode are the environmental benefits as the saving of CO<sub>2</sub> emissions. The emissions saved in the EU due to cycling equals more than 16 million tons of CO<sub>2</sub> equivalents annually, which equals the total annual CO<sub>2</sub> emissions of a country like Croatia. Additional to the saved CO<sub>2</sub> emissions, cycling also reduces air and noise pollution and indirectly even soil and water pollution since cycling infrastructure demands less surface than car infrastructure, which has an impact on the quality of soils and water.

### 2.2.2.5 Political Benefits

With an increasing cycling culture and more cyclists in the streets, cycling will be an increasingly important topic in politics. Green movements, which happened in many countries recently, can enlarge this demand for the cycling community even more. Therefore, a good cycling infrastructure with everything that goes with it, can become political main topics, especially on a local level.

Thus, investing in cycling partly is and can become an important aspect for politicians to get voters. Private persons as well as entrepreneurs and businesses could increase the pressure on politics to invest in more liveability in cities, which cycling is a part of. Also, the current situation regarding the COVID-19 pandemic shows already a growing demand as the calls for better cycling infrastructure got louder (Beech, 2020).



### 2.2.3 Cycling as Part of the Culture

Due to the invention of the new safety bicycle in 1885, cycling became rapidly popular from the late 19<sup>th</sup> century on, as for most people it offered a long-distance mode of transportation for the first time. It offered people to travel beyond their own community which even had a strong impact on the more recent human evolution as the number of potential marriage partners highly increased, which resulted in a widening of the gene pools (Manners, 2015).

However, after World War II, many European cities were largely destroyed and were rebuilt in the following decades. Upon the emergence of the car in this time, most of those cities were rebuilt in a car-oriented way. This car-oriented reconstruction of cities resulted in long travelling distances, increased numbers of (deadly) accidents, and empty cities (Zuegel, 2018).

Nowadays, there are big differences regarding cycling in the different cultures. The Netherlands became one of the best cycling countries worldwide, and thus, are a role model for any country regarding cycling. Also, Germany and other countries are worldwide seen as forerunners, even though there can be noticeable differences among the cities in these countries. It is worth to mention that in those countries the share of commuting cycling is relatively high, while in many countries where cycling does not have a high modal share, cycling is more seen as a recreational activity (Fiorello et al., 2016).

The following subsections deal with the cycling cultures in the Netherlands, Germany, and other countries, and eventually, shows a comparison of the cycling in European countries.

#### 2.2.3.1 Cycling in the Netherlands

As in many other countries, also Dutch cities were largely car-oriented after the mid-20<sup>th</sup> century. After the death toll (with hundreds of children among) rose due to the increased car traffic and thus increased accidents, the pressure group "Stop de Kindermoord" (Dutch for: *Stop the Child Murder*) was established in 1973 (Figure 6). The objective of the group – pointing out the large number of deaths to children – eventually influenced the Dutch government to rethink the traffic planning and start building segregated cycling paths. The result of this action was an increase of cycling and a decrease of the death toll (Hembrow, 2011).



Fig. 6 – 'Stop the child murder'-protests (BicycleDutch, 2011)

Especially, in younger age groups (under 30 years old) the use of the bicycle is high and even increased from 2005 to 2016. The high bike share is related to the increased participation in education as well as this age group domiciles increasingly in urban areas, which has shown has an impact on the use of the bicycle (KiM, 2017). Also, the bicycle shares of the over-60 years old age group has increased in the

period from 2005 to 2016, which can be attributable to the improved general health situation in this age group as well as the ongoing increase of e-bikes (KiM, 2017).

Nowadays, cycling is a big part of the Dutch culture and everyday life. Figure 7 shows that 27% of the trips in the Netherlands were done by bicycle in 2016. While still the longest share of the distance travelled by bicycle is for recreational purposes (37%) (Figure 8), it is noticeable that almost half of the distance travelled by bicycle is to work or education (24% and 20% respectively) (OVIN, 2016).

Trips by mode of travel (NL)

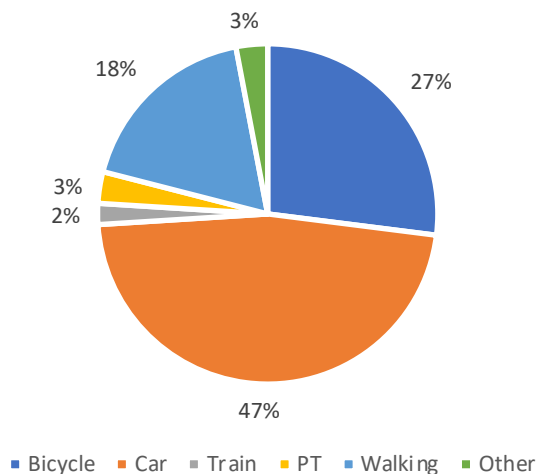


Fig. 7 – Modal Split of passenger traffic in the Netherlands (KiM, 2018)

Bicycle kilometres by purpose (NL)

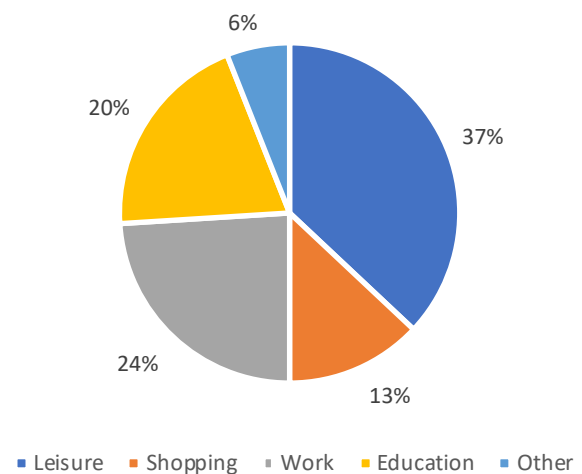
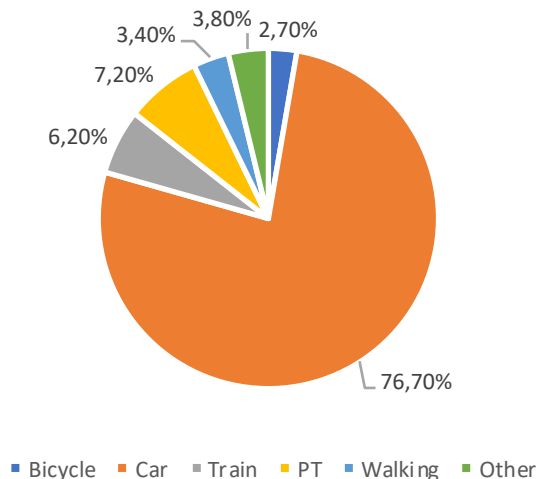


Fig. 8 – Distribution of bicycle kilometres by purpose in the Netherlands (KiM, 2018)

### 2.2.3.2 Cycling in Germany

Even though, Germany has not reached the Dutch level of cycling yet, on a worldwide scale Germany can be considered as a cycling country. As it can be seen on Figure 9, the cyclists in Germany form 3.1% of the modal split of passenger traffic in 2018, with a plus of 0.4% compared to 2003 (BMVI, 2019).

Modal Split of passenger traffic (D, 2003)



Modal Split of passenger traffic in (D, 2017)

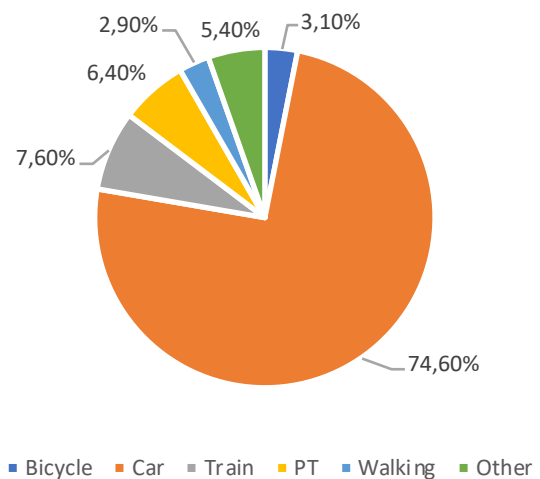


Fig. 9 – Modal Splits of passenger traffic in Germany, 2003 and 2017 (BMVI, 2019)

Figure 10 shows the Distribution of bicycle trips by purpose. With 36% of the total cycling trips, the biggest share are trips with recreational purpose as visits or recreational tours. Including the next biggest shares, grocery shopping (22%) and other private actions as visits to the doctor, it adds up to 70% of private trips. Trips to work or education make 23% of all trips. Generally, segregated cycling lanes are common in Germany and create a big network of the cycling infrastructure.

From 2021, seven German universities will offer bicycle traffic study programmes. Therefore, the Federal Ministry of Transport and Digital Infrastructure (German: *Bundesministerium für Verkehr und digitale Infrastruktur*) subsidises the universities with the maximum subsidy of €400,000 each. The study programmes are planned to participate in the transition towards an increase of active modes such as cycling. While cycling usually plays a secondary role in German traffic planning, the study programme aims on changing that and give more priority to cycling traffic (Melzer et al., 2020).

Bicycle trips by purpose (D)

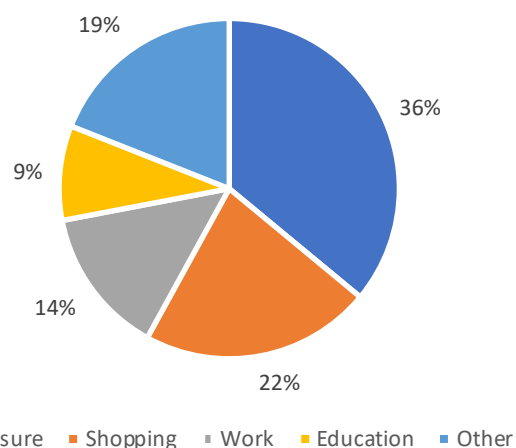


Fig. 10 – Distribution of bicycle trips by purpose in Germany (MiD, 2008)

### 2.2.3.3 Cycling in Other Countries

Besides the Netherlands and Germany, another country with a big cycling culture is Denmark. Its capital city Copenhagen has a cycling modal split of 35% – the highest of all capital cities in the world (ECF, 2018). Denmark has recreational cycling routes as long-distance national cycling routes and other regional routes. Furthermore, Denmark serves utilitarian cycling as in big cities the most major roads have cycling paths (Cycletourer, 2020).

Regarding cycling, Belgium is quite two-faced. The region of Flanders has a distinct cycling culture, cycling plays a big role and the infrastructure there has a good quality. Cycling lanes can be found on many roads. The Cycling Network BFF, which is further described in chapter 2.3.3 *Cycling Connection Concepts in other Countries* is a proof of the role cycling plays in Belgium. On the other hand, the more French-oriented region of Wallonia is lacking a good infrastructure and cycling culture in many places (Cycletourer, 2020).

Furthermore, countries as Sweden, Switzerland, Italy, China, Japan, and others have cycling cultures to some extent, but not analysed further.

## 2.2.3.4 Comparison of the Cycling Cultures

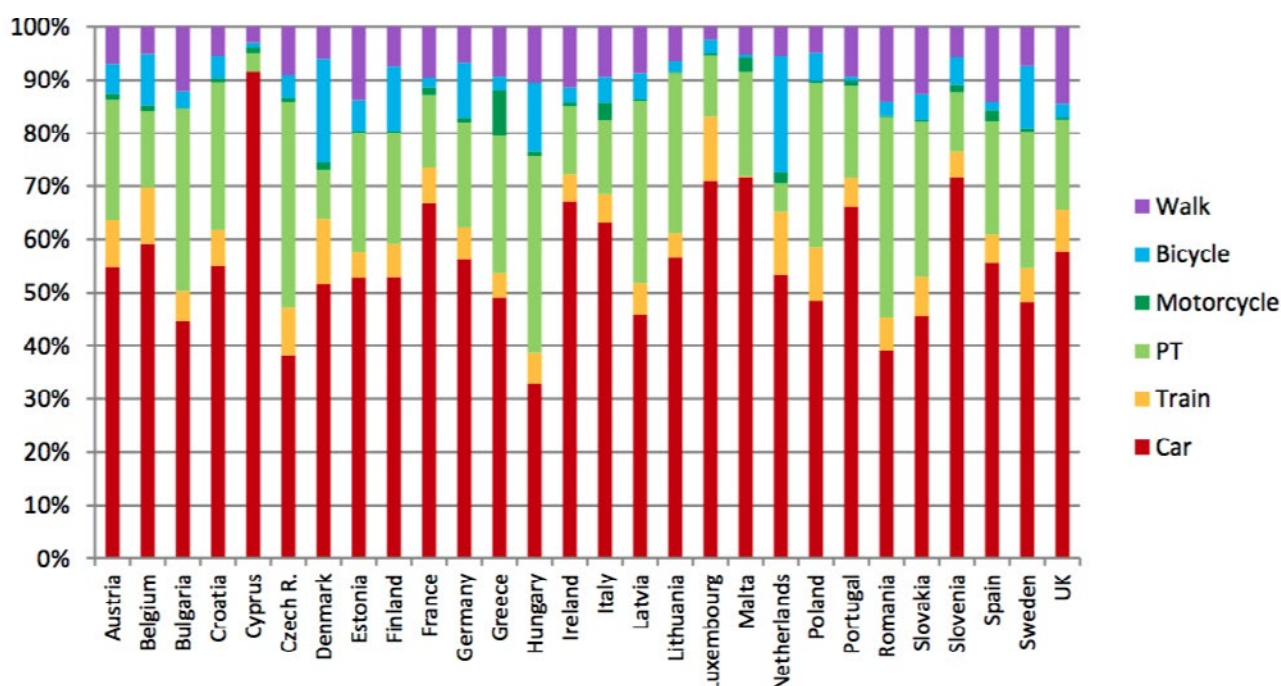


Fig. 11 – Modal Splits of the EU-28 (Fiorello et al., 2016)

Figure 11 shows a CAWI survey from 2016 comparing the modal splits across the EU member states (EU-28). It can clearly be seen that Northern European countries are leading in number of trips by bicycle: The Netherlands and Denmark have the highest shares in cycling followed by Sweden, Finland, Hungary, and Belgium. It is noticeable that in the Netherlands and Denmark public transport shares are very small, so the bicycle seems to be more as an alternative to public transport than to individual car use (Fiorello et al., 2016).

## 2.2.3.5 Cycling Culture During the COVID-19 Pandemic

COVID-19 (also known as Coronavirus disease 2019, caused by the virus SARS-CoV-2), which occurred in late 2019, caused lockdowns, shutdowns, and quarantines in almost all countries in the world by March 2020 (WHO, 2020). The pandemic and the resulting lockdowns are expected to have lasting consequences in the economy, society, and social behaviour.

