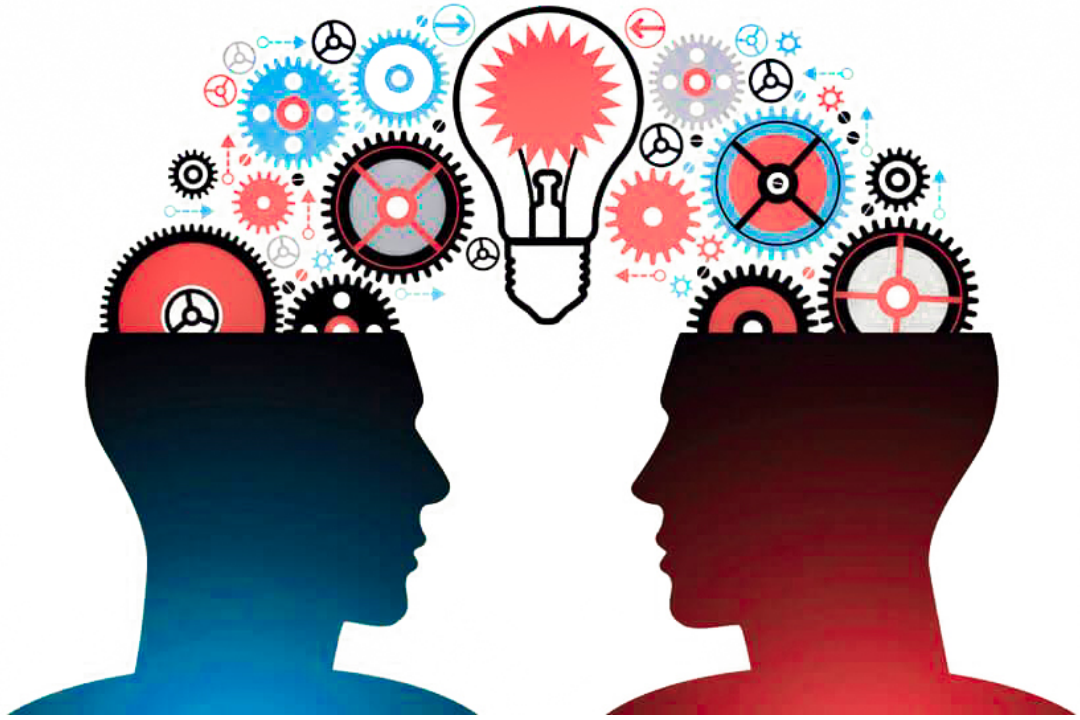
Behavioural Knowledge in Cycling Infrastructure Design

-A study of policymaking in the Northern Netherlands-



Youri Zwart
S2997819
16-03-2019

Supervisor: F. Niekerk
Spatial Planning & Design
University of Groningen

university of groningen

Colophon

Bachelor Project	Spatial Planning & Design
Title	Behavioural knowledge in infrastructure design
Subtitle	A study of policymaking in the Northern Netherlands
Location	Groningen
Date	June 10th, 2019
Status	Final version

Author	Youri Zwart S2997819
Contact	Tuinbouwstraat 16A 9717 JH Groningen youriraoul@hotmail.com
University	University of Groningen Faculty of Spatial Sciences Landleven 1 9747 AD Groningen
Supervisor	dr. F. Niekerk

Number of pages	25 (excl. appendices)
Word count	8447 (excl. appendices)
Figure front page	Volodymyr G. (Unknown). *Business concepten van het concept van de menselijke intelligentie mensen heeft een idee van hersenen bestorming.* 123RF: Unknown.

Abstract

Within the last 20 years, the amount of fatalities in traffic in total is decreasing in the Netherlands. However, the amount of fatalities of cyclists in traffic stays relatively constant. The three factors causing accidents involving cyclists within traffic are the bicycle, the infrastructure and the behaviour. The behavioural factor is the most important factor of the three, since behaviour causes most of the accidents involving cyclists. Within this study, the usage of behavioural knowledge within infrastructure is researched thoroughly by answering the following research question:

> *To what extent do local governments utilize behavioural knowledge in infrastructure design in order to improve safety for cyclists?*

Although behaviour is often taken into account during policymaking somehow, behavioural knowledge is generally not utilized optimally. By conducting seven semi-structured interviews with employees within the field of traffic and transport at a Dutch municipality, this research aims to create an overview of the current usage of behavioural knowledge in infrastructure design by local governments in order to increase the safety for cyclists.

It can be concluded that behavioural knowledge is not utilized to its full potential in order to increase traffic safety by infrastructure design. Moreover, the interviewees were mostly interested in learning more about the utilization of behavioural knowledge in infrastructure design. Therefore, the government are advised to invest in training local and regional government employees in the field of traffic and transport concerning behavioural knowledge and appointing behaviour experts in order to utilize the existing behavioural knowledge to its full potential. Since behaviour is the most important factor causing accidents involving cyclists, investing in behavioural knowledge within the field of traffic and transport is from vital importance.

Preface

In front of you lies the bachelor project 'Behavioural Knowledge in Cycling Infrastructure Design: A study of policymaking in the Northern Netherlands'. This bachelor project is executed within the bachelor Spatial Planning & Design at the University of Groningen.

After growing up and studying in the Northern part of the Netherlands, I chose to execute the bachelor project in the area I know best. I have been studying the policy making process in the provinces of Groningen, Friesland and Drenthe. It has been interesting and informative to study this area with the skills and knowledge I gained during the bachelor Spatial Planning and Design.

I would like to thank my supervisor Femke Niekerk already for the constructive feedback, tips and the overall help along the process. Moreover, I would like to thank all interviewees for their time, effort and knowledge, which they provided me.

Youri Zwart Groningen, July 8th, 2019

Table of Contents

1. Introduction

Within this chapter, the different elements of this research are being discussed. An elaboration of the background of this study is presented in paragraph 1.1. The relevance and research goal are discussed in paragraph 1.2. Hereafter, the research questions are formulated in paragraph 1.3. Lastly, a reading guide for this thesis is presented in paragraph 1.4.

1.1 Background

The Netherlands can be seen as the number one country in terms of bicycle use. According to an estimation made by BOVAG and RAI there were 22,8 million bicycles in the Netherlands in 2017, which means that on average each resident of the Netherlands has approximately 1,3 bicycles (Stichting BOVAG-RAI Mobiliteit, 2018). Those bicycles are used for approximately 27% of all trips made by Dutch residents (CBS, 2018).

Cycling is being seen as a good way of transporting yourself, for various reasons. One of those reasons is that cycling is beneficial for personal health as an active form of transport (Ng et al., 2017). Moreover, transportation by bicycle instead of motorized vehicles is beneficial in terms of the environment and reduces congestion (Lindsay et al., 2011; Wegman et al., 2012). Therefore, more and more governments, cities and communities do encourage their citizens to cycle nowadays (Wegman et al., 2012).

However, there seems to be a disadvantage to cycling as well. Cycling seems to be relatively dangerous compared to other modes of transport. Although the total amount of fatal traffic accidents is decreasing with approximately 50 percent in the last two decades, the amount of fatalities of cyclists remains relatively constant. The overall decrease of fatalities is mainly caused by a decrease in fatalities which involved automobile users, as can be seen in figure 1. In 2017, the amount of fatal traffic accidents was higher for cyclists, compared to the automobile users for the first time (CBS, 2018). Noted has to be, that the total amount of fatalities within traffic has been increasing for the last four years (CBS, 2019). Since 2015 the total amount of fatalities in traffic per year rose from 570 to 678 in 2018. That is an increase of approximately 16 percent. This is an overall increase, but it does include an increase of fatalities of cyclists.

