DESIGNING CYCLE-ATTRACTIVENESS

PART A. EXPLORING CYCLE-ATTRACTIVE DESIGN CRITERIA

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During the process of the formulation of this research, I have had the opportunity to rethink about what cycling in a city like Amsterdam really means to me.

Cycling in Amsterdam is so normal, that you do not really think anything special of it. For a long time I thought the reason I cycled a lot was due my irritations towards the public transport. Rather than recreational, cycling was just a functional way of getting around. For four whole years, during my Bachelor study (2010-2014), at the Hogeschool van Amsterdam which is located at the Amstelstation, I cycled roughly 24 kilometers every day. Nevertheless, also quite some Amsterdammers ridiculed me for cycling such a long distance getting to classes. But... nothing could beat my trustworthy bicycle in time... and also in enjoyment. Not only did the long cycle trips wake me to get ready for class (which was of course very useful), for four years I have been able to experience the development of a part of the city through different times, situations and seasons. I learned how this part of the city moved and what was happening at every corner of the street.

Cycling in Amsterdam... It really is a serious matter. However, it is also a thing you can enjoy at any moment. And that is what makes cycling in Amsterdam so attractive to me.
ABSTRACT

MAIN-ISSUE

All over the world countries are focussing more and more on implementing a bicycle infrastructure. Amsterdam, as a representative of the Netherlands, is one of the most bicycle-friendly cities in the world and should be a city where the cyclists get enough room to move around safely in the public streets. However, issues still occur and the space for the cyclist is often compromised to fit other modes of mobility and functions as well.

The Municipality of Amsterdam and urban planners/designers should aim for public streets to be designed as attractive as possible for cyclists, while considering its context within the city, to make the city as liveable as possible. However, although the Municipality has the goal to choose for and have the public space become attractive to cyclists (and pedestrians) she is unable to define what this attractiveness is and therefore is unable to properly evaluate when this goal has been achieved (Gemeente Amsterdam 2011; 2012; 2013). Although attractiveness is something personal, many types of people do think alike. By defining the different types of cyclists, and the spatial evaluation criteria which influence attractiveness, a stronger goal to attract cycling could move from ‘problem solving’ into a clear vision to be reached.

In order to take on the issue of defining cycle-attractiveness this study answers the following main question (figure 1):

WHICH SPATIAL DESIGN INTERVENTIONS ARE ABLE TO ENHANCE THE ATTRACTIVENESS OF CYCLING FROM THE VIEWPOINT OF DIFFERENT TYPES OF CYCLISTS?

MAIN-RESULTS

Explorations made by Stipo (2016) and Gehl (2010) and (suggested) implementations in the Netherlands (Gemeente Amsterdam, 2010 & CROW, 2005) each use a different way of formulating what they find the most important criteria to design for attractive cycling. Nevertheless they all define their themes similarly to each other, but their criteria differ in their ability for interpretation. Attractiveness is generally defined per individual, and although in all explorations and policies the importance of defining attractiveness is named, it is at the same time left vague and (too) open for interpretation. While comparing all criteria between each other, the design criteria can be defined on their impact on three different scales ('the context', 'the street/place' & 'the building') as well on their spatial impacts ('direct' & 'indirect').

In order to make the spatial design criteria more focussed the criteria are divided in different groups where the outcomes are similar for each within that group and different for each outside that group. The groups are formulated as the following:

- **‘the same for all cyclists’** this group contains the spatial design criteria which count and are the same for anyone using the bicycle.
- **‘the same for the category’** this group contains the spatial design criteria which count and are the same for the type of cyclists in the same category. The categories are defined by their ‘cycle mentality’ as easy-going-, steady-going- and fast-going- cyclists.
- **‘the same for the type of cyclist’** this group contains the spatial design criteria which count and are the same for specific types of cyclists. The types are defined by their ‘cycle goal’ or ‘cycle insecurity’ as child-, elderly-, tourist-, trip-,
shopping-, attraction visiting-, daily activity-, weekly activity-, occasional activity-, student-, commuting-, working-, visiting- and racing cyclist.

To test the defined criteria and groups, Amsterdam is used as a case study on both context- and street-/place- & building-level: On context-level Amsterdam is looked at from the city perspective. The Municipality of Amsterdam has already formulated a vision for the bicycle-network in the form of a ‘plusnet’ for 2030 and a ‘mainnet’ for 2040, the base of these envisioned networks can already be used for this new approach of cycle-attractiveness. The bicycle-network of Amsterdam is redefined while taking into account the criteria for cyclists in general and the cyclists per category. The total bicycle-network still forms a whole where cycling clearly has a priority to other traffic, however parts of this network which is specified per category each hold their own qualities fitting for that location. Separately, per category, the networks form a whole as well to ensure all cyclists are able to find their place by their functions within the city.

On street-/place- & building-level the locations of De Clercqstraat, Kinksterstraat and Willemsparkweg are further looked at as representing city-streets where there is currently already too little space for the cyclists. Each of the locations are reviewed at eye-level through a representative section and map, while exploring possible redesigns through the preferences of all specific cyclists as well as the impact on the most important characteristics of the existing location (building shape, trees, underground pipes and cables, functions and xxx). The redesigns are also reflected on their impacts on the location (other traffic, climate, finance and feasibility) which allows to see which redesigns would fit best onto the locations and what choices should be made to implement them. To further elaborate on the street-/place- & building-level, a part of the Kinkerstraat is looked upon. The characteristics of this location and the criteria for cycle-attractiveness together form a spatial plan of demands, after which inputs from other perspectives give input to a complete spatial urban design. The final urban design is reflected on all scales and is able to redefine the meaning of the location on context-, street-/place- & building-level.

**MAIN-CONCLUSIONS**

This study shows that the further definition of spatial design criteria for cycle-attractiveness could become a more elaborated tool for design choices when putting the priority or evaluations for the space for cyclists on context-, street-/place- and building-levels. Implications of this study are focussed on that it is limited to the impact on city streets (leaving out parks and residential streets) and it does not elaborate fully on how to cope with the contradictions of other users.

**MAIN-RECOMMENDATIONS**

In general - In the current ways cities are being envisioned and designed for cycling, designers/planners/policy-makers see the cyclist as one generic and do not take into account the different types of cyclists and their different uses. Designers should become more aware of the similarities and differences a city can plan the best possible network and facilities for its cyclists depending on the spatial opportunities of the city. Too often space for cyclists is being compromised, when designing for cycle-attractiveness it is required to put the cyclist first. To review what space and elements are needed for the cyclist for a location to become cycle-attractive and
what space is available for flexible interpretation, all spatial criteria should be spatially visualized on the specific location. This should be visualised in a plan of demands which can become the base of a complete urban design.

For Amsterdam - Amsterdam has the strength of already working on a complete as possible bicycle network, they should use this existing vision and further explore the opportunities in a more (visually, with a legend showing what the current state of the network is) elaborated proposal giving clear design and evaluation goals. By defining the envisioned bicycle-network into the categories of easy-going cyclists, steady-going cyclists and fast-going cyclists these goals can be evaluated through the cycle-attractive criteria.

In the small streets of Amsterdam, the cyclist is (too often) given too little space in the street compared to other mobility modes. Even though the Municipality is able to mention this and suggests to separate the different modes of mobility, in the elaborations of their plans it is still unclear how much space the cyclist is getting and why. By defining a plan of demands, firstly, through the perspectives of the cyclist the space for the cyclists should not get compromised with other uses and design choices can be more properly argumented.
In front of you, you can find ‘part A - Exploring cycle-attractive design criteria’ of this thesis. This booklet is part of a series of three and was formulated as part of the graduation thesis ‘Cycle-attractiveness’ of the Master study Urbanism at the Architecture at Delft University of Technology.

This research consists of seven chapters which are divided into three parts. All questions are introduced at the start and answered the end of each chapter:

A Exploring cycle-attractive design criteria
Part A consists of the first three chapters of this research: introduction (1), relevant criteria for attractive cycling (2) and types of cyclists (3). These chapters focus on the generic parts of this topic and form the basis of part B and C.

Chapter 1 discusses and sets the motivation, problem statement, objectives, relevances, research questions and the approach of this research.

Chapter 2 explores, through a literature study, what spatial design criteria are already being used and/or should be further looked at when designing for attractive cycling.

Chapter 3 defines different types of cyclists which make use of the city and clarifies the similarities and differences amongst them to show the importance.