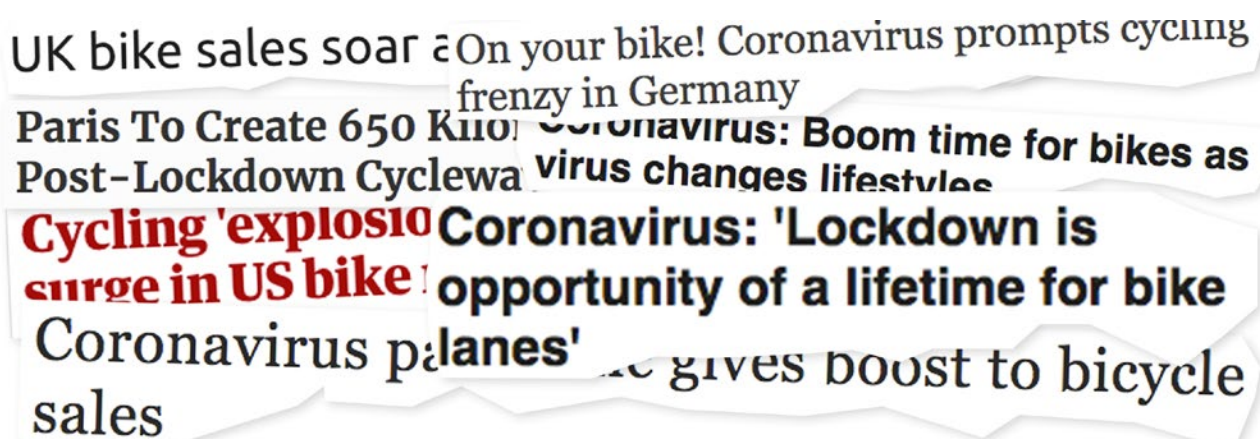


Fig. 12 – Collage of newspaper headlines during the COVID-19 pandemic (Author's own work, 2020)



Since the virus is highly contagious, many governments initiated strict regulations regarding transport modes, especially in public transport. The consequence of these regulations is that in many countries cycling has increased dramatically (Hilary Staples, 2020).

In many cities, pop-up cycling lanes are introduced to cope with the increased cycling traffic and enable the new distance rules (1.5 metre distance). The pop-up lanes are mostly at the expense of car lanes, which are less busy due to more people working in home office. This increase in cycling including the implementations of pop-up cycling lanes are a great chance for a change towards an improved cycling culture. Figure 12 shows a collage of newspaper headlines, which emphasises the global increase of both the demand and the supply of cycling and its infrastructure.

In Paris, 650 kilometres of cycling lanes (including pop-up cycling lanes) were implemented after the ease of the lockdown on 11 May 2020, as Paris' Mayor Anne Hidalgo had promised already before the pandemic that every street of the city will become cycle-friendly by 2024 (Reid, 2020).

As of April 2020, Berlin has already created ten kilometres of pop-up cycling lanes due to the COVID-19 pandemic as shown in Figure 13. Many of the provisory cycling lanes, which have a width of up to 2 metres, are planned to become permanent. Many pop-up lanes were built on planned future cycling lanes anyway and the current situation speeds up these implementations (Pieper, 2020).

As a Coronavirus vaccine is expected to be available not earlier than by the summer of 2021 according to experts, it is expected that a lot of restrictions will still be active during that time, and hence, cycling will stay a significant transport mode (Gallagher, 2020). Favoured by the coming summer time, cycling might even have a big potential to become established for many people who did not cycling frequently before.



Fig. 13 – Pop-up bike lane in Berlin (NFTS, 2020)

## 2.3 Cycling Connection Concepts

In this subchapter, concepts for cycling connections in the Netherlands and Germany will be discussed and analysed. These countries are in the main focus of the cycling connections, principally the Netherlands, as well as a pioneering example for cycling. Ultimately, further cycling connection concepts in other countries will be inspected.

The analyse of the respective subsections in this subchapter are conducted with the HSO method, which consists of measures of hardware, software, and orgware. The Hardware part deals with components such as the infrastructure, including the actual cycling way with its surface(s), signage, and regulated measurements. The Software part looks at components such as branding, or events for promotional purposes. Eventually, the Orgware part includes the work of stakeholders such as workshops for creating cycling connections, or governmental issues such as subsidies or regulations.

### 2.3.1 Cycling Connection Concepts in the Netherlands

Already in the 1980s, first cycle superhighways were implemented in the Netherlands. Especially cycling connections with up to 15 km length intended to enable commuters to reach their destinations fast and safe.

#### Fietsknooppunten Concept

The Fietsknooppunten (Dutch for: *Cycling nodes*) create a dense network of cycle route junctions. The 'Knooppunten' are the nodes, which connect cycling ways with each other and thus, build up the network. The node points are numbered, and, similar to highway junctions, help one to navigate through a route. The cycling connections between two nodes are usually not more than a few kilometres long and can be seen as segments of the whole route, which usually consists of several node points. With help of a route planner, which is available on a website and as an app, individual routes can be set, saved and used as a navigation system while cycling.

White signs with green text on the route indicate the direction to the next node point (see Figure 14). On the node points themselves, large maps showing an overview of the area with surrounding node points (Figure 15).



Fig. 14 – Signs indicate the next node point (Author's own construction, 2020)



Fig. 15 – Map of the node point 91 (Author's own construction, 2020)

## LF Routes Network

LF routes (Dutch: *Langeafstand Fietsroutes*) are national cycling routes creating a network of around 3,900 km (Stichting Landelijk Fietsplatform, 2020). The long-distance routes are signposted in both directions with green lettering on white signs. The routes are serially numbered (i.e. LF1, LF2, etc.) and have an additional letter, *a* or *b*, which indicates the direction. The *a* stands usually for routes from North to South or West to East, and vice versa for the addition of *b*. For example, *LF4 Midden-Nederlandroute* goes from Den Haag to Enschede. *LF4b* would indicate the direction from Enschede to Den Haag (East to West) in this case. Figure 16 shows a schematic map of the LF route network. Roermond is connected on the LF3 (Maastricht-Holwerd) between Maastricht and Venlo. In that region is potential for more routes, e.g. by connecting the LF network with German or Belgian cycling routes.

Some of the existing LF routes get turned into so-called *LF icon routes*, which are LF routes with strong themes and renewed signage. The *LF Maasroute* is the first LF icon route, and in 2020, the new LF icon routes *LF Zuiderzeeroute* and the *LF Kuistroute* will be launched (Nederland Fietsland, 2020).

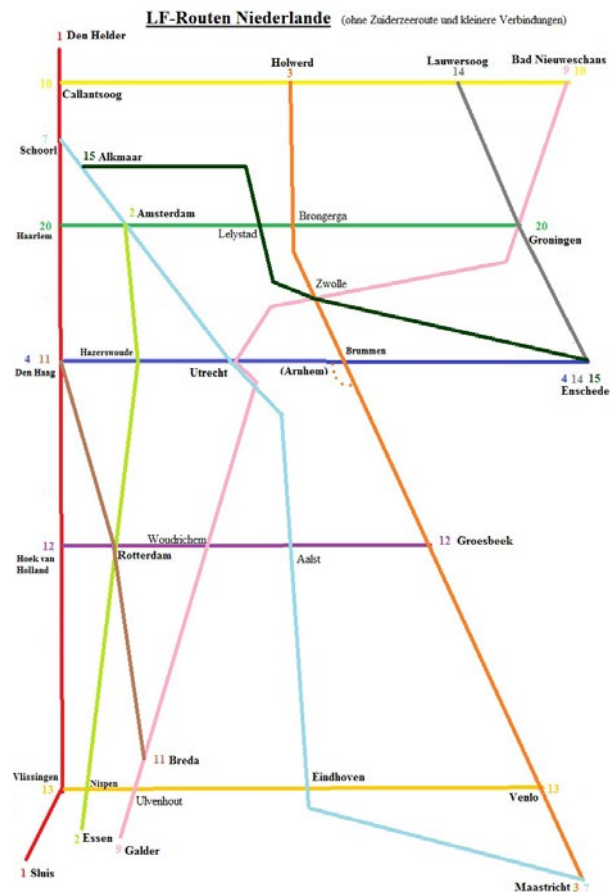


Fig. 16 – Schematic LF route network (Felix-Ente, 2018)

Additionally, an app (see Figure 17) and a website have been created for more information. GPS tracks of all LF routes are available for cyclists with GPS devices (Nederland Fietsland, 2020). Apposite to the long LF routes – which are ideal for multi-day trips – many points of interest are reachable with the LF routes such as camping sites, and bicycle rentals.

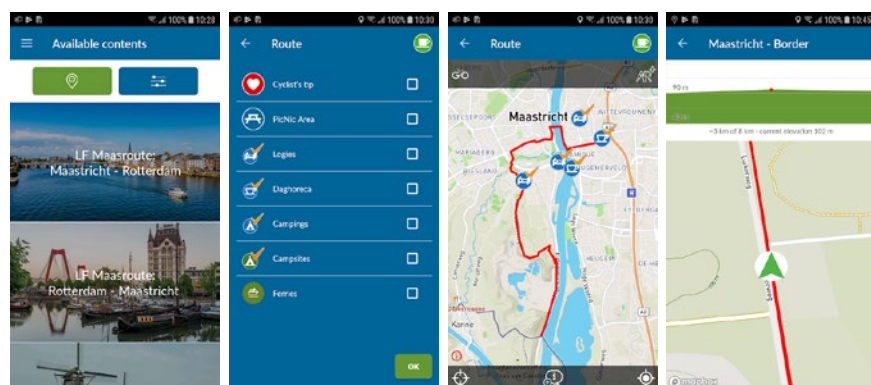


Fig. 17 – Screenshots of the LF route app "LF iconroutes" (Google Play, 2019)

Some routes are even part of international cycling connections. For instance, the Dutch *Rijnfietsroute* is part of the *International Rhine Cycle Route (EuroVelo 15)*, which is a cycling connection along the Rhine River, running through Switzerland, Germany, France, and the Netherlands. Figure 18 shows a map of the whole Rhine Cycle Route. On the left side are the different stages of the route with more information.



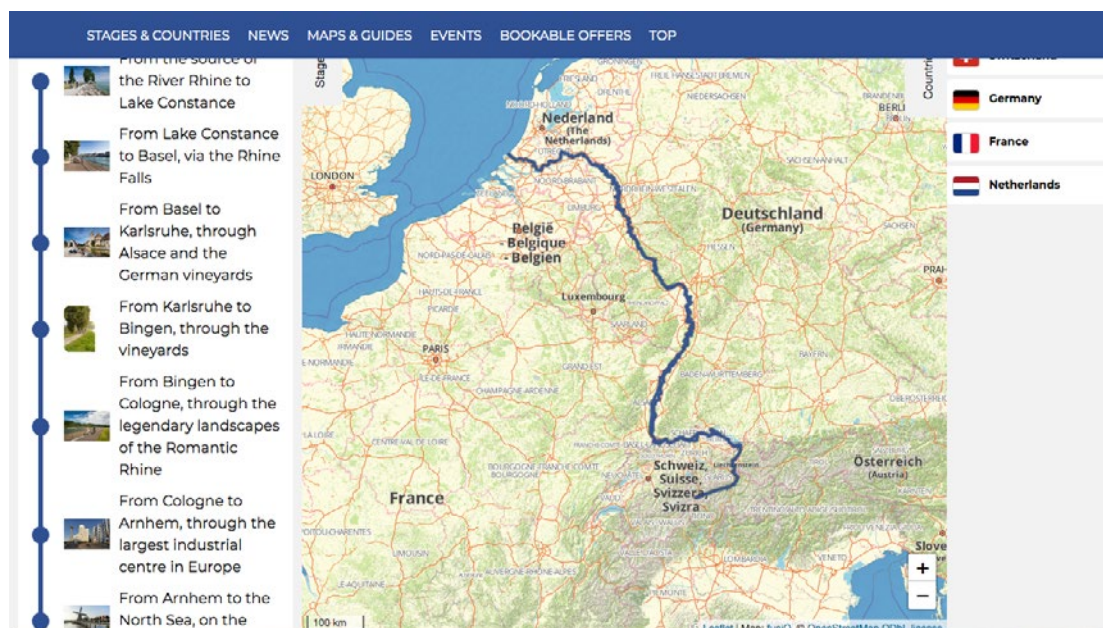


Fig. 18 – Screenshot of the International Rhine Cycle Route – EuroVelo 15 (EuroVelo, 2020)

### Fietzersbond Routeplanner

The *Fietzersbond* (Dutch for: *Cyclists' Union*) offers a route planner for any individual route within the Netherlands. Starting and destination address (plus optional detours) can be entered with an average speed (for the calculation of the duration) and the preferred route type (e.g. Shortest Route, Recreational Route, or LF Routes).

### RijnWaalpad, Arnhem–Nijmegen

The *RijnWaalpad* (Dutch for: *Rhine-Waal-Path*) is an intercommunal cycling connection between Arnhem and Nijmegen – an area with around 740,000 inhabitants (Eurostat, 2019). The cycling connection, which was planned with help of *Fiets Filevrij* (see subsection *Fiets Filevrij*) had a total cost of around €17 m, and on its complete length of 15,8 km, cyclists have priority over motorised traffic.

One of the main aims of the cycling route is to encourage people of taking the bicycle more often, and especially to work. Therefore, a developing area in Nijmegen was already connected to the cycling route during its construction phase (NRVP, 2019).

### Cycling Connection Breda–Etten-Leur

The cycle superhighway between Breda and Etten-Leur was the first intercommunal cycling connection in the southern province of North Brabant. It connects Breda and Etten-Leur including several residential areas and business locations, on a 7.5 km distance. The cycling connection has a width of 3.5 m in two directions. With an exception of two traffic lights, cyclists have priority on the rest of the route, as shown in Figure 19. On both ends the cycle superhighway merges into the local cycling networks of Breda and Etten-Leur respectively.

The improvement of the path cost €14 M of which 80% was paid by the province North Brabant, which aimed on stimulating longer-distance trips by bicycle. As a result of the cycling connection, the number



of cyclists on the route, both within and between municipalities, multiplied several times (Landelijk Bureau Fietsersbond, 2020; SOAB, 2013).



Fig. 19 – Priority for cyclists on the cycling connection Breda–Etten-Leur (Thiemann-Linden)

### Slowlane, Eindhoven

The *Slowlane* is a 32 km-long cycling connection in and around the city of Eindhoven and connects different major economical sites such as the High Tech Campus, the Technical University of Eindhoven, and Phillips Healthcare with distances of 5 to 10 km. The project aims to connect these locations with a 4 m-wide cycling way and decrease the conflict potential with other traffic.

While the construction is still in progress, already in 2012, the first passage of the Slowlane was done: An underpass along the Beatrix Canal, which improved the passing of the Oirschotsedijk. Also, several test strips have been set with different designs, for instance different surfaces of asphalt and concrete, and in different colours. Eventually, the cycling union (Dutch: *Fietsersbond*) Eindhoven has recommended the city to implement red asphalt due to the recognisability of the streetscape (Fietsersbond Eindhoven, 2013).

### Fiets Filevrij

In 2006, the project *Fiets Filevrij* (Dutch for: *Cycle congestion-free*) aimed tackling congested streets by encouraging people to cycle to work if it is within a 15 km-distance. Fiets Filevrij works in an interdisciplinary way with different authorities ('Wegbeheerders') on the routes, proactive process management, and a strong communication. As the project reached continuous growth, it became a platform which now leads the way of achieving the stimulation to cycle distances exceeding 15 km length (Landelijk Bureau Fietsersbond, 2020). SOAB initiated this concept together with the Dutch ministry of Transport, Fietsberaad, the head office of the Fietsersbond, and some Dutch provinces, and worked on more than 25 of such Fiets Filevrij-routes so far.

The project started with five cycling connections along highly congested areas: Apeldoorn–Deventer, Zoetermeer–Den Haag, Delft–Rotterdam, Zaandam–Amsterdam, and Breukelen–Utrecht. Hence, the

routes got new cycling ways as well as existing infrastructure got improved. As a result, infrastructure for these routes was improved and new cycling ways were developed.

In 2008, the Dutch government allocated €10 M for the cycling connections Leiden–The Hague and Arnhem–Nijmegen, and one year later, in 2009, another subsidy of €21 M was made available for further cycle superhighways. Fiets Filevrij offers support in the planning of cycling connections, and in frequent meetings of the platform, representatives of new routes come together to share experience and knowledge. After allocating €100 M for new fast cycling connections in June 2018, the Dutch Ministry of Transport announced to allocate €345 M more for fast cycling infrastructure and cycling parking facilities in the end of the year (CCO, 2018).