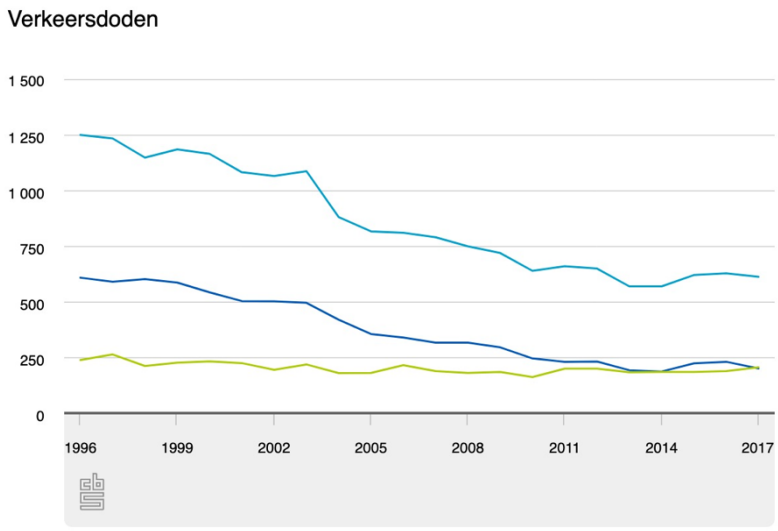


Figure 1: Fatalities in traffic (CBS, 2018). Light blue: Total, Deep blue: Car users, green: Cyclists

According to the SWOV (2017), there are three main factors causing traffic accidents where cyclists are involved in: infrastructure, the bicycle and behaviour. Most of the times, an accident is caused by a combination of these different factors. The behavioural factor, which influences the safety of cyclists, consists out of two sub-factors, namely the cyclist's behaviour and the behaviour of other users of the infrastructure. According to Bucchi et al. (2012), the factor that is the most important according to the statistics, is behaviour because behaviour is responsible for the majority of the accidents in traffic.

Besides the behaviour of others in traffic often (partially) causes traffic accidents, the unsafe behaviour of cyclist themselves has a negative influence on the amount of traffic accidents as well. Examples of unsafe behaviour to be considered might be ignoring norms and values within traffic (for example: Not being aware of other traffic flows) or violation of traffic laws (for example: cycling on the wrong cycling path). Other examples of unsafe behaviour worth mentioning, although not directly connected to infrastructure, recalled by SWOV (2017) are smartphone usage, being under influence of alcohol and/or drugs, and cycling without adequate lights. The percentage of cyclists having front and back lights attached to their bicycle within the nightlife district of the city of Groningen is, for example, 27 percent (Goudappel Coffeng, 2015). This example illustrates the big proportion of people which do not behave optimally in terms of safety. Another factor influencing the safety of cyclists is the increasing amount of people owning an e-bike or a speed pedelec (Stichting BOVAG-RAI Mobiliteit, 2018). These relatively new forms of cycling can be seen as a good development, since those kinds of bicycles do allow people who would otherwise not be able to cycle, to use a bicycle as their mode of transport for a specific trip. However, at the same time people on these types of bikes are able to cycle substantially faster and people tend to be unable to safely control their bicycle. Therefore, the impact of an accident would be bigger compared to an accident involving someone on a 'normal' bicycle.

1.2 Relevance and research goal

Within the background section of this study, it became clear that there happen to be numerous accidents which involved cyclists. The overall number of fatalities in traffic is, although the trend of the last couple of years does suggest the contrary, decreasing over the last two decades. However, the amount of fatalities of cyclists has remained relatively constant within this period of time. The most important of the three main factors causing traffic accidents which involve cyclists, is the behaviour of both cyclists and other infrastructure users (SWOV, 2017; Bucchi et al., 2012). Therefore, changing the behaviour of people with the goal to increase the safety for cyclists would potentially decrease the accident rate. Spatial interventions are being used to improve both the subjective and the objective safety of cyclists. When designing spatial interventions, it should be important to be aware of the effects it will have on the behaviour of people since behaviour is one of the three main factors causing traffic accident. It is therefore interesting that, according to the RLI (2014), behaviour does always play a role within governmental policymaking, however, the knowledge concerning behaviour is not utilized optimally. It is unclear to what extent local governments do make use of knowledge about the behaviour of humans within traffic. The effects of policies on behaviour are taken into account to little, during the policymaking process according to the RLI (2014). Bucchi et al. (2012) moreover state that the psychology, i.e. the behaviour of road users, has not been extensively explored or adequately applied. In order to increase the exploration and application of behavioural knowledge, Bucchi et al. (2012) advise to include a psychologist in the set of engineers, town planners and economists. The role of the government is to influence individual behaviour in order to reach overarching goals within society, which will not be accomplished if the government does not intervene

(RLI, 2014). Although the RLI (2014) and Bucchi et al. (2012) stated that the effects of policies are taken into account to little it is unclear to what extent those effects are taken into account. It is therefore interesting to study to what extent local governments utilize behavioural knowledge in order to improve the safety of cyclists.

1.3 Research question

In order to be able to examine and analyse the subject, the following research question and sub-questions are formulated:

To what extent do local governments utilize behavioural knowledge in infrastructure design in order to improve safety for cyclists?

1. *How does infrastructure design influence cycling behaviour?*
2. *What infrastructure designs do increase either subjective safety or objective safety?*
3. *To what extent is behavioural knowledge utilized in order to increase safety for cyclists?*
4. *To what extent is behavioural knowledge utilized in infrastructure design?*

1.4 Hypothesis

By studying the relevant scientific literature, the hypothesis of the research question has been formulated. According the RLI (2014), the effects of policies on behaviour are taken into account too little. Although, different local governments do use different infrastructure designs, the effects on behaviour are therefore taken into account to little. Therefore, the hypothesis on the research question is 'Behavioural knowledge in infrastructure design in order to improve the safety of cyclists by local governments is overall not utilized to its full potential. However, different levels of utilization between different local government do occur.'

1.5 Reading guide

Within this thesis the theoretical framework, including the conceptual model will be discussed first. Next, the methodology will be discussed, including the data collection methods and the ethical considerations. Hereafter, the results will be discussed and linked to the research questions. Within the conclusion, the main research question and sub-questions will be answered. Lastly, recommendations for further research will be addressed and there will be a short reflection and discussion on the thesis and the execution process.

2. Theoretical Framework

Within this chapter different topics and concepts are discussed in order to be able to answer the first secondary research question. Consecutively, paragraphs on the topics of 'traffic safety', 'infrastructure design' and 'cyclist behaviour' will be discussed. Lastly, the research question '*How does infrastructure design influence cycling behaviour'* will be answered.

2.1 Importance traffic safety

According to Ng et al. (2017) the risk of being involved in a road collision is a major reason for people not to cycle. However, across the world cycling is being promoted because of its health, environmental and societal benefits such as boosting personal health as an active way of transport, reducing emissions and congestion (Ng et al., 2017; Lindsay et al., 2011; Wegman et al., 2012) Environments where cyclists feel relatively safe are during cycling in residential locations, off-road and roads without parked cars, while cycling on major roads with high motorist traffic is perceived as relatively unsafe. According to Ng et al. (2017), it is critical to consider cyclists' perceptions towards the proposed infrastructure, because it impacts their desire to use cycling infrastructure. Although the perceived safety is important since it impacts the desire to use cycling infrastructure, the actual numbers and figures about safety of cyclists do matter for the governments. The Dutch province Drenthe for example, did launch a campaign called 'Together towards Zero traffic fatalities!' (Veilig Bereikbaar Drenthe, 2019). According to Heinen et al. (2010) safety can be distinguished into two different categories. The first category is *objective safety*. Objective safety is based on the actual number of accidents and fatalities. The second category, *subjective safety*, is measured by the perception one has of the situation. For local governments, it is important to both increase the objective safety and the subjective safety. Although feeling unsafe does not lead to actual numbers of incidents, it does influence one's choice in mode of transport. People who think cycling is unsafe will more likely choose a different mode of transport. This is especially important in the contemporary world, since increasing the use of sustainable modes of transport, such as cycling, is being seen as a worldwide goal to achieve in order to battle climate change caused by humanity.

2.2 Cyclist behaviour

The ability of an environment to influence the behaviour of an individual is called *cue power* (WRR, 2009). Berger et al. (2008) illustrated cue power within a research about voting booths. The result of their research was that the surroundings of the voting booth influence the voting behaviour of individuals. Individuals voting in a school building were more likely voted pro-education and individuals voting in a church more likely voted on religious parties. Another example, which is related to infrastructure planning, recalled by the WRR (2009), is the usage of roundabouts within traffic. Roundabouts would force the road users to slow down and pay attention. Driving straight ahead without reducing speed is made impossible. Within the shared space concept, cue power does play an important role as well, since the environment without specific traffic rules influences the behaviour of individuals. People tend to be paying more attention to their surroundings and self-regulate the traffic they are in. In busy environments, it is more likely that people have to regulate themselves (WRR, 2009), this is even more the case in shared space zones. Self-regulation, in cooperation with other users of the environment, is needed because of the level of chaos. Self-regulation cannot be done constantly though, the self-regulation battery of people will then be depleted. Kaplan (2001) stated that environments with fields of grass, trees and public parks have an effect of restauration on the attention levels of individuals. Therefore, isles of tranquillity could have a restoring effect on the self-regulation battery levels. However, according to the WRR (2009),

normless environments and environments without order should be avoided to stimulate desirable behaviour. Since the concept of shared space relies on self-regulation, this concept cannot be implemented everywhere. There have to be so called 'isles of tranquillity' to be able to successfully regulate yourself.