B Exploring cycle-attractive designing in Amsterdam
Part B consists of another three chapters of this research: Amsterdam cycling city (4), Variations exploration (5) and Kinkerstraat design (6). This part is a follow up on part A, where the outcomes of part A are being put into practice in the case-study of the city of Amsterdam.

Chapter 4 looks at the city as a whole while elaborating on the current context, existing plans in regards to cycle-attractive designing and proposes a new vision and concept for the city.

Chapter 5 looks for opportunities when designing a street to the (extreme) preferences of one type of cyclist at the locations De Clercqstraat, Kinkerstraat and Koningsparkweg and reflects which changes would be most feasible and which would not.

Chapter 6 continues with the Kinkerstraat alone, and suggests a new design for a specific area of the street while considering all previous outcomes of the research.

C Recommendations for cycle-attractive designing
Part C consists of the final chapter of this research: Summary, conclusions, recommendations & discussions (7). This chapter looks back and reflects on the outcomes and approach of this research. Recommendations are made when it comes to designing for a cycle-attractive city and street and a discussion is started by bringing the outcomes of this research in a broader perspective as well as reflecting on the approach of this research.
PART A - EXPLORING CYCLE-ATTRACTIVE DESIGN CRITERIA

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PART B - EXPLORING CYCLE-ATTRACTIVE DESIGNING IN AMSTERDAM

PART C - RECOMMENDATIONS FOR CYCLE-ATTRACTIVE DESIGNING
CHAPTER 1

INTRODUCTION

This first chapter focusses on the motivation of this research.
The question that is being answered is:

What is the importance and approach of researching how to design for cycle-attractiveness?

The answer to this question leads to get a better understanding on why and how the topic of ‘attractive cycling’ has been addressed and gives an overview of the starting point of the final results of this research.
Research framework

The overview of this research and the links between all parts. Highlighted is the topic being discussed in this chapter.
MOTIVATION

This research has been driven by the following motivations: my personal -positive and negative- experiences as a cyclist in Amsterdam and other cities, the increasing worldwide awareness that cycling is a solution to many issues in the city, in which Amsterdam often serves as an example, and lastly the vision that more elaborated choices -early in the design process- should and could be made to provide for a logic bicycle network in which Amsterdam could explore the opportunities more.

Own experience as a cyclist

Cycling in Amsterdam is so normal, that you do not really think anything special of it. For a long time I thought the reason I cycled a lot was due my irritations towards the public transport. Rather than recreational, cycling was just a functional way of getting around. For four whole years, during my Bachelor study (2010-2014), at the Hogeschool van Amsterdam which is located at the Amstelstation, I cycled roughly 24 kilometers every day. Nevertheless, also quite some Amsterdammers ridiculed me for cycling such a long distance getting to classes. But... nothing could beat my trustworthy bicycle in time... and also in enjoyment. Not only did the long cycle trips wake me to get ready for class (which was of course very useful), for four years I have been able to experience the development of a part of the city through different times, situations and seasons. I learned how this part of the city moved and what was happening at every corner of the street. Next to that, I noticed how I prefered to cycle different routes when I was doing different things: for example cycling to class I prefered the most direct route, but when going home I did not mind cycling through the Vondelpark. I became aware that different routes fit different cyclists, not meaning that one person can only be one type of cyclist but that the goal of the cyclist may determine how they would cycle.

“There will never be too many bikes in Amsterdam, there are too many cars and scooters in Amsterdam. That’s for sure.”

(Cutler, H. in Streetfilms, 2013)

Worldwide awareness of cycling as a solution

Worldwide, there is a growing awareness of cycling as a solution to making cities more livable again with the use of a cycle-network. The current bicycle network Amsterdam holds is unique in the world. Almost everywhere one can find routes specifically reserved for cycling. However, the network is still not as complete as it could be and lacks in the attractiveness from the cyclists point of view as other users often still receive most space in the streets. Figure 5-8 show both positive and negative aspects of the attractiveness of cycling in Amsterdam at eye-level, often the lack of space reserved for cycling is an issue. Especially in relation to diversion space in case something is blocking or more room next to other infrastructure modalities would make cycling feel more safe. In the past years the bicycle as a solution has been a hot-topic in Amsterdam again: the role of the car in the city is questioned and cities want to become more
General space for the cyclist in streets of Amsterdam seen from a street profile.

**Kinkerstraat**
- **Cycle Lane:** 18%
- **Cycle Parking:** 24%

**De Clercqstraat**
- **Cycle Lane:** 15%
- **Cycle Parking:** 12%

**Willemsparkweg**
- **Cycle Lane:** 17%
- **Cycle Parking:** 20%
vital again. The answer? Bicycles! The bicycle is seen as the solution for cities all around the world to tackle sustainability and traffic issues. Amsterdam takes a leading role in this perspective and continues to develop its bicycle system in many ways. Nevertheless, Amsterdam is criticized for its highly praised bicycle system as well. A lot of criticism is even actually based on its success: “[...] the city finds itself a victim of its own success with biking programs” (Stone, Z., 2013). The critics note the big issue that “Amsterdam is currently tackling a problem most cities can only dream of having: It has way too many bikes.” (citylab, 2015). The critics take on Amsterdam's chaotic bicycle problem direct: “The Dutch prize their pedal power, but a sea of bikes swamp their capital” (New York times, 2013). They see the thousands of bikes scattered around the city, the lack of parking spaces and the feeling that there simply are too many cyclists. Critics seem to frame cycling as something that is not a positive thing to the city. In response to the article of New York times (2013), StreetFilms (2013) made a video with comments of international local cycle experts in Amsterdam. “The success is a challenge, it is not a problem. We are already talking about the next level where we are going to make parts of the city car-free.” (Woudenberg, M. van., in StreetFilms, 2013). Responses to the many articles from locals make one thing clear: “the extensive bicycle use is a challenge to provide for, but it is way easier than to provide for cars” (Lange, M. de., in StreetFilms, 2013).

Amsterdam states (Gemeente Amsterdam, 2013, p. 60). that the historical city streets of Amsterdam are often too small to facilitate for public transport, cars, cycling and pedestrians and therefore in certain streets a priority for a specific type of infrastructure should solve this issue. In their policy, the Municipality of Amsterdam, also states that normally compromises are made to facilitate both residence and movement functions causing neither to function properly, causing most of the accidents in traffic as well.

By appointing a plusnet for every type of modality (public transport, cars, cycling and pedestrians) a clear priority is set. The Municipality makes clear that a plusnet does not mean that the other modalities can simply be taken out, they still need to be facilitated and it is not their goal to separate the different modalities from each other since “the busy city streets are the enjoyable streets of Amsterdam” (Gemeente Amsterdam, 2013, p. 60). The Municipality urges: “Important considerations in favour of the physical reconstruction of streets should provide for plenty of room for customization. Due to the historic nature of many streets, but also by the presence of for example trees and the available width, an appropriate design needs to be provided in each street individually. Hard criteria on, for example, the separation mixed functions of traffic or the minimum width of pedestrian and cycle paths are often in the way of this customization and will therefore not be determined” (Gemeente Amsterdam, 2013, p. 52). One can wonder though, for example, a cycle path of 2.5 meters outside of the city centre can have the same quality of the plusnet as a cycle path of 1.8 meters inside the city centre. The Municipality does provide us with five typologies of streets (1. residential street with few public functions and without continuous traffic, 2. visitor street with many public functions and little continuous traffic, 3. City streets with many public functions and a large amount of
continuous traffic, 4. flow street with few public functions and a large amount of continuous traffic, 5. traffic artery without public functions and a large amount of continuous traffic) which they have recognized, but fail to include what value the providing of these typologies have and how a design can or should be implemented (Gemeente Amsterdam, 2013, p.60). The specific criteria of the plusnet are left vague and can still be (too) widely interpreted to provide an (as evenly as possible) qualitative bicycle network.

Amsterdam was originally never made for cars or large public transport, only neighbourhoods created after the second World War were able to provide sufficient space for all modes of transport. As understandable as it is, in the historical parts of the city, the cyclist is (literally) pushed away by the ‘need’ for cars and public transport next to the door. Although Amsterdam is seen as a bicycle-friendly city, one can wonder why the cyclist is still a visitor in many places. Amsterdam still tends to look through the eyes of the car driver and public transport, but the city may need to find the opportunities in a vision of the city through the eyes of the many cyclists it holds.