#### 2.3.1.1 Hardware Measures in the Netherlands

The Netherlands have a very strong network of cycling infrastructure. Cycling ways and lanes can be found everywhere in the country – in urban areas and rural areas. One example for the well-planned cycling infrastructure is the Knooppunten-network. The nodes are connected with separated cycling ways and lanes and signposted throughout. Maps on each node show the surrounding with cycling ways and further node points.

Set routes as the LF routes, which are available for the whole country, offer ideal routes for recreational purposes. In the Netherlands are many specific routes like the RijnWaalpad, which connects the cities of Arnhem and Nijmegen, or the cycling connection between Breda and Etten-Leur, where cyclists have priority (with two exceptions) over the motorised traffic.

In the Netherlands, routes with different purposes can be found. The LF route network e.g. focuses mainly on recreational cycling trips, while other connections like the RijnWaalpad are aiming on utility cycling like commuting.

#### 2.3.1.2 Software Measures in the Netherlands

In the Netherlands, also several software measures can be found. Route planners such as the Fiets-knooppunten route planner or the LF route planner can be used to create an individual route. Both of the mentioned route planners also offers GPS data for the routes, which can be used by cyclists with GPS devices.

The Slowlane in Eindhoven has a social impact as it connects different facilities with each other, which include the Brainport Innovation Campus, the High Tech Campus Eindhoven, Phillips Healthcare and the Technical University of Eindhoven. Additional to these work and educational facilities, the emphasis on green is essential. Hence, the Slowlane runs through the areas of the *Beatrixkanaal* and the *Dommeldal*, two green areas with recreational character (Gemeente Eindhoven, 2020).

### 2.3.1.3 Orgware Measures in the Netherlands

One of the key factors of the success of Dutch cycling might be the Orgware measures. Already in 1973, the "Stop the child murders"-group started an Orgware measure in order to improve cycling in the Netherlands. Nowadays, there are concepts which focus on the increase in the numbers of cyclists as the Fiets Filevrij concept, which has a great focus on communication.

### 2.3.2 Cycling Connection Concepts in Germany

This subdivision presents cycling connection concepts in Germany. Firstly, the *Radschnellverbindungen* (RSV; A German type of *cycle superhighway*), a guideline manual about the implementation of such cycle superhighways in the German region of North Rhine-Westphalia, will be presented. Furthermore, specific cycling connections will be presented such as the *Nordbahntrasse* in Wuppertal, the *eRadschnellweg* in Göttingen, which has specific infrastructure for e-bicycles, and the international Dutch-German *Euro-pa-Radbahn* will be analysed.

In the recent years and decades, the biggest share of the national subsidies for transportation infrastructure went into car and train traffic – only €100 M of the €6 B for road constructions (1.7%) has been invested in cycling infrastructure (Schmelzer, 2017). However, the German climate protection programme 2030 ('Klimaschutzprogramm') provides an extra amount of €900 M for cycling infrastructure until 2023, which accumulates on a total investment of €1.46 B by the federal government alone by that year (BMVI, 2020).

#### Radschnellverbindungen, NRW

Radschnellverbindungen (Abbr.: RSV; German for: *Cycle superhighways*) in the region of North Rhine-Westphalia is a concept for cycling connections with specific standards. Only when these standards are met, a cycling connection can be officially called Radschnellverbindung. For instance, RSV are constructed to cope with at least a travel speed of 30 km/h, which has e.g. an impact on the minimum width of the cycling lane(s). Examples of further quality standards can be seen in the list below:

- Traveling times should be decrease by a reduction of stopping/waiting to enable high speed moving (at least 20 km/h on average).
- For two-way RSV. Two cyclists per direction should be able to pass each other ( $\geq 4.00$  m width); For one-way RSV, two cyclists should be able to get overtaken by a third cyclists ( $\geq 3.00$  m width).
- Separated, parallel pedestrian ways improve the unimpeded cycling and increase the traffic safety. The separation can be realised by new construction or by the use of existing ways within sight.
- Operation and snow-plowing services are conducted with state road standards.
- In town, RSV are illuminated consistently. Out of town, RSV are illuminated only in special (agreed) cases.
- The recognisability of RSV is ensured by coherent design elements and unified standards. (VM NRW, 2019)

### **Nordbahntrasse, Wuppertal**

The Nordbahntrasse (German for: *North train line*) is a cycle superhighway in the city of Wuppertal, built on a former train track after which it is named. The cycling connection, which won the German cycling award 2015 ("Deutscher Fahrradpreis"), is 23 km long cycling track and part of the 300 km long cycling network panorama cycling ways (German: *Panorama Radwege*). The Nordbahntrasse offers five illuminated tunnels, viaducts, and viewing platforms as unique highlights, which makes it especially attractive for recreational trips (Wuppertalbewegung e.V., n.d.).

The Nordbahntrasse became a place where people from any backgrounds meet. Cafes, resting spots, and different sportive and cultural events are meeting places for those people (Wuppertalbewegung e.V., n.d.). Such attraction spots might not only attract cyclists from the Nordbahntrasse, but probably also the other way around: People get attracted to the cycling superhighway by being attracted to those places first. Therefore, such places of interest like cafes and events can work as a promotion tool for the cycle way and thus, increase the number of cyclists by time.

### **eRadschnellweg, Göttingen**

The e-cycle superhighway ("eRadschnellweg") in the city of Göttingen is Germany's first e-cycle superhighway as well as cycle superhighway, which runs centrally through a city. On a length of 4 km, it connects the train station with the university (NRVP, 2019). Besides the typical characteristics of cycle superhighways, this concept has an additional infrastructure in the form of charging possibilities for e-bikes. Furthermore, it offers phased traffic lights ("green wave" for cyclists), throughout illumination, and a smooth surface (University of Göttingen, n.d.).

### **Europa-Radbahn, Kleve–Nijmegen**

The Europa-Radbahn (German for: *Europe cycling track*) is an international cycling path, connecting the Western German town of Kleve with the Eastern Dutch city of Nijmegen. The cycling connection, which was finished in summer 2019, has a total length of 23.5 km. On the Europa-Radbahn, cyclists have priority over motorised private transport. Therefore, traffic lights have a priority circuit for cyclists on junctions (NRVP, 2019).

#### **2.3.2.1 Hardware Measures in Germany**

Germany has a quite developed network of cycling routes. In many cities, most of the major car roads have separated cycling lanes. Also, the projects described above show that there are many projects going on to improve and extent this infrastructure. The concept of *Radschnellverbindungen* is a well-thought measure to implement new cycle superhighways in order to boost commuting cycling.

Also, the specific cycling connections *Nordbahntrasse*, *eRadschnellweg*, and *Europa-Radbahn* are projects, which improve cycling through strong infrastructural measures. The *eRadschnellweg* is also a proof of a certain innovative approach as it also improves the infrastructure for e-bikes.



### 2.3.2.2 Software Measures in Germany

The Nordbahntrasse in Wuppertal is a good example of software measures additional to the infrastructure. Cafes, resting spots and frequent events attract people and can be seen as a promotion tool for the cycling connection.

All over Germany, several bike cafes can be found. These cafes often combine classic cafes with bicycle shops and workshops. Due to this combination, bike cafes are often a place for cyclists to gather, which can help building up a real cycling community (Donat, 2020).

### 2.3.2.3 Orgware Measures in Germany

Germany has different orgware measures regarding cycling. The biggest organisation for cycling is the ADFC with more than 190,000 members and is represented in more than 450 German cities (ADFC, 2020).

Furthermore, in the example of the *Nordbahntrasse*, there is an organisation called *Wuppertalbewegung*, which initiated the construction of the Nordbahntrasse by orgware measures in 2006. The organisation created a feasibility study for the implementation of a cycling connection on the former railway, and with help of public relations work in media, clubs and organisations, and political committees, the organisation could convince the city and further stakeholders of the project (Wuppertalbewegung, 2006). Nowadays, the Wuppertalbewegung organises different events at the *Nordbahntrasse*.

However, orgware measures seem a bit more neglected in Germany than for example in the Netherlands, which might have a general cultural reason.

## 2.3.3 Cycling Connection Concepts in Other Countries

### Cykelsuperstier, Copenhagen (DK)

The Cykelsuperstier are the cycle superhighways in Copenhagen connecting the city centre with residential areas, and business- and educational facilities in and around the city. Main aim of those cycle superhighways is to stimulate commuters to cycle on trips of more than 5 km distance. The Cykelsuperstier are designed with a blue high-quality surface and bicycle traffic lights. As shown in Figure 20, service stations along the way offer possibilities for pumping up tyres, making smaller repairs, or resting (NRVP, 2019). The phased traffic lights enable cyclists to have a "green wave" to be able to travel fast and with least-possible delays.



Fig. 20 – Service station along the Cykelsuperstier in Copenhagen (Supercykelstier, 2020)

### Cycle Superhighways, London (UK)

In order to relief the city centre from motorised private traffic, twelve cycle superhighways are implemented that radially connect the city centre with the urban fringe. The blue-marked cycle superhighways have a width of 2.5 m, are signposted and separated cycling lanes on road space. To increase safety, the cycle ways got upgraded in junction areas, got additional mirrors and signals. In 2015, the city of London allocated €214 M for further cycle superhighways.

### Freigleis, Luzern–Kriens/Horw (CH)

After a transformation of the central station Luzern, a train track became vacant and was eventually transformed into a cycling and pedestrian way – the *Freigleis*. The total width of the connection is 5 m – 3 m for cyclists, and 2 m for pedestrians (VKS, 2017).

### Bovenlokaal Functioneel Fietsroutenetwerk (BFF), Flanders (BE)

The Bovenlokaal Functioneel Fietsroutenetwerk (abbr.: *BFF*, Dutch for: *Supra-local functional cycling route network*), shown in Figure 21, is a cycling network, which focuses on so-called 'functional' journeys, i.e. trips to work, education, or shopping, and contrary to recreational trips (Vlaamse Overheid, 2020). The network is designed to connect points of interest with each other, such as schools, business parks, hospitals, stations, and shops. The network is divided into three levels of routes: Cycle superhighways and major routes acting as the backbone of the network, supra-local routes connecting two points in the most logical and shortest way, and alternative supra-local routes, which are quieter connections between two points (Vlaams-Brabant, 2020).

The network exists in collaboration of the municipalities, the provinces and Flemish government, and core of the concept is about connecting stakeholders. Therefore, municipalities can apply for subsidies from the province for the construction and improvement of the cycling infrastructure network. The planned infrastructure must then meet some conditions regarding, for instance, the width of the cycle paths or the use of materials (Vlaams-Brabant, 2020).



Fig. 21 – Map of the BFF in the Antwerp province (Dieussaert, 2013)

### 2.3.3.1 Hardware Measures in Other Countries

The examples above show that also outside of the Netherlands and Germany good cycling infrastructure can be found. With the *Cykelsuperstier*, Denmark has a great system of cycle superhighways. Besides the cycling ways themselves, the *Cykelsuperstier* offer service stations for pumping up the tyres or making small repairs.

Similar to the *Nordbahntrasse* in Germany, the *Freigleis* in Switzerland is a cycling connection built on a vacant train track.

### 2.3.3.2 Software Measures in Other Countries

Many countries have online route planners, which help cyclists to create individual cycling routes. Denmark, for instance, has the *DenmarkByBike*-route planner, a free online tool to find a good cycling route between two or more places. The user has the choice of different route types as for example 'everyday' for daily and quick (utility-based) cycling on bike-friendly routes; 'leisure' for cycling in a pleasant environment; 'S-Pedelec' for cycling routes for e-bicycle with speed of up to 30 km/h (Naviki, 2020).

### 2.3.3.3 Orgware Measures in Other Countries

The BFF in Flanders, Belgium is a network organisation focusing on commuting cycling. It collaborates with municipalities, provinces, and the Flemish government, and connects those with further stakeholders in the projects.

## 2.4 Building Blocks of Theoretical Elements

### Increase of E-Cycling

The history of cycling shows that the bicycle was the first for the general public affordable transport mode, which allowed people to travel beyond their local communities. The invention of the Rover Safety Bicycle in 1885, which is the prototype of the modern bicycle, had a big share of making cycling popular. Now, the next big evolution regarding bicycle technology might be the e-bike, which gets increasingly popular and makes cycling more convenient and enables further travel distances, and thus, is getting increasingly attractive and purchased. Nowadays, almost every third sold bicycle is an e-bike, and during the COVID-19 pandemic, e-bike sales even outpace sales of regular bikes in some cases. Hence, the e-bike can become an increasing competitor for other modes such as private cars or public transport. Projects like the eRadschnellweg with charging stations in Göttingen emphasise this trend.

### Place Making and Social Safety

A cycling connection can help to stimulate an area and make it more vibrant. Through the increased activity in the area, the social control and the social safety will increase by bringing more people in the streets. In that way, the raised attractiveness and accessibility of such a place can result in further developments in the region.

### **Cycling Infrastructure is Cheap**

Compared to car infrastructure, the implementation of infrastructure for cycling is relatively cheap. While a kilometre of main road costs around €4 M and a highway even €18.6 M, a kilometre of a cycle superhighway, which even has high quality standards, costs around €0.9 M. Thus, a cycling kilometre costs less than 25% of a main road and less than 5% of a highway.

### **Innovative Technologies**

The pilot phase of the *PlasticRoad*, a surface for cycling lanes made of recycled plastic, was successfully completed in May 2020. The Dutch company announced to launch the innovative surface material by early 2021, beginning in the Netherlands and neighbouring countries. The cycling connection Roermond-Mönchengladbach would fit into that pattern, so that the PlasticRoad could become an option. Self-luminous surfaces could contribute to the road safety and create a unique experience, which could be used as a magnet for tourists and attract attention.

### **Positive Impact on Local Economy**

Cycling tourism has a positive impact on the local economy. On average, cyclists spend €16 during a day trip, and even €76.50 per day during multi-day trips. Overall, cycling tourism even generates €44 B annually in Europe.

### **Many Environmental and Health Benefits**

Also, it is healthy, especially in times with many people having office jobs and do not move a lot. Furthermore, cycling has many economic benefits such as cycling tourism and also the sales of e-bicycles, which both create huge revenues. Copenhagen has perfectly shown how the increase of cycling can solve economic issues of a city as the increase of cycling was forced by the government to tackle consequences of the energy crisis. Nowadays, around 35% of the people there take the bike on a daily basis. Another big advantage of cycling got clear during the current pandemic: Cycling is an ideal transport mode as a sufficient distance to others can be kept, and it is a cheap, healthy and sustainable mode of transport.

### **Cycling as Political Interest**

Especially, in times of strong election results for green parties in many countries and strong restrictions during the COVID-19 pandemic, cycling becomes an increasingly important political topic. To win voters, cycling could become more and more important, which would create a win-win situation for both the politicians and the cycling culture.

### **Potential for Orgware Measures**

The analysis of the existing cycling connections has shown that in the Netherlands orgware measures such as workshops and collaboration between many different stakeholders can show good results, whereas in Germany for example, cycling projects often lack orgware measures, and planning is often more conducted with a top-down approach. Therefore, it is good to increase the stakeholder participation and work with the different parties together.



### Different Cycling Purposes in Urban and Rural Areas

In Germany, the different purposes of cycling are quite strongly dependent on the region. In urban areas utilitarian cycling is often already quite common. Due to short distances and often inconvenient situations for cars (few/expensive car parking possibility, traffic jams, etc.), the bicycle is often already used as a transport mode. However, in rural areas, where those issues occur less and traveling distances are often further, the bicycle is often used as a recreational mode. A mixed-purpose could then be a good implementation when these types of regions mix, as it is the case for the cycling connection of Roermond and Mönchengladbach, where the route connects different urban areas with rural areas in between.

