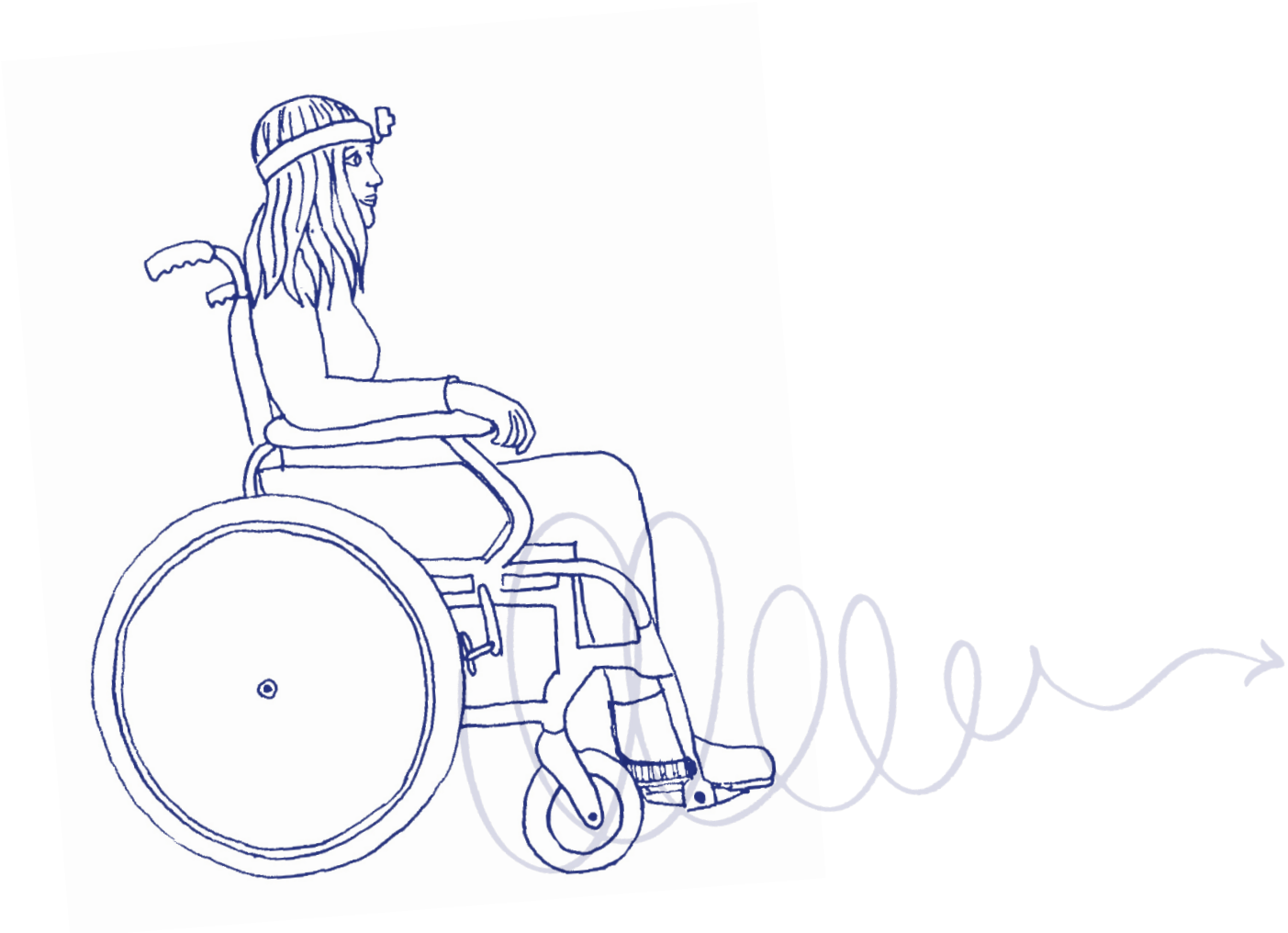
ROTTERDAM: READY TO ROLL?

A PHENOMENOLOGICAL RESEARCH ABOUT WHEELCHAIR ACCESSIBILITY IN URBAN DISTRICTS

THE TARWEWIJK



MSC THESIS LANDSCAPE ARCHITECTURE **MARIEKE OOSTVEEN**

Colophon

Marieke Oostveen
Chair Group Landscape Architecture Wageningen University
August 2020

Geertruida Hendrika Maria Oostveen
Registration number - 920510627010
mariekeoostveen@gmail.com
LAR82000 - Master Thesis Landscape Architecture

Landscape Architecture Chair Group
Phone: +31 317 484 056
E-mail: office.lar@wur.nl
www.lar.wur.nl

Postbus 47
6700 AA, Wageningen
The Netherlands

Supervisor:
MSc S.H. (Sjoerd) Brandsma

.....

Examinors:
Dr.ir. R (Rudi) van Etteger MA

.....

Prof.dr. S (Sanda) Lenzholzer dipl.ing.MA

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Submitted in the partial fulfilment of the requirements for the degree of Master of Science in Landscape Architecture at Wageningen University, 14 August 2020.

- Marieke Oostveen -

PREFACE

This thesis is the last element of my master degree in landscape architecture at the Wageningen University. It reflects how I have developed as a designer during my studies and how I position myself in the field of landscape architecture today. In order to explain my position, it is important to tell you something about myself and some experiences that motivated me to conduct this research.

One of the lessons that really stuck with me during my study in landscape architecture is that you never design for yourself. You design places for other people. You have to understand the needs of the people who you are designing for in order to make a design that is influential in a positive way. You need to understand the 'who' and 'why' in order to be able to figure out the 'how' and the 'when'. This 'why' is not always straightforward and easy to grasp. Therefore, I believe that empathy is a great strength of a designer. It allows us to form connections with people and the landscape they are living in. By experiencing things from another's perspective, you can expose the relevance of interventions, raise awareness and make landscape designs that are functional and transform people's lives. The form follows function.

Since I was a little girl, I often went on trips with my aunt Ans. Ans has rheumatism and walking causes her a lot of pain. She therefor has a medical balancing bike (loopfiets) which supports her weight and allows her to still be quite mobile and undertake things (Fig. 1). But this is not without challenges.
Once we were shopping together in the city centre of Utrecht. We wanted to sit next to the canal, however those where only accessible by very steep stairs. Unfortunately going down was not an option. On her way home, an elevator on station Gouda was broken. She needed to travel half an hour longer to get home because she could not get of the platform.
On another occasion, we went walking/rolling on a scenic route through Achterveld. When we were almost at the end of our route the paved path suddenly stopped. We needed to drag Ans on her balancing bike through the mud because it got stuck more than once.
These are just a few examples of the things we encountered together, I could make a much longer list. Afterwards we always try to laugh together at the crazy situations we experience together. Yet, I still sometimes see the pain in her eyes that those situations cause her both physical and emotional. It made me aware from a young age that accessibility is not to be taken for granted.

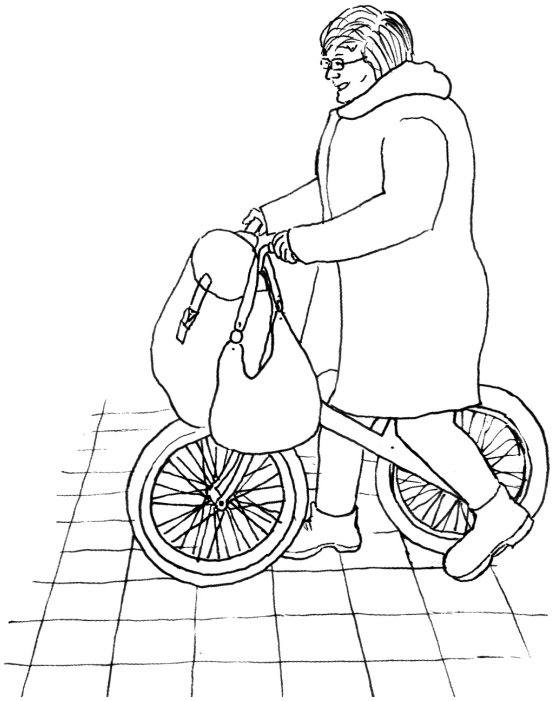

Fig. 1: Ans on her medical balancing bike

Three years ago, I moved to the nursing home 'Simeon & Anna' in Rotterdam South. This is a project in which I live as a volunteer in a studio between the elderly people. It is quite a special place to live. Small acts of kindness like a talk, a smile, a wave, a walk, can make the day of those elderly people.
I made some friends among those elderly people. One of them is Rob, an amazing painter and a big Rolling Stones lover. Rob has MS and told me what is it like to slowly lose control over your body. He has to say goodbye to parts of himself time after time. His wheelchair gives him the freedom to still go outside and sit in the sun. We often chat at his favourite place, the entrance of the building (Fig. 2). When we sit there talking about his latest art work, we see other residents all struggle at the same point with their rollators and wheelchairs: A small edge of 1 maybe 2 cm. Little things can have a great impact on people's lives.

In the beginning of this thesis process I went to the ‘Hackathon 010 toegankelijk’ where I spoke with people with different disabilities about the problems they face in everyday life. They talked about the frustrations, discrimination and pain they experience when going outside. For example, a man told me about a time when he felt down with his wheelchair and after that felt more scared to go outside. Another woman told that in a bar people always ask about her handicap, but never ask about who she is as a person, about her interests in life. Yet another woman told me about her struggles to get into the tram and train with her wheelchair and how rude people can be when she tries to get in.
All those people want to be more than their handicap or wheelchair. They want to be seen for who they are. Not having to worry when going outside about the obstacles that they might face. Those conversations made a lasting expression on me. Life is challenging enough without physical barriers on you path everywhere you go.

Fig. 2: Chatting and enjoying the sun at Simeon and Anna

During my internship at a design firm, I worked on a project where the majority of the people who lived in the area would be bound to a wheelchair. I was surprised that parking norms for handicapped vehicles where kept at the regular minimum standard used for all places in that municipality and that stairs where drawn frequently into the plans because it looked good. It made me wonder why lookss go before the functionality of the people in wheelchair and even though we had technical standards in rule books it did not result in a good accessible project design. Why is that?

Even though I had all those experiences, I still did not know how I could show other people the importance to design accessible places for them to really understand the struggles those people face in daily life. It made me wonder if I myself completely understood the ‘why’ and thus could not communicate it clearly to others. Am I missing key knowledge to make a good accessible design myself?
During this research, I was surprised to discovered many more problems wheelchair users have to face that I did not find out by talking to them or from my previous experiences. I believe that my designing process has permanently been changed by the findings conducted during this research. I’ve tried to give the most complete overview of the information I found out about wheelchair accessibility and I hope that by reading this it will change the way you think as a designer.

I would like to close this preface by thanking the people that have supported me and helped overcome the obstacles I faced during this research: Ad, Anne, Annie, Gerjan, Helen, Jildou, Joa, Kathrin, Martin, Pieter, Renske, Tessa, Tijmen and Xanthe. I also would like to thank the people from the municipality of Rotterdam that took the time for an interview and all the people I have spoken to about their experiences of being a wheelchair user. At last I would like to thank the people that guided me through this research at the university: Sjoerd Brandsma, Rudi van Ettgeren, Maarten Jacobs, Maaike Prangsma and Kevin Raaphorst.

SUMMARY

Navigating in urban open spaces is still a challenging task for people in a wheelchair. Wheelchair bound people go less outside because of the way the public open space of their direct living environment is shaped. There are guidelines for wheelchair accessibility, however they appear not to be sufficient. This research focuses on the impact of the direct living environment in urban districts on people in a wheelchair. The case study for this research is the Tarwewijk in Rotterdam.

The concept of phenomenology formed the basis of the method ‘phenomenological rolls’, in which the focus lies on first hand experiencing the multisensory and emotional impact of the public open space while rolling in a wheelchair through the Tarwewijk. The experience is recorded with video and in written text. The senses and feelings formed the basis of a directed content analysis and resulted in an overview of the problems encountered shown in text, drawing and video. The evaluation on the impact on positive health of people in a wheelchair shows that the frequency and multi-sensory problems that people in a wheelchair encounter have a big impact on the perceived positive health.

A semi-structured interview at the municipality of Rotterdam shows what problems and opportunities the municipality encounters when trying to make urban districts wheelchair accessible.

The outcomes of the phenomenological rolls and interview serve as a basis for the research through design process in which a design strategy to improve the wheelchair accessibility in the Tarwewijk was formed. Plus Routes on which later the other streets can be connected when the opportunity arrives form the basis of this strategy. Cars get a less dominant place and slow infrastructure gets a higher priority. To conclude the outcomes of the research in the Tarwewijk are evaluated to determine how the generated knowledge can be used in other urban districts.

KEYWORDS

Wheelchair accessibility, Urban districts, Tarwewijk, Rotterdam, Phenomenological rolls, Sensory design, Slow infrastructure, Plus Routes

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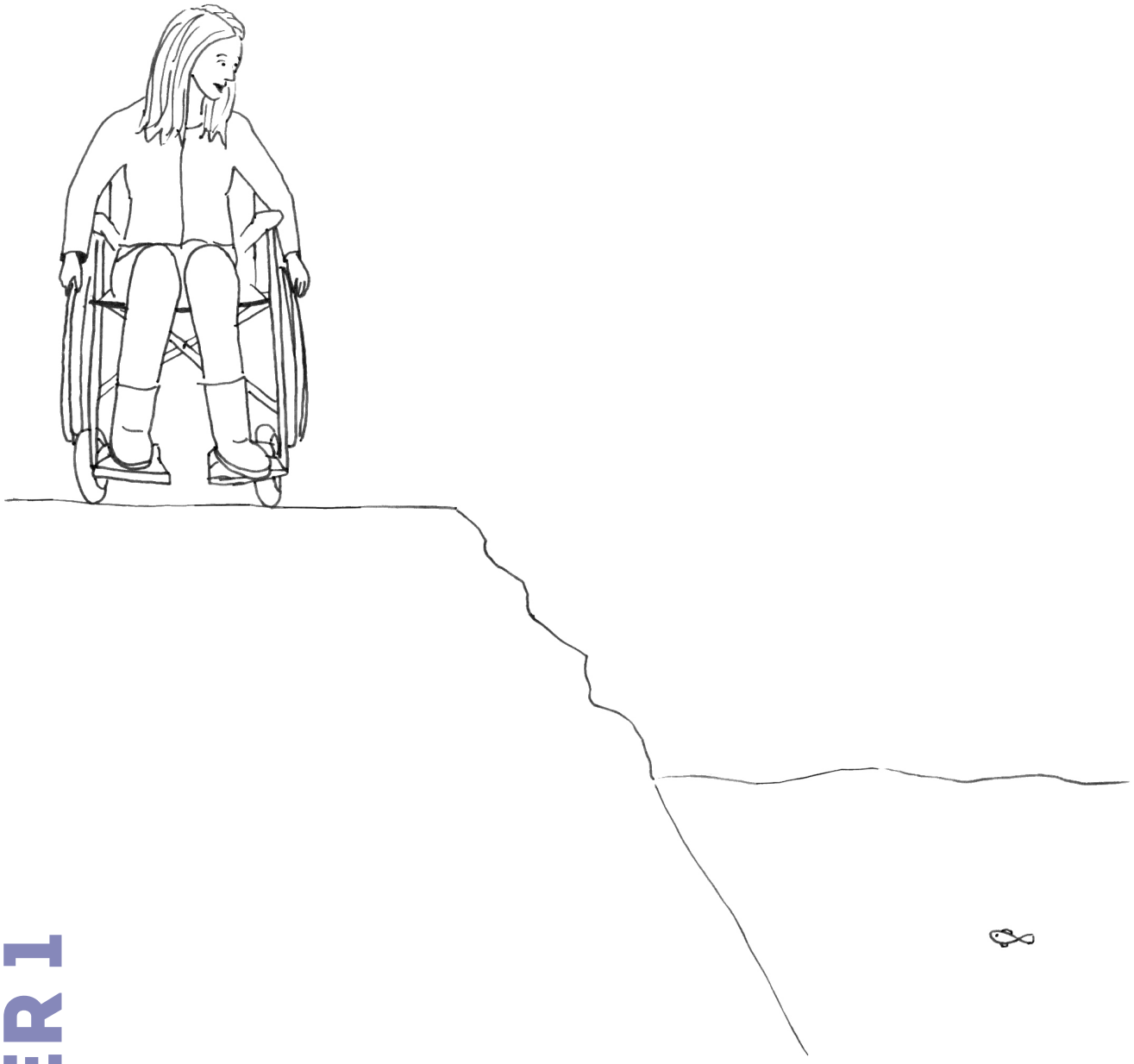
INTRODUCTION



CHAPTER 1

In this chapter the problem statement, case study selection, objective, knowledge gap and research questions of this research will be explained.

1.1 PROBLEM STATEMENT

People in a wheelchair go less outside even though they really long to do so more often (Lovelock, 2010 and Christensen et al, 2010). Because navigating in urban open spaces is still a challenge for people who are bound to a wheelchair (Beale et al., 2006). Beside physical obstacles like no dropped curbs, too steep ramps, stairs, too narrow sidewalks and objects placed onto the sidewalk, also less obvious physical elements can form barriers like routing and a lack of maintenance (Nasar, 2010). Moreover, safety is an important issue. People in a wheelchair are a third more likely to get into a fatal road accident then other people (Poon, 2015).
Furthermore, there is also an emotional side to this story. People who are bound to a wheelchair often experience forms of discrimination, not only by other people but also by how their living environment is shaped. How physically accessible a place is plays an important part in the feeling of social involvement. When you cannot get somewhere, there is no way to communicate with the people who are in that place. Which results in denying them the possibility of social engagement (Seeland and Nicole, 2006). It is literally a social distancing problem. An urban space may provide the basic need of accessibility, but not the satisfying experience in relation to emotional comfort (Nasar, 2010). People in a wheelchair do not want to stand out and feel more excluded because of how the open urban space looks. They wish that their needs for accessibility are integrated in the design, that all users can have the same experience and that they are treated as equals (Seeland and Nicole, 2006). The way the urban public space of our living environments is arranged is an external element that can influence a person's perception of health and their quality of life. However, people have limited control over their environment. They have to rely on the work of others, on the work of landscape architects.

Additionally, the group of people who are influenced by a lack of accessible public open spaces is bigger than just people in a wheelchair. Also caregivers, elderly with rollators and scoot mobiles and people with stroller's experience problems. Making it even a more pressing manner, since elderly people are expected to be self-reliant and live longer at home (CBS, 2016).

Nowadays, there is more recognition for the problems people in wheelchairs are facing. In 2007, many countries including the Netherlands signed the VN's 'Convention on the Rights of Persons with Disabilities'. This convention has been an important step in the recognition of the equality, autonomy and dignity of people with a disability. In 2016, the Netherlands officially rectified this convention (010toegankelijk, 2020). In this convention, it is stated that parties involved should:
"Recognizing the importance of accessibility to the physical, social, economic and cultural environment, to health and education and to information and communication, in enabling persons with disabilities to fully enjoy all human rights and fundamental freedoms." (Wettenbank, 2016)
As a result, municipalities in the Netherlands have formed guidelines for accessibility since 2007. Unfortunately, these guidelines are still not self-evidently applied in our everyday society and thus in urban open spaces. Even though there are regulations and technical guidelines, it does not guarantee a wheelchair accessible urban public space (Rimmer, 2004).

A more holistic view is needed to really integrate wheelchair accessibility in our designs for urban open space. The professional fields of healthcare and environmental design are intrinsically linked, however mutual understanding is limited (Who cares, 2017). Less is known about how the surrounding should look for specific target groups, like people in a wheelchair. It requires cooperation between designers and the target group to gain insight about the right design solutions. (Venema, 2016) This should take place from the beginning of the design process to avoid mistakes and unnecessary costs, since the urban context is not quickly renewed, mistakes are not easily fixed (Rodermond, 2016).