Whether critics are taking things out of context or not, there is a correct sense that Amsterdam does have a challenge it needs to take care of. However, the problem will not be solved by pointing at the cyclists. Who says that there is no space left for the cyclist needs to look further: there is not enough space for the cyclist provided, but it is certainly there. Also the Municipality of

A new view on how Amsterdam can be an example

In the Netherlands, discussions about the importance of becoming more cycle-attractive and the role of the other ways of moving through and staying in the city are increasingly questioned. Amsterdam can be proud of its bicycle network, however practise shows there are still enough gaps to be found that cyclists experience. The gaps cannot always be recognized from the city- and network scale, and only become very evident at the street- and eye-level of the cyclist.

A cyclist is someone who experiences the bicycle network at eye-level, and one should not forget that they are on a bicycle. Cyclists are very flexible in moving around, they can decide where they get on their bike and where to get off. Cyclists can often get to areas in the city more easily than pedestrians, car drivers or people using public transport. However, its flexibility also comes with a weakness: vulnerability. As the cyclist is so flexible in moving around, it is often put on a lower importance when there is a lack of space for other modalities which need (or do they?) to share the streets of the bicycle network. In contradiction, with the increase of cyclists there is a question of making a choice when it comes to assigning space (Gemeente Amsterdam, 2013, p. 60).

The most obvious gaps in the bicycle network are made evident by the traffic safety and clearly shows how vulnerable to cyclist still is: a majority of 56% of all serious injuries in traffic happen to cyclists (Noordhoff atlasproducties, 2015, p. 136-137), however surprisingly 60% of those injuries happen 'one sided' (Gemeente Amsterdam, 2011; Gemeente Amsterdam
amongst the total users of Amsterdam, somewhere between 2003 and 2008 it was the first time that bicycles are used more than other traffic modes except for the car while considering the amount of trips being made. Also note the rapid decrease of car use from this moment. It can be expected that the bicycle use for all users in Amsterdam is (soon) above car use as well.

Spatial implications within the bicycle network are not yet designed for the cyclist and that is something that should not be part of Amsterdam, as the Capital of cyclists. The cyclists should be properly acknowledged in the planning and design process.

It is important to judge by each specific (problematic) location if the balance with other traffic is lacking or if the designed surroundings are lacking quality for cycling. In recent discussions (Pakhuis de Zwijger, 2015; 2016) cyclists and policymakers have come together to debate about the future of Amsterdam and other Dutch cities. Both parties make clear that some things still have to be done, some quicker than others. While policymakers try to get negative numbers down (traffic safety, travel time, etc.), cyclists also point out the dangers that still occur in the city while cycling. Both parties need to keep coming together in order to bring experiences and solutions together.

Figure 3-4 (Brondata Amsterdamse Thermometer van de Bereikbaarheid, 2015)

Figure 2

Modelsplit residents and visitors of Amsterdam - Amount of trips
Amongst the total users of Amsterdam, somewhere between 2003 and 2008 it was the first time that bicycles are used more than other traffic modes except for the car while considering the amount of trips being made. Also note the rapid decrease of car use from this moment. It can be expected that the bicycle use for all users in Amsterdam is (soon) above car use as well.

Modelsplit residents of Amsterdam - Amount of trips
Amongst the local residents of Amsterdam, somewhere between 2003 and 2008 it was the first time that bicycles are used most considering the amount of trips while comparing with the other traffic modes. Note also, is the rapid decrease of car use from this moment and on.
Designing attractive streets for cyclists involves all users of the street. Every user needs a place and every user has an impact on the attractiveness of the place.
A cyclist is approaching, but her way is blocked and she is unable to divert anywhere

Cargo for the shops is being unloaded, on the bicyclerane blocking the way

Bicycles are parked on the loading/unloading cargo places

Cargo may only be loaded and unloaded between 6 and 11 AM. Not in the evening.

Photo of the Kinkerstraat made at 23 o’clock in November (Author, 2016)
All over the world countries are focusing more and more on implementing a bicycle infrastructure. Amsterdam, as a representative of the Netherlands, is one of the most bicycle-friendly cities in the world and should be a city where the cyclists get enough room to move around safely in the public streets. The Municipality of Amsterdam and urban planners/designers should aim for public streets to be designed as attractive as possible for cyclists, while considering its context within the city, to make the city as livable as possible. However, although the Municipality has the goal to choose for and have the public space become attractive to cyclists (and pedestrians) she is unable to define what this attractiveness is and therefore is unable to properly evaluate when this goal has been achieved (Gemeente Amsterdam 2011; 2012; 2013).

“The base of the main-criterium ‘attractiveness’ shows difficult to determine. This is because of the fact that experience is very personal. This does not take away that complaints of cyclists, even if they are not objectively measurable, should deserve serious attention”

(CROW, 2006, p. 31)

That the Municipality of Amsterdam is unable to define what attractiveness is, is mainly because (as the designguide bicycle-infrastructure from CROW (2006) states) attractiveness is seen as something defined per individual as it is very personal. Nevertheless, the wishes of the Municipality
clearly show (Gemeente Amsterdam, 2012, p.26;29;30;36 and 2013, p.1;23;30;60) how important they find it to become attractive and that makes it incredibly important to being able to evaluate their goals. By keeping these evaluation criteria vague and general the goal to become as attractive as possible may fail to show the best opportunities for some of the public streets in the city.

Although attractiveness is something personal, many types of people do think alike. By defining the different types of cyclists in Amsterdam, and the spatial evaluation criteria which influence attractiveness, a stronger goal to attractiveness of the public space can be set and evaluated, while considering the context within the city. The Municipality could move from ‘problem solving’ into a clear approach to become attractive to cyclists.

Amsterdam, as a representative of the Netherlands, is one of the most bicycle-friendly cities in the world and should be a city where the cyclists get enough room to move around safely in the public streets. The Municipality of Amsterdam and urban planners/-designers should aim for public streets to be designed as attractive as possible for cyclists, while considering its context within the city, to make the city as livable as possible. However, although the Municipality has the goal to choose for and have the public space become attractive to cyclists (and pedestrians) she is unable to define what this attractiveness is and therefore is unable to properly evaluate when this goal has been achieved at various locations (Gemeente Amsterdam 2011; 2012; 2013).

That the Municipality of Amsterdam is unable to define what attractiveness is, is mainly because (as the designguide bicycle-infrastructure from CROW (2006) states) attractiveness is seen as something defined per individual as it is very personal. Nevertheless, the wishes of the Municipality clearly show (Gemeente Amsterdam, 2012, p.26;29;30;36 and 2013, p.1;23;30;60) how important they find it to become attractive and that makes it incredibly important to being able to evaluate their goals. By keeping these evaluation criteria vague and general the goal to become as attractive as possible may fail to show the best opportunities for some of the public streets in the city.

Although attractiveness is something personal, many types of people do think alike. By defining the different types of cyclists, and the spatial evaluation criteria which influence attractiveness, a stronger goal to attractiveness of the public space can be set and evaluated, while considering the context within the city. Designing for the attractiveness of cycling could move from ‘problem solving’ into a clear vision to be reached.
RELEVANCE & OBJECTIVES

Scientific relevance

A research about cycle-attractiveness could provide a further elaboration on how to design for cyclists at eye-level which is currently lacking.

Currently, a lot of investments are made into bicycle-friendly design all over the world. However, these designs still lack the indepth meaning of attractiveness. More often literature notes the importance of criteria on the attractiveness of the public space in relation to cycling (Akar, G. & Clifton, K.J., n.d.; Gehl, J., 2010; Pelzer, P. & Brömmelstroet, M. te, 2010; Pelzer, P., 2012), however these criteria are often not made spatial and are still unclear on when a criteria is met. Attempts to do this for pedestrians are already made (Gehl, 2010; Stipo, 2016), however this is still lacking for cycling specific. There is currently still too little focus on the actual users and how they experience their routes.

A research on how Amsterdam could take a leading role in cycle-attractive designing could show new opportunities and views on what kind of cycling city Amsterdam could and should be (to herself and to the outside world).

Amsterdam struggles with the limited space and other traffic modes causing compromises. Amsterdam is internationally criticized for being a bicycle chaos. The chaos in the city is an arising topic (Bicycle Dutch, 2014; Citylab, 2015; Tagliabue, J., 2013; The Guardian, 2013) in Amsterdam and receives more and more attention. Amsterdam should take the leading role when it comes to designing through the attractiveness of bicycle network, which could possibly give the flexibility in the limited space the city has while keeping the quality of the bicycle network high.

Social relevance

With a research focusing on making cycling more attractive the freedom of the cyclists (and with that the users of the city) can be further motivated.