### Sharp Rise Due to the COVID-19 Pandemic

During the COVID-19 pandemic with its consequences like lockdowns, the popularity of cycling has increased all over the world. In many cities in and outside of Europe, the use of the bicycle has increased and additional (temporary) cycling lanes were implemented. Also, the bicycle and e-bike sales soared as soon as shops were able to open. This increase of the bicycle use shows and proves the potential of it as a daily traffic mode. Furthermore, the situation creates a big chance for the people and governments to strengthen cycling during its high demand.

**Increase of E-Cycling**

**Place Making and Social Safety**

**Cycling Infrastructure is Cheap**

**Innovative Technologies**

**Positive Impact on Local Economy**

**Many Environmental and Health Benefits**

**Cycling as Political Interest**

**Potential for Orgware Measures**

**Different Cycling Purposes in Urban and Rural Areas**

**Sharp Rise Due to the COVID-19 Pandemic**



# 3

## **PRACTICAL ELEMENTS – CASE PROJECT: ROERMOND– MÖNCHENGLADBACH**



*Abandoned rails of the Iron Rhine (Mortelmans, 2018)*



### 3.1 Introduction

The third chapter *Practical Elements – Case Project: Roermond–Mönchengladbach* deals with the planned mixed-purpose cycling connection between the cities of Roermond and Mönchengladbach.

The sub-chapter 3.2 *The Case Roermond-Mönchengladbach* introduces the project beginning with the four participants Roermond, Roerdalen, Wegberg, and Mönchengladbach, whereas Wegberg is the project leader of this project. SOAB works together with two German consultants, Mr. Arne Blase and Mr. Jörg Thiemann-Linden, to make a feasibility study of the mixed-purpose cycling connection.

Furthermore, the role of Interreg is explained, which is a European programme to stimulate cross-border collaboration on with different focal points, and the Iron Rhine railway – a train connection between Antwerp and the Ruhr metropolitan area, which runs partly abandoned, partly in use between Roermond and Mönchengladbach.

The *Area Analysis* (3.3) provides information of the spatial elements as the first draft of the route, destination points as schools, hotels, mills, and parks. Furthermore, a STEEP analysis was conducted to analyse different focal points in the area, and eventually, the stakeholder analysis of the project.

3.4 *Workshops* elaborates the held workshop in mid-March 2020 and its outcomes. Besides brief presentations in the beginning of the workshop, the main focus was on the so-called World Cafe, which is a technique of collection thoughts about specific topics within the project. The positive conclusion of the workshop even led to the launch of task forces among the German partners and stakeholders, which will work more intensively together after this first step.

The last part 3.5 *Building Blocks of Practical Elements* collects the conclusion of this chapter.

## 3.2 The Case Roermond-Mönchengladbach

### 3.2.1 Scope of the Project

Since beginning of 2019, the four municipalities of Roermond (NL), Roerdalen (NL), Wegberg (D), and Mönchengladbach (D) are working on an implementation of a new cycling connection to stimulate cycling in the region. Therefore, Wegberg acts as lead partner in the project. Together with the German consultancies *AB Stadtverkehr*, under the direction of Mr. Arne Blase, and *büro thiemann-linden stadt & mobilität*, under the direction of Mr. Jörg Thiemann-Linden, SOAB creates a feasibility study on this cycling connection to work out its best possible route and learn about the potentials of the different parts in the region. Eventually, an advice should be given to Interreg, and recommendations will be made for the whole connection.

The four places and the region beyond will benefit from a strong cycling connection with different aspects. The commuting facet of the cycling connection would relieve the motorised passenger traffic as it offers the local residents an alternative for daily trips, which would have a direct positive impact on the physical and mental health as well as the environment. The recreational facet of the cycling connection would attract more tourists to the region, which the local economy could benefit from. Furthermore, also the local residents would benefit from the recreational aspect as they get an additional option for leisure trips. That would also result in an increased attractiveness of the region in general.

Because of the special context in terms of varied cycling cultures, history, economical differences, and planning restrictions (Iron Rhine), the cycling connection will be planned as a mix-purpose route, i.e. it serves a utility and recreational purpose. During the project's progress, several workshops were and will be held in collaboration with different stakeholders.

### 3.2.2 Key Data of the Participants



Fig. 22 – Map of the locations of the participants (Author's own construction, 2020)



The map in Figure 22 shows the location of the participating Roermond, Roerdalen, Wegberg, and Mönchengladbach. Table 1 shows an overview of the place's population, size, and province/state they belong to.

Table 1 – Key data comparison of the participants

|                       | Roermond   | Roerdalen                            | Wegberg                              | Mönchengladbach   |
|-----------------------|--|--------------------------------------|--------------------------------------|---|
| <b>Population</b>     | 58,300 <sup>[1]</sup>  | 20,500 <sup>[1]</sup>                | 28,200 <sup>[2]</sup>                | 261,400 <sup>[2]</sup>  |
| <b>Size</b>           | 71.05 km <sup>2</sup> <sup>[3]</sup>   | 88.79 km <sup>2</sup> <sup>[4]</sup> | 84,34 km <sup>2</sup> <sup>[5]</sup> | 170,47 km <sup>2</sup> <sup>[6]</sup>   |
| <b>Province/State</b> | Limburg (NL)   | Limburg (NL)                         | NRW (D)                              | NRW (D)   |
| <b>Sources</b>        | <sup>[1]</sup> (CBS, 2020)<br><sup>[3]</sup> (AlleCijfers, 2020)<br><sup>[5]</sup> (Tilasto, 2018) |                                      |                                      | <sup>[2]</sup> (IT.NRW, 2019)<br><sup>[4]</sup> (AlleCijfers, 2020)<br><sup>[6]</sup> (Tilasto, 2018) |

### Roermond

Roermond is with around 58,300 inhabitants the third biggest city by population in the province of Limburg in south-eastern Netherlands. The city lies on the mouth of the Rur River (Dutch: *Roer*), where it flows into the Maas River. In the west of the city are several lakes, which are connected with each other. The centre of the city has a distance of only 5 km to the German border, and only 11 km to the Belgian border.

### Roerdalen

Roerdalen is a municipality southern of the city of Roermond. The municipality, which counts around 20,500 inhabitants, consists of the six villages Herkenbosch, Melick, Montfort, Posterholt, Sint Odiliënberg, and Vlodrop. In the north-east of the municipality, partly in Herkenbosch and partly in Vlodrop, is the national park *De Meinweg*, which is further described in the STEEP analysis.

### Wegberg

Wegberg is the northernmost town in the district of Heinsberg. The town, which has a population of around 28,200, lies between Roermond and Mönchengladbach and borders on the Dutch national park *De Meinweg*. Wegberg has several tourist sites as castles, mills, and conservation areas. Furthermore, the city of Wegberg is project leader and executes the central project management of this project.

### Mönchengladbach

With around 261,400 inhabitants and an area of 170,47 km<sup>2</sup>, Mönchengladbach is by far the biggest city among the participants in this project. It is the 11<sup>th</sup> biggest city in North Rhine-Westphalia and 25<sup>th</sup> biggest of Germany (Destatis, 2018). The city lies between the Dutch border in the west and the city of Düsseldorf in the east with a distance from the city centre of around 16 km and 25 km respectively. Furthermore, Mönchengladbach has several castles, as *Schloss Rheydt* and *Schloss Wickrath*, and is well-known for its football club *Borussia Mönchengladbach*, which is, currently and overall, one of the most successful football clubs of Germany (Transfermarkt, 2020).

### 3.2.3 Interreg

Interreg (officially: *European territorial cooperation*) is a programme of the European Union and is part of the structural and investment policy. Interreg supports transnational cooperation between regions, towns and cities influencing everyday life as in the field of transport, employment and environmental protection (Interreg, 2020).

Interreg has three key areas, called strands:

#### **Strand A: Cross-border cooperation**

Advancing economic and social cooperation in adjacent border regions.

#### **Strand B: Transnational cooperation**

Promoting cooperation between national, regional and local partners in transnational programme areas in order to increase the territorial integration of these areas.

#### **Strand C: Interregional cooperation**

Promoting cooperation networks and exchange of experiences in order to improve the efficiency of existing regional development and cohesion instruments.

Furthermore, the Interreg projects are divided into six programme areas with different focal points, as follows:

- Alpine Space
- Baltic Sea Region
- Central Europe
- Danube Region
- North Sea Region
- North-West Europe

The programme area of North-West Europe, which is the responsible area for the cycling connection project of Roermond-Mönchengladbach, has the main themes of innovation, CO<sub>2</sub>-reduction, and efficiency of resources and materials. This project mainly aims on the second point: CO<sub>2</sub>-reduction through low-carbon traffic.

Interreg is not managed centrally by the European Commission. The transnational programmes are realised through concrete projects in each border region. Partners from both – or even several – countries are participating and team up in different projects.

### 3.2.4 Iron Rhine Railway: An Old Contract Is Still Active

The Iron Rhine (Dutch: *IJzeren Rijn*; German: *Eiserner Rhein*) is a freight railway connecting the port of Antwerp, Belgium with Mönchengladbach, Germany, and from there to the inland port of Duisburg in the Ruhr area. Between Belgium and Germany, the route is running through the Dutch province of Limburg. Since 1991, the Dutch-German part between Roermond and Dalheim is not operated anymore (ProRail, 2020).

The history of the Iron Rhine goes back to the independence of Belgium from the United Kingdom of the Netherlands in 1830. Nine years later, the Treaty of London was signed, which also covenanted Belgium the right to build a street or canal through Limburg on their own expenses to connect with Prussia (now Germany). In 1868, this right was exercised by Belgium when – instead of a canal or street – a railway was built, and first trains ran from 1879 (Stieding, 2020).

From its launch until WWI, the train connection was – mainly by freight trains – constantly used. During WWI, and also after WWII, the train traffic on the Iron Rhine was temporarily interrupted, and in 1992, the transboundary part between Roermond and Dalheim was discontinued (United Nations, 2005).

Today, this part is abandoned as Figure 23 shows. Intermediate plans of a re-opening were very controversial due to noise pollution and nature protection reasons in *De Meinweg*. Currently, there are no concrete plans for a re-opening, but because of the complicated legal situation due to the Treaty of London, the rails must not be dismantled in order to keep the possibility of a relaunch of the railway. Due to the fact that the railway is one option for the cycling route, it has the consequence that the cycling route must not prevent this relaunch. Figure 24 shows that in some parts, however, rails are dismantled due to practical planning issues as crossing streets.



Fig. 23 – Abandoned rails of the Iron Rhine (Author's own construction, 2020)



Fig. 24 – Dismantled rails of the Iron Rhine (Author's own construction, 2020)

### 3.3 Area Analysis

#### 3.3.1 Spatial Analysis

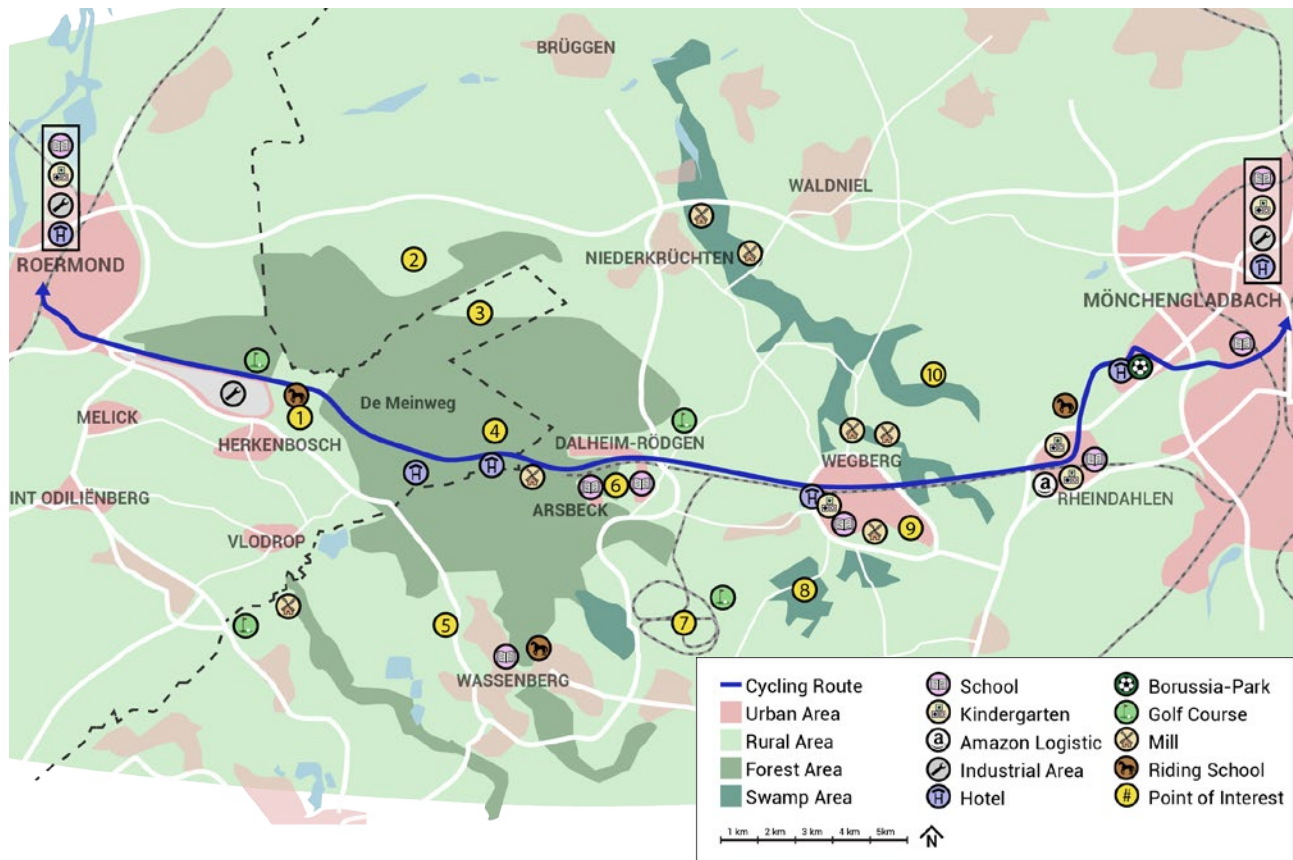


Fig. 25 – First draft of the cycling connection RMG (Author's own construction, 2020)

The map of the area Roermond-Mönchengladbach (Figure 25) shows the currently favoured cycling connection (blue line), which is not definitive yet. Additionally, further potential destinations are shown on the map such as schools, hotels, golf courses, and mills (see legend of Figure 25). Table 2 lists further special points of interest on the map, which are serially numbered from west to east.

Table 2 – Point of Interest along the route

| #  | Description  |
|----|--|
| 1  | Fishing club – <i>Visvijver Herkenbosch</i>  |
| 2  | Former military air field – <i>Royal Air Force Station Brüggen</i>                 |
| 3  | Former coal mine – <i>Staatsmijn Beatrix</i>                                       |
| 4  | Health and research centre – <i>International Maharishi AyurVeda Foundation</i>    |
| 5  | Water castle – <i>Schloss Elsum</i>  |
| 6  | Motte-and-bailey castle – <i>Alde Berg</i>   |
| 7  | Siemens Mobility railway test centre   |
| 8  | Castle – <i>Schloss Tüschenbroich</i>  |
| 9  | Museum for flax plants and for Europeans folk costumes – <i>Heimatverein Beeck</i> |
| 10 | Rheindahlen Military Cemetery  |



### 3.3.1.1 Route of the Cycling Connection

After having analysed different route options, the route on or parallel to the Iron Rhine railway (see chapter 3.2.4 *Iron Rhine Railway*) seems to have a high potential as a cycling connection regarding the connectivity and points of interest/destinations.