For the purpose of this research thesis a holistic view is translated to "Positive Health". A concept that focuses on the perception of quality of life. 'Positive Health' focuses on the self-reliance of people, addresses them as more than their illness and focuses on their strengths rather than their weaknesses (Huber et al, 2016a). The concept helps to evaluate and communicate the influence of public open space on people in a wheelchair. The concept of 'Positive Health' will be further explained in Chapter 2 page 9.

1.2 LOCATION CHOICE

Research about wheelchair accessibility is often conducted in public urban places such as city centers and parks, but not often in the direct living environment of people. The direct living environment is important for people in a wheelchair because their radius of action is smaller than for other people (Beale et al., 2006). Therefore, in this research the focus will be put on the direct living environment of people in a wheelchair. People in a wheelchair, live everywhere in society. However, renewing the urban public space will not happen just for one specific group since the cost will be too high. There lies an opportunity to implement the needs of less mobile people into areas where other transformations are needed. So, the entire population can benefit from it and the overall health and wellbeing of the neighborhood will increase. The Tarwewijk in Rotterdam South is such a neighborhood in which both wheelchair accessibility and other problems occur.

The location of the Tarwewijk in Rotterdam South can be seen on (fig 1.1). The big shopping center and transition hub Zuidplein, concert and event locations Ahoy and the Maassilo are nearby. Also, the Zuiderpark and the waterfront of the Maashaven are in close proximity. Separated by the Maashaven is the popular neighborhood Katendrecht and the touristy Kop van Zuid. Metro, tram and bus connections are at hand and the city center of Rotterdam is only 3,5 km away. Only the frequency of metro stops in Rotterdam South is less frequent than in the city center.

But this mixed use, dense, 19 century urban district with many narrow streets has a lot of issues when it comes to accessibility. Further, the Tarwewijk scores very low on the ‘leefbarometer’, a tool that evaluates the livability neighborhoods, by comparing all kinds of socio-economic data (fig. 1.2)(Ministerie van Binnelandse Zaken, 2016).

Platform31 (Uyterlinde and van der Velden, 2019) did research into vulnerable neighbourhoods in Rotterdam. They made a distinction between rising, wavering and forgotten neighbourhoods. The Tarwewijk was categorized as a forgotten neighbourhood. A forgotten neighbourhood is not a neighbourhood that is never on the agenda, but rather one that is never high upon the priority list. The Tarwewijk is a neighbourhood in which there is hardly any physical renewal, there is a high turnover, students and starters do not stick, the safety index fluctuates and social rent properties deteriorate (Wijkcomité Tarwewijk, 2018). The municipality is already working on creating more diversity in the housing stock. But an improvement is also needed in the public open space, since this can be a key factor in the improvement of the leefbarometer of the neighborhood. Together with social programs the Tarwewijk has a potential to improve (Uyterlinde and van der Velden, 2019).

Another more practical reason for the selection of the Tarwewijk as my research area instead of Carnisse or Pendrecht that also score low on the leefbarometer, is the fact that I live next to the Tarwewijk. For the fieldwork, I needed to be able to get there easily in a wheelchair. Otherwise it would influence my research results.

In chapter 5 on page 52 the location will be further analyzed and explained.

Fig. 1.1 Location case study: Tarwewijk in Rotterdam South

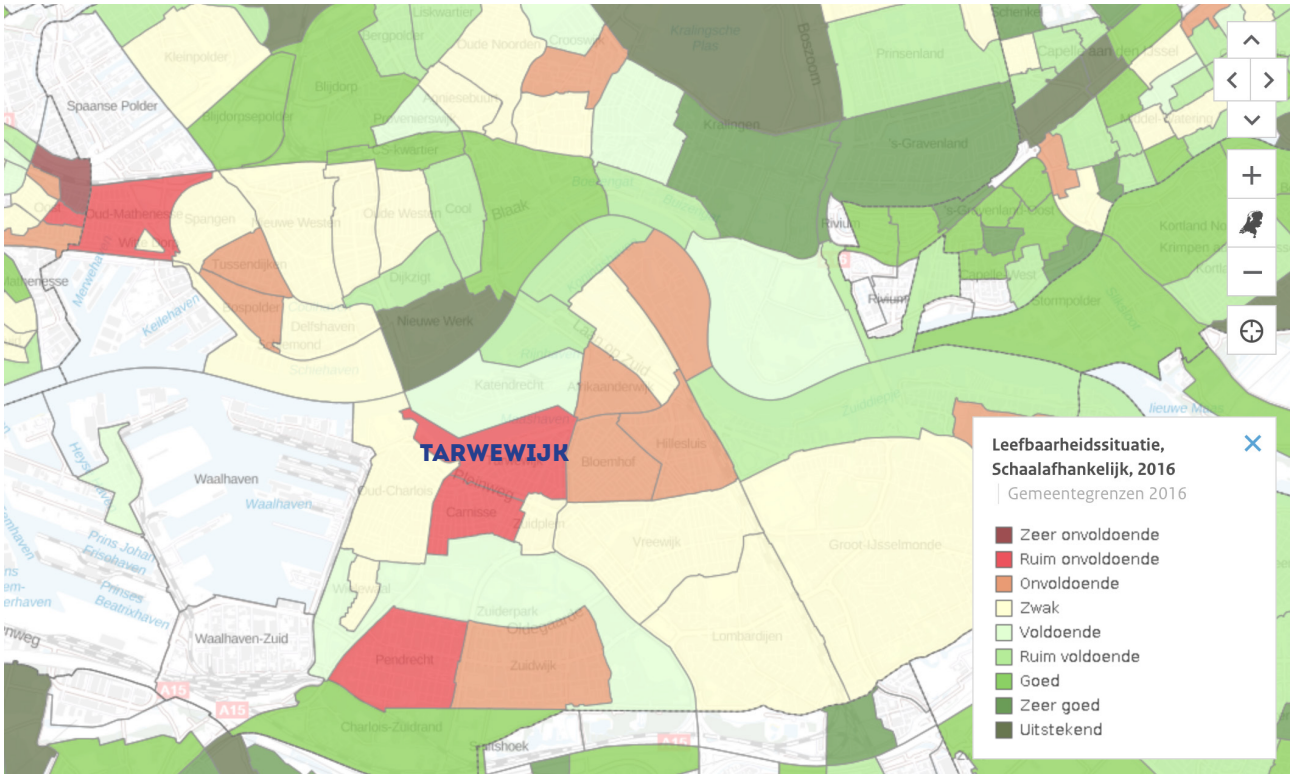


Fig. 1.2 Leefbarometer Tarwewijk

1.3 OBJECTIVE, KNOWLEDGE GAP AND RESEARCH QUESTIONS

OBJECTIVE

The aim of this research is as follows:

To contribute to the research of improving wheelchair accessibility of public spaces in urban districts by showing the underlying elements that influence the positive health of people in a wheelchair. Further, to research what problems occur when municipalities try to implement wheelchair accessibility in the public open space of urban districts. Moreover, research how to improve this by developing a holistic approach for designing with wheelchair accessibility in the Tarwewijk.

By doing this I hope to raise more awareness for wheelchair accessibility in the field of landscape architecture and put the topic of wheelchair accessibility back on the agenda.

KNOWLEDGE GAP & RESEARCH QUESTIONS

Guidelines for wheelchair accessibility exist, however they do not result in accessible urban districts. We need to find out why. The knowledge gap that needs to be solved in this research consists of a twofold issue. The social-political side and the spatial element of wheelchair accessibility.

The first element is the social-political side of wheelchair accessibility. The municipality of Rotterdam has been working on wheelchair accessibility since the VN convention on the Rights of Persons with Disabilities in 2007. Policies are made and technical guidelines available, yet urban districts such as the Tarwewijk are still not completely accessible. Why? Resulting in the following research question:

What problems does the municipality of Rotterdam encounter when working on wheelchair accessibility in urban districts?

Secondly, the spatial element of wheelchair accessibility. In order to figure out how to design accessible urban districts, we need to understand ‘what’ spatial elements influence a wheelchair bound person. Moreover, to communicate this to other designers we also need to understand what people in a wheelchair experience when encountering certain spatial elements and how this has an impact on their positive health.
Resulting in the following research question:

What spatial elements in the Tarwewijk influence the ‘Positive Health’ of people in a wheelchair?

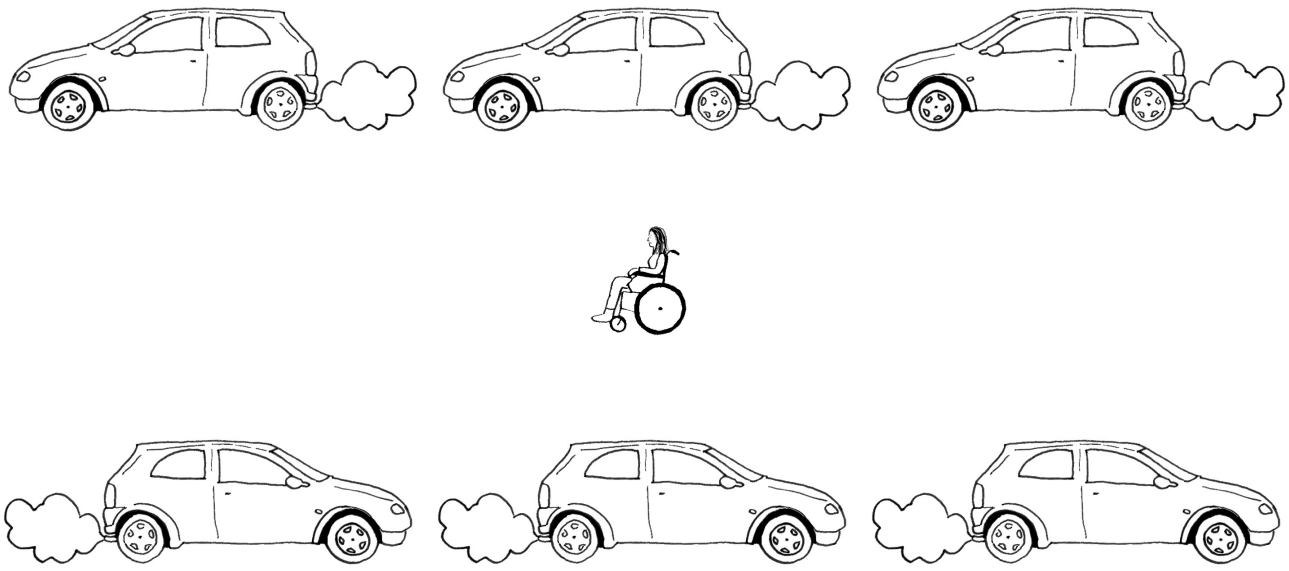
By answering the research questions above we know what goes wrong and what must spatially be improved when it comes to wheelchair accessibility in urban districts/the Tarwewijk. What we do not yet know is how these spatial demands can be integrated into a holistic and realistic design strategy. The case study of the Tarwewijk will be used to test this. Resulting in the following design question:

How can the wheelchair accessibility in the Tarwewijk be improved?

In the end, we need to discuss and conclude how the obtained knowledge of the above research and design questions is transferable to other city districts. This will answer the Main Research Question:

What interventions could improve the wheelchair accessibility of urban districts?

THEORETICAL FRAMEWORK



CHAPTER 2

In order to answer the research questions several key concepts are used as well as specific research methods. This will be explained in this chapter.

The following key concepts are explained:
Urban districts, Accessibility and the relation with the human senses and Positive Health.

The following methods are explained:
Phenomenological rolls in the Tarwewijk, interview with the municipality and the research through design process.

This is summarized in the conceptual framework.

2.1 KEY CONCEPTS

ACCESSIBILITY

Accessibility
Noun
- the fact of being able to be reached or obtained easily
- the quality of being easy to understand
(Cambridge University Press, 2020)

When we look back in history, cities used to be comfortable to walk in. However, cities drastically changed when motorized vehicles took a prominent place in the streetscape. Slow infrastructure such as walking and cycling was no longer a priority in the design of streets (fig. 2.1). More and more objects were put 'out of the way' to make room for cars and landed onto the sidewalks. Lampposts, traffic signs, parking meters, trees, trashcans, traffic lights, driveways, side roads and thus height differences. Resulting in less space and more obstacles in our slow infrastructure networks (Gehl, 2010). This strongly affects the wheelchair accessibility of the public open space.

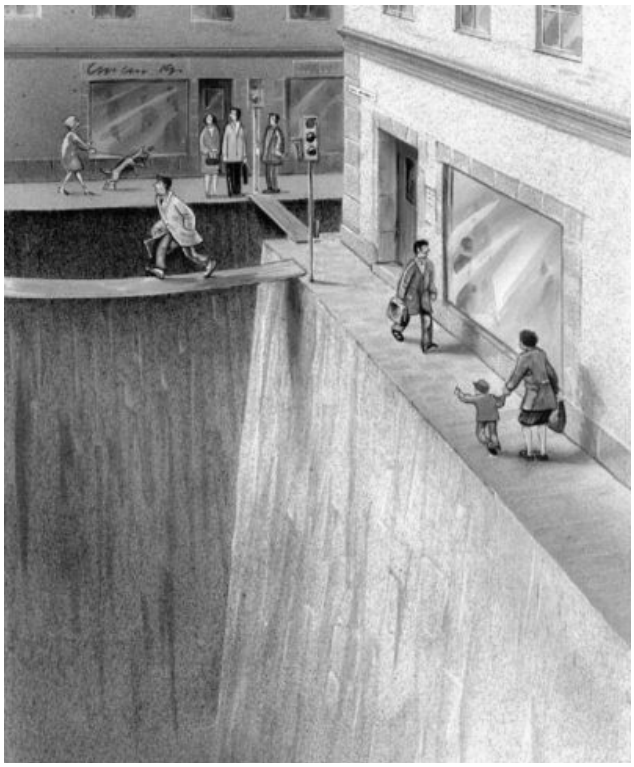


Fig.2.1 Karl Jilg illustrates how much space we give to cars

Nowadays the realization of the importance of giving a higher priority to the slow infrastructure in order to create healthy and livable cities gains ground again. It is not a quick transition, it takes time to change the way people think.
One of the founding figures in this movement is Jan Gehl. In his book 'Cities for people' (2010), he explains the importance of designing with the human scale and giving priority to **slow infrastructure** above cars (fig. 2.2).

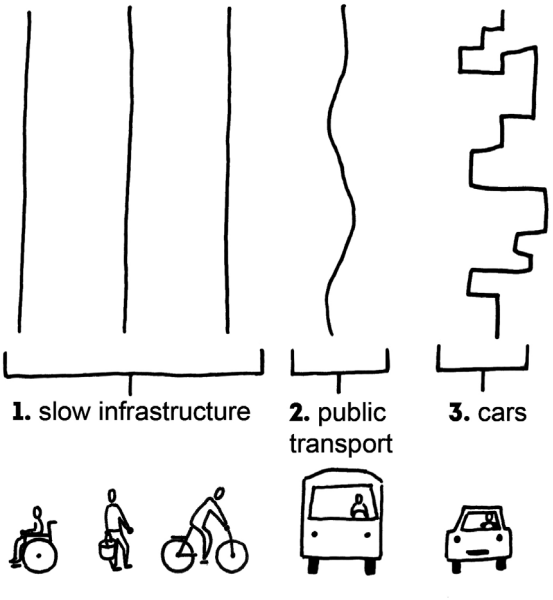


Fig. 2.2 Priority slow infrastructure, discourage car use

By slow infrastructure I mean the infrastructure for: Pedestrians, cyclists, skaters, runners, children, elderly (with rollators and scoot mobiles), people with strollers and people in a wheelchair.

A lot is known about how a city should look like for pedestrians, cyclists and even runners. In recent years, more research is done about elderly people because they have to live longer at home. But overall less is known for the more vulnerable groups in our society, such as people in a wheelchair. They do however all have some things in common, all those different groups of people benefit from a city with no obstacles and a 'good' slow infrastructure network. Creating this 'good' slow infrastructure network is done by taking the **human body as the basis for**

design. Jan Gehl says the following about this in his book cities for people (2010):

"In choosing street types and traffic solutions, it is important to start with the human dimension. People must be able to move comfortably and safely in cities on foot or by bicycle, and when traffic solutions are adapted special consideration must be given to children, the young, the elderly and people with disabilities. Quality for people and pedestrian safety must be key concerns." (p. 93)

"The human body, senses and mobility are the key to good urban planning for people. All the answers are right here, encapsulated in our own bodies." (p. 59)

"Cities must provide good conditions for people to walk, stand, sit, watch, listen and talk. If these basic activities, which are tied to the human sensory and mort apparatus, can take place under good conditions, these and related activities will be able to unfold in all possible combinations in the human landscape. Of all the city planning tools available, attention to this small scale is the most important." (p. 118)

More about the human senses and their relation to phenomenology/experiencing the landscape will be explained on page 13 in the methodology section.

When we talk about accessibility in this thesis it is either in relation to slow infrastructure in general (which includes people in a wheelchair) or wheelchair accessibility.

POSITIVE HEALTH

"All those concerned in creating healthy places – public health professionals, planners and landscape architects – need to recognize landscape as an asset that has enormous potential to improve our health and wellbeing."
-Landscape Institute UK, 2013-

The characteristics of our living environment influences our lifestyle. It is the surrounding in which we learn, work and develop ourselves during our lives. For example, greener places are stress reducing, improving mental health and encourage physical activity. Also, when we look at the history of cities we can see that green spaces like urban parks always have been places to relax and rewind from the hectic city life (Landscape Institute, 2013). Also Gehl (2010) states that if walking and cycling can be a natural part of the pattern of daily activities it results in healthier cities.

However, there are great differences in life expectancy within the different neighborhoods of every city. According to the research of both Prof. Margaret Whitehead of the university of Liverpool and Lex Burdorf of the Erasmus university of Rotterdam, there are several causes that play a role in people's health that can explain those differences:
Firstly, the human factors like genes and lifestyle. Secondly, cities are not a homogenous mass and the unequal distribution of power, money and resources also creates inequalities. Furthermore, there are differences in exposure to health-damaging factors, as well as opportunities to enjoy positive health factors. There are four levels for intervention to tackle health inequalities (fig. 2.3). On level 3 we can see that the role of a landscape architect is important to remove health inequalities. Yet, the interventions need to take place on all four levels simultaneously and preferably are integrated in order to show a good result. So, the entire population of an area can profit from it. Because of this it is necessary to know how the environment influences our health (Erasmus University Rotterdam, 2014 and Utrecht University Studium Generale, 2015). More specifically the health of the target group in this research, the health of people in a wheelchair.

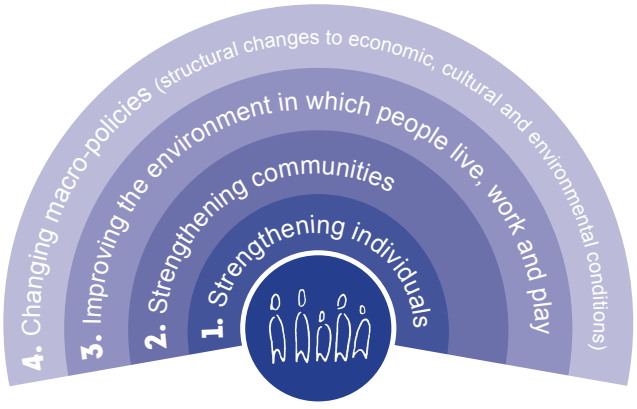


Fig. 2.3 Levels of action to tackle health inequalities

Table 2 Six dimensions of health indicators, covering 32 aspects of health

Bodily functions	*Mental functions and perception*	*Spiritual/existential dimension*	*Quality of life*	*Social and societal participation*	*Daily functioning*
▸ Medical facts ▸ Medical observations ▸ Physical functioning ▸ Complaints and pain ▸ Energy	▸ Cognitive functioning ▸ Emotional state ▸ Esteem/self-respect ▸ Experiencing to be in charge/ manageability ▸ Self-management ▸ Resilience, SOC (sense of coherence)	▸ Meaning/meaningfulness ▸ Striving for aims/ideals ▸ Future prospects ▸ Acceptance	▸ Quality of life/well-being ▸ Experiencing happiness ▸ Enjoyment ▸ Perceived health ▸ Flourishing ▸ Zest for life ▸ Balance	▸ Social and communicative skills ▸ Meaningful relationships ▸ Social contacts ▸ Experiencing to be accepted ▸ Community involvement ▸ Meaningful work	▸ Basic ADL ▸ Instrumental ADL ▸ Ability to work ▸ Health literacy

ADL, activities of daily living.