With the bike being available in all shapes and sizes for anyone, no matter the age, background or other situation, it is a way of transportation that can still highly increase in popularity. Not only are bikes cheaper and (could be) faster than the car in the city, they get the people outside and active as well. The bicycle is, literally, accessible for anyone to use.

With a research on both the individual impacts and (more importantly) the collective impacts of getting on the bicycle on both eye-level and city-level, a stronger drive to design for cyclists can be explored.

By motivating to getting on the bike, instead of in the car, lifestyles and city life can change. Think about what an impact it can have on the health of the people, not only by getting more active but also by the improving the air quality that is still strongly being polluted by emissions of cars today. By finding more motives to cycle, more people can get out on the streets and experience the city in an interactive way. Not only can they see, which is the car experience, they will also be able to smell, feel and hear the details of the city.
The bicycle is used all over the world and is one of the most accessible ways of transportation in the cities. Globally the cycle network can still drastically be improved as many compromises are made in both cities that have yet to or already have accepted the bicycle culture. Amsterdam is one of the cities which has accepted the bicycle culture the most in the world. With its high accessibility and freedom of moving, cycling is becoming more and more popular. The Municipality of Amsterdam envisions pedestrians and cyclists as the main traffic users in the innercity (Gemeente Amsterdam 2010, 2011, 2012), however compromises still are being made at the cost of the cyclist and that is something a city like Amsterdam (as a worldwide example for its bicycle culture) should not accept as a standard.

The design process always asks for choices to be made, the interventions happening in Amsterdam currently are still open for better argumentations as to why they are changed and (most importantly) when the goal has been reached. The criteria the Municipality currently uses are left so open for interpretation that it is very unclear when a place is ‘attractive’ (Gemeente Amsterdam 2010, 2011, 2012).

Objectives

By exploring the opportunities of designing cycle-attractiveness within the city the following objectives can be reached:

- Provide a further elaboration on how to design for cycle-attractiveness at eye-level from existing literature.
- Provide elaborated motivations for the individual to get on the bicycle with a city focussing on cycle-attractiveness.
- Provide a stronger drive to design for cycle-attractiveness by elaborating on the impacts for individuals and the collective users on both eye- and city-level.
- Provide for opportunities for the functioning of the city without compromising the space of the cyclists.
- Provide an approach to an elaborated and properly argumented design and evaluation, in consideration of a larger goal and vision.
- Provide a view on what kind of cycle-city Amsterdam could be when designing for cycle-attractiveness.
RESEARCH QUESTIONS

The following main research question forms the basis of this thesis:

**WHICH SPATIAL DESIGN CRITERIA ARE ABLE TO ENHANCE THE ATTRACTIVENESS OF CYCLING FROM THE VIEWPOINT OF DIFFERENT TYPES OF CYCLISTS?**

With this research question the relation between different types of streets and cyclists, on both city- and streetlevel, are reviewed and evaluated. This exploration to spatial design criteria will provide new viewpoints (that of the different types of cyclists) on the attractiveness of a street and route to the existing knowledge within this topic.

In order to answer this question this thesis is structurized by the following, each using their own methods which will be further elaborated on, subquestions:

**General**

1) Which relevant spatial design criteria are currently used to positively influence the attractiveness of cycling in the city?

2) What are the similarities and differences in the experienced (spatial) attractiveness between the different types of cyclists?

**Amsterdam case-study**

3) How could the cycling network of Amsterdam be planned to function best for all types of cyclists in the city?

4) How can the spatial design criteria for attractive cycling be implemented on different locations at eye-level from the (extreme) preferences of all different types of cyclists?

5) What urban design could fit the Kinkerstraat best while considering the different types of cyclists?

**Scope**

This research explores if and how attractiveness of a place can be deeper defined as basis of a new street design, from the viewpoint of the cyclists and the bicycle network of the city. This research only reflects on city streets where currently multiple modes of transport are flowing through and which currently show a lack of space for cyclists within the city of Amsterdam. The interventions and principles focus on the spatial aspects of the design.

The results of this research are based on the context of Amsterdam, however the spatial design principles may be applicable to other (Dutch) bicycle cities. These cities are, just like Amsterdam, working on enhancing the cyclist-friendly bicycle network since the network of Amsterdam can be seen as a representation of others.
WHICH SPATIAL DESIGN CRITERIA ARE ABLE TO ENHANCE THE ATTRACTIVENESS OF CYCLING FROM THE VIEWPOINT OF DIFFERENT TYPES OF CYCLISTS?

1. Which relevant spatial design criteria can be used to positively influence the attractiveness of cycling in the city?

2. What are the similarities and differences in the experienced (spatial) attractiveness between the different types of cyclists?

3. How could the cycling network of Amsterdam be planned to function best for all types of cyclists in the city?

4. How can the spatial design criteria for attractive cycling be implemented on different locations at eye-level from the preferences of all different types of cyclists?

5. What (realistic) urban design could fit the Kinkerstraat best while considering the different types of cyclists?
Which relevant spatial design criteria can be used to positively influence the attractiveness of cycling in the city?

This question is answered through a literature study comparing existing explorations of designing at eye-level and existing plans of the Municipality of Amsterdam when it comes to designing for cycling. The outcomes of this study are themes and criteria which can be used as the basis of this thesis research into further formulating spatial design interventions to enhance the attractiveness of cycling from the viewpoint of the different cyclists worldwide and in Amsterdam alone.

What are the similarities and differences in the experienced (spatial) attractiveness between the different types of cyclists?

This question is answered in two parts: 1) by defining different types of cyclists as part of a literature study as well as discussions with urban planners and cyclists and 2) by reflecting on the previous question and looks at which types of cyclists fit well together in one category (easy-going, steady-going or fast-going cyclists) through these criteria, and which types do not.

How could the cycling network of Amsterdam be planned to function best for all types of cyclists in the city?

This question is answered by reflecting the criteria which are important at the city-scale in its current context at the level of the three formulated categories as an outcome of the previous question. By overlapping and comparing these categories at the city-scale a concept of a new vision on design focus areas is made as part of a larger picture. The new vision has also been reflected with the outcomes of the following question considering the three case-studies.

How could the Kinkerstraat, De Clercqstraat and Koningsparkweg be redesigned from an (extreme) preference while looking at all the different types of cyclists?

This question is answered by comparing the three design locations with new situations as a preference of the different types of cyclists. The designs are principles and represent a large(r) part of the route. As outcomes, similarities and differences between cyclists are put into context as well as a reflection is made for the three locations on which design focus would be most feasible to implement.
How could the Kinkerstraat be redesigned from the viewpoint of the shopping and attraction visiting cyclist?

This question is answered by further looking into a specific area of the Kinkerstraat which represents the most feasible types of cyclists to design for in this street. This question reflects back to the first two questions and reviews if and how all criteria are implemented in the design.

Finally, all questions and outcomes are put next to each other and reflected in a final answer to the main research question 'which spatial design interventions are able to enhance the attractiveness of cycling from the viewpoint of different types of cyclists?'. This question is both answered from a generic perspective as well as that for the city of Amsterdam.
CHAPTER 2

RELEVANT CRITERIA FOR ATTRACTIVE CYCLING

This chapter focusses on answering the question

‘which relevant spatial design criteria are currently used to positively influence the attractiveness of cycling in the city?’

By answering this question it is possible to better define what ‘attractive cycling’ is and what it could mean to the designing of the public space on different scales within a city as this is currently often left too vague for interpretation. The results of this literature review have formed the basis of the further process of thesis research into (further) formulating spatial design interventions to enhance the attractiveness of cycling from the viewpoint of the different cyclists worldwide and in Amsterdam alone.

The following sources have been used as a scope within this literature review and have been compared to each other: Design guide bicycle infrastructure (CROW, 2006), Structural vision 2040 of Amsterdam (Gemeente Amsterdam, 2010), Cities for people (Gehl, J., 2010), The city at eye level (Stipo, 2016).
Research framework

The overview of this research and the links between all parts. Highlighted is the topic being discussed in this chapter.
Amsterdam is one of the most representative cities in regards to bicycle-use, and with a growing amount of cyclists it is of great importance to continue invest in the attractiveness of cycling in the city. Amsterdam already has a basic bicycle network, however gaps can still be found and become very evident at the street- and eye-level of the cyclist. In order to keep up with the growing amount of cyclists and minimizing the gaps in the bicycle network, a design viewpoint from the cyclist could give new insight in how to approach the issues that still occur. This, in order to make use of the full potential of the bicycle network of Amsterdam. The question what spatial themes can influence the positive experience of cyclists and how they relate to each other stands central in this literature review. Summaries of the specific content of each source can be found in appendix A (pages 76 to 79).