#### Roermond and De Meinweg

From west to east (Roermond to Mönchengladbach), the route runs from the back side of the Roermond central station (eastern side) to the southeast of the city. It passes between the forest area in the north, where the golf club *De Herkenbosche* is located, and the industrial area *Roerstreek* in the south. Figure 26 shows the abandoned rails at that point. A bit further east is the riding stable *Rijstal Venhof* and the fishing club *Visvijver Herkenbosch*. From this part on, the rails continue in and run through the national park *De Meinweg*, where *Boshotel Vlodrop* and the health and research centre *International Mahari-shi AyurVeda Foundation* are located. The route passes the former Vlodrop station next to *Hotel St. Ludwig*.



Fig. 26 – Iron Rhine rails between Roerstreek and De Meinweg (Author's own construction, 2020)

#### Dalheim-Rödgen

Right after the hotel, the route crosses the border to Germany, passes the mill *Dalheimer Mühle*, and leads to the German town of Dalheim-Rödgen, which is the end of the abandoned part of the Iron Rhine, and first station of the operating railways in direction of Mönchengladbach. Dalheim-Rödgen offers several schools, and the motte-and-bailey castle *Alde Berg*. From here, the cycling route runs parallelly to the railway through rural areas towards east.

#### Wegberg

The cycle route runs through the town of Wegberg, which has a population of around 28,200 and offers several schools, kindergartens, mills, and the museum for flax plants and for Europeans folk costumes. Furthermore, in the centre of Wegberg is the as a hotel functioning castle *Burg Wegberg*. In the surrounding are parts of the swamp areas *Schwalmbruch*, *Mühlenbachtal* and *Knippertzachtal*.

#### Rheindahlen

Further east is Rheindahlen, which is part of the city of Mönchengladbach. When entering Rheindahlen, the potential connection passes the new Amazon Logistics Centre. Furthermore, there are some educational institutes such as schools and kindergartens.

### Borussia-Park

In Rheindahlen, the route leads towards north through another short rural part, where it passes the two riding stables *Reitstall Klinken* and *Yvonne Reitschule*, and eventually leads to the *Borussia-Park* – stadium of the German football club *Borussia Mönchengladbach*, which has the own hotel *H4 Hotel*.

### Mönchengladbach

In Mönchengladbach, the route goes a last time through a more rural area, but mainly through urban areas of the city, which offer all kinds of facilities as schools, hotels, shop, etc. Eventually, the cycling route connects to the southern side of the central station *Mönchengladbach Hbf*.

#### 3.3.1.2 Spatial Division of the Cycling Connection

The spatial line (Figure 27) shows the division of the favoured cycling route. In quite equal parts the route runs through urban areas (30%), rural areas (40%), and forest areas (30%). The Dutch part (38% of the total route) consists especially of forest areas (*De Meinweg*), while the German part (62% of the total route) consists mainly of urban and rural areas.

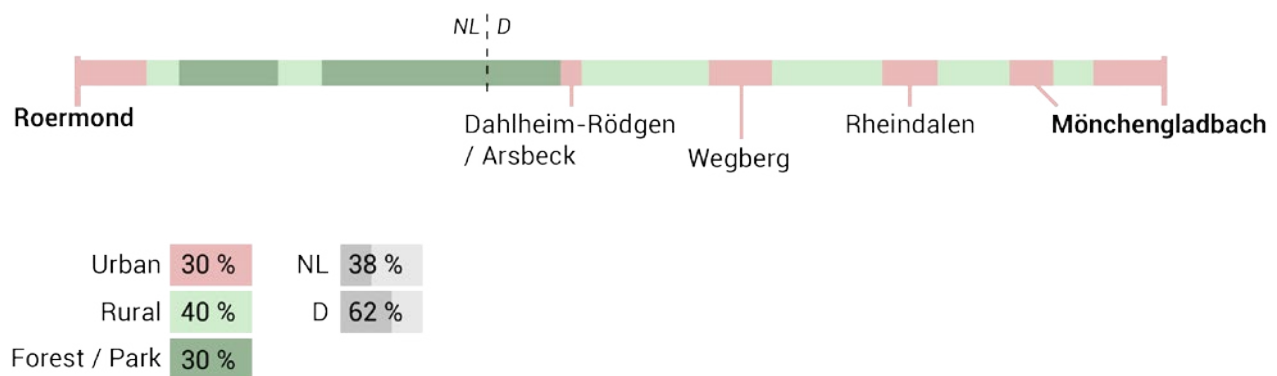


Fig. 27 – Spatial line of the cycling connection RMG (Author's own construction, 2020)

### 3.3.2 STEEP Analysis

The STEEP analysis deals with the social, technical, economic, environmental, and political aspects in the area of the project. The STEEP analysis helps to cover important elements.

#### 3.3.2.1 Social Aspects

#### Placemaking Through the Cycling Connection

A strong cycling connection can have a positive impact on the attractiveness of the adjacent neighbourhoods as a well-connected region with a strong infrastructure creates the attractiveness for potential future-residents. The planned cycling connection, which ends on the East side of the Roermond central station, also has the potential to increase the social safety by increasing the number of cyclists and pedestrians.

### Schools Along the Route

In Roermond and Mönchengladbach, as well as in between in the towns of Dalheim-Rödgen, Arsbeck, Wegberg, and Rheindahlen there are several schools from different kinds, as primary schools, high schools, kindergartens, and other schools. Figure X shows the schools along the route of the cycling connection Roermond-Mönchengladbach. With a strong cycling route connecting schools and residential areas, the possibility for children to cycling to school increases.

### Demographic Change

The demography is ageing worldwide, which means that the percentage of older people is increasing. There are two main reasons for the demographic change: Firstly, the mortality decreases due to improving health care, and secondly, low birth rates, which can be found especially in the more developed countries (Land et al., 2017).

#### 3.3.2.2 Technical Aspects

### E-Cycling

As the popularity of e-cycling increases and is even intensified due to the COVID-19 pandemic, this trend has to be considered more in the planning of new cycling routes. Especially, for recreational purposes, where trips might take several hours and probably even some days, charging stations for e-cycling should be considered. Furthermore, due to higher speeds of e-cycling, wider cycling lanes, especially in case of high traffic volumes, should be considered.

### Innovative Surfaces

The implementation of special surfaces of the cycling route such as plastic roads, and self-luminous surfaces could be considered. In 2018, the first PlasticRoad bicycle path was introduced in the Dutch city of Zwolle. The surface is made of hollow parts of recycled plastic. On the inner side of those parts, pipes and cables can be laid (Pluta, 2015). Also, self-luminous cycling paths were already implemented as in the Polish Lidzbark Warminski, the Dutch Eindhoven, or the US-American Houston, Texas. While the example in Texas has mainly safety purposes, the Dutch example created an homage to Vincent van Gogh's painting *The Starry Night* (see Figure 28). This surface creates a unique selling proposition for the cycling route and might enlarge the attention for potential visitors (Finger, 2017).

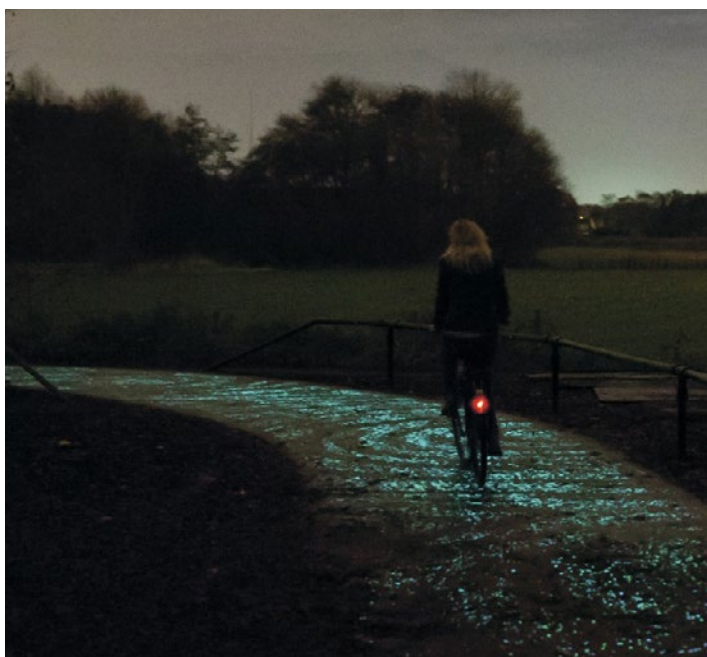


Fig. 28 – Self-luminous cycling path in Eindhoven with a van Gogh homage (Studio Roosegaarde, 2019)

## Online Presence and Social Media

Several cycling routes have websites and social media accounts as on Facebook or Instagram. For instance, the Danish Supercykelstier ([www.supercykelstier.dk](http://www.supercykelstier.dk)) and the German Nordbahntrasse ([www.wuppertalbewegung.de/nordbahntrasse](http://www.wuppertalbewegung.de/nordbahntrasse)) have websites as well as Facebook- and Instagram accounts, where information of the cycling routes are published as well as photos of the route, which are partly taken by the followers. This can be used as an effective promotional tool. The Nordbahntrasse, for example, has more than 2,400 followers and 530 posts on Instagram (Instagram, 2020).

### 3.3.2.3 Economic Aspects

#### Amazon Logistics Centre

Since 2019, there is a new Amazon warehouse in Rheindahlen. Already more than 1,300 employees (Effective October 2019) work in the warehouse, which is still growing as it is still under construction. More than 1,100 of those 1,300, who already work there, are residing in Mönchengladbach due to site director Ernst Schäffler (Gruhn, 2019). The warehouse with its great number of employees might be an interesting node in the planning of the cycling connection ROERMOND–MÖNCHENGLADBACH as it is located closely to the planned cycling connection and lies in a good cycling distance to Mönchengladbach (around 10 km to Mönchengladbach central station).

#### Gouden Driehoek

The Gouden Driehoek (Dutch: *Golden triangle*) is an economic union of different businesses in the region between De Meinweg, Herkenbosch, and Vlodrop – the golden triangle. Part of it are e.g. the two garden centres *Tuincentrum Daniëls* and *Tuincentrum Schmitz*. Further east to the border is the flower shop *Bloemetje van Daniëls*. The Gouden Driehoek represents the interests of these businesses regarding the development of their businesses, traffic (safety), parking, recreation and tourism, and the nature (Drimble, 2020).

#### Tourist Industry

The tourist industry plays a big role in the region. Several mills can be found in the area – many of them are combined with restaurants, which create attractive destinations for recreational trips. In Wegberg are two museums: One about the flax plant, and one for Europeans folk costumes (Heimatverein, 2020).

#### Industrial Park Roerstreek-Noord

Between the centrum of Roermond and the Dutch-German border, there is a big industrial park (around 45 hectares) with more than 100 companies. These include industry, wholesale, and logistics/distribution companies as for example UPS, Rockwool, and Sekisui (Parkmanagement, 2020).

#### Hotels

There are several hotels along the cycling connection. Close to De Meinweg lies the bungalow park *Elfenmeer*. The *Boshotel Vlodrop* lies in the forest next to the national border, the *Hotel St. Ludwig* is close



to the former *Vlodrop Station* just next to the railway, and thus, close to the planned cycle route. In Wegberg, one hotel is part of the castle *Burg Wegberg* in the centre of the town. At the Borussia-Park is the *H4 Hotel*, which belongs to the football club.

### **Borussia Mönchengladbach**

The football club *Borussia Mönchengladbach*, which has its stadium and the office along the route, is one of the biggest football clubs in Germany regarding members, won titles, and current value (Transfermarkt, 2020). The stadium has around 54,000 seats, and it attracts people from the whole region, the rest of Germany, and even many other countries worldwide (Borussia, 2020).

### **Riding Schools**

The area has several riding schools. The riding schools in Herkenbosch and in Rheindahlen are in immediate proximity of the planned cycling route. Another riding school lies a bit more southern in Wassenberg. The riding school could have a high potential as people who ride horses might be generally interested in active modes such as cycling. Additionally, a share of the customers might be underage as riding horses is popular among children, a safe and strong cycling connection, which leads to those riding schools, could serve a big potential.

### **Golf Courses**

In the region is a relatively big number of golf courses. On the Dutch side, at *De Meinweg* just along the planned cycle route is the golf club *De Herkenbosche*. In the German Wassenberg, close to the Dutch border, is the golf club *Rothenbach*, and east of the Siemens Train Test Centre is the golf club *Wildenrath*. Furthermore, northeast of Dalheim-Rödgen is the golf club *Schmitzhof* located.

#### 3.3.2.4 **Environmental Aspects**

### **National Park De Meinweg**

In Roerdahlen, between Roermond and the border to Germany in the East, there is the national park De Meinweg (Figure 29), which has the size of around 1,600 hectares and managed by the Dutch forest administration *Staatsbosbeheer* (Natuurparken Limburg, 2020). Together with further conservation areas on the German side of the border, De Meinweg forms a big ecological unit (Naturpark Maas-Schwalm-Nette, 2020).



Fig. 29 – Panoramic photo of the national park De Meinweg (Cosar, 2017)

The word “Meinweg” originates from the Celtic word “Gemeyne”, which means “common” as it was a common meadow of the fourteen villages, which were in control of the area. Now, those villages are partly in the Netherlands (as Vlodrop, Herkenbosch, and Roermond), and partly in Germany (as Wassenberg, Arsbeck, and Niederkrüchten) (Natuurparken Limburg, 2020).

The park has a unique terraced landscape with height differences of 50 metres, and has a mix of forest, heathlands, creek valleys, and swamps (Natuurparken Limburg, 2020). Furthermore, the national park is home to several bird species, as well as boars, foxes, snakes, and many more (Naturpark Maas-Schwalm-Nette, 2020). Furthermore, the park offers hiking trails, horse riding trails, dog parks, and a visitors' centre with a cafe.

From 20 till 24 April 2020, a forest fire burnt in De Meinweg – its cause is still to be found. A very dry spring and winds reinforced the fire, and made it destroy 200 hectares (see Figure 30) – around 10% of the total area of the park (1Limburg, 2020). In total, more than 1,600 firefighters from the Netherlands and Germany were in the line of duty (RP Online, 2020). In order to control the fire and avoid it to jump over to other parts, a 6-metre swath was cut in the forest (see Figure 31). Forest fires occur increasingly due to warmer and drier periods in Europe, which is caused by the climate change (Nordstadtblogger, 2020).



Fig. 30 – A big part of De Meinweg got destroyed by the forest fire (van den Brook, 2020)



Fig. 31 – A swath was cut into the forest to control the fire (Jungmann, 2020)

### Conservation Areas in Germany

On the Germany side of the area are several conservation areas such as the *Helpensteiner Bachtal*, *oberes Schaagbachtal* und *Petersholz*, which combines different, mainly woodland areas. The area lies directly on the route, close to Dalheim-Rödgen and transitions into De Meinweg in the Netherlands.

The area has several mottes, which are small (often wooden) fortifications, usually on top of manmade hills. Close to Dalheim is the biggest and best-preserved motte, called *Alde Berg* (see Figure 32). It is around twelve metres high and offers a great view of the surrounding.



Fig. 32 – The motte Alde Berg (Tünnissen-Hendricks, 2009)

Furthermore, there is the conservation area of *Tüschenbroich*,

south of Wegberg, which is a wetland area. Tüschbroich has two mills, further historic sites, and a pond, which allows to fish (Naturpark Maas-Schwalm-Nette, 2020).

Also, the *Schwalmtal* offers several conservation areas northern of Wegberg. The swamp forests are characteristic for the area, and similar to the other parts of the areas, several mills can be found here.