Fig 2.4 The original dimensions of 'positive health

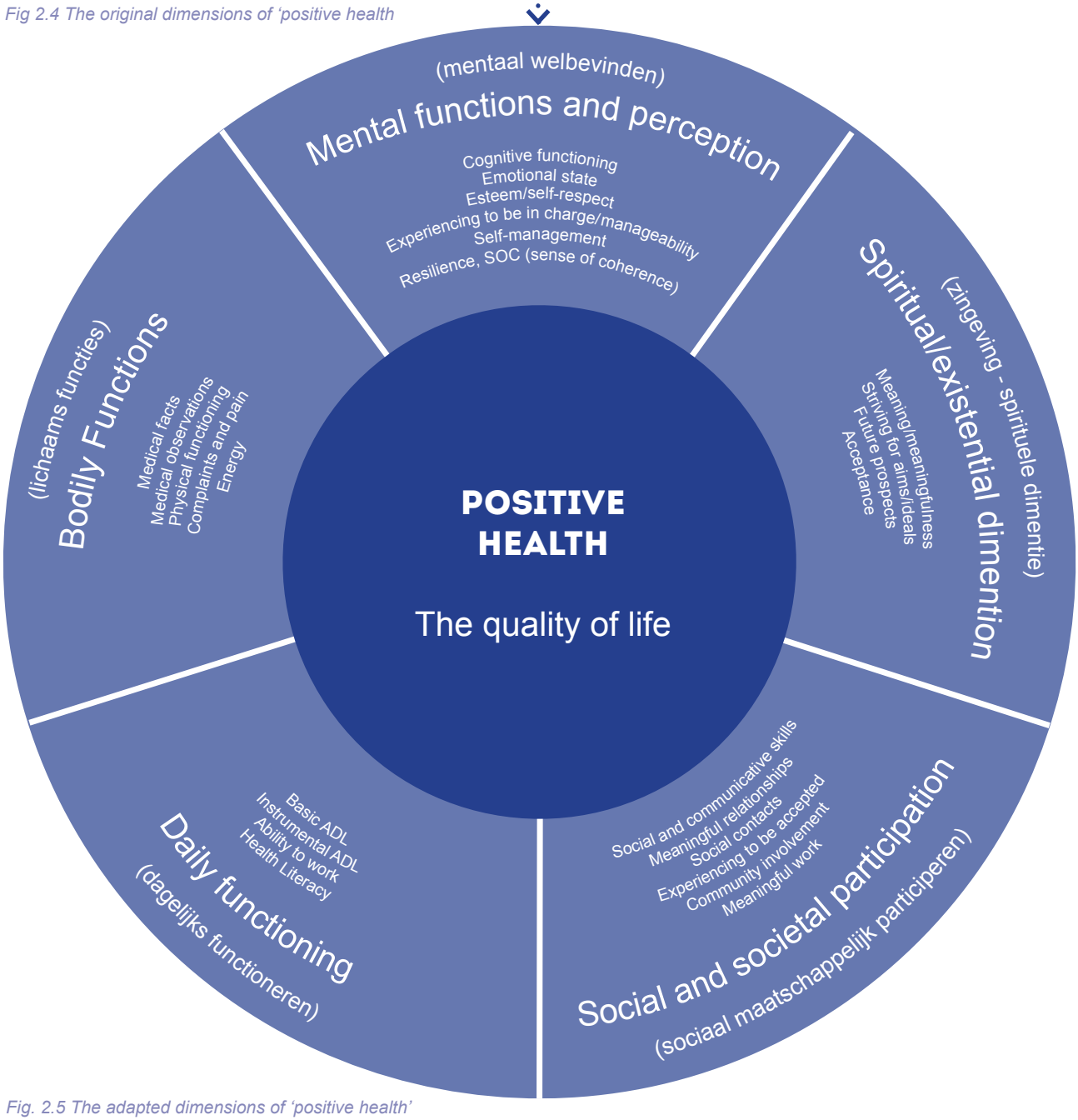


Fig. 2.5 The adapted dimensions of 'positive health'

In order to work on healthier cities and a more holistic view to design for people in a wheelchair we need to define what health is.

In 1948, the following definition of health was stated by the World Health Organisation (WHO): “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” The definition has not changed ever since (World Health Organisation, 2018). However, this definition has some flaws: Firstly, the word ‘complete’. The requirement of complete health would mean that most of us are unhealthy most of the time. Besides, the term ‘complete’ is not operational nor measurable. Moreover, it declares people with chronic diseases and disabilities definitely ill (Huber et al, 2016b). Because healthcare policy in the Netherlands is based upon this definition, healthcare is mostly focused on being ill and pays little attention to other dimensions of health. For example, the environment can contribute to the well-being of people both ill and healthy (Huber, 2016). These points combined raises some questions such as: Is a person in a wheelchair unhealthy just because their legs don’t work? Don’t we need to be a little more elaborated? In December 2009 the “Invitational Conference: Is health a state or an ability? Towards a dynamic concept of health” was organised by ZonMw the Dutch organisation for health research and development, and the Dutch Health council. They sat together with professionals from different sectors within the field of healthcare to formulate a new conceptual framework to define health (Huber, 2010). This new concept is called ‘Positive Health’ consisting of 6 main-dimensions and 32 underlying aspects (fig. 2.4). In the introduction (chapter 1) this new concept of Positive Health was briefly introduced. This concept addresses people as more than their illness and focuses on their strengths rather than weaknesses (Huber et al, 2016a). I adapted this concept a bit because in my opinion the aspects of the dimension ‘quality of life’ (consisting of quality of well-being, experiencing happiness, enjoyment, perceived health, flourishing, zest for life and balance are a result of the other 5 dimensions, which results into the scheme seen in figure 2.5.In this research, this adapted concept of Positive Health will be used to evaluate on what aspects my positive health is influenced by the physical configuration of the public open space in the Tarwewijk while I am sitting in a wheelchair. To explore the experience of a wheelchair-bound person in everyday life.

Most of the aspects of Positive Health speak for them self, but some need to be explained:

ADL: are Activities of Daily Living. The **Basic ADL** consists of six basic tasks: eating, bathing, getting dressed, toileting, transferring, and continence. **Instrumental ADL**s are more complex but also reflect the ability of people to live independently in a community. This includes going outside, moving within a community and going shopping for groceries and other necessities (Kindly Care, 2018).

Health Literacy: *“the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.”* (Network of the National Library of Medicine, …)

SOC (sense of coherence): *“The SOC is defined as: “The extent to which one has a pervasive, enduring thought dynamic, feeling of confidence that one’s environment is predictable and that things will work out as well as can reasonably be expected.” In other words, it’s a mixture of optimism and control.”* (Collingwood, 2020)

2.2 METHODOLOGY

QUALITATIVE RESEARCH

Considering the research questions focus on a very specific case quantitative research would be unfit to answer the research question. Therefore, qualitative methods are chosen.

"Qualitative research is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The process of research involves emerging questions and procedures, data typically collected in the participant's setting, data analysis inductively building from particulars to general themes, and the researcher making interpretations of the meaning of the data. The final written report has a flexible structure. Those who engage in this form of inquiry support a way of looking at research that honors an inductive style, a focus on individual meaning, and the importance of rendering the complexity of a situation." Cresswell (2013, p. 32)

In this qualitative research, several methods are used in order to answer the research questions and meet the research objectives.

WORLDVIEW

The methods used in this research are not (post) positivistic but mostly constructivism. These methods are important to address socio-cultural issues, are embedded in a context (the Tarwewijk/urban districts) in which the interactions of humans (people in a wheelchair) and their relation to the landscape are addressed. This research is about problem finding and generating new insights (Lenzholzer et al, 2013).

Because this constructivist research is place specific and researcher dependent I evaluated my findings by using different sources and methods to get a complete as possible outcome to fill the knowledge gap.

In my preliminary research:
I interviewed different people in a wheelchair (experts) about their experiences.
I consulted scientific literature, lectures and websites of representative organizations.
In the main research:
I Interviewed three experts in (wheelchair) accessibility at the municipality of Rotterdam
I did phenomenological rolls – in which I systematically first hand experienced the problems people in a wheelchair encountered, did a direct content analysis and evaluated the findings based on the concept of Positive Health.
Test the findings in a research through design process

Moreover, the methods used and findings are fully described. This transparency makes the research reproducible by another person and open to discussion at all time (Lenzholzer et al, 2013).
In this chapter each method used will be explained in depth.

To answer the research question
'What spatial elements in the Tarwewijk influence the 'positive health' of people in a wheelchair?',
(modified) walking-methods based on the theory of phenomenology will be used.

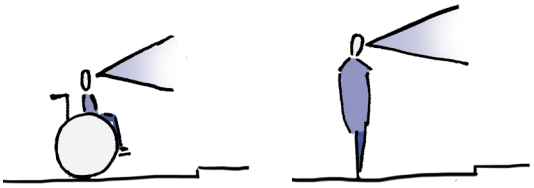


Fig. 2.7 Different experiences

PHENOMENOLOGY

Phenomenology is a philosophical concept that focusses on the manner in which people experience and understand the world. The interpretation of Phenomenology in this thesis is the following and based on the work of Heidegger and Merleau-Ponty described by Anne de Zeeuw (2019):
"Phenomenology focusses on the encounters between subject (A person) and object (Part of the world) that make reality." (fig. 2.6)
This means that the meaning of a place depends on who and how a person is experiencing it (Tilley, 1994). A person in a wheelchair may experience totally difference things than a person who walks (fig. 2.7).
"The sensory qualities are directly relatable to the object (what we see, hear, feel, smell, taste) and may evoke our imagination and memories as well, or direct our attention towards believes and ideas. Thus, creating a whole context of meaning caused by our encounter with the object" (De Zeeuw, 2019).
Not the object itself but also the way it is encountered that makes it relatable (fig. 2.6).

"While walking and bodily perceiving a landscape researchers/designers become part of the landscape and, thus, no longer distinguish between themselves (subject) and the landscape (object). Walkers explore what is already there, immediately creating and thus changing this 'reality' by walking through it and by connecting elements in their minds and with their bodies and by reflecting on the insights gained." (van Etteger and Schultz, 2017 p. 181)

Designing specific places requires knowledge that can be provided by these insights. It gives the designer knowledge about what elements cause comfort or discomfort. By walking, the designer can gain intuitive knowledge that otherwise cannot be gained by sitting at a desk. It is necessary to become part of the landscape and experience its dynamics, its movement and its performance (van Etteger and Schultz, 2017).

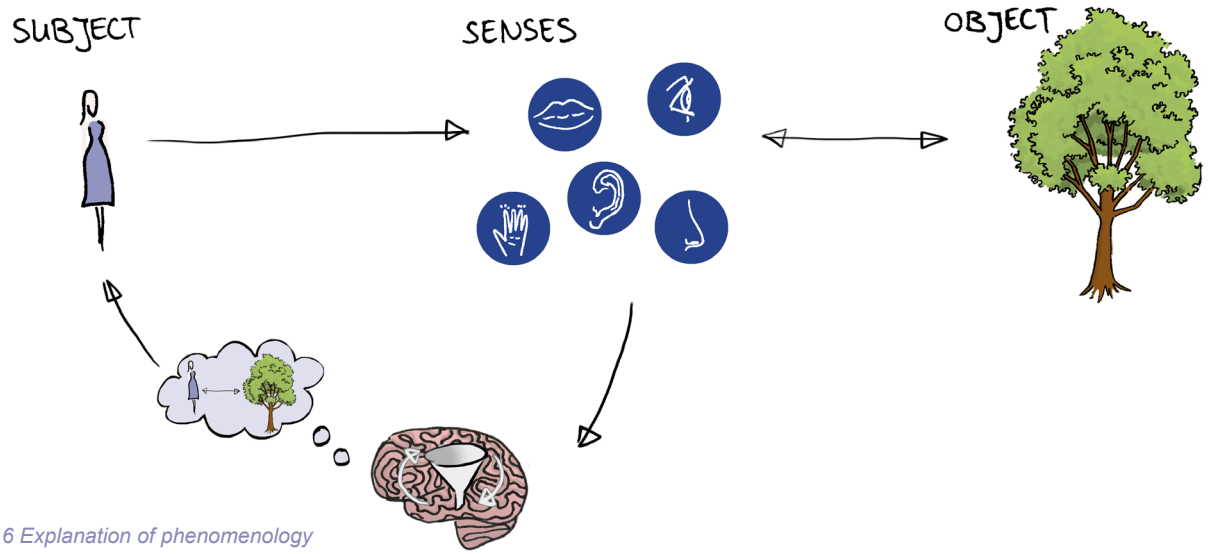


Fig. 2.6 Explanation of phenomenology

PHENOMENOLOGICAL WALKING METHODS

In my research, I replaced walking through the landscape with rolling in a wheelchair. My method is the result of combining two phenomenological walking-methods; the 'narrative walking method' (Costa, & Coles, 2019) and the 'continuous/stop-motion method' (van Etteger and Schultz, 2017 and van Etteger, 2013).
The reason for combining the two descriptive research methods helps to research the experience of perceiving the landscape while sitting in a wheelchair in a more holistic way. It enabled me to reflect on all aspects that form a person's 'positive health'. In the scheme below is highlighted in blue what elements I took from which method. You can also see at what points I derogate from the original methods. These choices will be clarified in and after the scheme, where my method is explained in depth.

Continuous/stop-motion Rudi van Etteger	**Narrative walking** Sandra Costa	**Phenomenological rolls** This thesis
Predetermined routes	No predetermined routes	Predetermined routes
Walking alone (researcher)	Walking alone (participant)	Walking together (researcher and participant that pushes the wheelchair)
Silent	*Talking out loud*	Talking out loud. A conversation with the person that is pushing the wheelchair
Walking twice	Walking once	Rolling twice
- Written records overall experience *- Notes senses on regular intervals* - Photographs on regular intervals	- Audio recorded - Few photographs *- Gps data*	- Written records overall experience - Notes senses on predetermined intervals - GPS-data - Video recording with GoPro instead of audio recordings and photographs. Because I wanted to capture the experience of movement and being part of the landscape while being in a wheelchair to be able to communicate it to others.
Focus on the aesthetic (multi-sensory) of moving through the landscape.* ** Aesthetic is not only the visual component of the landscape but the full multisensory appearance.*	*Focus on meaning and value behind physical and emotional encounters and interactions while moving through the landscape.*	Focus on aesthetic (multi-sensory), meaning and value behind physical and emotional encounters and interactions while moving through the landscape.

DESCRIPTION METHOD PHENOMENOLOGICAL ROLLS

Before I worked on the real phenomenological rolls I did some tests with the equipment. I tested out the GoPro to see how long I could record with the batteries and SD-card. I also did a short test ride with the wheelchair and came to the conclusion that I could not go so far with the type of wheelchair I had available (unmotorized) on my own. I needed someone to help me push the wheelchair in order to be able to cover the magnitude of the area I wanted to explore.

After the initial testing of the equipment the first step was to predetermine routes for the phenomenological rolls based on maps. While making those routes I took several points into account:

The length/duration of the routes. I had a maximum of one hour rounds, with the exception of the longer trip to the city center.

The equipment I used gave me a limited amount of time I could film. The colder temperatures made my batteries go empty quicker. Mine lasted approximately half an hour each.

The routes of the rolls were chosen in a way that they would cut through different parts of the landscape and thus represent the variety of the city scape (van Etteger, 2013). They crossed places that are necessary activities in everyday life such as the supermarket, apothecary and schools. But also, past optional activities, for entertainment such as the waterfront, park and playground (Gehl, 2010).

I predetermined four different routes (fig 2.9). One within the Tarwewijk, two that explored parts of the Tarwewijk and the connection with the surrounding neighborhoods (Carnisse and Bloemhof) and one longer route towards the city center that includes, Katendrecht, Kop van Zuid, going over the Erasmus bridge, a trip with the metro and ending at Zuidplein.

The next step was to go outside and roll the routes. Because I was not doing the rolls on my own but with somebody who pushed me most of the time, automatically a dialog about the experience took place between the person sitting in a wheelchair (me) and the person who pushed the wheelchair. I recorded the rolls which captured the experience of being part of the landscape and the conversations with a GoPro placed on my forehead with a special Head Strap (fig. 2.8). I also rolled some parts of the routes myself to experience what that is like. I used the Strava-app on my phone to track my rolls, to see afterwards where I needed to deviate from my pre-determined routes (fig 2. 9 and 2.10). Directly after each roll I wrote down my experience of the route in order to 'save' the intuitive knowledge gained during the roll in words before it faded from my mind (van Etteger and Schultz, 2017).

For the second roll, the stop motion roll, I predetermined stopping points on the routes based on different types of streets and nodes I encountered during my first rolls (see fig. 2.11). At each stop I filled in a form in which I scored and wrote down what I experienced for the different senses and if this is positive, neutral or negative (see fig. 2.12). I only did a small part of the route because it was very time consuming and after a while it felt like it did not give me any new information.