Themes for attractiveness from urban planning/architecture perspective

Calls to design at eye level through the experience of the user have been increasingly made since the upcoming of the car. People thinking like Kevin Lynch (Lynch, 1960), Gorden Cullen (Cullen, 1961) and Jane Jacobs (1961) are the founders of thinking and designing for the life at street level. In the past decade Jan Gehl (Gehl, 2010) is an important name which can be added to this group of people. Also, this year Stipo (Stipo, 2016) published their book ‘The city at eye level’ as another attempt to enhance the thinking and designing at eye level.

“Everyone should have the right to easily accessible open spaces […]. Well-designed neighbourhoods inspire the people who live in them, whilst poorly designed cities brutalize their citizens. As

Jan says: We shape cities, and they shape us.” (Gehl, 2010, p.IX)

“Urbanites experience their cities in what we call the ‘public realm’. It has a broader meaning than just ‘public space’; it includes façades of buildings and everything that can be seen at the eye level. Plinths are therefore a very important part of buildings: the ground floor, the city at eye level. A building may be ugly, but with a vibrant plinth, the experience can be positive.” (Stipo, 2016, p.15)

While both explorations elaborate on the city at eye level, Gehl takes on an approach directed to movement and way finding and Stipo directs their approach more towards the plinth of the street.

As the main cause for the lack of designing in human scale, both explorations (Gehl, 2010, p.3; Stipo, 2016, p.48) see the rising of the car as the main issue. They both acknowledge that before the coming of the car, cities had a better sense of human dimension. Another important cause was the changing planning ideologies, where a low priority was placed on “public space, pedestrians and the role of city space as a meeting place” (Gehl, 2010, p.3). Cities have been growing, and that will still continue. “The city is not only a functional environment, but also an environment of experience. […] Now we experience […] the shift from ‘making the city’ to ‘being the city’. New construction and areas of growth will persist, but the reinvention of existing urban structures will
become more dominant” (Stipo, 2016, p.14-15). Although both explorers mainly focus on pedestrians in general, their sayings are applicable to cycling as an activity as well. Although cycling is currently a way to often move quicker through the city (Gemeente Amsterdam, 2013) cycling is also on such a human dimension (unlike the car or public transportation) that details in the street at eye level are almost as evident as that of a pedestrian.

Although more simplified, Gehl is able to still touch a large variety of criteria which are important to understand the human dimension in a city. The themes and criteria of Gehl could form a proper base for further elaboration, as his formulation is very broad and open for interpretation which, for a consequent quality of the bicycle network is needed. The theme ‘delight’, as similar to ‘attractively’ (CROW, 2006), is formulated in a different systematic way as the other themes where (suddenly) designing the place seems to be most evident. The designing of a place should, like the criteria Gehl stated in the other themes, not be a criteria but a tool to achieve a certain level of delight.

In The city at eye level (Stipo, 2016), in addition to the criteria by Gehl (2010), criteria are further specified. Next to being further specified, this exploration also adds the dividing in scales: the context, the street/place and the building. By dividing the criteria the toolbox gives the designer the ability to see and focus what is most important at what type of design depending on the scale.

*Current themes applied in the Netherlands and Amsterdam*
Designing for a bicycle network has been going on for several decades in the Netherlands and there are already a lot of principles and criteria to work with. An example of this is the Design guide for bicycle infrastructure (CROW, 2006) in which generic evaluation criteria are presented. The Municipality of Amsterdam has, as well, formulated several policy documents which go about the approach and evaluation of the designing for the bicycle network:
1. Structural vision 2040 (Gemeente Amsterdam, 2010)
2. Mobility Agenda Implementationplan 2030 (Gemeente Amsterdam, 2013)
3. Multiple Yearplan Bicycle 2016 (Gemeente Amsterdam, 2012)

Although the Mobility Agenda Implementation plan 2030 and the Multiple Year plan Bicycle 2016 are focussed on a smaller time period, both policy documents are generally more abstract than the structural vision and the design guide. However, the structural vision 2040 and the design guide for bicycle infrastructure hold criteria formulated which are properly to compare to each other. That the policies of the smaller time period are more abstract, is due the new approach in which the Municipality states that there should be enough room for customization as every street is different and set measures can be in the way of the design process (Gemeente Amsterdam, 2013, p.60). While comparing, common themes can be recognized: comfort, speed/directness, traffic safety and social security.

In both cases, the criteria are either very hard or very soft. The soft criteria, meaning that they are very open for interpretation, and the hard criteria meaning that they can
still be questioned whether they should count for every type of cyclists (see the following chapter). Although open interpretations are not necessarily something negative, it could leave too much freedom to define what the actual quality of the bicycle network should and will be. More important even would be the strict criteria which do not explain why they state a certain amount and also not what should happen if the criteria cannot be met. An example of this would be the width of the bicycle lanes. In an optimal situation the structural vision 2040 (Gemeente Amsterdam, 2010) states that a one-way lane should be at least 2,5 meters wide, however... they also note that in the city centre a width of only 1,8 meters is sufficient. Even though it is understandable streets within the city centre are less wide, we have to question how the quality of the bicycle network can be comparable to each other in this way. A follow up question would then be: ‘should the bicycle network be of comparable quality?’.

The theme ‘attractiveness’ is underdeveloped in both cases, while in the Design guide the theme is named and stating that attractiveness is a subjective criteria which will be different per person (p. ) it only includes social security as an achievable goal. The structural vision, although often referring to creating attractive public space, does not include any further definition. As attractiveness is an important part of the experience of the cyclist, this theme needs to be further elaborated on, and might even be the solution to a comparable quality where space lacks in the streets.

The Dutch guidelines in comparison to themes for attractiveness
Comparing the Dutch guidelines to the themes for an attractive public space as concluded from the researches of Gehl (2010) and Stipo (2015), something notable can be seen. All criteria named as important by the Municipality of Amsterdam (Gemeente Amsterdam, 2012) and the National guidelines (CROW, 2006) all fit into one or more of the categories concluded by Gehl and Stipo. However, not all themes of attractiveness are touched. From the themes which could be seen as functional program the following themes are left open: Overlapping functions day/night, pollution, humanscale, a design focus between the buildings and the ground floor, the building design and te density of amenities. The themes which could be seen as aesthetic design are left open: enjoying the sun/shade/heat/cool/breeze, a lively public real, interesting views, invite for activities, fine views, goed detailing, good design, great plinths, the movement between public and private, personality, character, uniqueness and style. Almost all of these themes relate to the climate, the feeling a place gives and the functions. These themes seem to be more difficult to define, they are either vulnerable to change, not directly visible or describing a feeling or taste. These themes, however, are likely to influence the behaviour of people and should be attempted to be further defined. Setting everything in regulations may not be proper for these themes though, and that is why the definition of these themes at the location could be the role of the designer.

Conclusion
Criteria used to enhance the design at eye level through the eyes of the pedestrians are very similar or could even be easily reformulated to fit that of the eyes of the cyclists. By reformulating the criteria, both the studies of Jan Gehl and Stipo become a strong added value to the enhancing of a bicycle network as well. In contrast to the Structure vision
2040 of the Municipality of Amsterdam and the Design guide infrastructure by the CROW, the explorations of designing at eye level are able to formulate their criteria more through the eyes of the user. All the studies show that there are criteria which can be formulated really strict in numbers. However, they also show that there are criteria which should be left open or cannot be formulated further in depth and therefore are left for wider interpretation by the designer. What is important to distinguish, is which themes and criteria should have the freedom of interpretation and also the reason behind it. Without a proper reason, but also without enough depth of the criteria, it is more likely that the design of the street becomes more of a compromise rather than an outspoken image of the city. By formulating the criteria in a strict way, but in a variety depending on the users, the designer as well as the evaluator (user) can become more aware of for who the specific part of the network is meant and what kind of experience is needed.

While viewing what Gehl (2010) and Stipo (2015) conclude (figure x) from their researches on what the important themes are to define the attractiveness of the public space at eye-level, for this research it is important to look at what is already being (proposed to be) implemented in the Netherlands and Amsterdam. The design guide for bicycle infrastructure (CROW, 2006) was made as guidelines for the Netherlands in general and the Structural vision 2040 (Gemeente Amsterdam, 2012) was made as a guiding policy for the city of Amsterdam. Both documents define themes and actions to address similar points to each other but very different from the themes named by Gehl (2010) and Stipo (2015). Notable is that only the Dutch design guide for bicycle infrastructure states the importance to define attractiveness, but also admits that this is very difficult to do as attractiveness is defined by the individual person. Nevertheless, it does specifically (and only) state social security as part of attractiveness. And although the Municipality of Amsterdam multiple times states that they want to create attractive public space, they fail to further define this topic completely. However, while comparing all researches and documents with each other, it becomes clear many topics actually do relate and come together.