### 3.3.2.5 Political Aspects

Compared to cycling connections within the borders of one country, the political situation for transnational cycling routes gets usually more complicated due to differences in laws, restrictions, or approaches. General cultural differences are further explained in chapter 2.2.3 *Cycling as Part of the Culture*.

### Chance for Iron Rhine

The project of this international cycling connection is a chance for the Iron Rhine, which does not serve any purpose at the moment. With a cycling connection (partly) on the route of the Iron Rhine, it would not only create an attractive environment, but also could be interesting by giving the former railway a new function. The use of the rails could become a regional political topic.

### Cycling As a Political Topic

In the Netherlands, cycling is such a big part of the culture, and thus, inclusive in the planning, that it is implicit to create such cycling connections.

In recent years, cycling becomes an increasingly important topic in German planning. The increasing climate change with its consequences, and the strengthening of the green party in many regions in Germany surely contribute to this transition as it can be seen that since 2018, the green party increased their votes in almost all state elections in Germany since then (BPB, 2020). It is very noticeable at the last state election, which was in Hamburg in February 2020, where the green party became second strongest party with 24.2% – a plus of 11.9% compared to the previous elections in 2015 (Landeswahlamt, 2020).

### Consequences of the Coronavirus Pandemic

The COVID-19 pandemic with its possible long-term impacts on the cycling culture as described in chapter 2.2.3.5 *Cycling Culture during the COVID-19 Pandemic*, could also influence the mixed-purpose cycling connection Roermond–Mönchengladbach. The importance of this connection could increase and have an influence on both utilitarian and recreational cycling. As public transport modes are not recommended due to a high contamination risk, commuter cycling traffic gains in importance and could be served by a new cycling connection. Furthermore, due to the many limitations and restrictions caused by the pandemic, also the increased demand for recreational cycling would be served by the mixed-purpose cycling connection.

### 3.3.3 Stakeholder Analysis

Figure 33 shows the stakeholder matrix shows an overview of the different stakeholders involved in the project. The stakeholders are classified by their estimated power and interest. Additionally, the expected attitude towards the project is stated. Some of the stakeholders are divided into the countries of the Netherlands and Germany. Since not all roles of the stakeholders are clear, this information is estimated with help of Ms. Ineke Spapé, Mr. Jörg Thiemann-Linden and Mr. Arne Blase. It is likely that these estimations might change during the process of the project

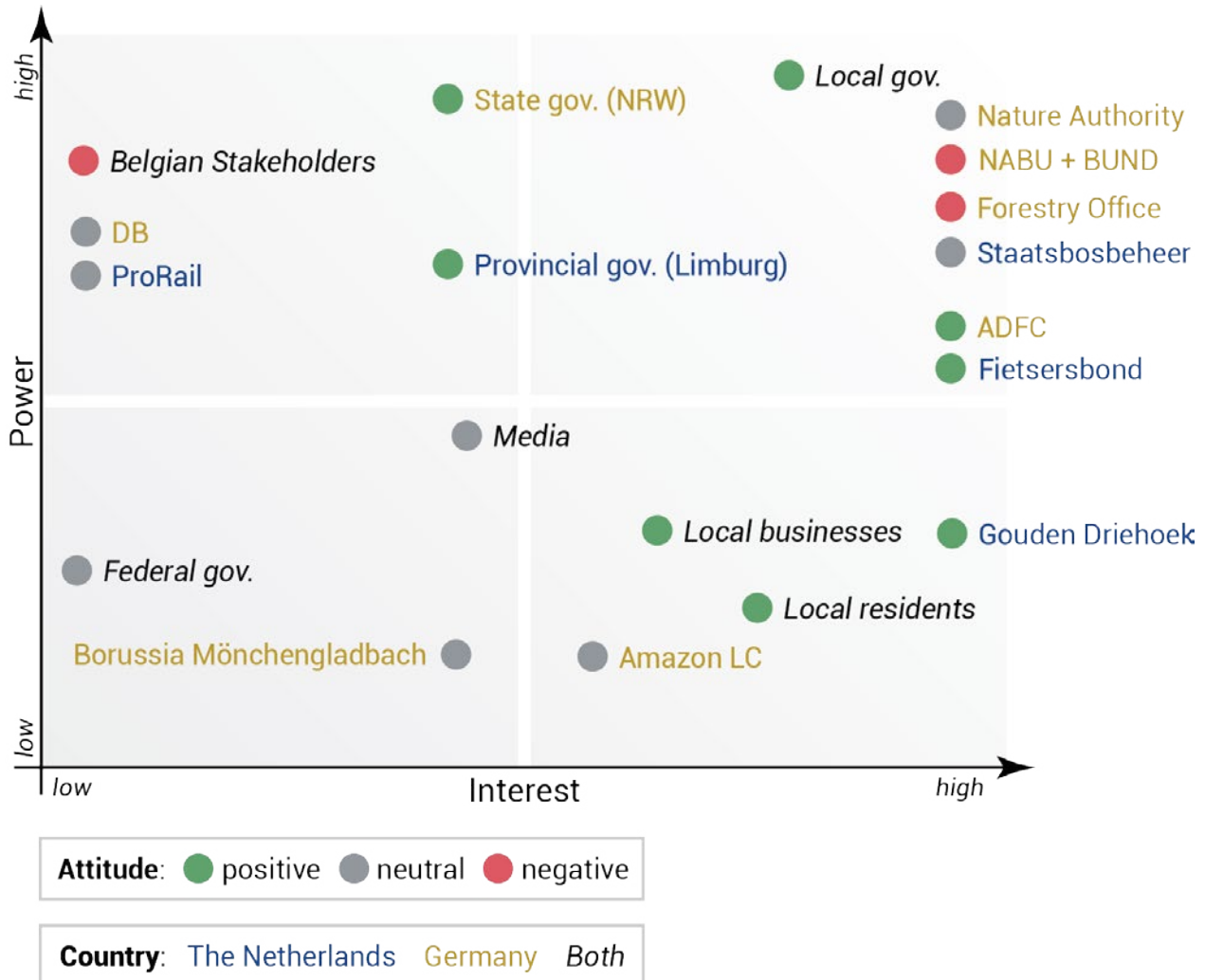


Fig. 33 – Stakeholder Matrix (Author's own construction, 2020)

#### 3.3.3.1 Key Players (High Power / High Interest)

##### Forestry Office, NABU and BUND

The German Forestry Office as well as the NABU (*Nature and Biodiversity Conservation Union*) and the BUND (*Federation for Environment and Nature Conservation*), which have high power in Germany. Since they care about the nature protection, they are expected to have a high interest in implementations in the area such as the cycling connection. Hence, their attitude is expected to be rather negative as they might worry about a suffering of the nature when implementing a new cycling connection.



Due to experience of former projects, the German nature-related stakeholders might have a bit more power in Germany than the Dutch equivalents in the Netherlands. Though, that is an estimation as it is not fully clear for this project yet.

### **Nature Authority**

The local nature authority in Germany is ranked as a key player with high power and high interest. Since big parts of the area are conservation areas, the authority will care about nature protection. However, the authority does not seem to have concerns about this cycle route and the attitude is rated as neutral.

### **Staatsbosbeheer**

The Staatsbosbeheer is a Dutch governmental forestry organisation, which manages De Meinweg. As the planned cycling connection would go partly through the national park, the Staatsbosbeheer becomes an important stakeholder with a high power and high interest. Its attitude is expected to be neutral as it might be in favour of an increased attraction through the cycling connection, but also cares about the protection of the natural environment.

### **Fietzersbond and ADFC**

The Dutch Fietzersbond (*Cyclists' Union*) and the German ADFC (*German Cyclists' Association*) have quite a high power and a very high interest as they are in favour of an increase and improvement of cycling connections. Hence, their attitudes are definitely expected to be positive towards the development. In previous projects it seemed that the Fietzersbond might have a bit more power in the Netherlands than the ADFC in Germany.

### **Local Governments**

The local governments (in both countries) are both highly interested in a strengthening of the regional infrastructure, and hence, a strong connection to the neighbouring municipalities and countries, and thus, have a positive attitude. As the cycling connection run through their municipalities, they have high power.

#### **3.3.3.2 Meet Their Needs (High Power / Low Interest)**

### **State / Provincial Government**

The state government of North Rhine-Westphalia and the provincial government of Limburg are estimated to have a medium high interest in the project, but high power. Especially, the German state government of NRW has high power as the project depends on their subsidies. Their general attitude might be positive as the cycling connection could strengthen the region.

### **Belgian Stakeholders**

The clustered Belgian stakeholders are linked to the Iron Rhine railway. These include the governments of Belgium, Flanders, Antwerp, and further municipalities, which are passed by the railway, the harbour

of Antwerp as one start-/endpoint of the railway as well as the National Railway Company of Belgium (NMBS/SNCB). As the resumption of the railway between Roermond and Dalheim is very unlikely, but contractually possible, the Belgian stakeholders are expected to have a rather low interest (currently), but high power as they can decide to resume the rail traffic due to the contractual situation. The overall attitude is expected to be neutral or negative due to the possible economic interest in a resumption of the railway at some point.

### **DB / ProRail**

The railway companies DB and ProRail are involved as a part of the Iron Rhine railway is considered to be used for the cycling route. Their interest might be quite low as the Iron Rhine railway does not serve any purpose at the moment, which is not to be expected to change in the short- or medium-term future, their attitude is ranked as neutral. Their power as owners of the rails is very high.

#### **3.3.3.3 Show Consideration (Low Power / High Interest)**

### **Gouden Driehoek**

The Gouden Driehoek (Dutch for *Golden triangle*) has a high interest in the project as already mentioned by Mr. Han Daniëls (from *Daniëls Tuincentrum* as part of the Gouden Driehoek) in the first workshop on 11 March 2020. The retailers of the Gouden Driehoek could benefit from the cycling connection and are thus in favour of it. Nevertheless, their power in the project is rather medium to low.

### **Local Businesses**

The local businesses in both countries have rather low power, but a high interest in the project as a strong cycling connection has the potential of flourishing the local economy. Hence, they are expected to have a positive attitude.

### **Local residents**

Similar to the local businesses, also the local residents have rather low power, but high interest in the cycling connection as it creates another strong transportation possibility for commuting and for recreation rides and strengthens the general infrastructure. Thus, also the attitude might be generally positive.

### **Amazon Logistics Centre**

The interest of the Amazon Logistics Centre in Rheindahlen is expected to be high to medium as workers could benefit from the cycling connection as it would create an adjacent cycling connection from the warehouse to Mönchengladbach, where most of the workers reside. However, the general attitude towards the projects is probably rather neutral, and the power rather low.

#### **3.3.3.4 Inform (Low Power / Low Interest)**

## Media

The media is estimated to have a medium high interest and power, which could probably vary very strongly. The interest and power might have a high correlation as an increased interest of the media would probably result in increased power due to media coverage, which many consume. Their attitude is estimated to be rather neutral.

## Federal Government

The federal governments of both countries have a rather low interest as well as low power, as possible subsidies would come from the state government. Also, this project is probably not of great significance compared to other bigger projects the federal government deals with.

## Borussia Mönchengladbach

The football club Borussia Mönchengladbach has its stadium *Borussia-Park* and the office along the cycling connection. As the club could benefit from the route as visitors of the stadium as well as the staff could cycle there, the interest is expected to be medium. The power, however, is rather low and the attitude low.

## 3.4 Workshops

Initially, two workshops with different stakeholders were planned in order to have discussions on the project, share ideas and experiences, and make decisions on the progress of the project. A first workshop with the Dutch partners did take place on 11 March 2020 in Vlodrop – luckily just before the lockdown began. The second workshop with both the Dutch and German partners, planned for 28 April 2020 in Wegberg, had to be cancelled due to the COVID-19 pandemic and is postponed to autumn 2020 if the situation will then allow it.

Instead of this second meeting, a brief online meeting with the core partners was held to plan the further procedure. The German partners, who initially did not plan an internal workshop (which might be related to the less orgware-oriented planning culture), eventually started two task forces due to the reported positive outcomes of the first workshop in the Netherlands. These two task forces focus on nature and on tourism/economy respectively and are planned to take place in June 2020.

### 3.4.1 First Workshop with the Dutch Partners

The first workshop took place on 11<sup>th</sup> March 2020 in the Boshotel Vlodrop in Vlodrop, Roerdalen, and was focused on the Dutch part of the route. Therefore, mainly Dutch, but also some German stakeholders participated. The participants consisted of employees of the municipalities of Roermond and Roerdalen from different departments, representatives of the Dutch and German cycling unions Fietzersbond and ADFC, representatives of regional nature authorities, and representatives of the economic union Gouden Driehoek (the full list of participants can be found in appendix X).

Generally, the workshop was seen as successful by all participants, and everybody agreed on the rough route of the cycling connection and the potential for the local economy.

#### 3.4.1.1 Topics and Outcomes of the World Cafe

Besides some presentations of the project in general, the Iron Rhine railway and some other topics, the focal point of the workshop was the so-called 'world cafe' in form of six posters with one topic each, which were discussed by the participants in two rounds. Ideas, discussion points, concerns and other information were then collected on the posters, as shown below. The full list of the outcomes of the poster are shown in Appendix X.

##### **Poster 1: Potential / USP**

The first poster was about the potential and USP of the cycling connection. The east-west-oriented cycling connection should be commuter-friendly with feeders to the centres of the adjacent towns such as Herkenbosch, Vlodrop, or Rothenbach. Recreation is a pivotal part of the area. Hence, the cycling connection should offer 'something special' for the recreational use. Regarding the recreational use, the route should offer facilities such as rest areas, picnic areas, terraces, and sanitary facilities.

The final cycling route does not necessarily hold tight to the planned route, it should be flexible and adapt to the environment. As the area around the Vlodrop station is a sensitive nature area, special care is required there. A cycling connection at existing, busier points as the Gouden Driehoek could be therefore a good variant. The area of the Venhof should be treated in a creative way as the route is between the recreational area in the north, and the utilitarian business area in the south. A functional cycle path is needed, but recreation is a USP of area, thus a combination is important to serve both target groups.

##### **Poster 2: Points of Interest**

In the northern part (De Meinweg), nature is omnipresent and should give some POIs. The southern part could be connected with the many facilities such as the horse stables, horeca, and the Gouden Driehoek. The route should facilitate 'little Happiness'. As locals might know POIs as De Meinweg, but strangers usually not, the route should focus on giving emphasis on that.

##### **Poster 3: Target Group**

As there are different target groups (utilitarian and recreational cyclists), differences in speeds must be considered. A combination of tranquillity and vulnerable natural parts could be combined with a node system. Attractive eye catchers could help to withdraw urban dwellers in the western part (Roermond) into the nature.

##### **Poster 4: Design**

The design of the route should be adapted to and fit in the environment. Especially in the nature parts, the connection should blend in instead of being a sleek design. Furthermore, an option could be the ladder principle with two parallel routes – one for recreational and one for utilitarian cycling traffic. In general, the design is dependent of the environment and possible nature conservational, technical, or



political preconditions. Nodes and attraction points should have an own, unique character. Possible tunnels should be designed in a spacious and socially safe way.

### Poster 5: Branding / Name

The branding and the name are essential to create a unique and attractive route. Many of the ideas for possible names refer to the topography and USPs of the area. That includes the mills, rivers, the border area, nature and parks, the valleys, and the Iron Rhine. The name should be attractive for both the Dutch and the German users as they should be attracted to use this cycling connection in the respective direction. Some Concrete names are: *Schulweg St. Ludwig*, different variants of *Mein(Fiets/Rad) Weg*, *IJzerRoute*, *Maas-MolenRoute*, *Drieparkenroute* (Park Meinweg, RoerdalPark and BorussiaPark), *Niers-Maasweg*, *Schwalm-MaasWeg*, *van wegBerg naar Roer*, *Maas-Borussiaroute* (if sponsored), *RheinDalen*, *Drahtesel statt Stallross* (Bicycle instead of Train), *Grenzenlos zur Maas*, *Roermond-Gladbachfietspad*

### Poster 6: Further Ideas / Remarks

The cycling connection should also focus on pedestrians and riders in the area and should not only be exclusively for cyclists. As the entrance via Herkenbosch is a business park, and the De Meinweg-area is hidden from the road, the design of this entrance is important and should create a positive first impression. The cycling connection could even have more potential in the future, e.g. by connecting to other routes in the region (LF Maasroute and other cycling connections in the German part).