Although regulating yourself within traffic is important for the safety of cyclists, other types of behaviour do play a role as well. Another form of behaviour that influences the safety of cyclists is overloading (Schepers et al., 2014). Taking into account the capabilities of cyclists, the workload can be to high due to the demands of the cycling task. Moreover, other activities while driving can cause overloading of the cyclist. Recently, this has been brought to attention by the Dutch government with the national MONO campaign. The word mono stands for solely and it should avoid people from using other devices while cycling or driving (Rijksoverheid, unknown). The more units of information a road user must attend to the higher becomes the accident rate according to Elvik (2006). Other factors such as higher cycling speeds do also increase the probability of being involved in an accident.

2.3 Infrastructure designs improving cycling safety

In order to increase cycling safety both objectively and subjectively, different infrastructural designs have been applied. Examples of infrastructural designs are cycling lanes, roundabouts, lane width and curve treatments (Sørensen & Mosslemi, 2009). All of these infrastructural designs do fall under the umbrella of the sustainable safety concept created in the Netherlands. The concept of sustainable safety consists of five principles to improve safety in traffic both objectively and subjectively (Wegman et al., 2008). According to Wegman et al. (2008) sustainable safety has the objective to prevent traffic accidents from happening, and when prevention is not feasible, reduce the impact of the accident. Sustainable safety can be accomplished by using the following five principles (Wegman et al., 2008):

1. Functionality of roads.
2. Homogeneity of masses and/or speed and direction.
3. Forgiveness of the environment and of road users.
4. Predictability of road course and road user behaviour by recognizable road design.
5. State awareness by the road user.

Although the five principles, are not designed for cyclists in particular, the principles are used in order to create an environment as safe as possible for traffic in general and thus is applicable to cycling safety. The overall aim of the five principles is to decrease the complexity of the traffic as much as possible. Moreover, the impact of potential accidents should be minimized as much as possible. State awareness by the road user means the ability of someone to assess one's task capability to handle the driving task and therefore does not focus on the infrastructure directly (Wegman et al., 2008).

However, since the last couple of decades an infrastructural design became popular that is not in live with the sustainable safety concept, namely infrastructural design according the concept of *shared space*. Shared space is the concept of all street users moving and interacting in their use of space on the basis of informal social protocols and negotiation (Hamilton-Baillie, 2008). Traffic signs, crossings and other regulation do create an illusion of safety. Instead of this illusion of safety, shared space does create uncertainty. Due to this uncertainty, users of the infrastructure act more cautious, by for example lowering their speed (Imrie, 2012). This increased level of cautiousness is meant to result in less accidents and therefore an increased objective safety. In this way a decreased subjective safety would result in an increased objective safety.

Both overarching ways of infrastructure design have the goal to achieve maximal safety. However, they differ in the means to achieve this safety. The five principles of sustainable safety focus on decreasing the complexity, as the shared space concept focusses on an increase of the complexity.

2.4 The influence of infrastructure on cyclist behaviour

Within this paragraph, the following research questions will be answered: '*How does infrastructure design influence cycling behaviour?' and* '*What infrastructure designs do increase either subjective safety or objective safety?'.* In order to answer this question, the relevant scientific literature has been studied thoroughly.

As described in the previous paragraphs, infrastructure design does influence the behaviour of cyclists. There are various ways in which the behaviour can be altered using infrastructure design. However, the principles of sustainable safety and the shared space idea can be distinguished from each other because of the influence both methods of infrastructural design accomplish safety in different ways. Infrastructure can be designed in order to increase the homogeneity, the predictability, the forgiveness of the environment by using the principles of sustainable safety (Wegman, 2008). This would result in an increased subjective safety and objective safety. However, by creating an environment of uncertainty, using the shared space concept, increased objective safety can be increased by decreasing the subjective safety (Hamilton-Baillie, 2008).

3. Conceptual model

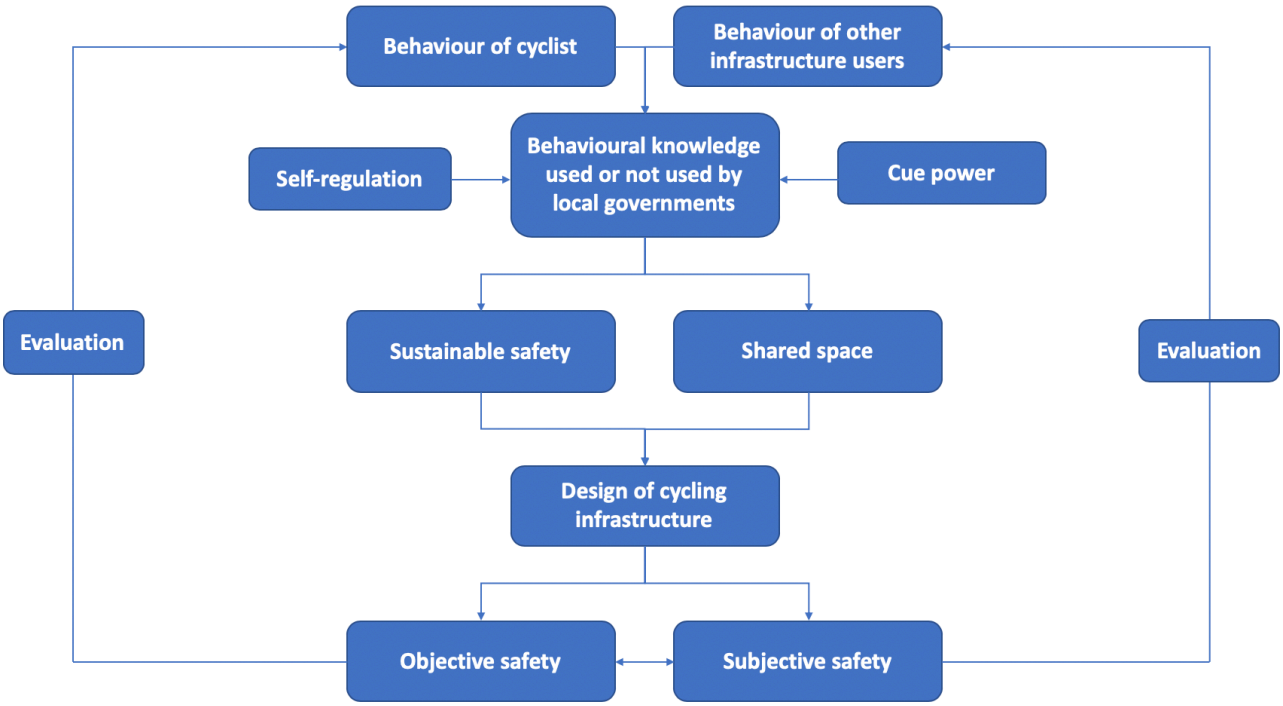


Figure 2: Conceptual model

Within this section the conceptual model, as shown in figure 2 will be explained. Usage of behavioural knowledge by local governments within infrastructure design, with the goal to increase safety for cyclists, will result in two ways of designing infrastructure; either designing regarding the sustainable safety objectives or designing using the shared space concept. When one of these ways is utilized, this will result in a particular design of the cycling infrastructure. This design will influence both the objective and subjective safety. After evaluating the objective safety as well as the subjective safety, different ways of thinking might be applied to the new behaviour of both cyclists and other users of the infrastructure in order to improve the situation (even more).

4. Methodology

Within this chapter, the research method is discussed in paragraph 4.1. Hereafter, the case selection process is evaluated in paragraph 4.2. Within paragraph 4.3, the ethical considerations are elaborated. The data analysis methods are described in paragraph 4.4. Lastly, the data quality is discussed in paragraph 4.5.