The themes which are not further defined in the guidelines and policy but are named as important by Gehl (2010) and Stipo (2015) show to either be difficult to define or do not seem to be of greatest importance. Also notable is that the guidelines and the policy both name the logic and understanding of a place for the people, however these themes cannot be placed properly within the themes Gehl and Stipo have named. What can be concluded is that all these themes are mainly those which you cannot objectively measure, and actually this is where the designer should come into place within the process. Of course it is easiest if a street could be planned in such a way that everything is objectively measured and functional to every user. However, one must not forget that a street is not only a practical ‘tool’ to move from A to B, but also a place which people will experience. Just like a building or specific place, a public street is a design which some people will appreciate while others will not. Designing (a vision of) a public street to be attractive for specific users should form through a process of what would fit best considering the current context and the current function(s) of the street. It clearly shows that formulating criteria to design through delight are generally difficult to do as they are incredibly subjective and different for every user. Nevertheless if an
attempt is made, as the explorers of The city at eye level (stipo, 2016) did, a broad focus can be initiated which can help the designer to further envision and visualize the street at eye level, as part of the larger (bicycle) network.

By further elaborating on for who one designs and how their objectives in an attractive cycling experience could reflect in a design on street level as well as that within a larger context, the criteria for attractiveness can be formulated more in depth. Not only does the designer get a tool they can actually work with, the design can also be better evaluated in practise once it has been implemented.

‘which relevant spatial design criteria are currently used to positively influence the attractiveness of cycling in the city?’

Explorations made by Stipo (2016) and Gehl (2010) and (suggested) implementations in the Netherlands (Gemeente Amsterdam, 2010 & CROW, 2005) each use a different way of formulating what they find the most important criteria to design for attractive cycling. Nevertheless they all define their themes similarly to each other, but their criteria differ in their ability for interpretation.

All criteria respond differently within a spatial design and implementation on the following aspects:

- the difference in themes for attractive cycling
- the difference in impact on scales
- the directness of the impact
- the openness for interpretation

Attractiveness is generally defined per individual, and although in all explorations and policies the importance of defining attractiveness is named, it is at the same time left vague and (too) open for interpretation.

On the following pages a summary of all criteria which were named by all four sources (CROW, 2005; Gehl, 2010; Gemeente Amsterdam, 2010; Stipo, 2016) is given which showcase the criteria for attractive cycling which are current used and/or suggested.
THE CONTEXT

GRID POSITION
Direct design criteria
- Street connectivity
- Proximity to large green areas

SOCIO-ECONOMIC CONTEXT
Indirect design criteria
- Socio-economic capital in the neighborhood

VISUAL QUALITY
Direct design criteria
- Humanscale
- Logical
- Clear wayfinding

FUNCTION INTENSITY
Direct design criteria
- Density

STRATEGY
Indirect design criteria
- Longterm vision
- Shortterm initiative

Meaningful functions
**THE STREET/PLACE**

**USER COMFORT**
Direct design criteria
- Logical
- Understandable
- Interesting views
- Fine views
- Texture

**CYCLEABILITY**
Direct design criteria
- Lively realm
- Feeling
- Enjoy sun / shade / heat / cool / breeze
- Cold/heat
- Wind/rain/snow
- Pollution
- Obstacle free
- Physical

**PROGRAM VARIETY**
Direct design criteria
- Density of amenities
- Invite for activities
- Overlapping functions day/night
- Summer/winter

**VISUAL QUALITY**
Direct design criteria
- Good materials
- Uniqueness
- Humanscale
- Colour
- Clear beginning and ending of the street

**MANAGEMENT**
Indirect design criteria
- Maintenance
**THE BUILDING(S)**

**FUNCTION MIX**
Direct design criteria
- Overlapping functions day/night

**VERTICAL ORIENTATION**
Direct design criteria
- Vertical orientation plinths

**HYBRID ZONE**
Direct design criteria
- Movement between public/private

**HIGH FLEXIBILITY**
Indirect design criteria
- Flexibility in the landuse plan

**VISUAL QUALITY**
Direct design criteria
- Characteristic architecture
- Appropriate signing on the facade
- Humanscale
CHAPTER 3

TYPES OF CYCLISTS

This chapter focusses on answering the question

‘What are the similarities and differences in the experienced (spatial) attractiveness between the different types of cyclists?’

It is important to answer this question to put the ‘individual’ into types of cyclists and give a clear(er) (design) focus.

The results of this exploration show which design criteria and interventions are able to facilitate for which type of cyclists, with this a better focus can be made at a specific location.
Cycle-attractive design criteria

- Context
- Place/street
- Building

Criteria for types of cyclists
- All cyclists
- Per category
- Per type of cyclist

Introduction

- Motivation & relevance
- Problemfield
- Research questions & approach

Amsterdam casestudy
- The city envisioned
- The citystreet explored
- The Kinkerstraat redesigned

Finalization

- Conclusions
- Discussions
- Recommendations

Research framework
The overview of this research and the links between all parts. Highlighted is the topic being discussed in this chapter.
One who has been in Amsterdam cannot help but notice the many different bicycles which are used to get around. Bicycles come in many different shapes and sizes which each deal with their surroundings in their own way. Next to that, with so many cyclists and so many different goals of their cycle trips, a city like Amsterdam cannot talk about the one typical cyclist of Amsterdam, there are so many typical cyclists. Streets should not be designed and cannot be designed as if cyclists are always one and the same, which is currently being done (Gemeente Amsterdam 2011; 2012; 2013). Cyclists can be divided into various types from which some can function well together, while other types form a strong contradiction. While the attractiveness of the public space differs per individual (as concluded in chapter 2), people with a common goal and use of the public space (and with that types of cyclists) are generally able to think similar about this. In this chapter different types of cyclists are named and related to each other on their basic needs and preferences, in chapter 4 and 5 the cyclists are compared on city and streetlevel.

Types of cyclists
Cyclists can be defined by the goal of their cycling trip. In his book ‘Cities for people’ (Gehl, 2010, p.21) Jan Gehl distinguishes three activities in which people travel for:

1. Necessary activities
2. Optional activities
3. Social activities

Although his research is mainly based on pedestrians by foot, the type of activities are the same for cyclists. In total 14 types of cyclists have been distinguished:
Necessary activities:

- student-, commuting-, working- (mailman, police, etc.), daily activity- (buying groceries)

Optional activities:

- trip-, attraction visiting-, shopping-, weekly activity- (sport or cultureclub, etc.), occasional activity- (dentist visit, doctor visit, etc.) and racing cyclist

Social activities:

- visiting-, tourist cyclist

It should be noted that next to the 12 defined cyclists by their activities, also two other types of cyclists have been defined: the child- and elderly cyclist. These two cyclists are generally more vulnerable cyclists due to their age and other limitations and should be looked at as a separate type of cyclist to be aware of. All these different types of cyclists should be able to find their way within a city and as their mentality and goals are different they can conflict with each other by using the space differently than the others.

Figure 4 (based on: Fietsforum Tilburg, 2015)

The amount of space in relation to the speed of a bicycle
Next to the type of cyclists, all cyclists are free to use any type of bicycle. Bicycles are (for example) widely used by the Amsterdammers and visitors in the city. Bicycles come in many shapes and sizes, therefore a bicycle very flexible and fitting for many kinds of different people and uses. According to the Bosatlas of Amsterdam (Noordhoff Atlasproducties, 2015, p.137) Amsterdammers mostly own the citybike (61%). The citybike is seen as the common. Current measurements within the public space take into account the citybike, however one must be aware of all the other types of bicycles which people could use as well. Other types of bicycles Amsterdammers own are the ‘oma’ bike (18%, a typical Dutch roadster bike), tourbike (13%), racing bike (8%), mountainbike (8%), motherbike (3%), cargo-bike (2%), the folding-bike (2%) and others (5%). Amongst ‘others’ you could think of childbikes, recumbent bikes, tricycles and electronical bikes to name a few. As a conclusion: there are many different bikes for many different people and the question remains how you design the public space for that?