#### 3.4.2 Next Steps

The next step of the cooperative work are the two task forces on the German side. The outcomes of these meetings will be shared with the rest of the workgroup (i.e. the Dutch partners).

The following main event will be the second workshop, which was initially planned for late April 2020, but had to be postponed. When this workshop will be made up presumably in autumn 2020, the outcomes of both workshops (i.e. the outcomes of the world cafe of the Dutch workshop and the two work forces of the German workshop) will be shared in detail and an integrated concept will be created.

### 3.5 Building Blocks of Practical Elements

#### **Potential of the Iron Rhine Railway**

The railway of the Iron Rhine has high potential of being transformed into a cycling path due to its straight and pre-built connection between the cities. As several examples show, many cycling routes are built on former railways. Besides the ideal connectivity of places, the width of rails of a few metres, is more or less perfectly the space needed for cycling routes.

#### **Branding through Use of the Iron Rhine**

The project has the potential to use the Iron Rhine railway as part of the cycling route, which has a lot of history. The railway is not only a good opportunity due to space it offers, but it also creates an appealing environment for the connection and could be used for the branding of it.

#### **Online Presence and Social Media**

The Nordbahntrasse and many other cycling connections have online presences like websites and social media accounts as on Facebook or Instagram. Such measures can help to increase the attention, make announcements, organise events, and generally, stay in touch with the users.

#### **Mixed-Purpose Destinations Along the Route**

The spatial analysis shows that there is a big variety of potential destinations along the planned route. Those destinations serve a utilitarian purpose as several schools and work facilities are along the route. Additionally, the region is rich in touristic attractions such as mills, motte-and-barley castles, forests, parks and many more. These two different types of destinations show the potential of a mixed-purpose cycling connection in the area.

#### **Interest of Local Stakeholders**

The general interest of the cycling connection by local stakeholders as residents, educational institutions, and businesses is expected to be high and with a positive attitude. Even though it cannot be ruled out that there are such local stakeholders with a negative attitude, the benefits of a strong cycling connections will generally win these over. The opportunity of cycling will improve for local residents for both daily commuting trips and occasional trips. Members of educational institutes such as pupils and students have naturally a high demand for cycling, not least because of the young age and often limited financial possibilities for driving for instance. An improved cycling connection would help them with the choice of transport. Also, local businesses could benefit from a higher share of cycling as the cycling tourism industry is quite strong with an annual value of €44 B in Europe alone. Having such local stakeholders on the side, can help giving arguments to convince decision makers and other powerful stakeholders.

#### **Communication with Partners and Stakeholders**

The workshop (as well as previous cycling projects) has shown that a good communication with the partners and further stakeholders is very important as different stakeholders have different sights on such a project.

### **Subsidies by Government and Interreg**

Many cycling projects are qualified for subsidies by the government on different levels as the on the national or state level. Also, EU programmes such as Interreg offer the possibility of subsidies. This possibility of financial support can help to convince municipalities to create new cycling infrastructure.

### **Potential of Combination with Other Cycling Connections**

A cycling connection creates the potential of a combination with another existing or future cycling connection or concept. A cycling connection could be implemented in a node system as known from the Dutch Fietsknooppunten. Also, an integration into an existing route or an extension of the route in the future in order is a possibility of the route.

### **Potential of Tourism**

Due to the big number of recreational points of interest such as De Meinweg, swamp areas, several mills, castles, museums, and more, the area has a high potential of tourism with a positive impact on the local economy. A strong mixed-used cycling connection could exploit this potential of the region.

### **Cycling Lane as Forest Fire Prevention**

For stakeholders with a rather negative attitude towards the project, it can be very important to have good arguments in favour of the cycling connection in order to get their support. A big argument for sceptical nature authorities and nature conservation associations could be that a cycling route through the forest can be used as a swathe to split the forest, which could become of importance in case of forest fires. As the fire of De Meinweg has shown, such swathes were cut to avoid the fires. Therefore, the cycling route can even have a positive impact on protecting the forest as fires occur increasingly, which could convince nature protection organisations.

**Potential of the Iron Rhine Railway**

**Branding through Use of the Iron Rhine**

**Online Presence and Social Media**

**Mixed-Purpose Destinations Along the Route**

**Interest of Local Stakeholders**

**Communication with Partners and Stakeholders**

**Subsidies by Government and Interreg**

**Potential of Combination with Other Cycling Connections**

**Potential of Tourism**

**Cycling Lane as Forest Fire Prevention**



# 4

## INTEGRATED CONCLUSION



Cyclists in an urban environment (VVV Midden-Limburg, 2017)

## 4.1 Introduction

The fourth chapter *Integration of the Building Blocks* presents the combined building blocks from the previous two chapters. In that way, new integrated conclusions were created. The integral conclusions are Importance of Orgware Measures, High Political Interest, Unique Identity of the Cycling Connection, Attention on E-Cycling, Stimulation of the Local Economy, Extension in the Future, and Use of the Iron Rhine Railway.

The second part describes the *Bow Tie Concept*, which approaches the utilitarian focus on the more urban ends in Roermond and Mönchengladbach and emphasises the recreational heart in the centre, which attracts people from the outside into the nature.

## 4.2 Integrated Building Blocks

### Theoretical Elements

### Practical Elements

#### 4.2.1 Importance of Orgware Measures

##### Potential for Orgware Measures

##### Communication with Partners and Stakeholders

The workshop in Vlodrop in March 2020 has shown the big potential of such orgware measures. A great variety of stakeholders was invited to exchange ideas, experience, and concerns in order to create a strong concept for the cycling connection Roermond-Mönchengladbach. While such collaboration with different stakeholders is common in the Netherlands, in other countries like Germany for example, there is often still more potential for a closer exchange.

The report on the positive outcomes of the first workshop even caused the creation of two task forces on the German side. Therefore, the German partners will hold the two work forces with external stakeholders of nature authorities and tourism-related stakeholders respectively.

Also, other projects like the development of the Nordbahntrasse have shown the great influence of orgware measures. The exemplary cycling connection was started by an organisation called *Wuppertalbewegung*, which created a feasibility study and did public relations work in media, clubs and organisations, and political committees and could eventually convince the city of building this cycling connection.

#### 4.2.2 High Political Interest

##### Cycling as Political Interest

##### Subsidies by Government and Interreg

##### Cycling Infrastructure is Cheap

##### Many Environmental and Health Benefits

In many places, cycling becomes an increasingly important political topic. Due to the raised awareness of the climate change due to pro-environment movements like *Fridays For Future*, as well as the current COVID-19 pandemic with the recommendations of keeping physical distance to other people, cycling becomes an important focal point in future planning.

Generally, there are subsidies on different levels (e.g. European, national, or regional) municipalities can apply for. The German climate protection programme 2030 shows the willingness of stimulating cycling and invest in more cycling infrastructure: While only around €100 M were annually allocated for cycling lanes in the past, the government will provide an extra amount of €900 M until 2023, which sums up to €1.46 M for cycling infrastructure in the coming three years.

Another important advantage of cycling routes is the relatively low costs as a kilometre of cycling path costs with around €0.9 M less than 25% of a main road for cars and less than 5% of a highway.

Besides these financial benefits, also the general environmental and health benefits should play a key role for the stakeholders as primary the governments. Cycling does not only save CO<sub>2</sub> emissions, and tackles air and noise pollution compared to motorized passenger traffic, also the health benefits are great. Among other health benefits, cycling strengthens for example the general fitness and prevents cardiovascular diseases. Therefore, the government should have an interest of bringing more people to cycling and gain from these benefits.

#### 4.2.3 Unique Identity of the Cycling Connection



A cycling connection can become a place rather than only an object of infrastructure. A strong branding could help to attract more people, which would not only have an impact on the number of users of the connection, but also positively impacts the social safety, which can have a big influence of the whole area or region by conveying this feeling of safety and attracting even more people to the area. Especially, in darker times of the season this increase of social safety is important.

A unique branding, as for instance through the use of the Iron Rhine railway, can help to gain attention and create the cycling route into a unique place. Different topics of the region could be used for the branding: The Iron Rhine railways, the national parks (e.g. De Meinweg with an area for vipers), the mills, the football stadium of Borussia Mönchengladbach, and others.

Innovative technologies such as the *PlasticRoad* or attractive self-luminous surfacing could contribute in a sustainable or safe environment, but also such USPs could attract notice and transform the cycling connection to something unique.

A strong branding creates the potential of using an online presence and social media to give the cycling connection a strong identity. The organisation of events, announcements, or even just the sharing of photos of the cycling route can contribute to the popularity and thus a strong identity.



#### 4.2.4 Attention on E-Cycling

##### **Increase of E-Cycling**

##### **Sharp Rise Due to the COVID-19 Pandemic**

The bicycle sales in the recent years and especially during the COVID-19 pandemic show a great increase of e-cycling. E-bikes make around 20-30% of the total numbers of bicycle sales, nowadays, and during the current pandemic, the shares exceed sometimes even 50%. Especially, for older people e-bikes seem as an increasingly interesting option.

However, this increase of e-cycling should be considered in cycling planning. Firstly, due to e-cycling, users can easily cycle with high speeds. Especially, for users, which did not use to cycle a lot and then use an e-bike, this technology can become an increasing cause of accidents. Not only the speeds increase due to e-cycling, also the differences of spends among cyclists could create a higher potential for accidents. A consideration of that is crucial for the planning of cycling connections.

Furthermore, besides of the safety issues, also an expansion of charging stations for e-bikes should be considered. Especially, recreational and mixed-purpose cycling connections have the potential to attract cyclists for longer trips. The provision of charging infrastructure could be combined with horeca facilities, so that cyclists can charge their e-bikes while taking a break at a cafe.

#### 4.2.5 Stimulation of the Local Economy

##### **Positive Impact on Local Economy**

##### **Interest of Local Stakeholders**

##### **Mixed-Purpose Destinations Along the Route**

##### **Potential of Tourism**

An important result of a cycling connection could be the stimulation of the local economy. Especially, recreational cyclists spend a lot of money during the trips. Day trippers spend on average €16 per day, cyclists during multi-day trips spend on average even €76.50 per day. Thus, local businesses, shops, horeca and other facilities could gain from an increase of cycling tourists in the region.

The mixed-purpose destinations along the route help to attract cyclists. Facilities as offices, schools, warehouses (e.g. Amazon LC) approach on the potential of the utilitarian side of the cycling connection. The touristic points of interest such as the parks and nature reservations, mills, or the museums approach the recreational facet of the connection. This mix of destinations emphasises on the potential of a mixed-purpose cycling connection.

This increased potential of the local economy is shown through the interest of the local stakeholders. Participants of the Gouden Driehoek, an economic association of different enterprises in the region of Roerdalen, made the interest of the cycling connection clear during the workshop in Vlodrop. The enterprises expect a positive impact on their businesses through a strong cycling connection. The interest of such stakeholders can help to state the great demand of the cycling connection and create good reasons to approach the governments with. Also, for the receiving of subsidies, the strengthening of the local economy can be a good argument.

#### 4.2.6 Extension in the Future

##### **Different Cycling Purposes in Urban and Rural Areas**

##### **Potential of Combination with Other Cycling Connections**

The cycling connection has a great potential to be combined with other cycling connections in the future. Therefore, the cycling route could be connected to existing cycling routes (e.g. the LF Maasroute) or future cycling routes, which are expected to be built more often due to the increased political interest and money allocated for subsidies.

A growing cycling network could also make it more important to focus on mixed-purpose cycling connections as there are less unattached routes due to the creation of a network. The Netherlands show with the network of the 'Fietsknooppunten' that there is one big network and specific cycling routes as the LF routes or individually created routes make use of this network.

#### 4.2.7 Use of the Iron Rhine Railway

##### **Potential of the Iron Rhine Railway**

##### **Cycling Lane as Forest Fire Prevention**

Due to its straight and pre-built connection between the cities, the (abandoned part of the) Iron Rhine railway seems like a good option for the cycling connection. A transformation of the railway could contribute to the branding and design possibilities of the cycling linkage. The course of the rails would fit to the draft version of the cycling connection.

The cycling connection on (or close to) the Iron Rhine could have the purpose of acting as a prevention measure against forest fires. A forest fire in the end of April 2020 at the national park De Meinweg visualised the threat of forest fires, which occur more often due to an increasing number of dry periods. Fire prevention measures like swathes can help to keep the flames into a specific area in case of a forest fire. A cycling connection could serve this purpose therefore. This could be also an important argument to convince nature-related stakeholders, which might have doubts about a cycling connection in the area.

### 4.3 Integration of Theory and Practice: Bow Tie Concept

In the urban areas in Roermond and Mönchengladbach utilitarian cycling is predominant. Recreational cycling can be found mostly in between in the De Meinweg area and the other parts around. Though, due to a missing proper cycling connection, these parts do not exploit their full potential of cycling. The places along the cycling route have many educational institutes like schools and kindergartens as well as workplaces like different industrial sites, offices, and more, which are potential cycling destinations. These functions demand the utilitarian part of the cycling connection. By supplying these utilitarian aspects and increasing travel speed and safety through new infrastructure, cycling can become more an alternative for motorised passenger traffic. That approaches the political interests of stimulating sustainable traffic, create a strong cross-border link between Roermond, Roerdalen, Wegberg, and Mönchengladbach, and it improves the general health and natural environment.

Furthermore, the recreational and touristic potentials of the area get approached and exploited. The big variety of touristic points of interest emphasise the possibilities regarding a recreational focus of the route. That includes nature parks, forests, mills, museums, and other attractions as well as horeca and shops. Such touristic destinations attract visitors, which creates the chance to stimulate them to take the bicycle. The local economy would benefit from the money spent by visitors.

Borussia Mönchengladbach's stadium *Borussia-Park* is located along the designated route and could benefit from the cycling connection. The football club is popular in the whole region even beyond the national borders. The mixed-purpose cycling route improves the accessibility of the stadium and could possibly relieve the car traffic and parking. Stadium visits from both sides (Roermond and the centre of Mönchengladbach) could be increasingly done by bike. The good connection towards the recreational heart of the route could even attract cyclists to combine stadium visits with cycling day trips.

With a unique identity and support of an online presence and social media, the cycling connection could get transformed from a piece of infrastructure to an attractive place for cyclists and other tourists, and further potential developments in the region.

Figure 34 visualises the current division of functions of the cycling connection between Roermond and Mönchengladbach. The potential of the cycling connection is not exploited as the accessibility is weak and strong links between the different places are missing.

Figure 35 shows the bow tie concept of the mixed-purpose cycling connection with integrated recreational and utilitarian functions, which strengthens the overall infrastructure, and thus, improves the accessibility from all sides. The utilitarian ends and the recreational heart merge with each other. The cycling route attracts people from the cities into the nature, where it offers several touristic destinations.

In the future, the concept could get extended and even merged with other cycling connections with example of the earlier addressed LF icon routes or the Dutch Rijnfietsroute, which is part of the *International Rhine Cycle Route (EuroVelo 15)*.