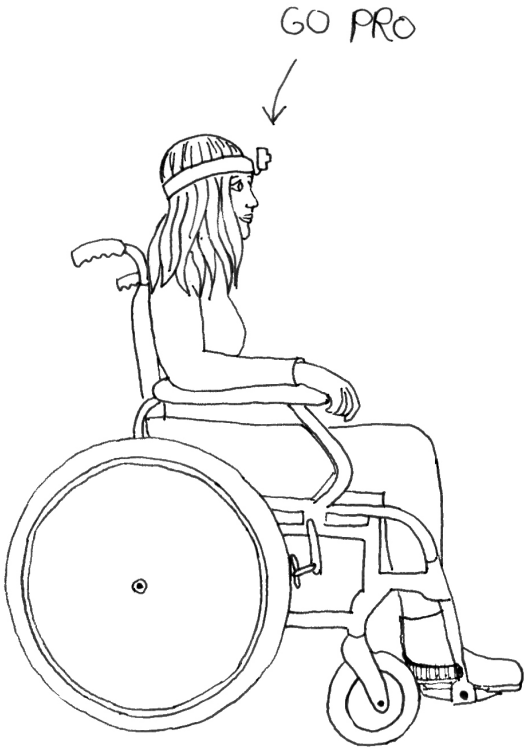


Fig. 2.8 GoPro on forehead to record the phenomenological rolls

Fig. 2.9 Maps of the routes for the phenomenological rolls

Fig. 2.10 Gps data phenomenological roll

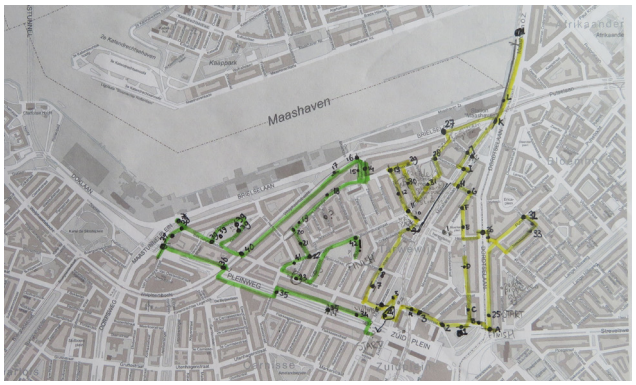


Fig. 2.11 Analyzing data first rolls for stop points second roll

Fig. 2.14 Wheelchair used during the phenomenological rolls

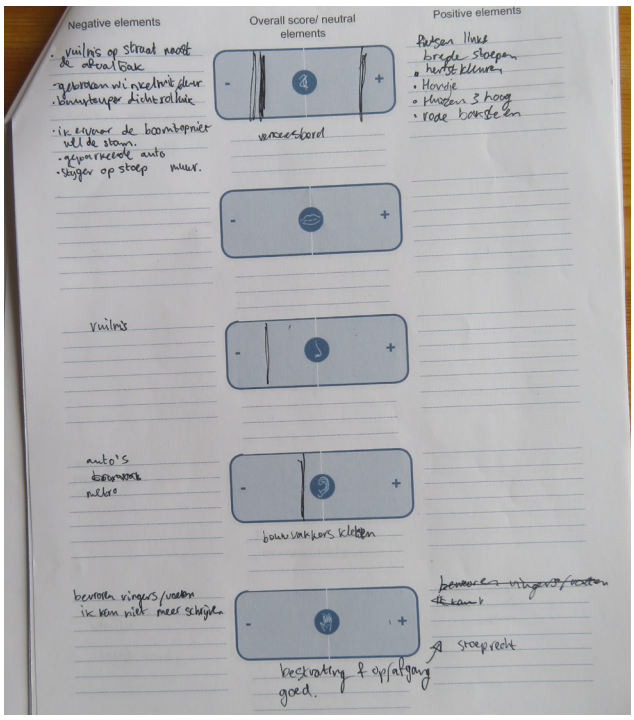


Fig. 2.12 Filled in form senses

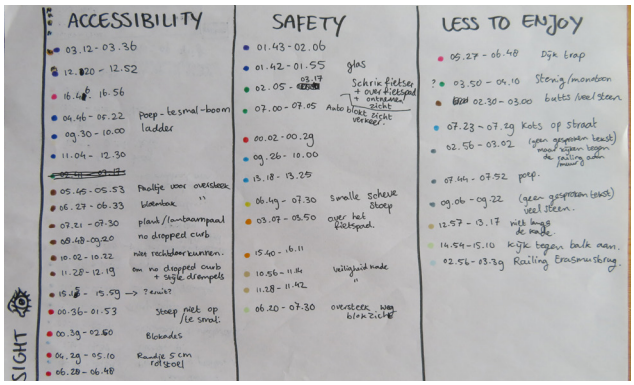


Fig. 2.13 Coding the data of the GoPro movies

CONTENT ANALYSIS

After the rolls, I had three different sources of data that need to be analyzed in the content analysis:

- The movies made with the GoPro (1st rolls)
- The written records of the overall experience (1st rolls)
- The filled in forms of the senses (2nd roll)

I did a directed qualitative content analysis described by (Hsieh & Shannon, 2005). In this process, I went over my different sources of data several times in the steps described below.

Coding is an essential step to get from the collected data towards developing of a theory and drawing conclusions (Charmaz, 2006). The human senses formed my main predetermined coding categories; smell, hearing, sight and touch. I left out the sense 'taste' because it was not relevant for this research.
I started the content analysis by highlighting the predetermined codes (senses) in 'the written records of the overall experience'. After that I identified subcategories within the predetermined main coding categories.
Data that could not be coded immediately where later addressed again to see if they form a new category (feelings and thoughts) or sub-category.
Secondly, I started viewing, coding and editing the movies into fragments to put them into the different sense categories and its sub-categories (see fig. 2.13). While doing this more sub-categories where formed.
Next, I went over the forms of the senses from the 2nd roll to see if I missed any information so far and refined the sub-categories.

To clarify the different categories and subcategories I made drawings and selected the best video fragments that would support the explanations in text.
This is done because:
"The methods used deliver grounded, implicit, embodied knowledge that cannot always be explained in words. This is why beside descriptions in words visual means of communication are included." (van Etteger, 2013 p.189)

Lastly, I reflected on how the landscape while sitting in a wheelchair influenced my 'positive health' by using the scheme explained in the theoretical framework of this thesis on page 9.
The result is an elaborate overview of the comforts and discomforts that I encountered while rolling in the Tarwewijk in my wheelchair.

The results of this part of the research is described in chapter 3.

MATERIALS

The following materials were needed in order to apply these phenomenological rolls in practice:
- Predetermined routes (In the Tarwewijk, Connections with surrounding neighborhoods and a route to the city center)
- Gps (Strava app)
- A wheelchair, I used the sunrise medical light wheelchair (Fig. 2.14)
- GoPro (hero 3 silver), GoPro Head Strap and extra batteries for the GoPro
- Micro-SD cards with enough capacity to film for a long enough time (test beforehand) I used 32 GB
- Forms of the senses (fig. 2.12), pen and clipboard
- Extra person who can help push the wheelchair
- Movie editing software Premiere Pro (Or a similar program, Imovie did not work for me since you could not edit on specific times I used to code my data)

4 predetermined routes/stops

2 rolls

3 data sources

5 categories: smell, touch, hearing, sight, thoughts and feelings

3 conclusions in text, drawing and movies + evaluation of PH

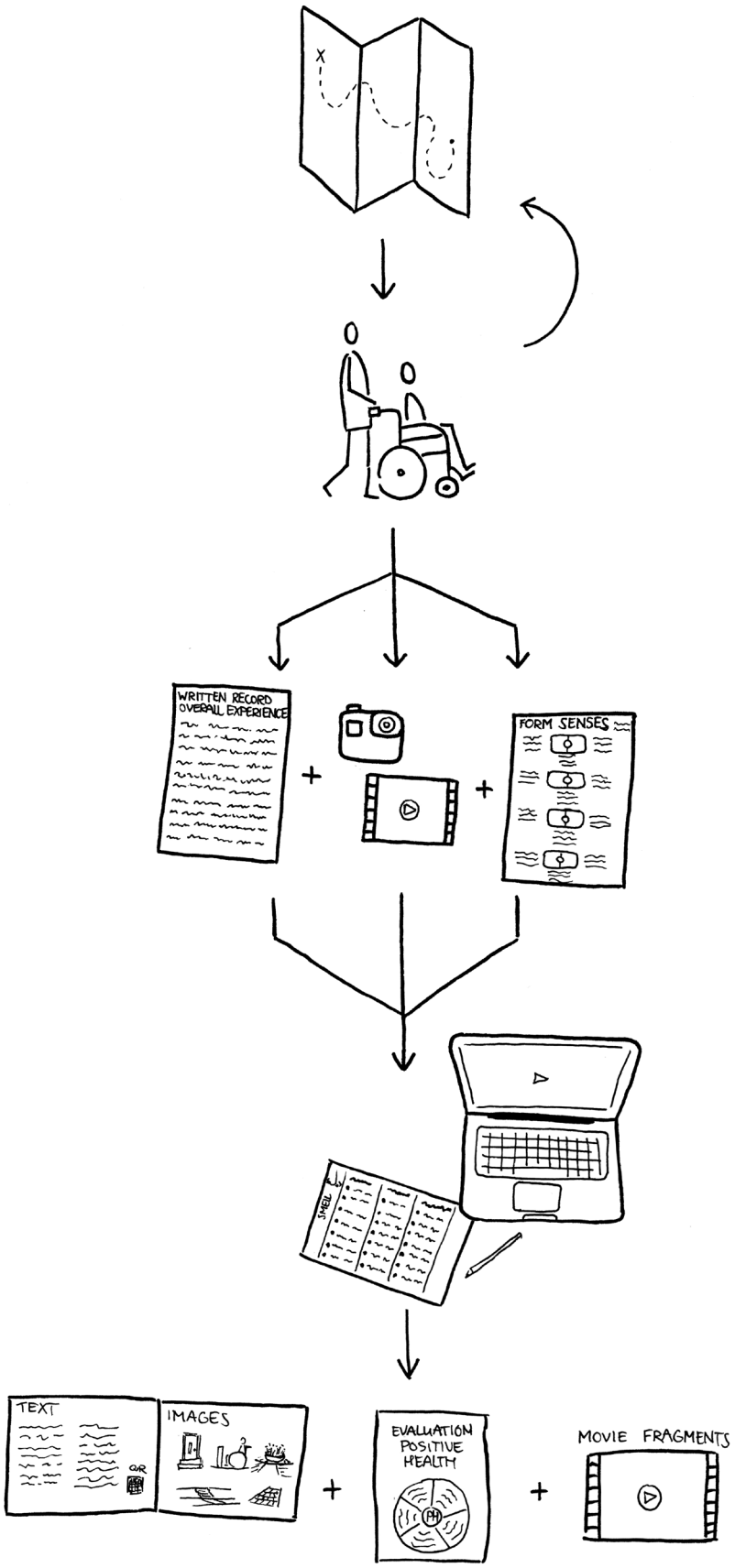


Fig. 2.15 Overview methodology Phenomenological rolls

METHODOLOGY INTERVIEW MUNICIPALITY OF ROTTERDAM

To answer the research question
"What problems does the municipality of Rotterdam encounter when working on wheelchair accessibility in urban districts?"
I did a semi-structured interview at the municipality of Rotterdam.

SEMI STRUCTURED INTERVIEW

A semi structured interview has some degree of predetermined order but allows some flexibility in the way the issues are addressed by the informant (Clifford et al, 2016). Before the interview, I prepared an interview guide in which I formulated questions and follow up questions (see appendix A). However, due to the conversational and informal tone of a semi structured interview I was flexible to ask more questions that came to mind during the interview itself.
In January 2020, I spoke with the following people from the municipality of Rotterdam: Marlijn Wagenaar policy maker for accessibility, Rik de Nooijer landscape designer at the department Stadsontwikkeling and Jesse van Es from Rotterdam Onbeperkt.
I audio recorded the interview with my mobile phone so I did not have to write down the answers during the interview, but could focus on the conversation and the questions I wanted to be answered. After the interview, I listened back to the audio fragment, transcribed it and used this text to draw conclusions in order to answer the research question.

MATERIALS

The materials necessary for this method are:
- A phone with audio recorder
-The interview guide I made with predetermined questions and follow-up questions (see appendix A)

The conclusions of the interview will be discussed in chapter 4.

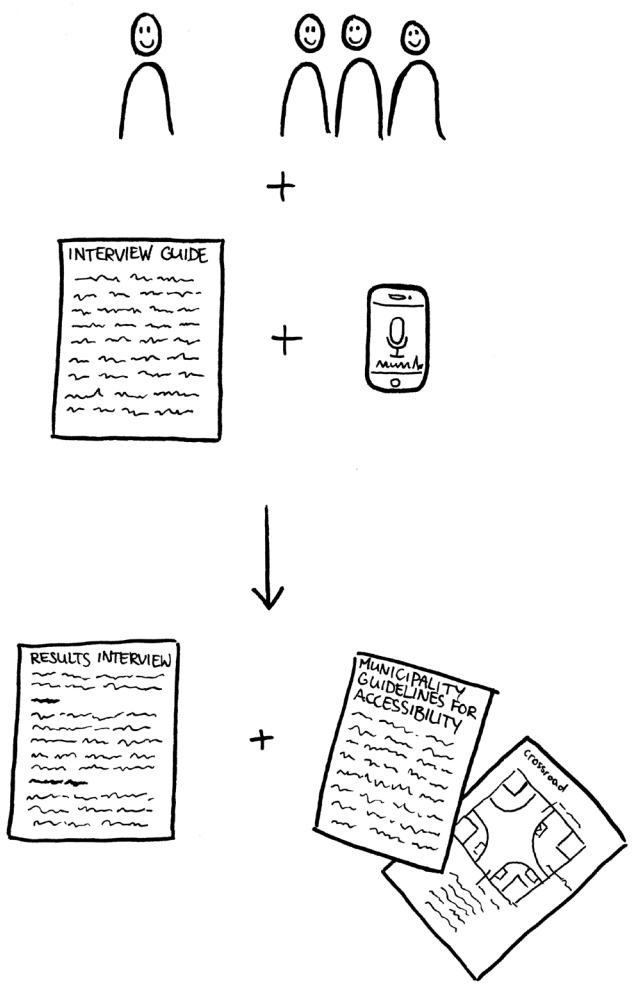


Fig. 2.16 Overview methodology interview municipality of Rotterdam

In order to answer the design question
'How can the wheelchair accessibility in the Tarwewijk be improved?'
a research through design process (RTD) took place (Lenzholzer et al, 2013). The RTD process consists of several steps.

STEP 1 LANDSCAPE ANALYSIS

It is important to thoroughly understand the spatial configuration of the research area in order to create a good design, since landscape design is always embedded in context. In the method of the phenomenological rolls the landscape is already analyzed (multi-sensory). This combined with a desk study (map studies) is the first step of the RTD process.

STEP 2 DESIGNING
(Research based design)

The aim of this part of the research is to develop a design strategy that can improve wheelchair accessibility in the Tarwewijk. While designing the spatial knowledge of the area and the information gained from the research questions and preliminary research form the foundations of the research through design process.
Designing is an intuitive process in which the designer while sketching constantly reflects upon the design, the spatial analysis, gathered (multi-sensory) knowledge and predetermined conditions for the design. It is a process in which you go back and forth between all facets and through different scales in order to develop concepts and designs. This process of going back and forth is important to develop a thorough understanding of the implications of the suggested design solutions.
This process resulted in an overall design strategy for the Tarwewijk and four detailed design locations, with site specific design solutions and guidelines to improve wheelchair accessibility.

STEP 3 DESIGN EVALUATION

Although evaluation of the designs happens constantly during the process of designing, it is also important to evaluate if the design informs the design question and the main research question.

Therefore, the different design solutions (some with multiple concepts) are evaluated on accessibility, the impact on the traffic system, overall improvement of the street (do they improve the other demands that are on this place) and on how realistic the solution is in the near future to be able to achieve the wheelchair accessible streets as soon as possible.

The last step is to evaluate how the outcome of the RTD process can be applied to other urban districts in order to inform the main research question. This step is important to take because of the constructivist worldview and methods used in this research:

"The strength of this type of research lies in the innovativeness of the research outcomes and the flexibility to respond to different contexts. The evaluation criteria reflect constructivist knowledge claim's values that are generally about authenticity, credibility and depending on context. This makes the knowledge not generalizable, but still it can be transferable." (Lenzholzer et al, 2013)

Therefore, evaluation on how the site-specific design and design guidelines can be translated into general design principles needs to take place (van Etteger, 2016).

2.3 CONCEPTUAL FRAMEWORK

In chapter 6 the findings of the research will be discussed and the main research question is answered. The methods explained are summarized in the conceptual framework on the next page. The conceptual framework is a brief overview of these methods and how they inform different parts of the research.

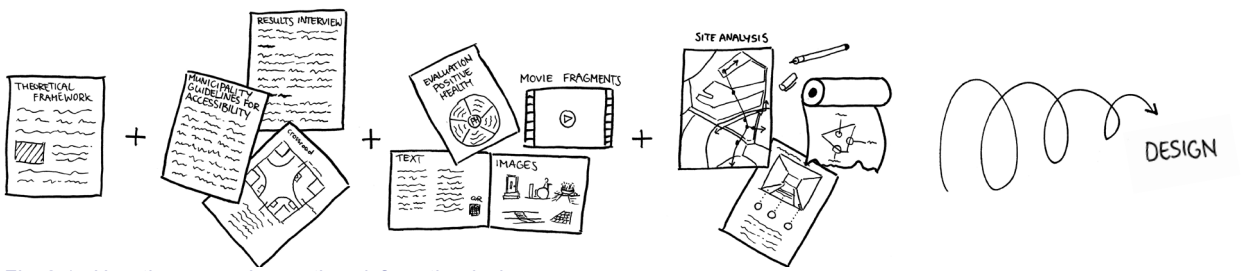


Fig. 2.17 How the research questions inform the design

2.3 CONCEPTUAL FRAMEWORK

MAIN RQ
What interventions could improve the wheelchair **accessibility** of urban districts?

THEORETICAL FRAMEWORK CHAPTER 2

ACCESSIBILITY

Positive Health

REFINING THE PROBLEM
Research for design

CHAPTER 3

RQ 1.
What spatial elements in the Tarwewijk influence the '**Positive Health**' of people in a wheelchair?

Spatial
Phenomenological rolls in a wheelchair through and around the Tarwewijk

Content analysis

Evaluation with scheme of Positive Health

CHAPTER 4

RQ 2.
What problems does the municipality of Rotterdam encounter when working on wheelchair **accessibility** in urban districts?

Social-politcal
Semi structured interview at the municipality of Rotterdam

SOLUTION
Research based design

CHAPTER 5

DQ
How can the wheelchair **accessibility** in the Tarwewijk be improved?

Research through design

Design strategy: Plus Routes, connect other streets and improve public transport

Design detail Plus Route Dordtselaan and Brielselaan

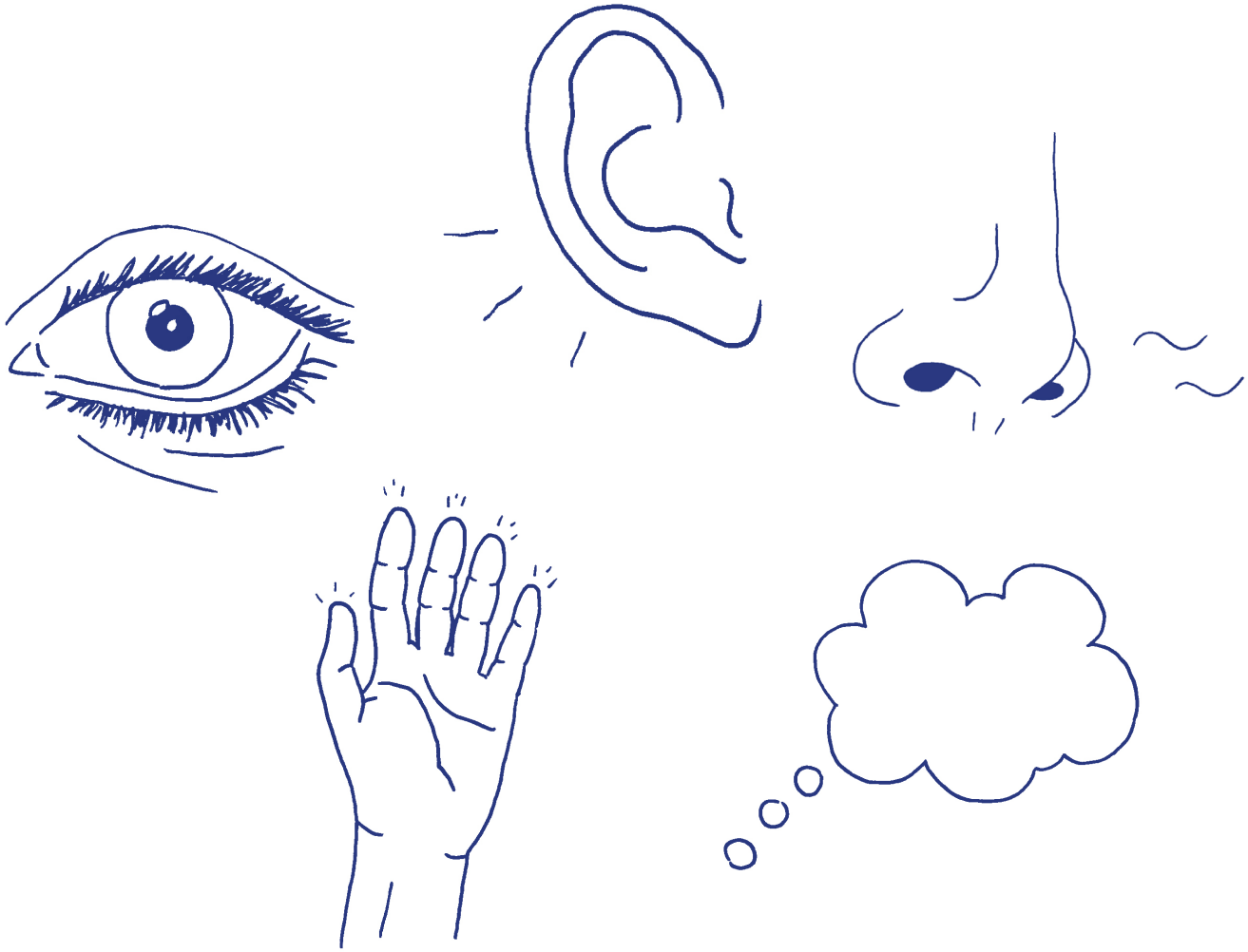
Design detail other streets Heenvlietstraat and Speltstraat

EVALUATE
Design principles

CHAPTER 6

DISCUSSION/AND CONCLUSION
To answer the Main RQ general design principles for other similar places will be formed.