4.1 Research method

Firstly, a literature study has been conducted in order to create an overview of the existing knowledge about infrastructure design, traffic safety and cyclist behaviour. Moreover, the first secondary research question is answered by the literature study by comparing influence on cycling behaviour of different kinds of infrastructural designs. In order to collect the data needed for answering the other research questions, semi-structured interviews with employees in the field of traffic and transport of different local governments have been conducted. The interview guide used as a framework, can be found in appendix 1. This qualitative method of data collection has been chosen because it contains both the predetermined order, while it leaves flexibility in the way the interviewee is being addressed (Dunn, 2005). By conducting semi-structured interviews, the researcher will be able to extract the necessary information from the interviewee, for example by asking follow-up questions to extract the deeper meaning of someone's answer. This will allow the researcher to gather the necessary in-depth information in the different municipalities on the topic, which allows the researcher to be able to answer the primary research question: '*To what extent do local governments utilize behavioural knowledge in infrastructure design in order to improve safety for cyclists?'*
In comparison, other research methods, such as surveys or structured interviews, would less likely result in this level of in-depth data gathering, since both methods do not allow the researcher to extract the deeper meaning of the given answers to the questions in the interviews. Next to the fact that quantitative research would not allow the researcher to get the in-depth insight as when used the qualitative method of semi-structured interviews, tempting enough employees in the field of traffic and transport of different municipalities, in order to be able to do statistical statements, to complete a survey would be unfeasible within this particular study.

4.2 Case selection

In order to be able to answer the research question, ten different municipalities in three different provinces of the Netherlands have been requested to participate in this study. The approached municipalities have been selected based on the level of variety of the characteristics of the different municipalities, such as population size amount of registered cycling accidents and the province in which the municipality is located. This variety is important in order to be able to study the subject in a comprehensive manner and draw comprehensive conclusions. An overview of the differences between the different researched municipalities can be found in table 1 and the map in figure 3 in order to exemplify the variety of the municipalities.

Municipality (Province)	Population size	Registered cycling accidents (2013-2017)
Aa en Hunze (Drenthe)	25.386	Total: 21
		Injury: 10
		Fatal: 1
Tynaarlo (Drenthe)	33.695	Total: 27
		Injury: 15
		Fatal: 3
Noordenveld (Drenthe)	31.270	Total: 36
		Injury: 21
		Fatal: 2
Stadskanaal (Groningen)	31.801	Total: 65
		Injury: 49
		Fatal: 2
Hoogeveen (Drenthe)	55.311	Total: 78
		Injury: 40
		Fatal: 2
Smallingerland (Friesland)	55.939	Total: 125
		Injury: 65
		Fatal: 3
Groningen (Groningen)	231.354	Total: 904
		Injury: 558
		Fatal: 3

Table 1: Amount of registered cycling accidents and population size per municipality (Ministry of Infrastructure and Water Management, 2019) & (CBS, 2019).

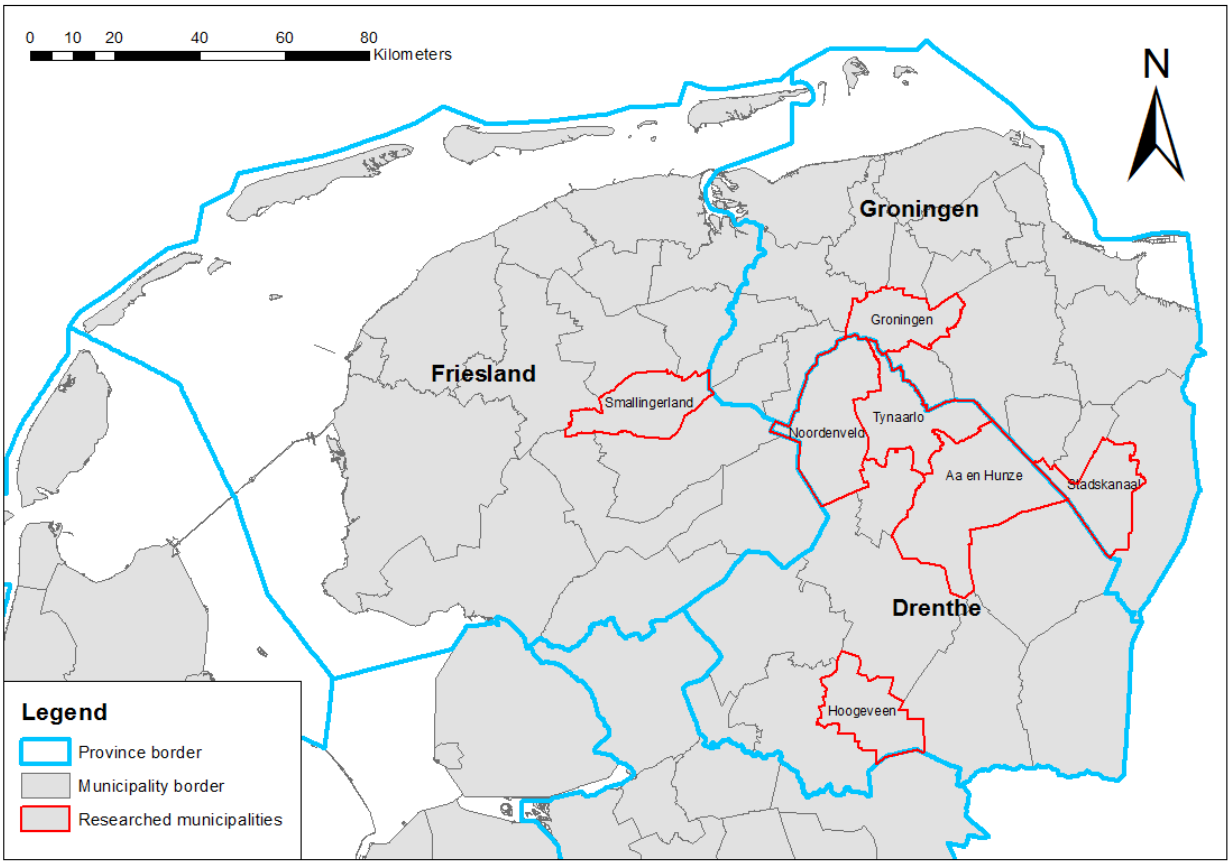


Figure 3: Map of the researched municipalities (created in ArcMap).

During this study interviews have been held with employees of 7 municipalities within the three most northern provinces of the Netherlands. The list of interviewed municipalities consists of the municipalities Noordenveld, Hoogeveen, Tynaarlo, Aa en Hunze, Stadskanaal, Groningen and Smallingerland. All interviewees have been approached via the municipality, in order to find the employee that is able to answer the questions related to cycling safety and the utilization of behavioural knowledge. All interviewees are working within the field of traffic and transport. Although every approached municipality in Drenthe did accept to contribute to this study, several municipalities located in the provinces of Groningen and Friesland were not willing to participate within this research. An overview of the specifics of the completed interviews can be found in table 2.

Name	**Working for the municipality of**	**Position**	**Date, time and location**
Rubert Enter	Noordenveld	Policy officer traffic and transport	03-05-2019 09.30 Roden
Oene Hoekstra	Hoogeveen	Traffic engineer	07-05-2019 13.30 Zuidwolde
Herman Kolker	Tynaarlo	Policy advisor traffic and transport	09-05-2019 10.00 Vries
Henk Ensing	Stadskanaal	Policy advisor	13-05-2019 15.30 Stadskanaal
Erwin de Jager	Groningen	Traffic engineer	14-05-2019 10.00 Groningen
Anonymous	Smallingerland	Policy officer traffic and transport	21-05-2019 09.00 Drachten
Johan Meirink	Aa en Hunze	Policy officer traffic and transport	03-06-2019 13.00 Gieten

Table 2: The list of specifications of the Interviews.

4.3 Ethical considerations

All interviews have taken place at the work place of the interviewee, the municipality building of the municipality the particular interviewee is working for. According to Longhurst (2010), the comfortability of an interviewee is important in semi-structured interviews. Therefore, the location and time of choice for the interview were chosen by the interviewees. When conducting interviews there are a couple of ethical considerations that should be taken into account. Two important ethical considerations when conducting semi-structured interviews are confidentiality and anonymity (Longhurst, 2010). Before starting the interview, the interviewee received a form of consent (appendix 2). All interviewees were asked to carefully read the form and sign it when they agree. Included in this form of consent were questions about audio recording the interview and the way they wish to be referred to within the thesis. If the interviewee wishes to remain anonymous, this could be indicated on the form of consent as well. Moreover, it is important for the researcher to be as objective as possible.