First, it is important that the designer is aware of what type of bicycle is used most likely by the cyclist which is designed for. Although most cyclists use the citybike, if a type of cyclist really suggests the possibility of another type of bicycle this may be reflected into the design. The design will mainly differ in the size of bicycle as well as the probable average speed. Figure 4 shows the impact of speed and the size of a bicycle on the space they would need to continue their way without feeling hindered and that is why different sizes and speeds need to be taken into account while designing. Figure 5 gives an overview of the general needs of the types of cyclists and the most likely fits of types of bicycles, this scheme can be used to create awareness of what to design for. It is then up to the designer how to work with this (or not).
Figure 5
Most likely bicycle-use compared to types of cyclists
Fast-going cyclists

Cycling is sport
Look ahead and around
As fast as possible

Steady-going cyclists

Cycling is practical
Want to be on time
Look ahead
Easy-going cyclists

- NOT IN A HURRY
- LOOK AROUND
- CYCLING FOR FUN

Figure 6 - Cyclist categories and types
‘What are the similarities and differences in the experienced (spatial) attractiveness between the different types of cyclists?’

Cyclists can be found in many shapes and sizes. Taking into account the criteria to design for attractive cycling (p. 32-35) similarities can be recognized for cyclists as a whole, the cyclists who fit into the same category and for the specific types of cyclists.

**Cyclists in general**

In general, the criteria considering the weather count for all cyclists. First of all, no matter in what setting, it is important for all cyclists (as well as other traffic users) that the streets they cycle in are understandable in their use. In the end, cyclists are able to use routes together freely even if some routes require different ways of cycling. Also the feeling of human scale is similar to all cyclists, as their sizes and speed are roughly the same (compared to other traffic users). Generally, all cyclists would prefer to cycle in the sun, out of the wind and stay as dry as possible from rain. Nevertheless for some types these weather issues and delights could count more or less for their experience of attractiveness as, for example, a trip cyclist would prefer to cycle on nice days while a student cyclist will go out anyway as it is a must to go out.
Cyclists in general

**Regional accessibility**
All cyclists, no matter what type, make use of the regional bicycle network as a whole and therefore it is of uppermost importance for all cyclists. Priority for all cyclists from other traffic users is preferred and a main road within 300 meters of where a cyclist is (so max. 600 meters between main roads).

**Ability to choose**
All cyclists use the same bicycle network, it is important that cyclists who prefer to use a different route are able to divert to another one as quickly as possible (within 300 meters).

**Clear wayfinding**
All cyclists use the same bicycle network, it is important that cyclists are quickly able to find what route they should take to get to their destination.

**Logic**
All cyclists use the same bicycle network, it is important that all cyclists (and other users) are easily able to recognize what is the expected behaviour from them (especially considering speed and taking space).

*Figure 2.1 - Spatial design criteria for cyclists in general*
**Humanscale**

All cyclists experience the proportions in a street and city similarly and therefore all routes should be designed at a fitting humanscale using the citybike as standard measurement (with exceptions of other types of bicycles) and an average speed of 15-18 km/h.

**Avoid physical contact with cars**

All cyclists form a vulnerable party in traffic compared to the other users, to avoid physical accidents with them contact (min. 0.5 meters with a large speed difference) should be avoided in speed and space.

**THE STREET/PLACE**

**Texture (flat)**

For all cyclists it is most comfortable to cycle on a flat surface.

**Uniqueness**

The uniqueness of a route and street help all cyclists in becoming aware of where they are and how they should continue their way.
Colour

Colours help all traffic users in understanding the function of the street. For cyclists most importantly (in the Netherlands) the colour red is used to show this section of the street is used for cycling.

Clear beginning and ending street

The beginning and ending of a street help all cyclists in becoming aware of where they are and how they should continue their way.

Fine detailing (thresh olds)

Diagonal tresholds (max. 50°) on each side of all bicycle lanes will be able to reduce accidents due to bumping into them. Cyclists are warned that they have reached the side of the lane through the height-difference, but are given extra space to respond to this.

Space to park

All cyclists should be able to park their bicycle at their destination. Space to park can be divided in temporary (where the bicycle is easy accessible and close by) and long-term (where the bicycle is standing safe) parking which should be suitable for all cyclists.

THE BUILDING

Characteristic architecture

Characteristic architecture helps making a route unique and recognizable for every cyclist (and other users) in the street.

Figure 2.1 - Spatial design criteria for cyclists in general
Cyclists per category

Cyclists can be divided into three different categories, who each differ in their mentality of cycling:

- **Cyclists in the category of easy-going cyclists** generally cycle in their free time looking around while cycling or have some insecurities while cycling in the public streets. These types of cyclists generally do not mind taking their time and prefer enough space to do what they want to do.
- **Cyclists in the category of steady-going cyclists** generally plan to cycle a set amount of time to get to their destination.
- **Cyclists in the category of fast-going cyclists** generally cycle as a form of sport.

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**Figure 7 - Spatial design criteria for each category**
THE CONTEXT

Street connectivity
Depending on how they use the street, the street connectivity may preferably work different for types of cyclists in another category. Cyclists with one specific goal and destination will prefer room for continuity, while cyclists with multiple destinations will prefer room to change their direction.

Proximity to large green areas
Depending on the category the importance of proximity to large green areas can differ a lot. Cyclists who are taking it easy will likely prefer a route with proximity to green areas, even if this is a longer route. Cyclists with a specific goal will likely prefer the shortest route, and do not mind if this will not take them through green areas.

Figure 2.2 - Spatial design criteria for each category
Density of functions

Depending on their goal of cycling, cyclists will either prefer many different kinds of functions for an active experience or as minimum as possible to cause as little disturbances along the way. Easy-going cyclists will likely prefer a large concentration to experience as much as possible while the fast- and steady-going cyclists would prefer a limited concentration.

THE STREET/PLACE

Invite for activities

Depending on their goal, cyclists will enjoy the variation of activities and how they can interact with those along the way, while others only have one specific goal and do not prefer their attention to be taken away by those 'disturbances'.

Figure 2.2 - Spatial design criteria for each category
Summer/winter functions

Depending on the category cycling is something which is a practical way of moving around for some, and should be accessible throughout the whole year, and a recreational/option of moving around for others. Activities should interact with these preferences.

Movement public/private

Depending on their goal, cyclists prefer strict or soft borders between the public and private. Those who prefer to experience the city to the fullest will likely prefer a soft border as they will be able to interact more, while those who have a specific goal will prefer a strict border to avoid as many disturbances as possible.

Figure 2.2 - Spatial design criteria for each category
Density of amenities

Depending on their goal, easy-going cyclists will likely prefer a large variety to experience as many from the city as possible, while the steady- and fast-going cyclists will likely prefer a small variety as they have one specific goal.

Obstacle free

Obstacles are something no cyclists want to ride into, however they can interact differently with them. Easy-going cyclists are generally in no rush and would likely be okay with enough space to move around the obstacle while the other two categories will likely prefer space where they do not have to mind any obstacles.

Figure 2.2 - Spatial design criteria for each category
Unhindered sightlines

Unhindered sightlines are important for all cyclists, however what differs per category is what is still within the sightlines. Important for easy-going cyclists is that all activities are properly notable, while for the other categories this is not as important.

Viewing distances

Depending on their general speed viewing distances are different for each category. Taken into account is one second reaction and one second response time compared to the average speed.

Figure 2.2 - Spatial design criteria for each category
**Fine views**

Fine views are difficult to define, however what is important for easy-going cyclists (compared to the steady- and fast-going cyclists) is the value in different or outstanding surroundings.

**Interesting views**

Similarly to fine views, interesting views are focused on what kind activities the type of cyclist is interested in.

*Figure 2.2 - Spatial design criteria for each category*
Good materials

For all cyclists a smooth material is preferred to cycle on as too many bumps can be uncomfortable. Asphalt is a material which works well with all types of cyclists, paving is also a material which works for the easy-going cyclist as this gives the visual idea of a ‘slow’ speed.

Appropriate signing

Finding your way through the city is something important to all cyclists, differently is that most steady-going cyclists are likely already familiar with their surroundings and therefore are better able to find their own way. On the other hand, easy-going cyclists may find their ways in unfamiliar areas and could use directions along the way on where and how they should cycle. The fast-going cyclists could find themselves in both circumstances.

Figure 2.2 - Spatial design criteria for each category
Cyclists per type

Although cyclists within the same category show many similarities, there are also still some criteria which really show different per cyclist depending on their specific goal. These criteria mainly differ in relation to the needed functions and the time of day these cyclists are most active.