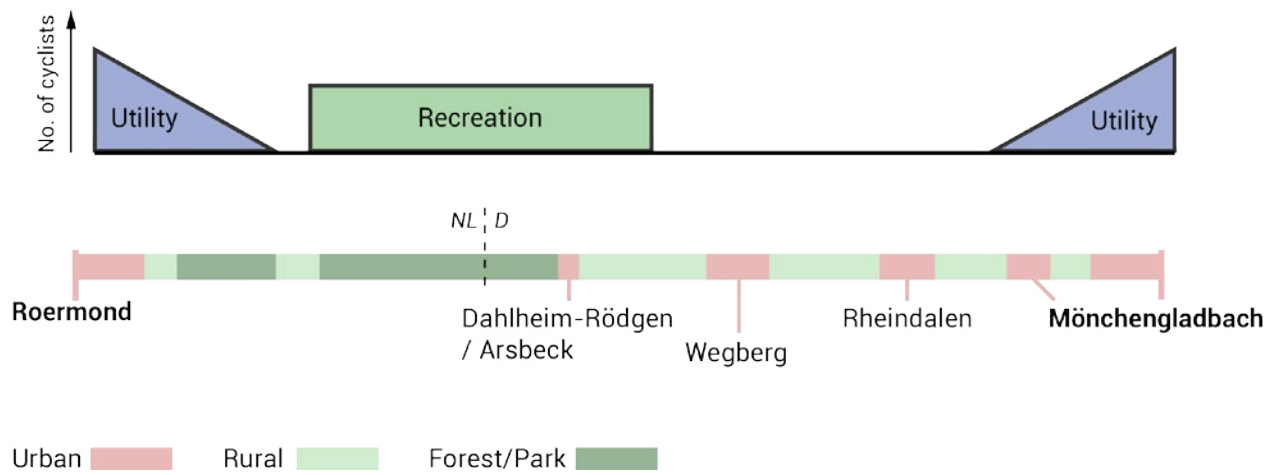


Fig. 34– Current division of functions (Author's own construction, 2020)

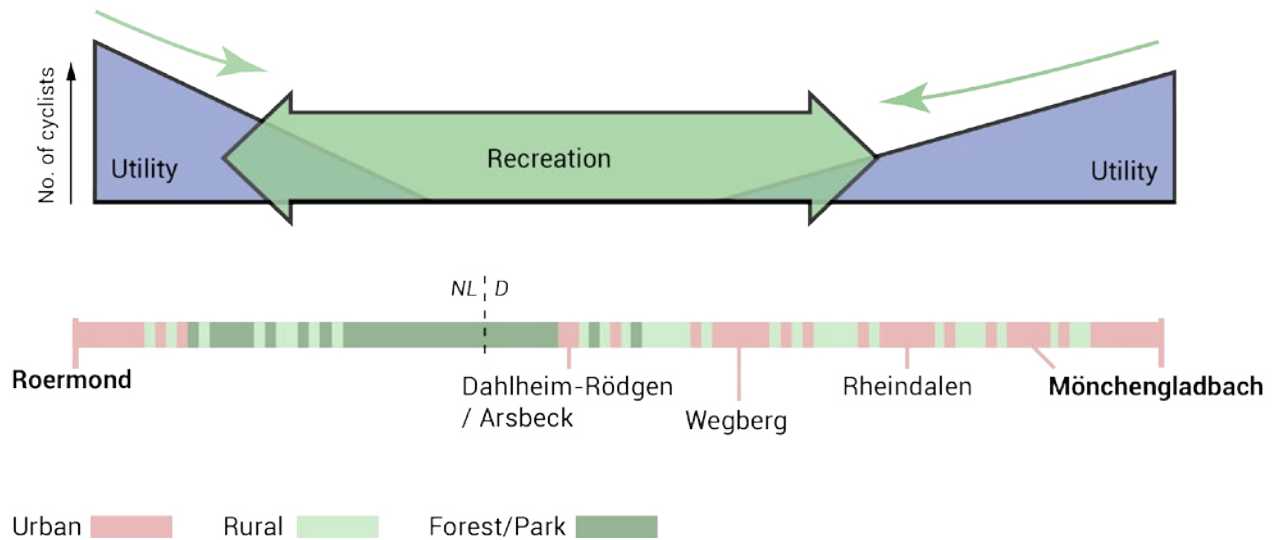


Fig. 35 – Bow tie concept: Integrated recreational and utilitarian functions (Author's own construction, 2020)



# 5

## CONCLUSIONS: ADDRESSING RESEARCH QUESTIONS



*Cyclists in a rural environment (VVV Midden-Limburg, 2017)*

## 5.1 Introduction

The fifth chapter *Conclusions: Addressing Research Questions* answers the main research question by concluding the sub research questions and reflects the outcomes of the report as conclusions. Eventually, recommendations for planning of mixed-purpose cycling connections are mentioned.



## 5.2 Conclusions

The following main research question will be answered by the conclusions of the sub research questions:

What is the best concept for mixed-purpose cycling connections in the Netherlands, Germany or elsewhere that contributes to the local liveability, accessibility, economy and the environment in the respective regions?

### 5.2.1 Conclusions of the Sub Research Questions

#### 1. How is cycling part of today's culture?

Cycling cultures can be very different among countries and regions. Without doubt, the Netherlands belong to the biggest cycling countries in the world. The whole country is connected via cycling connections, and the modal split of cycling is with 27% the highest in whole Europe. People of every age and gender cycle. Same counts for the Danish capital Copenhagen, where cycling has a share of 35% – the highest among all capital cities in the world.

Germany has overall a cycling share of 3.1%, but nevertheless, the cycling culture is quite big in an international comparison. There are big differences between the regions in Germany: whereas utilitarian cycling is quite common in cities and urban areas, in rural areas cycling is often not so common, which might be related to further distances. Generally, in rural areas cycling is mainly focussed on recreation.

The history of the bicycle showed that cycling has a lot of benefits and potential.

In the Netherlands, a big boost in the cycling culture and the begin of the high-quality cycling infrastructure came through the 'Stop the child murder'-demonstrations, which demanded better traffic safety through improved infrastructure such as separated cycling lanes.

The forerunner of the bicycle, the draisine, was invented to replace horses, which starved due to the 'Year Without A Summer' in 1816. The unforeseen event of the cold summer 1816 could be transferred to the COVID-19 pandemic, which boosted cycling itself as well as bicycle sales. In many cities worldwide, cycling lanes were added or widened to cope with the increase of cyclists. Such a big shift of the modal split and the change of the situation in general should be used to gain momentum and invest more in cycling to address the mobility turnaround.

#### 2. What are the benefits of cycling?

Cycling has many benefits. One of the most obvious and important benefits are the health benefits. Cycling improves the general fitness and prevents several chronic diseases such as cardiovascular diseases, diabetes and obesity. Studies have shown employees that cycle regularly have annually 1.3 days less absence due to sickness. Every year, the emissions saved in the EU due to cycling equal more than 16 million tons of CO<sub>2</sub> equivalents, which equals the total annual CO<sub>2</sub> emissions of a country like Croatia.

Another social benefit of cycling is the safety aspect. In general, the more people use a public space, the higher is the social safety. Therefore, the safety increases by an increased number of cyclists. This is a big benefit as studies showed that children more often take the bike to school in environments, which perceive high social control.

Cycling infrastructure generally costs less than car infrastructure. A kilometre of cycling lane costs less than 25% of a main road and less than 5% of a highway for cars. Furthermore, maintenance costs are lower.

Cycling tourists spend on average €16 during day trips and €353 for trips with overnight stays. In the EU, cycling tourism creates approximately 525,000 jobs and generates an economic value of €44 B. The local economy and horeca can benefit from that potential.

There are also political benefits regarding cycling. As environmental protection got more attention recently, cycling got more in the focus. Germany has allocated an extra amount of €900 M for cycling. Cycling developments could potentially become increasingly important for election campaigns.

Furthermore, the COVID-19 pandemic and its consequences created a big potential for cycling due to the increased number of cyclists as well as (e-)bike sales. As many cities implement (temporary) cycling lanes and, in some cases, reduce lanes for car traffic, the demand and potential for more cycling infrastructure gets revealed. Some cities plan to keep some of the lanes or even already implemented the temporary lanes on prospective parts initially. In general, this changed situation has a big potential of making a change in the cycling culture.

### **3. Which potentials do mixed-purpose cycling connections offer?**

The potentials of mixed-purpose cycling connections match with the general benefits of cycling. Generally, a big potential is the general strengthening of the region due to improved accessibility and stimulation of the local economy. Potentials like social safety can have a big impact on a long term if, for instance, the connection decreases crime rates due to more social control.

### **4. Which utilitarian, recreational, and mixed-purpose cycling concepts do exist already?**

Both the RijnWaalpad between the cities of Arnhem and Nijmegen and the cycling connection Breda–Etten-Leur, planned in collaboration with Fiets Filevrij, are cycling connections where the cyclists have generally priority over motorised traffic, which decreases the average travel time. The 15.8 kilometres of the Rijnwaal were built for €17 M. The cycling connection of Breda–Etten-Leur connects the two cities and several residential areas and business locations with a 3.5-metre-wide cycling lane. Both cycling connections are mainly focused on utilitarian cycling.

The Slowlane is a close cycling route in and around the city of Eindhoven. The route connects different economical and educational sites with the city and green. Therefore, it approaches both recreational and utilitarian cycling. The width of the cycling lane is four metres.

An interesting cycling connection in Germany is the Nordbahntrasse in Wuppertal. The route was initi-



ated by the organisation WuppertalBewegung, which started a feasibility study and reached through successful public relations work a political interest, which later got implemented. The cycling connection, which won the German cycling award in 2015, is built on a former railway and offers different highlights as viaducts and viewing platforms. The Nordbahntrasse turned into a place where people meet in horeca facilities or for events, which are organised by the mentioned organisation. Also, the social media work is noticeable as the Nordbahntrasse has online presences with relatively many users and current information available.

### **5. Who are the target groups of mixed-purpose cycling connections?**

The target groups are very broad for mixed-purpose cycling connections as the concept approaches two main groups with the mix of recreational and utilitarian cycling. The latter approaches mainly students and employed persons as the main focus of utilitarian cycling lies on commuting. The target group could depend on the points of interest in the region, which is with different historical sites, parks, mills, riding stables, and the Borussia-Park very broad.

### **6. Who are the stakeholders and what are their interests?**

The stakeholders consist of different governmental levels, cycling associations as the Dutch Fietzersbond or the German ADFC, nature authorities and environmental protection unions, the Gouden Driehoek, local residents, local businesses, train operators, and others. Many of the stakeholders are directly involved in the project and have a positive attitude towards it. The main interests are political or economic.

Some of the nature authorities and nature protection unions are expected to be against the project in favour of the nature protection, which applies especially for the area of De Meinweg. The stakeholders might be afraid that parts of the nature have to be sacrificed or get harmed due to the cycling connection. In this case, the parties should be approached with the intentions and asked to collaborate. An argument in favour of the cycling connection could be the function as a swathe, which separates parts of the forest to protect them in case for forest fires, which occur more often due to warmer and drier climate.

### **7. Which places/points of interest should be connected?**

The places and points of interests can be divided into utilitarian and recreational. The utilitarian points of interest are mainly schools, of which many of them are located closely to the planned route, workplaces as offices and industrial sites, and residential areas. Also, the Amazon LC with more than 1.300 employees is an attractive destination for utilitarian cycling. Furthermore, close towns should be connected with the route via feeders.

The recreational and touristic points of interests are De Meinweg, several mills and park areas, riding stables, golf courses, museums, hotels, and the Borussia-Park. Many of the points of interest are directly along the route, others are a more spread out in the urban or rural areas.

### **8. How could the new concept be branded?**

To create a strong identity of the cycling connection, characteristics from the region could be adapted.

In the case of the cycling connection Roermond-Mönchengladbach the Iron Rhine could become a key element, and thus, could be used for the branding. Railway-related objects as (old) signs or train parts could contribute the experience of users. Also, the other characteristics of the environment can become key points of the branding such as De Meinweg, the several mills, or the rivers.

An option could be the collaboration with the Amazon Logistics Centre or Borussia Mönchengladbach and its Borussia-Park. Both sites are closely linked to the cycling route and could benefit from it. In case of a sponsoring, the branding could be related to (one of) those sites.

### **9. How could a design for mixed-purpose cycling connections look like?**

The design of the utilitarian parts of the connection should be wide enough for the expected number of cyclists as 3.50 or 4.00 metres, and cyclists should have priority in case of junctions whenever it is possible. Specifically, due to the recreational approach, the natural region, and lower frequency on the rural parts, it is not required to have always a high-quality surface. In order to protect the environment and keep costs low, cheaper unbound surfaces like granite dust can be used.

### **10. Is there a demand for mixed-purpose cycling connections?**

The cycling connection Roermond-Mönchengladbach has a big potential especially due to being mixed-purposed. As utilitarian cycling for commuting is often related to the general school- or office hours and recreational cycling spread over the day with a concentration on the weekends, the use of the cycling route get distributed over the week.

Due to the many benefits of cycling, the whole region could gain from a cycling connection, which addresses both recreational and utilitarian issues. The strengthened local economy, the social safety, the general accessibility, and the other benefits have the potential to have a big positive impact of the region.

### **11. Could the concept for mixed-purpose cycling connections be used in other regions?**

Especially, in regions with similar conditions as an advanced cycling culture and touristic potential, the concept for mixed-purpose cycling connections seems suitable. The examples of existing cycling connections have shown the variety of concepts with different focal points in different countries.

A look at the benefits and potentials of the mixed-purpose cycling connections show very general aspects and characteristics, which can be found in other regions, too. Therefore, the concept could be used to connect two or more cities or places with utilitarian potential and recreational potential in the region.

### 5.3 Recommendations

Generally, it is recommended to research further on the potential of mixed-purpose cycling connections as the concept seems promising. Whole regions could gain from the benefits on different levels.

It is recommended to conduct further research on cycling standards and behaviour in different regions. EU-wide research could help to compare countries and regions in a more precise way and determine new potential regions for mixed-purpose cycling connections as it is hard to compare statistical data from different countries if the methods were not identical.

In order to connect a mixed-purpose cycling connection with a city, it is important that the cycling infrastructure continues in the city. The current implementations of additional (temporary) cycling lanes due to the COVID-19 pandemic is a great chance to reach that goal. The increased (e-)bike sales are an indication of the rising potential of cycling. Therefore, municipalities should seize the opportunity to use this incident in a positive way, along the lines of the Dutch 'Stop the child murders'-protest in the 1970s.

The development of cycling and especially e-cycling should be observed since that could change the culture and the planning of cycling regarding speed and the resulting space needed. Also, charging stations, especially in recreational parts and in combination with horeca, and safe parking garages could become crucial with the future development.

The successful pilot project of the PlasticRoad could become an interesting surface option for cycling connections. Its development after the market launch in the beginning of 2021 should be observed and further, independent studies should be conducted in order to analyse the potential of the material.

As the development of the Nordbahntrasse showed, the orgware aspect can be crucial for the implementation of new infrastructure. Tactical urbanism events can be organised proof the potential for new developments.

In many places cycling routes already get merged with each other. This creates the potential of building a big international cycling network. Cycling connections could then create a network with junctions as it is the case with the Dutch Knooppunten network, or existing like can be extended. Therefore, the cycling route Roermond-Mönchengladbach could be extended, for instance, to Eindhoven and Düsseldorf respectively.

The current COVID-19 pandemic and its impacts on the life as a whole creates the opportunity to research on the changes and potentials due to this event. Especially, the big impacts of cycling and (e-)bicycle sales as well as the implementation of the temporary pop-up bike lanes give reason to follow the process. Possible research could approach the change of the cycling behaviour and numbers of cyclists, and a possible redistribution of space in favour of cycling.

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