While the goal of this study is to get a best of an insight as possible, suggestive questions or remarks have been avoided as much as possible.

4.4 Data analysis

After the completion of all interviews, the interviews have been transcribed (appendix 5) and sent towards the interviewee for revision. Subsequently, the transcripts were coded using the computer program Atlas.ti 8. By coding qualitative data, a variety of patterns can be deducted. By identifying these patterns, the qualitative data is being made more coherent (Cope, 2010). Coding has been done after conducting the interviews and transcribing them. The different codes used are based on the literature, but created during the coding process, which means the codes are deducted from the interviews. The used codes can be found in the code book and code tree (appendices 3 and 4). Over the seven different interviews 263 codes have been given to answers given by the interviewees. In table 3 examples of codes given to answers can be found. The answers given by the interviewees have been analysed and compared to each other in order to answer the third and fourth secondary research questions comprehensively.

Interviewed Municipality	Quote (translated from transcripts)	Code
Hoogeveen	'I am a traffic engineer.'	Occupation
Aa en Hunze	'But we are at least broadening the infrastructure a bit.'	Spatial measure to improve cycling safety
Groningen	'You then need a little success story, for us that were the smart routes towards Zernike. That was our little success story, at which we accomplished something by using behaviour and altering.'	Usage of behavioural knowledge
Noordenveld	'No. I think eventually there happens to be quite a difference between the smaller municipality such as Noordenveld and a bigger one like Groningen. In Groningen they have more than a few traffic engineers, all specialized in a specific discipline within traffic and transport. I am here on my own and do not have the opportunity to broaden my knowledge in a specific subject like behaviour.'	Presence of behavioural knowledge employee
Tynaarlo	'Look, shared space is wonderful thought. Partially, I do believe in the concept, but on the other side I think that certain groups of people will avoid such areas. That is what I think.'	Thoughts about shared space

Table 3: Examples of codes given to answers of interviewees.

4.5 Data quality

It should be noticed that the interviewees were enthusiastic about the developments within the municipality they worked for. This resulted in in-depth answers to the asked questions, however occasionally interviewees did wander away with their answers. Moreover, as the interview was about the developments they are (partially) accountable for, the interviewees could tend to give answers which are different to the reality. The data gathered does give an

overview of the processes and views within local governments on the use of behavioural knowledge in infrastructure design in order to increase the safety of cyclists.

5. Results

Within this chapter, the outcomes of the secondary research questions will, subsequently, be elaborated. The first two secondary research questions have been answered in the theoretical framework by thoroughly studying the relevant scientific literature and therefore not elaborated within this chapter. In order to answer the two remaining research questions, semi-structured interviews have been conducted with employees of seven different municipalities.

5.1 Utilization of behavioural knowledge by local governments

Within this paragraph, the third research question will be answered: '*To what extent is behavioural knowledge utilized in order to increase safety for cyclists?'.*

In order to increase the safety for cyclists, the current status of the safety of cyclists has to be known. Objectively, there is information about registered accidents within each municipality available online. The specifics of the registered accidents per researched municipality can be found in table 1. However, this does not give a totally accurate representation of the safety of cyclists since the numbers do not include unregistered accidents and do not represent the subjective safety. In order to understand the safety of cyclists in the researched municipalities, the interviewees have been asked what the current status of the safety of cyclists is within the municipality they work for. Moreover, they were asked if and how both the subjective and objective safety is measured and analysed.

Four of the seven interviewees said the safety of cyclists within the municipality they work for is good or tolerable, however, two other interviewees mentioned that cycling safety was below average and that it deserves extra attention. Moreover, one interviewee was unable to answer the question since he did not have accurate information on cycling safety. When asked about the use of objective safety information, multiple interviewees explained that it became hard to improve the safety of cyclists based on objective safety data. The process of tackling the black-spots, the municipalities used to have, is completed, according to four of the seven interviewees.

> *'We do not have black spots anymore, all that occurs nowadays is occurring on individual locations.'*
>
> *Oene Hoekstra, Municipality of Hoogeveen*

> *'In the previous twenty years we tackled all those black spots.From that point of view we do look at objective safety, but people tend to experience more hinder from subjective safety. However, that is hard to tackle.'*
>
> *Herman Kolker, Municipality of Tynaarlo*

When asked about the use and collection of subjective safety data, four of the interviewees stated that they act upon the reports and complaints of the public and do not gather information about subjective safety themselves. Within the municipality of Groningen, there is an influx of subjective safety data gathered by the local media as well. However, three of the municipalities do actively gather opinions of the public on the safety of cyclists. This is done by conducting an (online) survey in the municipality of Tynaarlo for example. In the municipality of Noordenveld, a bottleneck register is being built in order to create an overview of all complaints and reports by citizens.

'We are currently busy with a cycling paths, roads and bottlenecks plan and we we decided what to do within the next ten years. We asked the citizens for locations that they do perceive as dangerous. We did that through social media and got 200 responses. Mostly it is subjective unsafety.'

Herman Kolker, Municipality of Tynaarlo

'We are currently busy bundeling all complaints and reports that come in into a bottleneck register. This bottleneck register is meant to bundle all bottleneck within the muncipality.'

Rubert Enter, Municipality of Noordenveld

The interviewees were asked if the municipality does have a behavioural expert or a psychologist under contract. None of the researched municipalities do have such an employee under contract or might not be aware of an employee focussing on the behaviour of people. Two of the interviewees mentioned the existence of such an employee at province level in the past. However, they did not utilize these employees or are not aware of the existence of such an employee at province level at this moment. The existence of a behavioural expert on a provincial level was mentioned by interviewees located in two different provinces; Groningen and Drenthe. It appears to be that the other four interviewees located within those two provinces are not aware of the existence of a behavioural expert within their province. Although none of the researched municipalities are in the possession of an employee specialized in behaviour knowledge, three of the seven interviewees mentioned the completion of a traffic psychology course. Although these employees are not fully focussed on the topic of behaviour, they did gather relevant information on the topic.

'I did complete a minor traffic psychology at the NHL. I am trying to broaden my on the topic of behaviour whenever I come across it. At this moment, one of my colleagues is completing the same minor. The level of interest for it really is something from the last five or six years.'

Erwin de Jager, Municipality of Groningen

When the interviewees were asked in which way behavioural knowledge is utilized by municipalities, the most frequently mentioned answer is altering behaviour by education. However, this is not part of utilizing behavioural knowledge in infrastructure design. This education is mainly targeted towards the more vulnerable groups within society, such as elderly. It seems that most of the interviewees do not consciously utilize behavioural knowledge in order to improve the safety of cyclists by infrastructure design. When asked if behavioural knowledge should and could be used more within this their field of work, five of the interviewees answered that when possible behavioural knowledge could be a useful tool when designing infrastructure in order to increase the safety for cyclists. However, the other two interviewees answered that they did not know how behavioural knowledge could be used more and they believe in their own vision on traffic safety. Notable is the fact that all three interviewees that completed a course or minor within traffic psychology thought behavioural knowledge could and should be utilized more in order to improve cycling safety.

So, to what extent is behavioural knowledge utilized to increase cycling safety? Overall, behavioural knowledge is not used through behavioural experts. Altering behaviour by education is recalled various times. However, this study focusses on improving cycling safety by infrastructural design using behavioural knowledge.

5.2 Behavioural knowledge in infrastructure design

Within this paragraph, the fourth research question will be answered: '*To what extent is behavioural knowledge utilized in infrastructure design?'*.

As stated in paragraph 5.1, it seems that most of the interviewees do not consciously utilize behavioural knowledge in order to improve the safety of cyclists by infrastructural design. Several interviewees mentioned that they use common sense while designing infrastructure. However, some interviewees did mention the use of behavioural knowledge in infrastructure design:

> *'A cyclist is behaving as water, as he or she always searches for the easiest route. Cycling extra distances are disliked and therefore the cyclist seeks for shortcuts. We do keep that in mind when looking at the infrastructure.'*
>
> *Anonymous, Municipality of Smallingerland*

The municipality of Groningen for example invented the smart routes towards the Zernike campus in order to decrease the flow of cyclists on another route. The route that they wanted cyclists to avoid, does consist of a heavily used intersection of cyclists and cars. In order to prevent as much interaction between cars and cyclists on their way towards the Zernike campus two other routes were promoted instead of discouraging users to use the to be avoided route. Nowadays, the other two routes, are used more compared to the route of which the municipality wanted to decrease the traffic flow. This example illustrates how the municipality of Groningen is utilizing behavioural knowledge. After the success of the Zernike route usage of behavioural knowledge is taken more seriously within the municipality of Groningen.