PHENOMENOLOGICAL ROLLS



CHAPTER 3

In this chapter, the following research question will be answered:

'What spatial elements in the Tarwewijk influence the 'positive health' of people in a wheelchair?'

To do this I did four phenomenological rolls through the Tarwewijk and coded the data into the categories of the senses (smell, hearing, touch and sight) and thoughts and feelings.

3.1 INTRODUCTION

It is important to note the following before reading and watching the conclusions:

Each problem is stated individually. However, the different problems often occur simultaneously. For example, the sidewalk is narrow, the sidewalk is sagging towards the street and there is an object on the sidewalk, together making it hard to turn or pass the object. They are separated in the overview to be able to give the most complete and systematic overview of problems that can occur when moving around in a wheelchair. Some problems are also mentioned in more than one sense category.

Each problem is not only described in text but also shown in drawings and with movie fragments made during the rolls. The drawings are made to point out specific elements in the public open space that influenced me.
It is impossible to capture all problems on video, since this only represents two of the four senses: hearing and sight. Certain problems are illustrated with a movie fragment, as it gives a more complete grasp. The video's show the landscape and its ever-changing movements in a way that a text, photograph or drawing cannot. Also, it is important to note that the GoPro was placed on my forehead so it is a bit higher than my eyes and does not track my eye movements. Moreover, the lens of the GoPro slightly distorts the image so the video is showing a wider and higher view than what you normally see, keep this in mind.

Because I am not bound to a wheelchair in everyday life I can make some comparisons to when I would walk through a city. This can make it more relatable for others who try to understand why it is important to work on accessible cities.

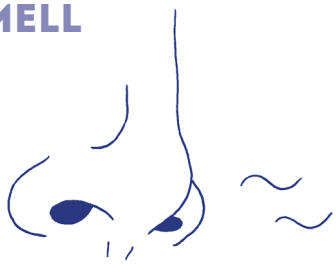
The exact procedure of the executed method: 'phenomenological rolls' is further explained in chapter 2 on page 13.

MOVIE FRAGMENTS

On the following pages there are blue boxes that refer to movie fragments that are part of the findings of the phenomenological rolls.. To access the playlist with the movie fragments scan the QR code or use the URL below.

https://www.youtube.com/playlist?list=PLS_Ezjw_jzH9vCj3sd40qvaUNxMTEQRF8

3.2 SENSES SMELL



See Movie Fragment: 1. Smell

Compared to walking, I was experiencing some unpleasant smells more strongly. Since in my wheelchair I was closer to the ground and thus to the sources of the bad smells that are explained below.

CAR EXHAUST

Next to busy roads and running cars I strongly smelled the exhaust gases, because I was sitting lower and thus closer to the cars exhaust pipes. When scooters passed by on bicycle lanes this also smelled bad. When I had to stand still for a longer period of time next to a place with running cars, the smell bothered me more as time continued (fig. 3.1).

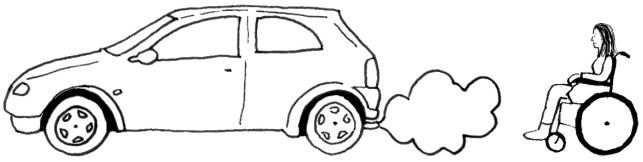


Fig. 3.1 Car exhaust

GARBAGE

There were many points where there was garbage on the sidewalk. It was especially messy at the places where inhabitants can put their garbage in fixed containers. Because I was sitting lower to the ground this smelled strongly.
Moreover, the opening of regular trash cans on the streets were exactly on my eye/nose level, this was not very pleasant (fig. 3.2).

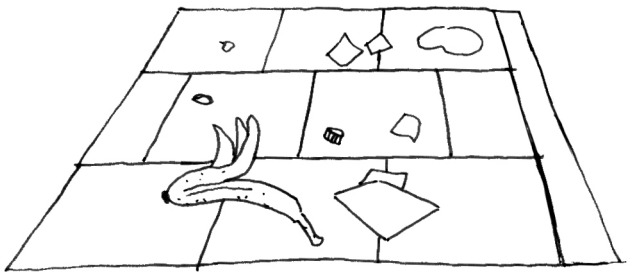


Fig. 3.2 Garbage

DOG POO

There was vomit and dog poop on the sidewalk that smelled. Moreover, on the grass lane at the Mijnherenlaan the smell of dog poop was the strongest. It was obviously frequently used for walking the dog. The smell made it unpleasant to roll, even though the sight of being up-close to the grass was quite nice (fig. 3.3).

Fig. 3.3 Dog poop

OTHER

Beside the mentioned points above there were some positive and negative smells that I cannot specifically link to sitting in a wheelchair. The negative smells were cigarette and weed smoke. The positive smells were the smell of the kebab store and something sweet I could not determine.

SENSES HEARING

See Movie Fragment: 2. Hearing

I did not have the feeling that the sounds I heard, liked and disliked while sitting in the wheelchair were much different from walking upright. The more mechanical sounds were mostly negative, human sounds and natural sounds are overall more positive (fig. 3.4) as is comfirmed by the literature on this subject (Yang and Kang, 2005).

SOUND CARS

There was however, one important exception in which the hearing was important for my personal safety. In some places, it was crucial to depend on my hearing to be able to determine if I could safely cross the road, since I was sitting lower and my view on the road was blocked by an obstacle. Those obstacles were mostly parked cars and large trees with broad trunks (fig. 3.5).

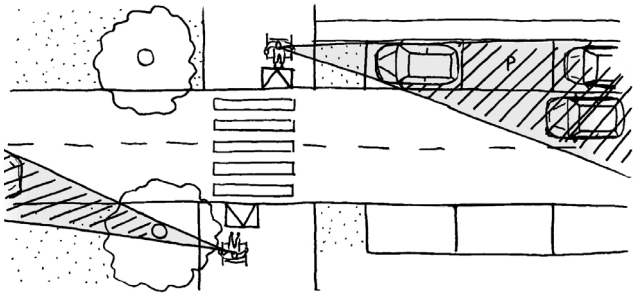


Fig. 3.5 View on road blocked, I needed to rely on sound

TALKING TO PERSON PUSHING WHEELCHAIR

Another point that was a bit annoying was the following: When I was talking to the person who was pushing my wheelchair, they sometimes did not hear me clearly. I needed to speak louder in order to communicate well with them, since I was sitting lower and in front of them. The sound of me speaking did not carry to their ears (fig. 3.6).

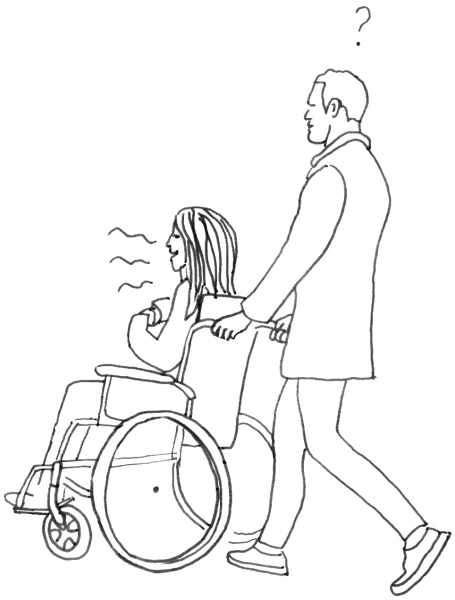


Fig. 3.6 Harder to communicate with person that pushes the wheelchair

Negative sounds	Neutral sounds	Positive sounds
Cars Scooters Metro Construction workers Car honking Car alarm Loud music with strong base Unloading and beeping of a truck Squeaking tires Mechanic sizzle	People talking Cyclist Crisping of plastic shopping bags	Birds Playing/laughing kids Kicking a soccer ball Soft music playing *You could hear cars driving-while crossing the road where the view was blocked*

Fig. 3.4 Sounds heard during 2nd phenomenological roll

SENSES TOUCH

DETOURS

After pushing myself forward for approximately 25 meters I was already quite tired and felt the muscles in my arms protest. I needed a short rest. Extra meters I needed to travel cost a lot of energy. Things I encountered that caused a detour where the following:

- My path was often blocked by obstacles like bicycles (fig. 3.8), a scaffolding (fig. 3.9), a man washing the windows, flowerpots, bulky waste (fig. 3.10) or the sidewalk was too small (fig. 3.11)(I needed the absolute minimum of 90 cm = 3 standard 30x30 concrete tiles next to each other with my small wheelchair).

- There was no dropped curb (fig. 3.12)

- A car was parked on the sidewalk exactly where the dropped curb was positioned. I needed to take a detour of approximately 60 meters (fig. 3.13).

- To enter a playground, I had to search for an entrance that was accessible to me. Some parts of the playground were not accessible at all due to too steep curbs or a step (fig. 3.14).

- The road was broken open (fig. 3.15).

- I had to zigzag while crossing the road because the dropped curbs were not lined out (fig. 3.16).

- Two people in a wheelchair could not pass each other since the sidewalk was not broad enough (fig. 3.17). One of us needed to go back to let the other person pass.

Fig. 3.7 Detours

See Movie Fragment: 3. Touch Detours

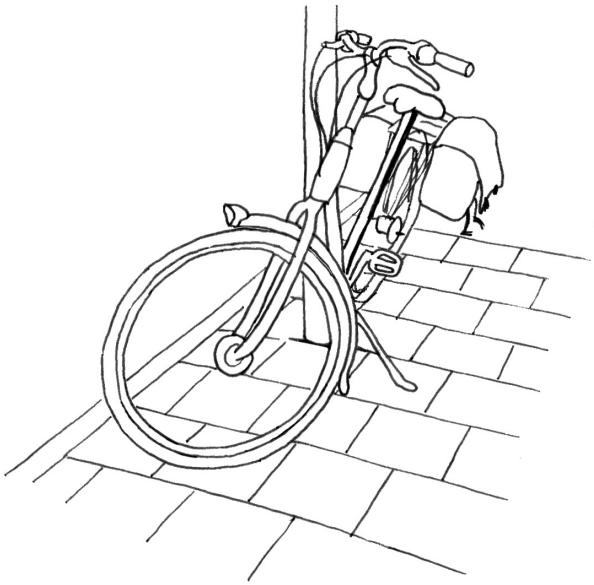


Fig. 3.8 obstacle bicycle and street light

Fig. 3.9 obstacle scaffolding

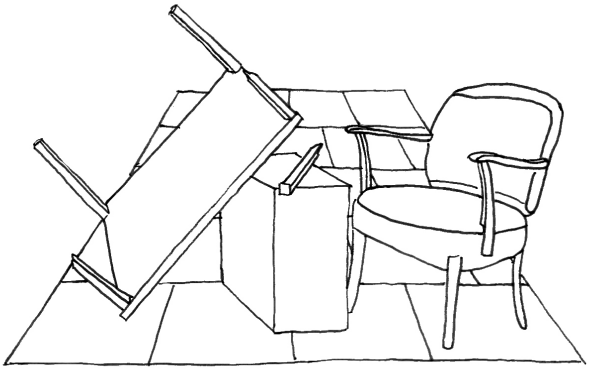


Fig. 3.10 Bulky waste on the sidewalk or at dropped curbs

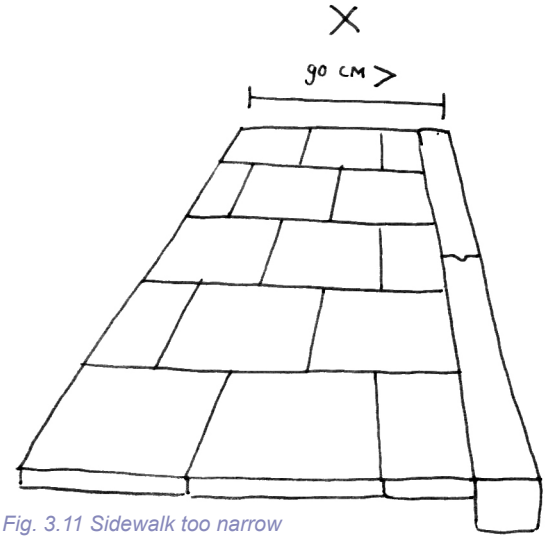
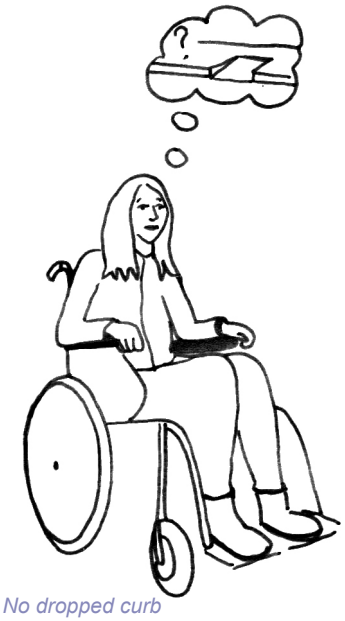


Fig. 3.11 Sidewalk too narrow



F.g 3.12 No dropped curb

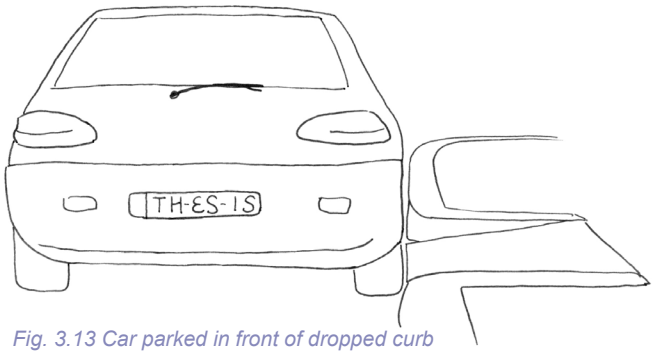


Fig. 3.13 Car parked in front of dropped curb

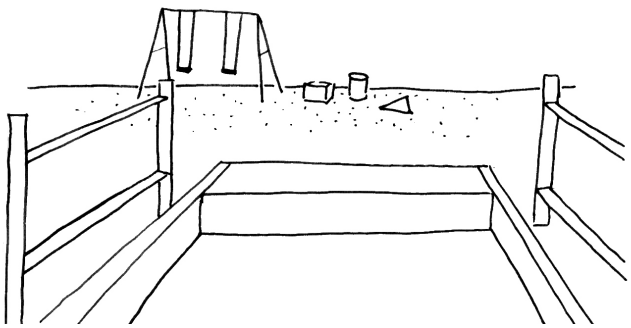


Fig. 3.14 entrance playground not accessible

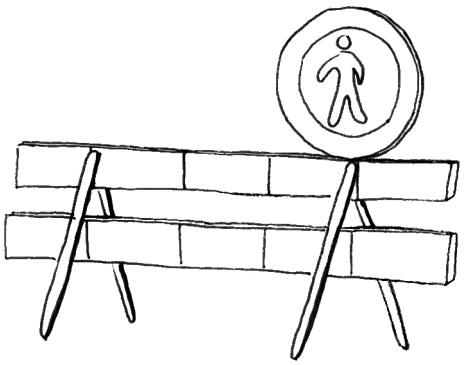


Fig 3.15 Road was broken open

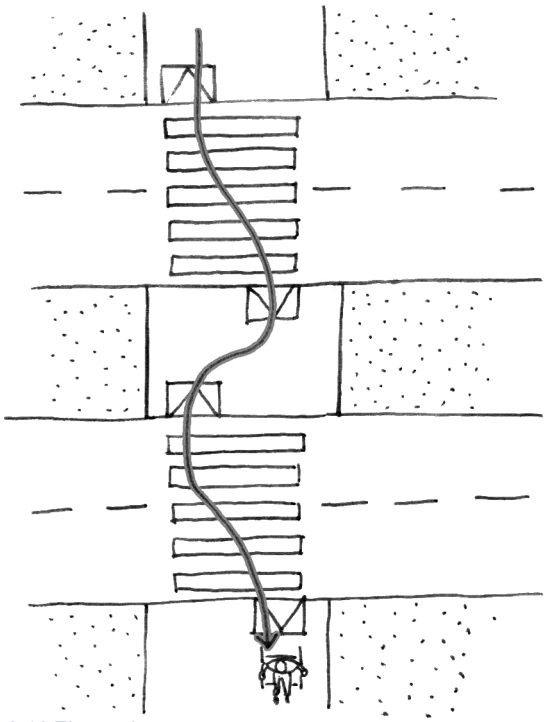


Fig. 3.16 Zigzagging

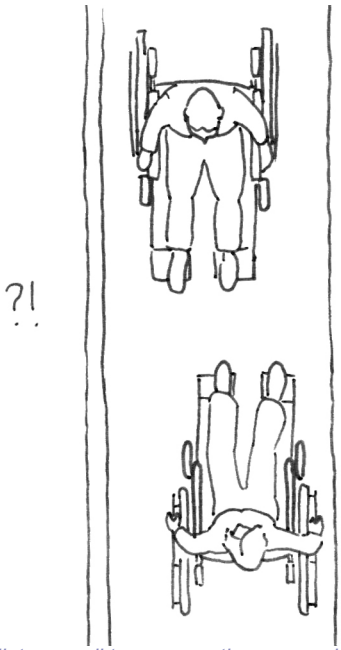


Fig. 3.17 Sidewalk too small to pass another person in a wheel-chair

SENSES TOUCH

See Movie Fragment: 4. Touch Shaking and slipping

SHAKING OF THE WHEELCHAIR

The shaking of the wheelchair by driving over different kinds of pavements was stronger than I had expected upfront. Even 'flat' evenly laid sidewalks with standard 30x30 cm concrete tiles gave quite a tremor. After rolling around for a while in the wheelchair, my buttocks started to ache. Some points were rather painful to pass, where the blow was so hard it physically hurt my body. The severity of the shaking, tremors and blows was caused by the following points:

- The kind of material used as pavement (See movie fragment).

- The way the brickwork was laid (See fig. 3.18 and movie fragment).

- Maintenance of the pavement. Such as the amount of subsidence of the sidewalk, sunken wells (fig. 3.19), cracks in the pavement (fig. 3.20), tiles pushed up by tree roots (fig. 3.21), etc.

- Bad construction of the paths, (dropped) curbs and tram rails, with high differences of 2 cm or more (fig. 3.22).

- Also, concrete curb stones could damage my wheelchair because the aluminium grips on my wheelchair scraped these concrete edges (fig. 3.23). This happened several times when the curb was quite narrow.