Figure 8 - Spatial design criteria for each type of cyclist
Overlapping day/night functions

Different types of cyclists generally can use the bicycle-network at different times of the day, this is depending on opening hours of functions as well as general freetime. The activities can be split up into three different moments when the general activities of cyclists happen: rushhour (7-9 AM and 4-6 PM), during the day (10 AM - 5 PM opening hours shops and other attractions) and during the evening (4PM-12 PM local (club) activities).

Eyes on the road

Depending on the general time of day cyclists use the bicycle-network, they will prefer different kinds of eyes on the road. During the day this is mainly public activity, while during the night this is mainly residential activity as that is where most people will be.

Lighting

Depending on the general time of day cyclists use the bicycle-network, lighting has a high or low value for different types of cyclists in order to increase their visibility when it is dark.

Figure 2.3 - Spatial design criteria for each type of cyclist
Space to cycle

Every cyclist prefers to use the bicycle lane differently. The difference in space depends on secure (min. 0.2 meters between passing cyclists) and insecure (min. 0.5 meters between passing cyclists) cyclists, and single (0.75 meters) and duo (2 times 0.75 meters) cyclists. In addition to this, corners should have a minimum turn (4 meters for 15 km/h and 10 meters for 20 km/h) plus the width of the bicycle lane. Additional space for large bikes is required to allow a smooth turn for all.

Figure 2.3 - Spatial design criteria for each type of cyclist
**Indirect design criteria**

The design criteria which can be influenced indirectly by spatial design have not been defined and are left open to be interpreted by the designer and the users after implementation. These criteria should be taken into account in the overall urban design of a location since they are exposed to change in climate, management and identity which can influence the usage of the location.

![Figure 2.4 - Indirect design criteria](image-url)


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APPENDIX A
In order to get to an overview of which relevant spatial design criteria are currently used to positively influence the attractiveness of cycling in the city (chapter 2) four literature studies have been reviewed and compared to each other. On the following pages you can find the summaries which helped come to the needed results.
THE CITY AT EYE-LEVEL

A  THE CONTEXT

1) Grid position
   - Cyclist streams day and night
   - The position in the urban fabric and in the city’s cycling routes
   - The grain of the street pattern; a finer grain allows cyclists to make many choices cycling
   - Connections to squares and parks

2) Socio-economic context
   - Socio-economic capital in the surrounding neighbourhoods

3) Visual quality
   - History and soul (identity)
   - Coherent and yet varied urban design
   - Clear and intuitive wayfinding

4) Function intensity
   - The presence of functions with a meaning for the whole of the city or even the region
   - Density

5) Strategy
   - The presence of a long term strategy
   - Partners who take initiative; allow for the community to take ownership

B  THE STREET

1) User comfort
   - Pleasant to cycle
   - Physical comfort (wind, sound, sun, shadow, maintenance)
   - Possibilities to park the bicycle
   - Pleasant views, people watching

2) Program variety
   - Minimum 10 doorways per 100 m of façade
   - A good place has at least 10 good reasons or activities to be there

3) Visual quality
   - Definition (the building height should at least be half the street width)
   - Quality that catches the eye
   - Variation in buildings
   - Clear beginning and ending of the street
   - Good tree canopy
   - Accentuate elements such as entrances, exits, paths and junctions

4) Cycleability
   - Room for cycling, no obstacles
   - Quality surfaces (no holes, not slippery, etc.)
   - Avoid car dominance and traffic noise
   - Car parking facilities, in balance with cyclist space
   - Protection against accidents
   - Protection against crime/violence
   - Easy to cross at many points

5) Management
   - A good street, plinths and/or place management.

C  THE BUILDING

1) Function mix
   - Enough small scale units (4-10 m width per unit)
   - Variety of functions
   - Quality of cafés, shops, culture in relation to the main users

2) Hybrid zone
   - A well-functioning ‘hybrid zone’ (the transition from private to public). Ideal: between 0.5 and 2.0 m from the façade
   - Façades with a ‘veranda feeling’

3) Visual quality
   - Special character of the architecture
   - Richness in material, architecture that embodies 15-18 km/h details
   - Not too large glass surfaces as they mirror light and amplify noise
   - Appropriate signing on façades, no neon

4) Vertical orientation
   - Vertical orientation of the façade for variety

5) High flexibility
   - Flexibility in height (> 4m)
   - Flexibility in the land use plan (zoning)
A  PROTECTION
1) Protection against traffic and accidents
   - Protection for cyclists
   - Eliminating fear of traffic
2) Protection against crime and violence
   - Lively public realm
   - Eyes on the street
   - Overlapping functions day and night
   - Good lighting
3) Protection against unpleasant sensory experiences
   - Wind
   - Rain/snow
   - Cold/heat
   - Pollution
   - Dust/noise/glare

B  COMFORT
1) Opportunities to cycle
   - Room for cycling
   - No obstacles
   - Good surfaces
   - Accessibilities for everyone
   - Interesting facades
2) Opportunities to stand/stay
   - Edge effect/attractive zones for standing/staying
   - Supports for standing
3) Opportunities to park
   - Zones for parking
   - Utilizing advantages: view, sun, people
   - Good places to park

C  DELIGHT
1) Scale
   - Buildings and spaces designed to humanscale
2) Opportunities to enjoy the positive aspects of climate
   - Sun/shade
   - Heat/coolness
   - Breeze
3) Positive sensory experiences
   - Good design and detailing
   - Good materials
   - Fine views
   - Trees, plants, water
A  DIRECTNESS
1) Distance in kilometers
   - Optimize detour distance
2) Distance in time
   - Minimalize amount of crossings without cycle priority
   - Minimalize stopfrequency

B  COMFORT
1) Prevent traffic hinder
   - Minimalize meetings with cars and bicycles
2) Findable destinations
   - Signs towards neighborhoods and attractions
3) Understandability
   - Optimal use of spatial and landscape characteristics
4) Other
   - Flatness, attractive and closed concrete of the road
   - Continuity with priority, minimal stopping and traffic conflicts

C  SAFETY
1) Reduce conflicts with crossing traffic
   - Reduce speed at conflict areas
   - Recognizable road categories
   - Minimalize crossing movements
   - Minimalize the density of car traffic
2) Separating of traffic modalities
   - Reduce speed differences
   - Facilities recognizable to all users
3) Uniform traffic situations
   - Bicycle facilities and crossing design solutions related to roads
   - with cars and cyclists combined

D  ATTRACTIVENESS
4) Other
   - Lighting, the road continuity is visible
   - Reduce one-sided conflicts like pillars, sidewalks and create diverting possibilities

E  COHERENCE
1) Complete network
   - Max. mesh width of about 250 meters
2) Complete routes
   - Cores and important facilities connected
3) Adjust to movement needs
   - Min. about 70% of cycle movements via cycle network
4) Other
   - Recognizable route options (signs and concrete)
STRUCTURAL VISION 2040

A  QUICK
1) Kilometers per hour (pre-war: 12-15 km/h and post-war: 15-18 km/h)
   - Priority for cyclists on roundabouts
   - Priority for cyclists at crossings
   - A few crossings only
2) Max. waitingtime of 30 seconds
   - Adjust traffic lights
3) Passing opportunities
   - Min. cycle width (1 way: 2,5 meters outside the inner-city and 1,8 meters inside the inner-city. 2 way: 3,5 meters outside the inner-city and 2 meters inside the inner-city)
   - Little car traffic on mainnet bicycle

B  COMFORTABLE
1) Flat and clean surface
   - Good maintainance (snow-, ice- and leaffree)
   - Sinusshaped threshold
2) No sharp turns or slopes
   - Radius min. 4 meters
   - Slope max. 1:10h
3) Recognizable routes
   - Red asphalt
   - Signs
   - Logic connections
   - Enough waitingspace at crossings
   - Enough distance to the carroad

C  TRAFFIC SAFETY
1) Strive for no red- and blackspots on the mainnetwork
   - Comply to ‘Sustainable safe’ a.o. cyclelanes next to main accessroads, cycle paths under circumstances
   - Cyclepaths in shoppingstreets (also residential access roads)
   - Safety strips (a.o. for parking)
   - Red asphalt
2) No scooters on the bicyclelane
   - Scooters on the carroad

D  SOCIAL SECURITY
1) The cyclist is visible
   - Visibility
   - Transparent plantation
   - Implement policy public lighting
   - Visualize bridges and tunnels
2) Comply to the norm public lighting and safe living
   - Implement policy public lighting
   - Implement policy safe living
   - Visualize bridges and tunnels
3) There is always an alternative route of comparable quality