> *'You then need a little success story, for us that were the smart routes towards Zernike. That was our little success story, at which we accomplished something by using behaviour and altering this behaviour.'*
>
> *Erwin de Jager, Municipality of Groningen*

Other small interventions mentioned by interviewees in order to improve the safety of cyclists are broadening cycling paths, removal of obstacles such as poles in the middle of cycling paths, adjusting the curbs and the surroundings of the cycling infrastructure to increase forgiveness, separation of modes of transport. For these interventions, national guidelines from for example the CROW are used to decide on the infrastructural design. These interventions do fall under the umbrella of the sustainable safety principles. Although these guidelines are most likely designed while considering the impact it has on the behaviour of cyclists, these infrastructural interventions are not linked to behavioural knowledge by the interviewees. It appears to be that the link between behavioural knowledge and infrastructural design overall is unclear for the interviewees; employees of local governments.

After asking the interviewees about the shared space concept and if it was used within their municipality, several interviewees as well mentioned the use of the shared space concept in order to increase safety for cyclists in certain areas. This concept, however, cannot be implemented everywhere according to the interviewees. It should only be used in areas that are suited for the concept of shared space. The concept of shared space is often seen as a good instrument to improve the safety of cyclists, but according to the interviewees there are some disadvantages as well. The shared space concept appears to moreover be more appreciated in the more urban municipalities, compared to the more rural municipalities.

'The best example is located here, the Folkingestraat. The Folkingestraat is a small road, but even smaller at both ends, if you enter from the south side or from the Vismarkt.'

Erwin de Jager, municipality of Groningen

'Partially, I do believe in the concept of shared space. However, on the other side, I think… I think certain groups of people will avoid those areas.'

Herman Kolker, Municipality of Tynaarlo

To summarize, it appears to be that overall behavioural knowledge is utilized very little in terms of infrastructural design with the goal to improve cycling safety. Although some of the municipalities, such as the municipality start using behavioural knowledge more since the last couple of years, most of the municipalities do seem to not consciously consider the influences of infrastructural design on the behaviour of cyclists. Both the concept of sustainable safety and the concept of shared space are used over the different municipalities, but not with the intention of altering the behaviour of cyclists.

6. Conclusion

Within this chapter the research question: '*To what extent do local governments utilize behavioural knowledge in infrastructure design in order to improve safety for cyclists?'* will be answered. In order to answer this research question, the relevant scientific literature has been studied as well as seven interviews with employees of local governments have been conducted.

6.1 Utilization of behavioural knowledge in infrastructure design for safe cycling

The utility of increasing safety for cyclists is clear, the numbers on cycling safety are not improving and are even getting worse for the last couple of years (CBS, 2018). According to the SWOV (2017) and Bucchi et al. (2012), behaviour is the most important factor for causing accidents. In general, there are two overarching ways of designing infrastructure in order to increase safety. By either using the five principles of sustainable safety (Wegman, 2008) or by implementing the concept shared space (Hamilton-Baillie, 2008). The first way of designing infrastructure focusses on increasing the functionality, the homogeneity, the forgiveness and the predictability of the infrastructure. The concept of shared space, however, almost aims for the contrary.

While interviewing employees of different municipalities which work within the field of traffic and transport, it became clear that aspects of both sustainable safety and the shared space concept are implemented within the studied municipalities. However, most of the interviewees did not consciously consider the effects of such an implementation on the behaviour of cyclists. This is in line with the hypothesis, which is based on statements of the RLI (2014). The interviewees often mentioned they do follow the national guidelines in terms of infrastructure design. Bucchi et al. (2012) already advised the addition of a traffic psychologist to the set of town planners, engineers and economists. However, at this moment the lack of such an employee is still existing. None of the researched municipalities is namely in the possession of an employee specialized in the behaviour of people and most of the interviewees do not possess behavioural knowledge to its full potential, there could be stated that behavioural knowledge is not utilized optimally in terms of infrastructure design. Although, behavioural knowledge might not be utilized to its full potential in terms of increasing the cyclist's safety by infrastructure design. It became clear that there are several educational programmes to in order to influence the behaviour of cyclists, such as training for the more vulnerable groups of people. However, education is not related to infrastructural design with the goal to improve the safety of cyclists.

Although some of the interviewees did not know how increased utilization of behavioural knowledge would help designing infrastructure in order to increase safety for cyclists, most of the interviewees are curious how behavioural knowledge could be utilized (even) more within this field of work. Considering the utility to improve cycling safety and the overall willingness of employees in the field of traffic and transport, the advice for the national government would be to train employees in the field of traffic and transportation and working for local or regional governments, that are not educated in behavioural knowledge, in terms of behavioural knowledge. Moreover, behaviour experts should be available for spatial planners in order to get a professional second opinion on the effects of infrastructural designs on the behaviour of people in terms of safety. When both advises are followed, the effects of infrastructural design on behaviour of cyclists will be increasingly considered. This is from vital importance when decrease the amount of accidents and fatalities involving cyclists, since behaviour is the most important factor causing accidents.

6.2 Future research

Since this study consists out of qualitative research in a specific region, namely northern Netherlands, it is not possible to generalize statements about the utilization of behavioural knowledge in infrastructure design in order to increase safety by all local governments. It would be interesting to study this topic in other regions, by for example comparing the usage of behavioural knowledge in infrastructure design in different countries. This would be interesting, because it allows comparison between regions with various cycling safety levels in terms of utilization of behavioural knowledge. Moreover, this study focusses on local governments and therefore, multiple municipalities, which differ in characteristics, have been studied. However, the utilization of behavioural knowledge on the scale of local governments has found to be intertwined with national governments and agencies. Therefore, researching the relations between local governments and other layers of governments on this topic are considered relevant. This would result in an insight in how these different layers of governments work together and reveal possible points of improvement.

6.3 Reflection

Working on this thesis has been both very challenging and informative at the same time. Because the timeframe for finalizing the study is strict, time management played an important role along the process. Building the theoretical framework has been found very important, since it is the basis of the rest of the process. After finalizing the theoretical framework and the interview guide, getting in contact and planning appointments with the interviewees, although time-consuming, generally went well. The analysis of the collected qualitative data has been found challenging, since the researcher did not have experience with coding transcripts of interviews.

Although the topic of cycling safety and behaviour is relevant because of the accident rates, there is little international peer reviewed literature on the topic of behavioural knowledge linked to cycling safety and infrastructural design. Therefore, the theoretical framework remained relatively basic and not as in-depth as preferred. During the interviews, interviewees tended to go in different directions with their answers compared to other interviewees. This made it hard to compare the utilization of behavioural knowledge between the different municipalities. However, it did give a thorough overview of the level of utilization of behavioural knowledge. The outcome of this research is equal to the hypothesis, therefore the outcome is as expected. The researcher is aware of the fact that the outcomes of this research are quite general, however, the gathered primary data does not allow the researcher to state more in-depth findings.

7. References

Berger, J., Meredith, M. and Wheeler, S.C. (2008). Contextual priming: where people vote affects how they vote. *Proceedings of the National Academy of Sciences* 105: 8846- 8849

Bucchi, A., Sangiorgi, C., & Vignali, V. (2012). Traffic psychology and driver behavior. *Procedia - Social and Behavioral Sciences*, 53: 972-979.

CBS (2018). *Onderzoek verplaatsingen in Nederland (OViN) 2017*. Den Haag: Centraal Bureau voor de Statistiek.

CBS (2019). *11 procent meer verkeersdoden in 2018.* Den Haag: Centraal Bureau voor de Statistiek.

CBS (2019). *Regionale kerncijfers Nederland.* Den Haag: Centraal Bureau voor de Statistiek.

Cope, M. (2010). Coding transcripts and diaries. In N. Clifford, S. French & G. Valentine (Red.), Key Methods in Geography, (pp. 440-452). Thousand Oaks: SAGE.

Dunn, K. (2005). 'Interviewing', in I. Hay (ed.) *Qualitative Research Methods in Human Geography (2nd edn).* Melbourne: Oxford University Press, pp. 79-105.