SLIPPING OF THE WHEELCHAIR

Not only shaking can be caused by the use of the wrong materials. Also, slipping of the wheels can be a problem when the material is too smooth to get a grip. I experienced this with the aluminium sheet that is around the garbage collecting bins in the Tarwewijk (fig. 3.24). I could not get a grip on the aluminium with my wheelchair. Making it impossible to reach the bin.

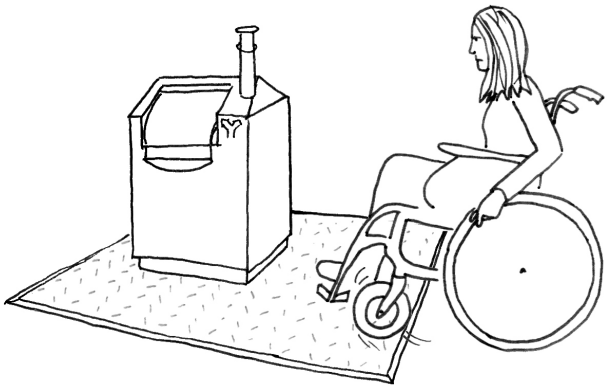


Fig. 3.24 Slipping with the wheelchair, wheels get no grip

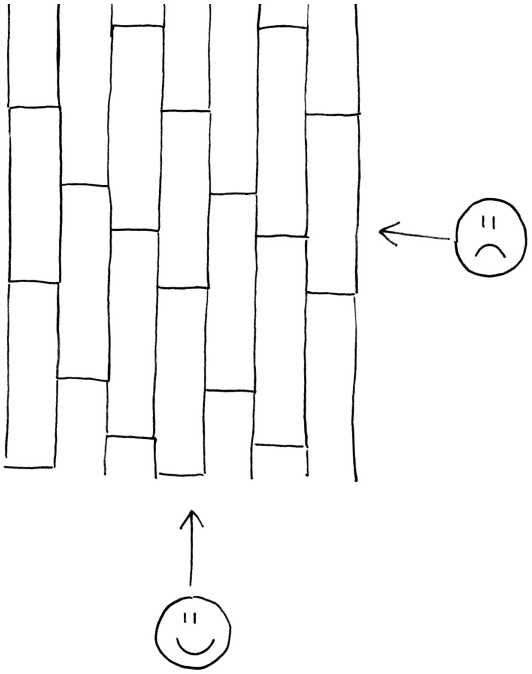


Fig. 3.18 Walking direction and amount of shaking in the wheelchair

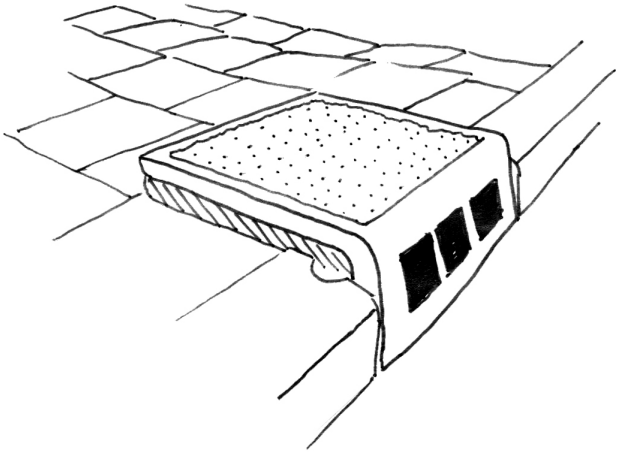


Fig. 3.19 Shaking because of sunken pavement or wells

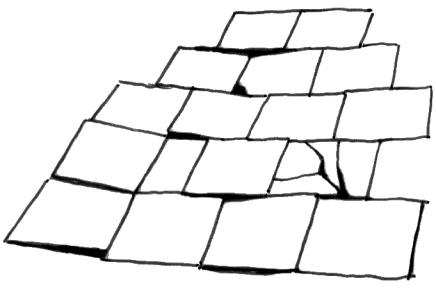


Fig. 3.20 Shaking because of cracked pavement or sunken pavement

Fig. 3.21 Shaking because of tree roots that press up the pavement

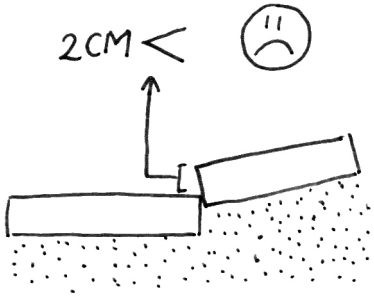


Fig. 3.22 Painful to have height differences from 2 cm and more

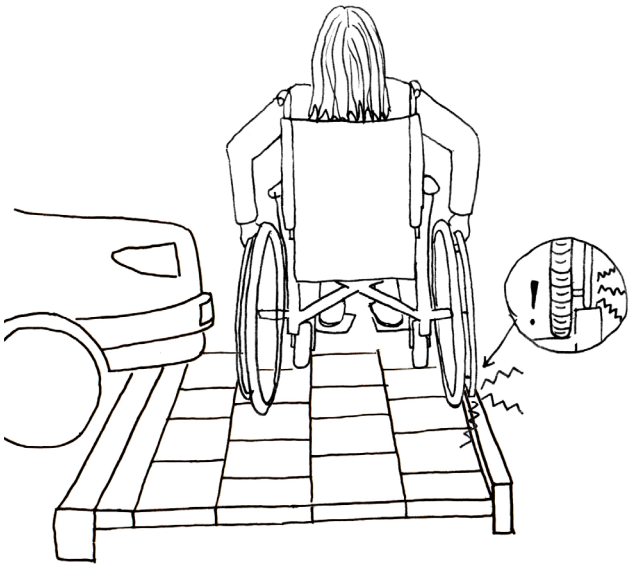


Fig. 3.23 Scraping over the concrete kerb stones with the grips of the wheelchair

See Movie Fragment: 5. Touch Sloping and sagging

DRAINAGE GRADIENT AND SAGGING OF PAVEMENT

Beside the sloping and ramps also the angle of the drainage gradient (afschot) and sagging of the sidewalk caused challenges (fig. 3.25). The drainage gradient of the sidewalks was uncomfortable especially when the angle was steep. I needed to keep correcting the wheelchair to keep going straight. It took a lot of power on one arm and a lot of energy. Furthermore, when somebody was pushing me in the wheelchair they said this was uncomfortable for them as well. When the angle of the pavement was too steep it was almost impossible to correct myself from rolling off the sidewalk. The person walking with me had to save me several times from rolling off the sidewalk and falling. This happened for example when I tried to get into the 'Dirk van der Broek' supermarket. It was scary to experience, because when I would have been on my own I would have fallen with my wheelchair.

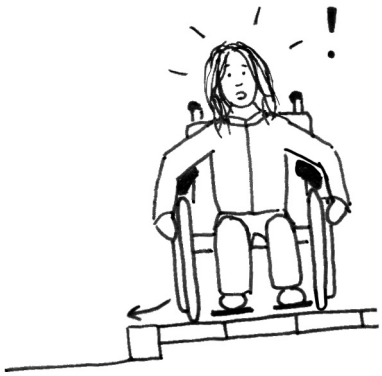


Fig. 3.25 Sagging of the pavement

SLOPING AND RAMPS

Pushing myself on a path that went up even a little bit took a lot of energy. I distinguish three types of situations:

Firstly, the small slopes/dropped curbs to get on and off the sidewalk (fig. 3.26). The steeper and higher they are, the more power you need to get up. In some cases when the angle is too steep, it is very hard or even impossible to do it by myself. It is also scary to get off these too steep dropped curbs, it is hard to control your speed because the wheels lose grip and I was sometimes afraid to fall. You just have to throw yourself off. This is especially scary at busy roads with a limited view. As mentioned before also height differences of the pavement of more than 2 cm cause trouble because you cannot get up the ramps, or I had to go on backwards with the wheelchair.

Secondly, the longer slopes and ramps, such as ramps to enter buildings, a bridge or a path/road/sidewalk that goes up or down (fig. 3.27). When these slopes are too long and have no resting points, or are too steep, it is hard or impossible to get on. Moreover, going down is also unsafe because you need a lot of power to slow down or cannot control your speed because the wheels will slip.

SLOPING AND SAGGING

The problem got even bigger when both the sloping and the drainage gradient were present at the same spot. When this is the case, it was not only hard to get uphill but also downhill took strength and energy. I could not simply roll down, it took a lot of effort to stay straight. This is only possible when you are not going downhill too fast, because if you go too fast you cannot correct yourself going left or right because the wheels lose their grip when you break on one wheel. You need a lot of power to slow down and to correct on one side.

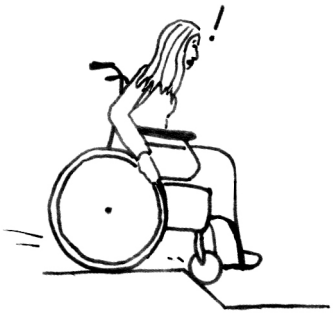


Fig. 3.26 Dropped curb is too steep

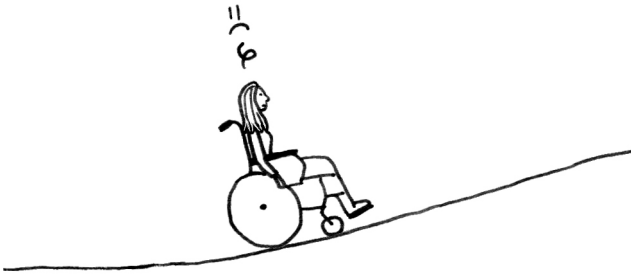


Fig. 3.27 Slopes that are too steep or too long and have no resting points

COLD AND DIRT

I did the rolls in November and December 2019. Even though this year winter was not very harsh, I got cold quickly (fig. 3.28). Even when I kept putting on more layers of clothing, a fleece blanket and at one point took a hot water bottle with me, I got cold. It started with my feet and after half an hour my entire body was cold. After an hour, it was simply too unpleasant to be outside. This was the worst on days when it was cloudy and very windy. Especially on the more open and wide spaces where the wind had free range. In the smaller more sheltered streets the wind was bothering me less, since the wind was less strong. But even there I got cold from not being able to move my feet and legs.
Furthermore, the aluminium grips on the wheels that allowed me to push myself forward were very cold. It was not possible for me to wear regular gloves to protect myself from this cold as I would not have grip to push myself forward (fig. 3.29).

Also, things would get attached to the wheels when rolling through a puddle, dirt, sand, trash, dog poop etc (fig. 3.30). When pushing myself forward I would also get the water or dirt on my hands (fig.3.31). This was unpleasant, not only because of the cold but it felt unhygienic. This happened frequently at corners where the neighbourhood trash collecting points were. In these places, I had no choice but to go around the trashcans, because they stood next to the places where the dropped curbs were to cross the road. Also at the base of dropped curbs, puddles could collect which I could not go around.

BRUISING

Beside the direct problems experienced during the rolls itself, the day after I experienced bruising on the palm of my hands from pushing myself in the wheel-chair (fig. 3.32).

Fig. 3.32 Bruised hand palms

See Movie Fragment: 6. Cold and dirt

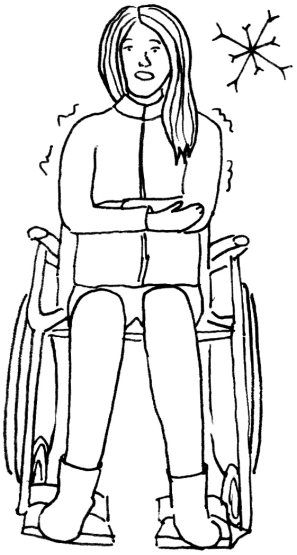


Fig. 3.28 Cold after half an hour

Fig. 3.29 Cold hands

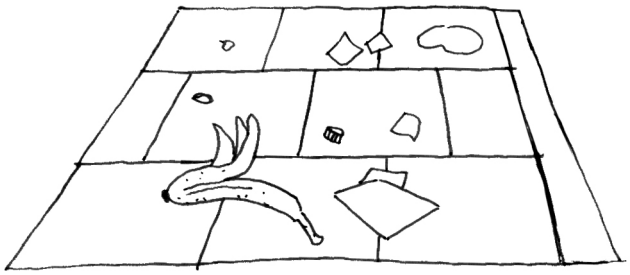


Fig. 3.30 Dirt on the pavement stuck to my wheels and onto my hands

Fig. 3.31 Dirt on the pavement stuck to my wheels and onto my hands

SENSES SIGHT

Because I was sitting in a wheelchair my eyes were approximately 50 cm lower to the ground than when I would be walking (1.20 m versus 1.70 m). You can compare this with the eye-level of an average 6-year-old child (fig. 3.33). This resulted in having less of an overview of the surrounding which made it harder to orientate myself. It took a lot more time to find my way.
Moreover, I was more focussed on way-finding/ navigating and less on enjoying the surroundings than while walking. Not only because I had less of an overview, but also because I needed to focus on where I could or could not go. I was constantly looking around and asking myself the questions: Can I go there? Is it accessible to me? Is it safe to go there? The things I looked for when debating these questions are described on the following pages.

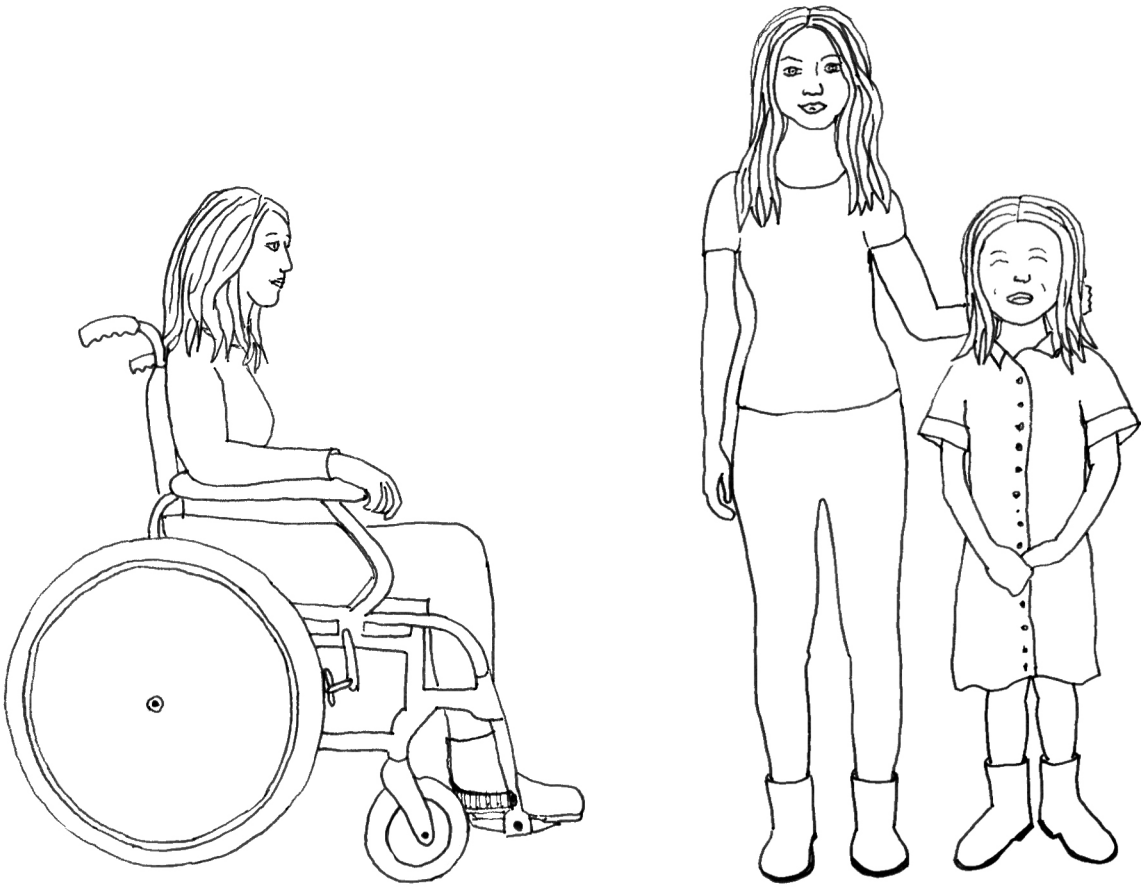


Fig. 3.33 Sitting in a wheelchair compared to a person standing and a 6 year old child.

SENSES SIGHT

See Movie Fragment: 7. Sight Accessibility

ACCESSIBILITY

The points I looked at to see if a path was accessible where the following:

Sometimes the **sidewalk was too narrow** for me to go there. The absolute minimum in width I need for my small wheelchair is 90 cm (fig. 3.34). But often the 90 cm was not sufficient since other problems/ obstacles occurred on my path.

Often **objects blocked** my path such as:

- Overhanging plants and hedges (fig. 3.35)

- Streetlights, traffic signs, traffic lights and small posts on the sidewalk or on dropped curbs (fig. 3.36). Sometimes these were also used to park bicycles against making the obstacle even bigger (3.37).

- Parked bicycles. But not only by lampposts as mentioned above. The orientation of bicycle racks (fietsnietjes) determine if parked bicycles are blocking the sidewalk or not. If bicycle racks are full, people tend to park their bike next to the racks. If the bicycle racks are placed at right angles to the walking direction of the sidewalk chances are higher that the path will be blocked when the bicycle parking overflows (fig. 3.38). On other occasions, there are no bicycle racks at all, so the bicycles are scattered all over, often causing problems.

- Planters and trees placed on illogical places (fig. 3.39).

- Garbage, bulky waste and glass on the sidewalk (fig. 3.40 till 3.42).

- Parked cars on the sidewalk, elevated crossings or dropped curbs (fig. 3.43 and 3.44).

- Scaffolding (fig. 3.45).

- Other people in wheelchairs, scoot mobiles or people walking slowly in front of me that I could not pass (fig. 3.46).

I was constantly looking where the dropped curb or a raised crossing was to get to another sidewalk or cross a road (fig. 3.47). Sometimes I needed to zigzag because the dropped curbs were not lined out (fig. 3.48). Or make difficult turns in order to be able to push a button for a traffic light next to the dropped curb. Speed Bumps that were level with the sidewalks and provide an opportunity to cross the road were often blocked by parked cars or another obstacle (fig. 3.39 and 3.43). Sometimes they were only level with the sidewalk on one side of the road, a missed opportunity. However, the biggest obstacle was the complete lack of a ramp or curb (fig. 3.47). Also, stairs and entrances of buildings with a small step in front of the door were not accessible (fig. 3.49 till 3.51).

Moreover, I was constantly judging if sidewalks and curbs looked like they could also be causing too much (painful) **shaking** because of:

- Tree roots pressing the pavement up (fig. 3.52).

- Sagging of the pavement, causing uneven pavement (lack of maintenance) (fig. 3.53).

- Wells that are lower or higher than the rest of the pavement (fig. 3.54).

- Incorrect construction with height differences of more than 2 cm (fig. 3.55).

- The type of pavement.