Elvik, R. (2006). Laws of accident causation. *Accident Analysis and Prevention*, 38(4), 742-747.

Gemeente Groningen (2015). *Groningen fietsstad: Fietsstrategie 2015-2020*. Groningen: Gemeente Groningen.

Goudappel Coffeng (2015). *Onderzoek fietsverlichting uitgaansgebieden.* Unknown: Goudappel Coffeng.

Hamilton-Baillie, B. (2008). Shared Space: Reconciling People, Places and Traffic. *Built Environment (1978-), 34*(2), 161-181.

Heinen, E., van Wee, B. and Maat, K. (2010). 'Commuting by Bicycle: An Overview of the Literature'. *Transport Reviews, vol. 30, no. 1*, pp. 59–96.

Imrie R. (2012). Auto-disabilities: the case of shared space environments. *Environment and Planning A 2012, Vol. 44, 2012,* p. 2260-2277.

Kaplan, R. (2001) 'The nature of the view from home: Psychological benefits', Environment and Behavior 2001, 33: 507

Lindsay, G., Macmillan, A. and Woodward, A. (2011). Moving urban trips from cars to bicycles: impact on health and emissions. *Australian and New Zealand Journal of Public Health*, 35: 54-60.

Longhurst, R. (2010). Semi-Structured Interviews and Focus Groups. *Key Methods in Geography.* London: Sage, pp. 103-115.

Ministry of Infrastructure and Water Management (2019). *Kaart fietsongevallen.overvekeer.nl.* Used on 03-03-2019 via https://fietsongevallen.oververkeer.nl/. Unknown: Ministerie van Infrastructuur en Waterstaat.

Ng, A., Debnath, A., & Heesch, K. (2017). Cyclist' safety perceptions of cycling infrastructure at un-signalised intersections: Cross-sectional survey of queensland cyclists. *Journal of Transport & Health, 6*, 13-22.

Raad voor de Leefomgeving en Infrastructuur (2014). *Doen en Laten: effectiever milieubeleid door mensenkennis.* Den Haag: Raad voor de Leefomgeving en Infrastructuur.

Rijksoverheid (Unknown). *Daar kun je mee thuis komen: Rij MONO.* Used on 07-07-2019 via https://www.daarkunjemeethuiskomen.nl/rijmono. Unknown: Rijksoverheid.

Schepers, P., Hagenzieker, M., Methorst, R., Van Wee, B., & Wegman, F. (2014). A conceptual framework for road safety and mobility applied to cycling safety. *Accident Analysis and Prevention*, 62, 331-340.

Stichting BOVAG-RAI Mobiliteit (2018). *Mobiliteit in Cijfers.* Amsterdam: Stichting BOVAG-RAI Mobiliteit.

Sørensen, M. & Mosslemi, M. (2009). *Subjective and objective safety – the effect road safety measures on subjective safety among vulnerable road users.* Oslo: Institute of Transport Economics Norwegian Centre for Transport Research.

SWOV (2017). *Fietsers.* Used on 27-02-2019 via https://www.swov.nl/feiten-cijfers/fact/fietsers-wat-zijn-de-belangrijkste-oorzaken-van-fietsongevallen. Den Haag: SWOV-factsheet.

Veilig Bereikbaar Drenthe (2019). *Samen richting Nul verkeersslachtoffers!* Used on 06-06-2019 via https://www.veiligbereikbaardrenthe.nl/veilig-gedrag/Samen-richting-nul-verkeersslachtoffers. Unknown: Veilig Bereikbaar Drenthe

Volodymyr G. (Unknown). *Business concepten van het concept van de menselijke intelligentie mensen heeft een idee van hersenen bestorming.* 123RF: Unknown.

Wegman, F., Aarts, L., & Bax, C. (2008). Advancing sustainable safety: National road safety outlook for the Netherlands for 2005-2020. *Safety Science, 46*(2), 323-343.

Wegman, F., Zhang, F., & Dijkstra, A. (2012). How to make more cycling good for road safety? *Accident; Analysis and Prevention*, 44(1), 19-29.

WRR (2009). *De menselijke beslisser: over de psychologie van keuze en gedrag.* Amsterdam: Amsterdam University Press.

APPENDICES

Appendix 1: Interview guide

Introductie

- Voorstellen van mezelf
- Bedanken voor de medewerking
- Doel van het onderzoek uitleggen
- Geïnterviewde wijzen op het toestemmingsformulier en zijn/haar rechten
- Navragen of geïnterviewde bezwaar heeft tegen het opnemen van het interview
- Opbouw van het interview toelichten

Algemene informatie

- Kunt u toelichten wie u bent en wat uw rol is binnen de gemeente?
    - Welke rol neemt u in binnen het beleid omtrent infrastructuur en fietsers?

Status fietsveiligheid

- In de afgelopen 20 jaar is de hoeveelheid verkeersdoden in Nederland sterk afgenomen, maar het aantal doden onder fietsers blijft relatief constant. Sinds 2015 stijgt de hoeveelheid verkeersdoden onder fietsers zelfs jaarlijks. Waar zou dit volgens u aan kunnen liggen?
    - Waarom denkt u dat dit hieraan zou kunnen liggen?
- Hoe zou u de huidige status omtrent fietsveiligheid binnen deze gemeente omschrijven?

Beleid fietsveiligheid

- Welk beleid wordt er op dit moment gevoerd binnen de gemeente betreffende fietsveiligheid?
    - Wordt er binnen de gemeente gekeken naar de effectiviteit van het gevoerde beleid omtrent fietsveiligheid?
        - Waarom doen jullie dit wel/niet?
        - Wordt er gekeken naar de objectieve veiligheid binnen de gemeente?
            - Waar gebruiken jullie dit voor?
        - Winnen jullie informatie in over de subjectieve veiligheid?
            - Analyseren jullie deze informatie?
            - Waarom wel/niet?
    - Hoe gebruiken jullie ruimtelijke planning als ‘tool’ om de fietsveiligheid te verbeteren?
        - Gebruiken jullie hierbij kennis over objectieve en/of subjectieve veiligheid om infrastructuur te ontwerpen of aan te passen?
            - NEE: Waarom niet?
            - JA: Op welke wijze wordt dit gedaan?
                - Zou u een voorbeeld kunnen noemen?
    - Hoe wordt binnen deze gemeente infrastructuur ontworpen en/of aangepast om de fietsveiligheid te bevorderen?
        - Zou u een voorbeeld kunnen noemen?
- Werkt deze gemeente samen met provincies of andere gemeenten

Gedragskennis

- Binnen dit onderzoek bestudeer ik het gebruik van gedragskennis binnen de ruimtelijke planning. Hoe zou u gedragskennis definiëren?

- Beschikt de gemeente over een medewerker of afdeling die zich bezighoudt met het gedrag van mensen? (Bijvoorbeeld een gedragswetenschapper werkzaam op de afdeling (psycholoog, socioloog))
- Wordt er bij het ontwerpen of aanpassen van infrastructuur advies ingewonnen bij zo'n medewerker?
    - Kunt u een voorbeeld of meerdere voorbeelden noemen van gedrag dat een negatieve invloed heeft op de fietsveiligheid?
- Maken jullie gebruik van kennis omtrent het gedrag van fietsers binnen het ruimtelijk beleid betreffende infrastructuur?
    - Op welke manier?
    - Zou u een voorbeeld kunnen geven?

Het gebruiken van gedragskennis definieer ik binnen dit onderzoek als het aanpassen van de fysieke omgeving met als doel het gedrag van fietsers in positieve zin te beinvloeden. Voorbeelden waar ik aan denk bij het gebruik van gedragskennis zijn:

1. Shared space. Waar de subjectieve veiligheid bewust verlaagd wordt met als doel de objectieve veiligheid te verbeteren. Fietsers zijn volgens de theorie oplettender door de subjectieve onveiligheid, waardoor er minder gevaarlijke situaties zouden moeten ontstaan.
2. Het scheiden van verschillende mobiliteitsvormen binnen infrastructuur met als doek de subjectieve veiligheid te verbeteren. Doordat fietsers niet in aanraking komen met andere vormen van verkeer voelen ze zich veiliger op de fiets.
3. Eenrichtingsverkeer met als doel om naast de objectieve veiligheid ook de subjectieve veiligheid te verbeteren. Omdat je als fietser enkel te maken hebt met verkeer dat dezelfde richting in rijdt, voelt het fietsen veiliger en is de subjectieve veiligheid dus hoger.