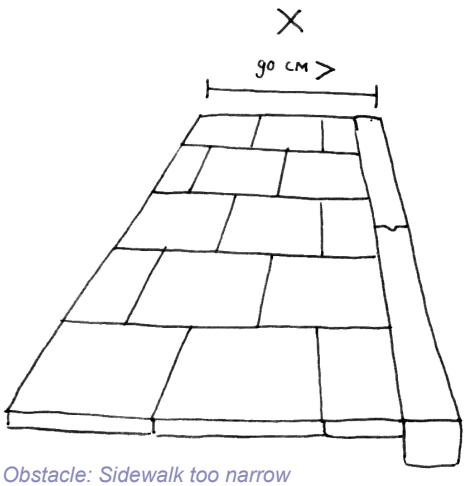


Fig. 3.34 Obstacle: Sidewalk too narrow

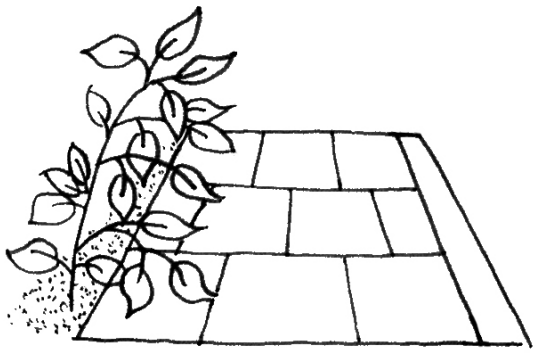


Fig. 3.35 Obstacle: Overhanging plants

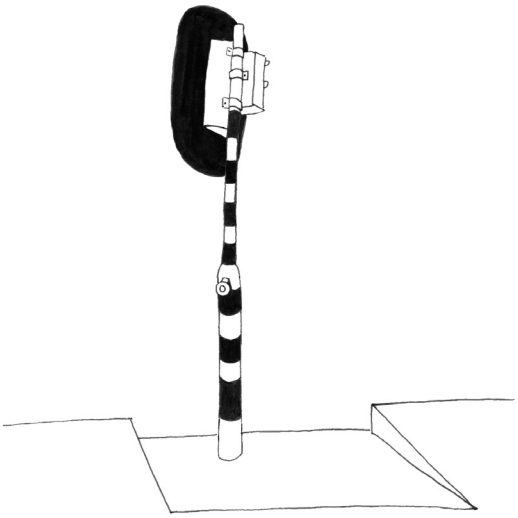


Fig. 3.36 Obstacle: traffic light on dropped curb.

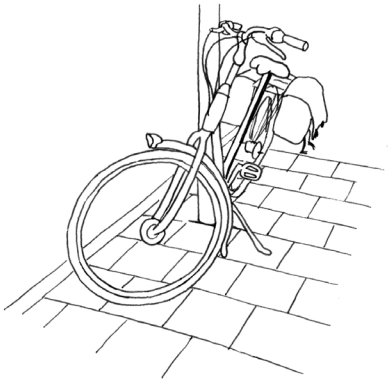


Fig. 3.37 obstacle bicycle and street light

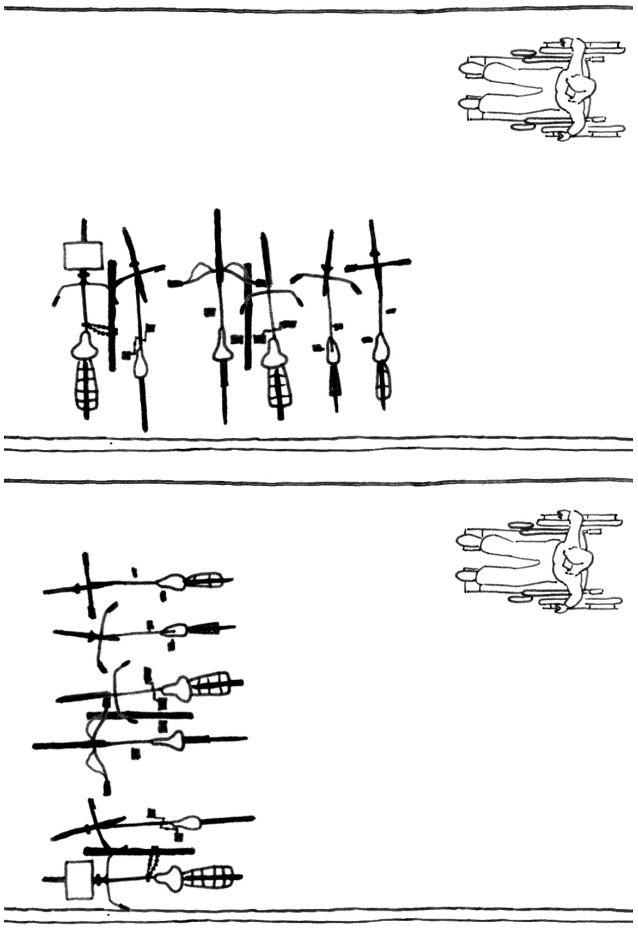


Fig. 3.38 Obstacle: overspill parked bicycles

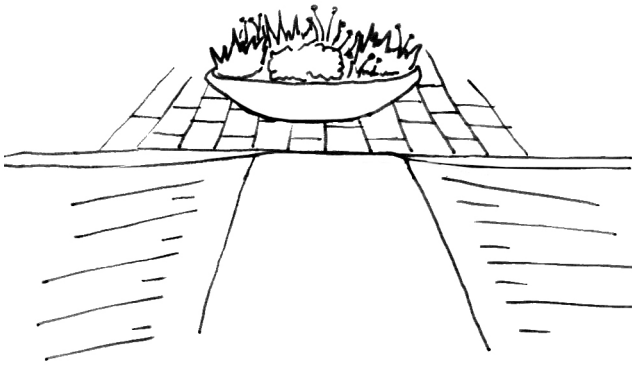


Fig. 3.39 Obstacle: planting pot

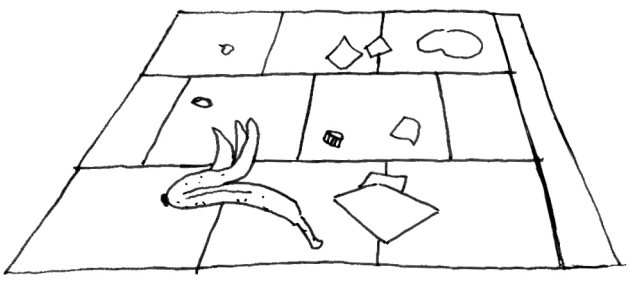


Fig. 3.40 Dirt on the pavement stuck to my wheels and onto my hands

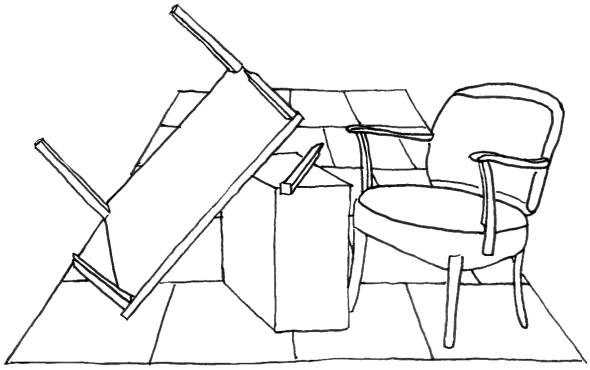


Fig. 3.41 Obstacle: bulky waste on the sidewalk or at dropped curbs

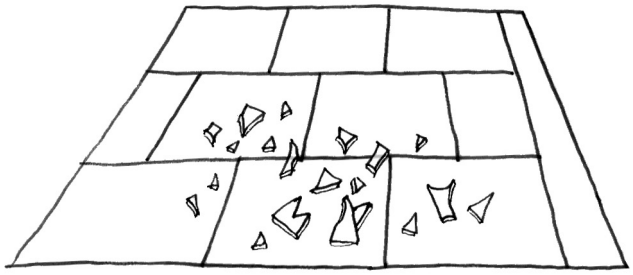


Fig. 3.42 Glass on the sidewalk

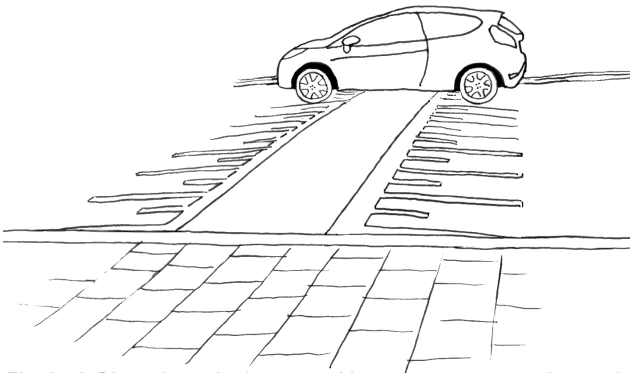


Fig. 3.43 Obstacle parked on speed bump can not cross the road.

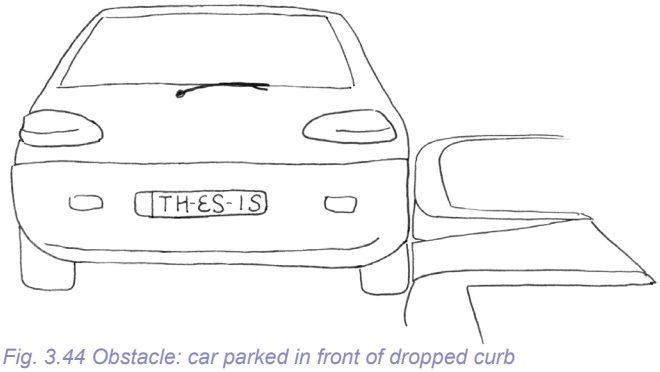


Fig. 3.44 Obstacle: car parked in front of dropped curb

Fig. 3.45 Obstacle scaffolding

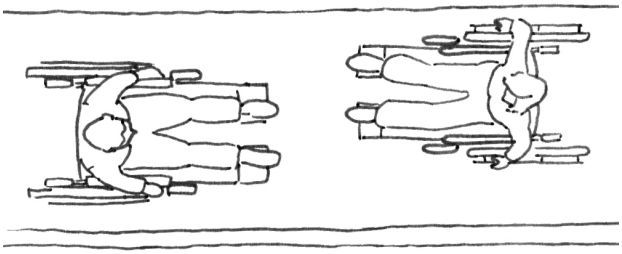
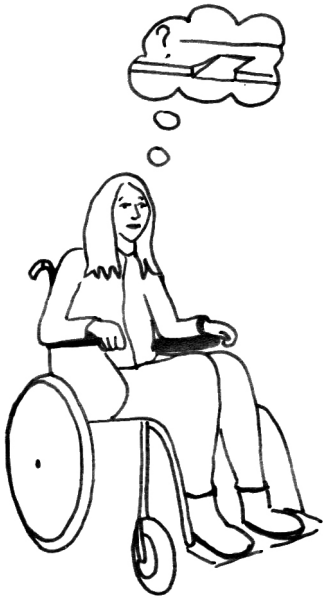


Fig. 3.46 Sidewalk too small to pass another person in a wheel-chair



F.g 3.47 Looking for the dropped curb

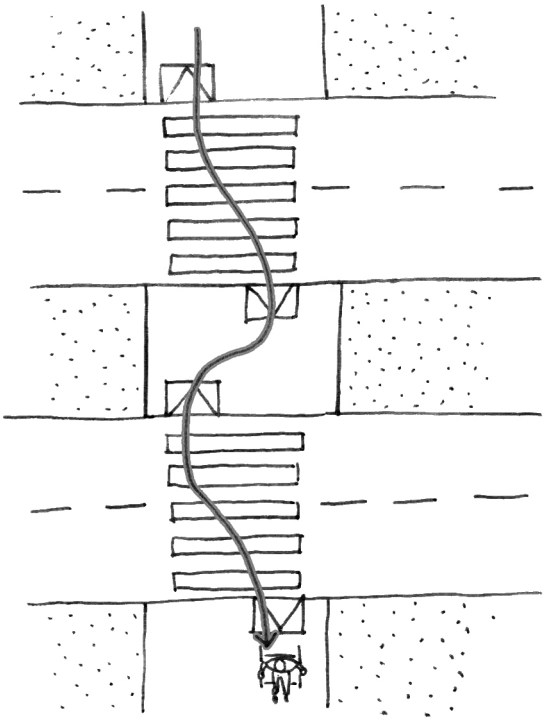


Fig. 3.48 Zigzagging because the dropped curbs are not lined out

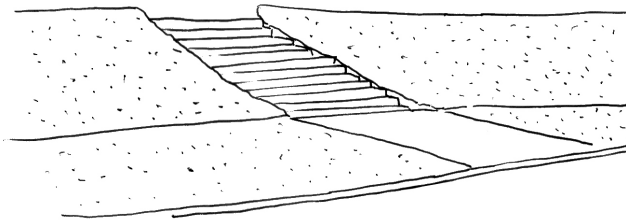


FIg. 3.49 Obstacle: Stairs

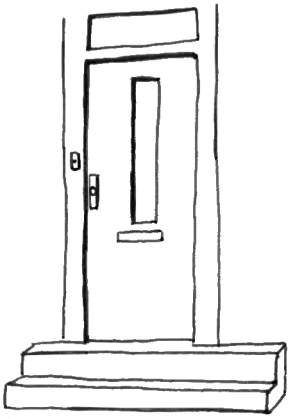


Fig. 3.50 Obstacle: steps

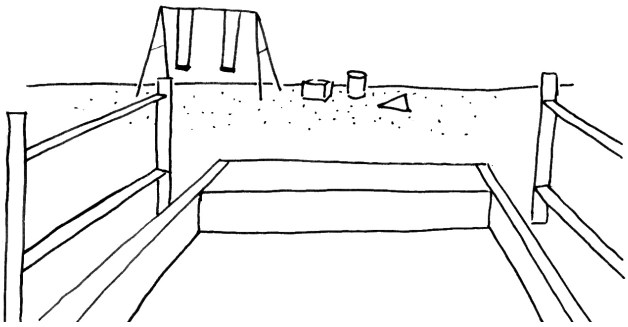


Fig. 3.51 Obstacle: step

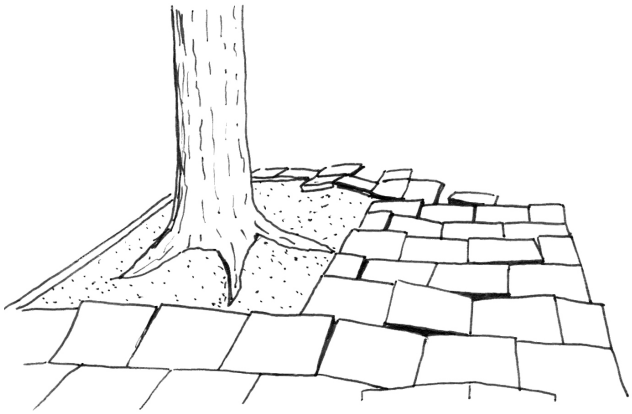


Fig. 3.52 Obstacle: Shaking because of tree roots that press up the pavement

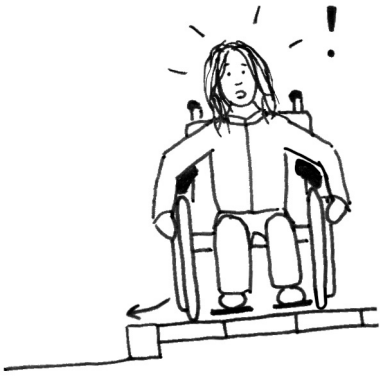


Fig. 3.53 Sagging of the pavement

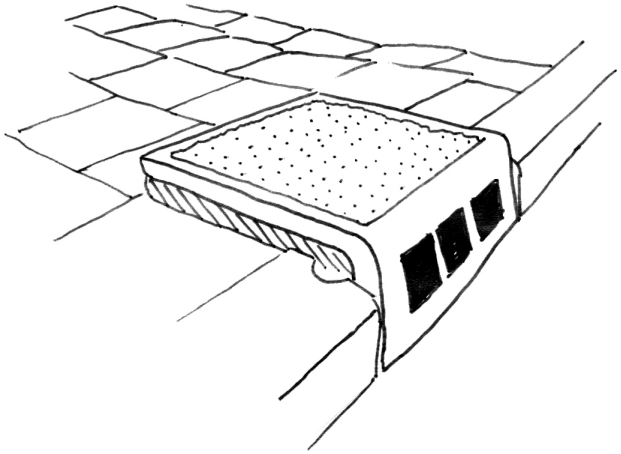


Fig. 3.54 Obstacle: Shaking because of sunken pavement or wells

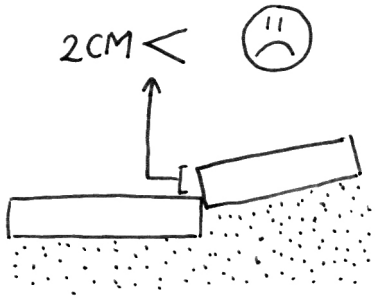


Fig. 3.55 Obstacle: Painful to have height differences from 2 cm and more

See Movie Fragment: 8. Sight Safety

SAFETY

I often debated if it was worth the risk of going somewhere or take the longer detour which would be more exhausting. Sometimes my judgement told me it was not very safe, but there simply was no other option than to take a certain route. Points I looked at to see if it was safe to go somewhere where the following:

- Sometimes there were no dropped curbs on places that would be logical to cross the road or bicycle path. Therefore I needed to go over the road or bicycle lane to get to the place I wanted (fig. 3.56 and 3.57).

- At some crossings, the dropped curb would be in the curve of the road. So, I would end up in the middle of the crossroad (fig. 3.58).

- Sometimes when crossing a road, the view was blocked by an obstacle like a parked car or a large tree which did not enable me to see if traffic was moving my way and if it would be safe to roll off the dropped curb onto the street to cross the road. This was especially a problem at busy traffic roads where the speed of the cars was fast. I needed to rely on my hearing (fig. 3.59).

- On several occasions, I was afraid to fall with my wheelchair. This was when dropped curbs were too steep to safely roll off. When the sidewalk was sagging so much I could not keep the wheelchair straight. Or when those points were combined, making it hard to get on or off the sidewalk at all. Also, when the pavement was too uneven it could cause unsafe situations (fig. 3.60).

- When glass was on my path, I was in danger of puncturing my tires and not being able to go any further (fig. 3.61).

- In the metro, I had very little time to get into the vehicle and put my wheelchair on break. Moreover, it was hard to get into the metro due to the gap between the train and the platform. I got stuck with my front wheel. Luckily somebody came to help me, but it was a scary and stressful experience (fig. 3.62).

- Also, rolling next to the water edge at boulevards without any railing or curb felt quite scary. I tried to keep my distance from the edge (fig. 3.63).