- Zijn er volgens u, na het horen van deze voorbeelden, meer voorbeelden te noemen waarbij er in het ontwerpen van infrastructuur gebruik wordt gemaakt van gedragskennis?
    - Maken jullie gebruik van een van de eerdergenoemde methoden?
    - Zien jullie het gewenste resultaat wanneer er gebruik is gemaakt van gedragskennis tijdens de inrichting van infrastructuur op het gebied van veiligheid?
        - Op het gebied van objectieve veiligheid?
        - Op het gebied van subjectieve veiligheid?
- Vindt u dat er meer gebruik zou kunnen worden gemaakt van gedragskennis binnen het ruimtelijk beleid in deze gemeente?
    - Waarom wel/niet?

Input geïnterviewde

- Zou u nog iets kwijt willen betreffende het onderwerp?
- Heeft u vragen naar aanleiding van dit interview?

Afsluiting

- Geïnterviewde bedanken voor zijn/haar tijd en moeite.
- Heeft u interesse in de eindversie van mijn onderzoek?
- Mocht u op een later moment vragen hebben, dan ben ik bereikbaar via youriraoul@hotmail.com & 0657363992. Ook kunt u contact opnemen met mijn supervisor F. Niekerk via f.niekerk@rug.nl.

Appendix 2: Form of consent

Toestemmingsformulier interview

Allereerst bedank ik u hartelijk voor het nemen van de tijd en moeite om mee te doen aan het onderzoek betreffende het gebruik van gedragskennis in ruimtelijk beleid. De onderzoeksvraag van het onderzoek luidt:

- *To what extent do local governments utilize behavioural knowledge in infrastructure design in order to stimulate safety for cyclists?*

Het is van belang dat u van het volgende op de hoogte bent:

- De antwoorden die u gedurende het interview geeft zullen uitsluitend gebruikt worden voor dit onderzoek en niet voor andere doeleinden.
- Indien gewenst deel ik de eindversie van de scriptie graag met u.
- Wanneer gewenst kunt u ten alle tijden stoppen met het interview. Dit betekent dat u uw toestemming voor dit interview ook na afronding van het interview kunt terugtrekken.
- Mocht u bepaalde vragen in het interview niet willen beantwoorden, vraag ik u om dit aan te geven. De desbetreffende vragen zullen dan niet behandeld worden.

Tot slot verzoek ik u om de volgende twee vragen te beantwoorden door het antwoord te omcirkelen:

1. Gaat u akkoord met het feit dat het interview wordt opgenomen ten behoeve van latere data-analyse?

   JA NEE

2. Geeft u toestemming voor het noemen van uw voor- en achternaam in de scriptie en koppelen aan citaten?

   BEIDE ALLEEN VOORNAAM ALLEEN ACHTERNAAM GEEN VAN BEIDE

Ondergetekenden verklaren dit document te hebben gelezen en begrepen.

Handtekening onderzoeker:

Youri Zwart
youriraoul@hotmail.com
0657363992

Handtekening deelnemer:

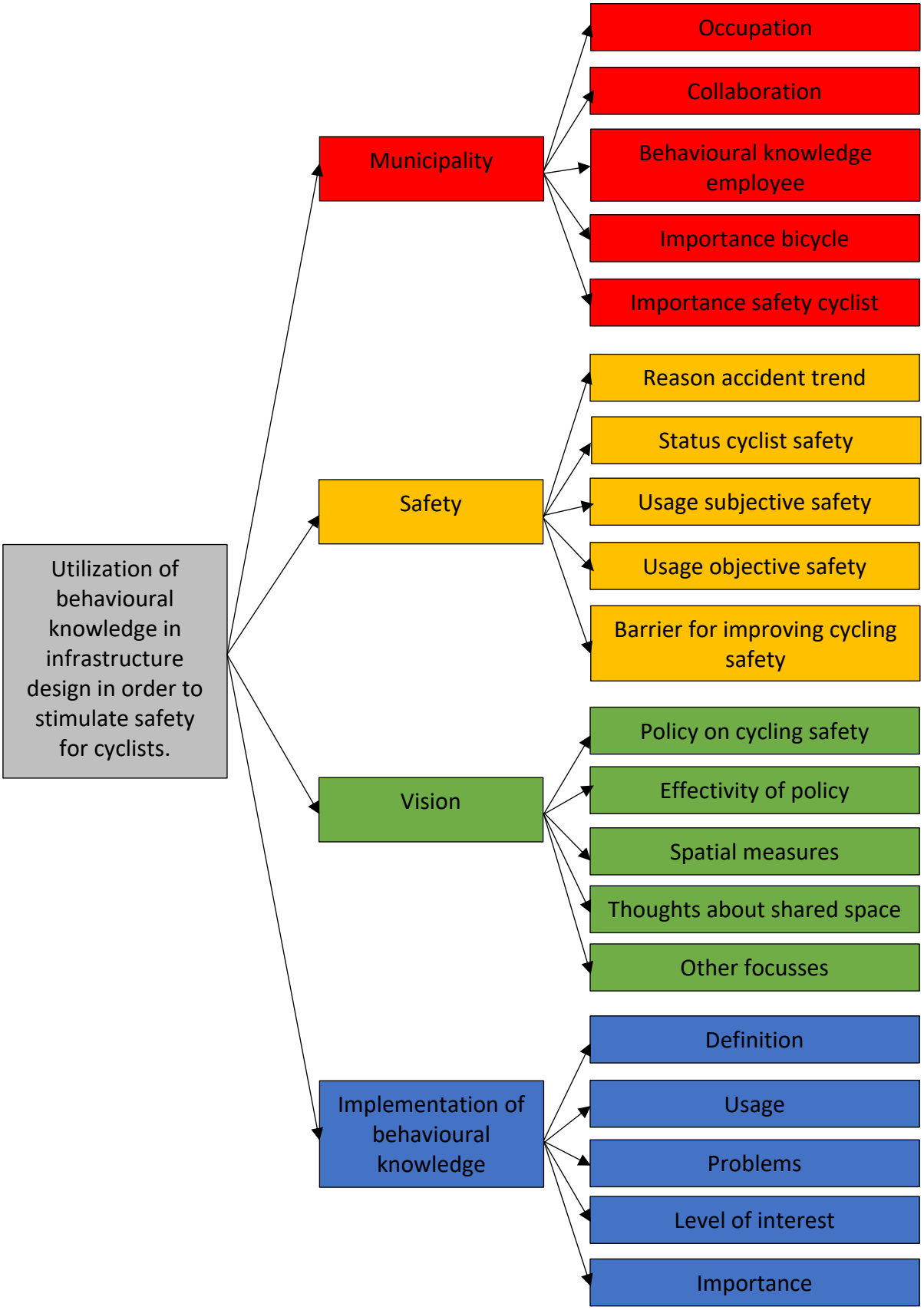
[NAAM GEÏNTERVIEWDE]

Getekend op …….. 2019 te ……

Appendix 3: Code Book

Code group	Code	Explanation
Municipality	Occupation	Important for understanding views.
	Collaboration with other municipalities and provinces	Important for advice and recommendations.
	Presence of behavioural knowledge employee	Partially answers the research question.
	Importance of bicycle	Important for understanding views.
	Importance cyclist's safety	Important for understanding views.
Safety	Reason for accident trend	Important for understanding views.
	Status cycling safety	Important background information.
	Usage of objective safety information	Important for answering the research question.
	Usage of subjective safety information	Important for answering the research question.
	Barrier for improving cycling safety	Important background information.
Vision	Policy on cycling safety	Important for understanding views.
	Level of effectivity of policy	Important for understanding views.
	Spatial measures to improve cyclist's safety	Partially answers the research question.
	Thoughts about 'shared space'	Important for understanding views.
	Other focusses	Important for understanding views.
Implementation behavioural knowledge	Definition of behavioural knowledge	Important for understanding views.
	Usage of behavioural knowledge	Partially answers the research question.
	Problems using behavioural knowledge	Important for answering the research question
	Level of interest in behavioural knowledge	Partially answers the research question.
	Importance of behavioural knowledge	Partially answers the research question.

Appendix 4: Code tree



Appendix 5: Interview transcripts

The transcripts of the conducted interviews have been sent to the supervisor by e-mail and are not included within this version of the thesis.