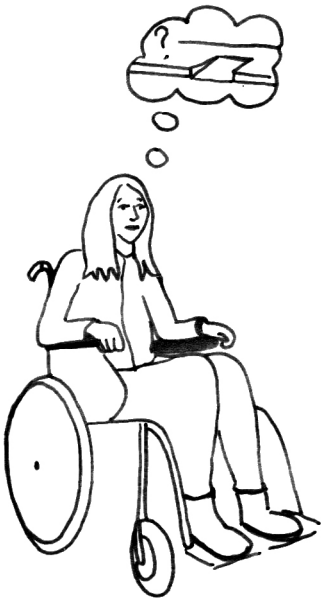


Fig. 3.56 No dropped curb on place I want to cross

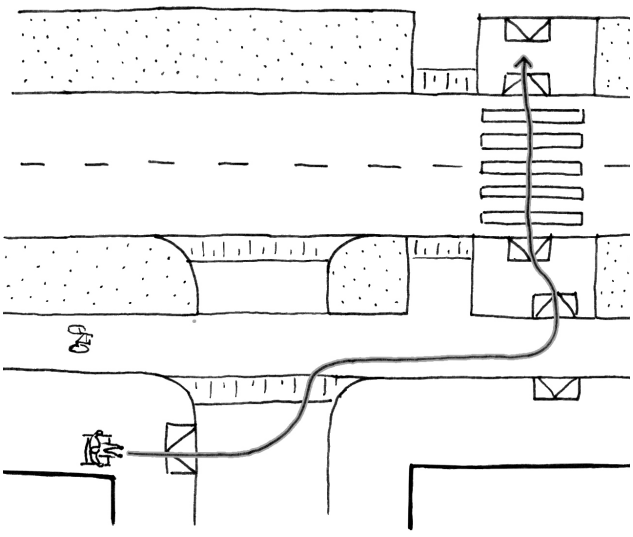


Fig. 3.57 No dropped curb need to go over the bicycle path

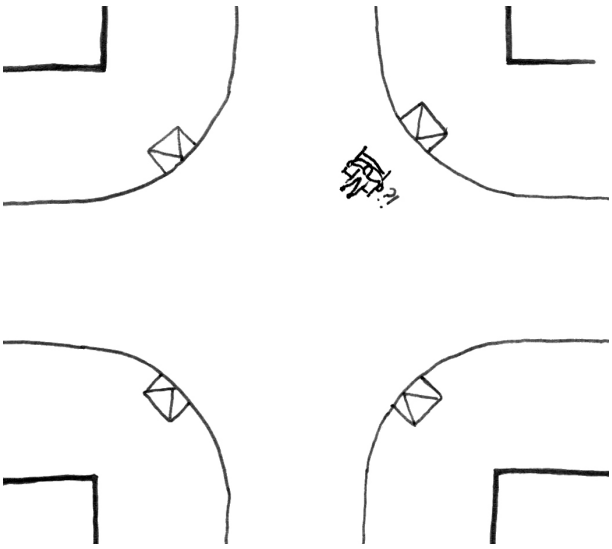


Fig. 3.58 Dropped curb on corner, ending up in the middle of the street

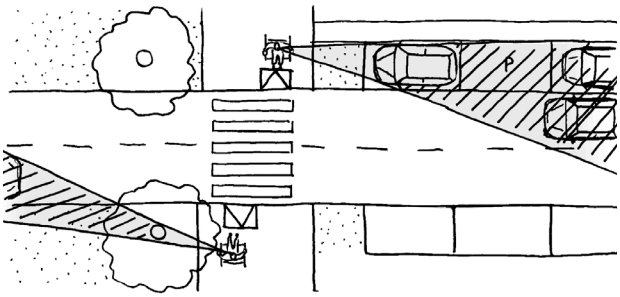


Fig. 3.59 View on road blocked by parked cars or trees.

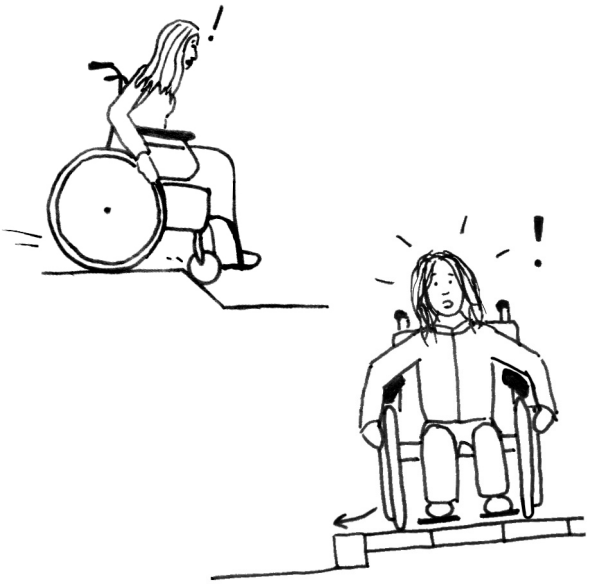


Fig. 3.60 Risk of falling with the wheelchair

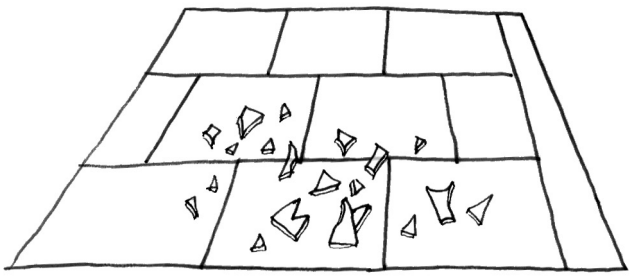


Fig. 3.61 Glass on the sidewalk, risk of punctured tire

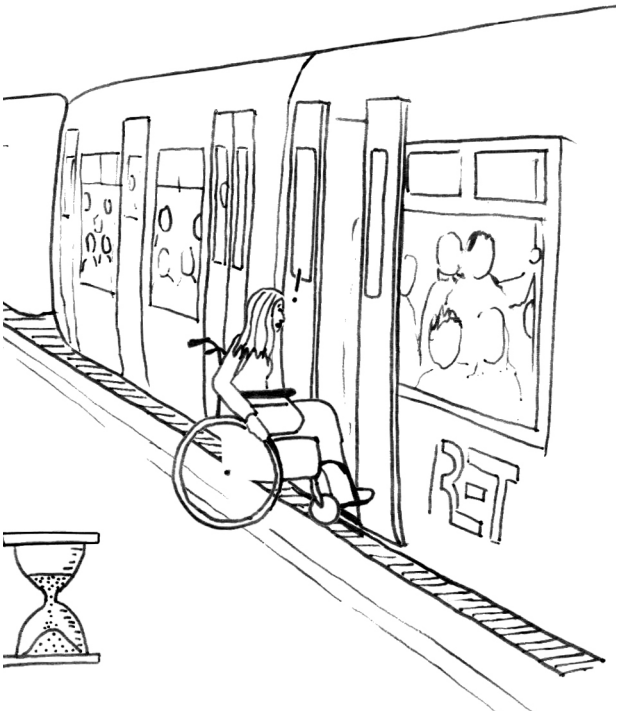


Fig. 3.62 Getting into the metro in limited time, stuck in the gap between the train and the platform

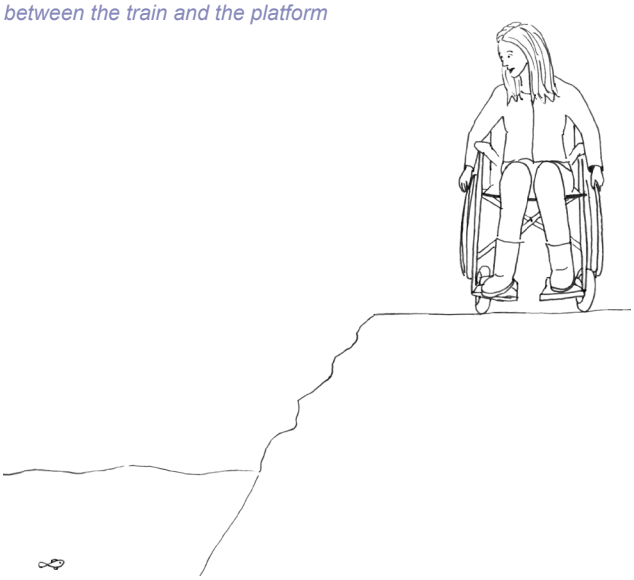


Fig. 3.63 Unsafe to roll next to the water edge with no barriers

See Movie Fragment: 9. Less to enjoy

LESS TO ENJOY

Beside that I needed to focus more on wayfinding, there was also less to be enjoyed while being on a lower level in the wheelchair since:

- I could not get to certain places. For example, I could not get up the dike to enjoy the view over the Maashaven, because there was a stair (fig. 3.64). Also, a lot of buildings like hairdressers but also normal houses had a small doorstep, which makes it impossible to enter (fig. 3.65).

- Because I was sitting closer to the pavement, I was more focussed on the dirt on it. Things I encountered in order of frequency were trash, cracks in the pavement, gum, dog poop, glass, vomit, paint and yogurt (fig. 3.66).

- I was also experiencing more of the stone materials in the cityscape. Not only the pavement, but also the walls. I could look less inside windows/houses. But looked more upon textures like walls, pavement and windowsills, but also parked bicycles and things like mechanical vents that, while walking, you would hardly notice (fig. 3.67).

- Sometimes I could not look over things such as railings and parked cars. An example of this was at the Erasmus bridge. I could not enjoy the view over the river as much as I would like, since I was looking at the railing (fig. 3.68).

- I looked more at people's backsides than at their faces. Although some people might argue that this is not a bad thing, it feels like you have less contact with people and they are looking down on you (fig. 3.69).

- I experienced the leaves of the trees less

- A positive point of sitting in the wheelchair was that lower growing planting was more enjoyable because I was closer to it (fig. 3.70).

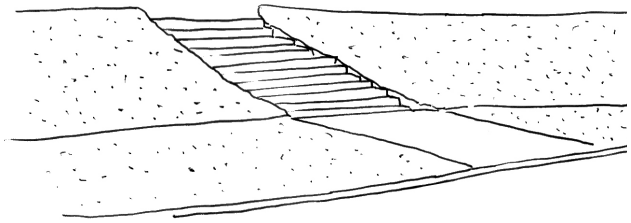


FIg. 3.64 Stairs

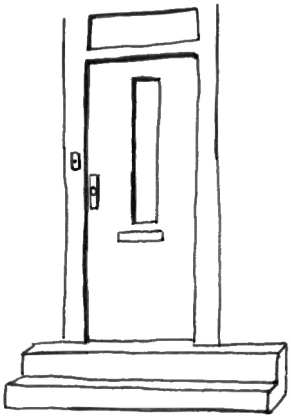


Fig. 3.65 Steps

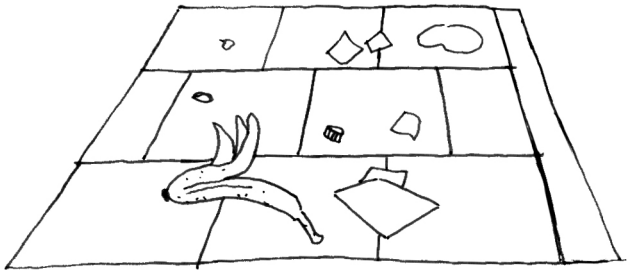


Fig. 3.66 More focussed on the dirt on the pavement

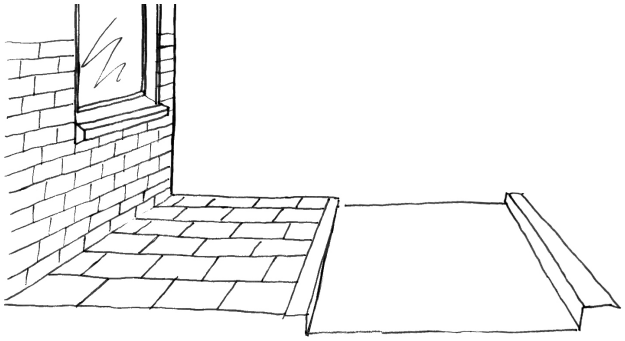


Fig. 3.67 Perceiving more stone surfaces

THOUGHTS AND FEELINGS

See Movie Fragment: 10. Thoughts and Feelings

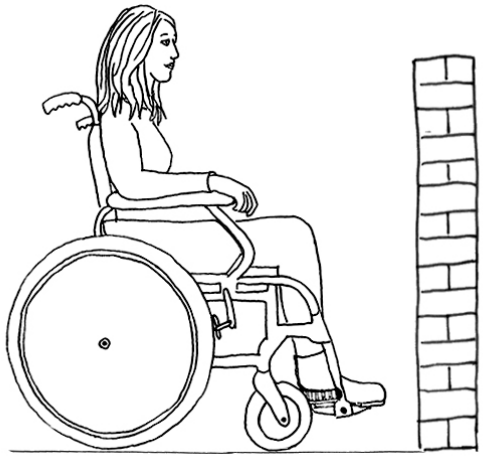


Fig. 3.68 Railings and walls you can not look over in a wheelchair.

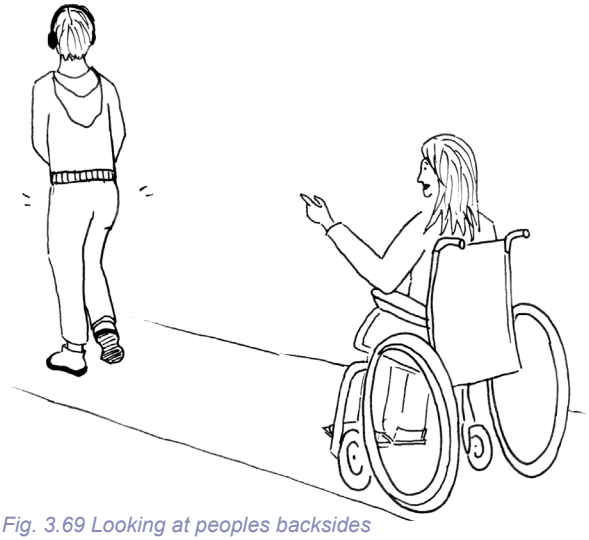


Fig. 3.69 Looking at peoples backsides

Fig. 3.70 Enjoying the planting

I can relate to the literature that states that people in a wheelchair are more reluctant to go outside (Christensen et al, 2010 and Lovelock, 2010). The first time I went outside in a wheelchair I was curious to see what I would encounter and was quite excited about the new experiences.
After a few times though, I started to notice I felt a reluctance to go outside in the wheelchair. I got annoyed and frustrated by all the different obstackles and challenges I encountered and the frequency in which they occurred. Moreover, I could not go as quickly as I would like and therefore also could go less far. It was frustrating that simple tasks I normally would do with ease were so much more difficult or that I simply could not do them myself and required the help of others. When a person was pushing my wheelchair, there were moments that I felt a loss of autonomy because they did not do what I wanted or did not hear me. And some streets felt very monotonous and thus I was quickly bored. I could not enjoy the surroundings as much as I normally do when I go outside for a walk since I was constantly focussing on wayfinding. I was so much more tired after I went outside on a roll compared to a walk. I have felt scared and unsafe when I was forced to take a certain route because there was no other option. For example, I was afraid to fall with my wheelchair. However, the most scary thing was going into the metro. But I also had the fear of not being able to get home because I would have a flat tire or because I would be too tired to get home. I just felt more scared in general, also because I had the feeling that other people were judging me. I got cold way quicker and it was even painful at times. All in all, I simply found it less enjoyable to go outside.
On the other hand, I did enjoy the small things more. Like the singing of a bird, a flowerbed that was low and thus easy for me to see and the fact that I was closer to the water when we were at the Wilhelminapier. It was also kind that some people offered to help me.

3.3 INFLUENCE POSITIVE HEALTH

OVERALL EXPERIENCE

What I noticed was that all the different problems I encountered were present in all kinds of streets and nodes. Every time a problem, unsafe situation or obstacle blocked my path it was a negative influence on my Positive Health (fig. 3.71). It is therefore important to eliminate all obstacles and work on an overall strategy to improve wheelchair accessibility for the entire neighbourhood in which navigating in a wheelchair becomes easier. However, often how narrower the street, the more problems occurred. In these narrow streets, there is a competition for the limited amount of space and thus more problems occur. This was also addressed by the municipality of Rotterdam. Therefore, it is very important to look into the design and the conflicting demands in these smaller streets.

INFLUENCE ON POSITIVE HEALTH

If we look at the scheme of Positive Health in figure 3.72 you can see on what aspects (highlighted in yellow) of my Positive Health were influenced by the physical configuration of the urban public space in the Tarwewijk. I can conclude that the perception of my own positive health decreases significantly when going outside in a wheelchair in comparison to when I would be walking through the city.

By redesigning the urban public space of the Tarwewijk in which these multi-sensory aspects for people in a wheelchair are taken into account, landscape architects can directly influence the health and quality of life of those people. This can stimulate them to go outside more frequently.

CONCLUSIONS PHENOMENOLOGICAL ROLLS

We can conclude that the physical elements that influenced me negatively were diverse, experienced by multiple senses and occurred frequently in all different kinds of places, but especially in narrow streets. Each obstacle is one too many. These obstacles and elements had a big impact on my perception of positive health while sitting in a wheelchair. To improve this an overall design strategy should be developed. This will be discussed in the next chapter.

In this strategy, I will look for opportunities in which the problems I encountered can be translated into design chances to improve the neighbourhood not only for those in a wheelchair but also for other groups in society. In that way, the solutions for accessibility will have a bigger societal backing and thus greater chances to be implemented. In chapter 5 this design strategy will be explained.

Fig. 3.71 Negative impact on Positive Health by the spatial configuration of the urban public space

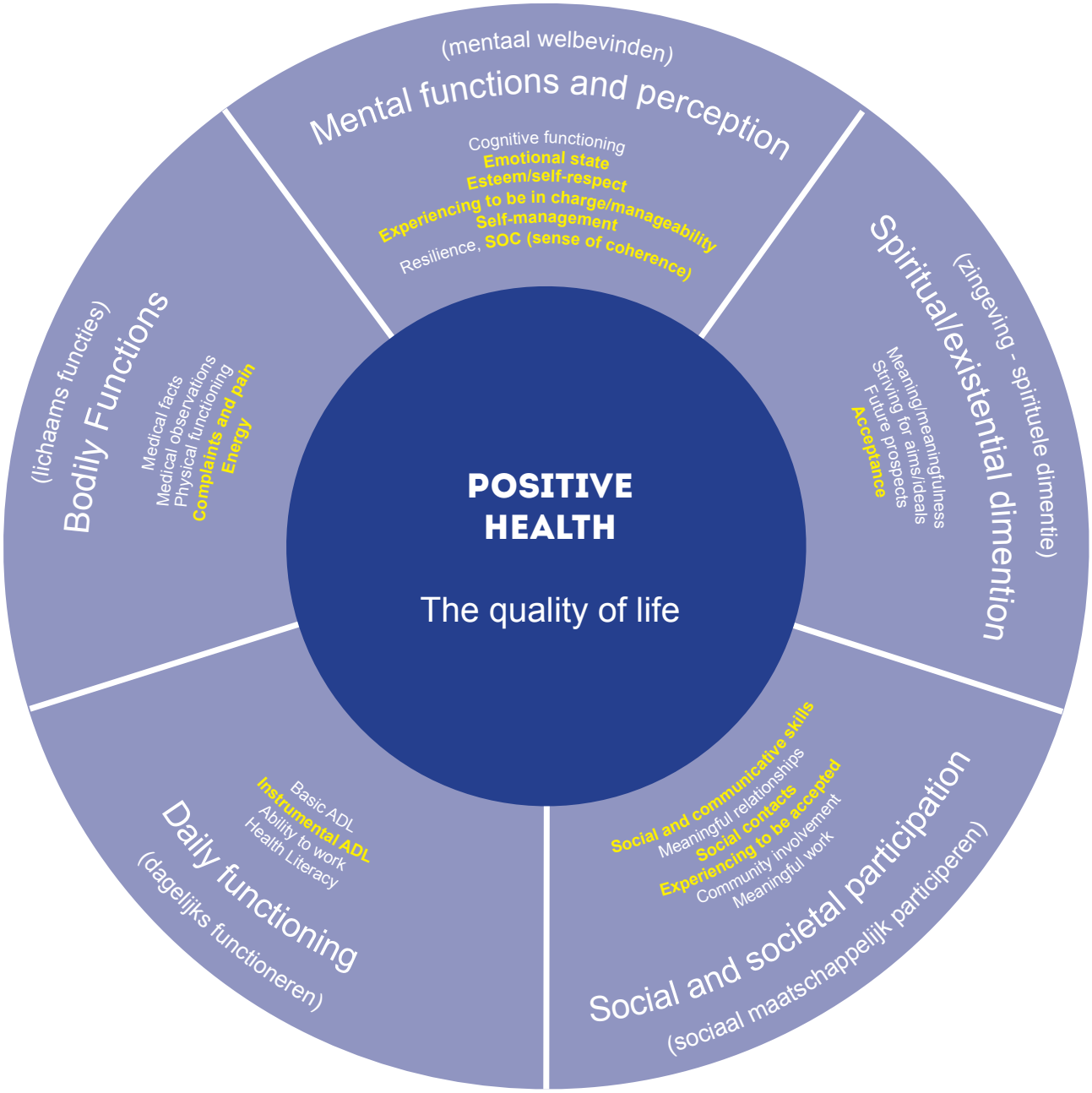
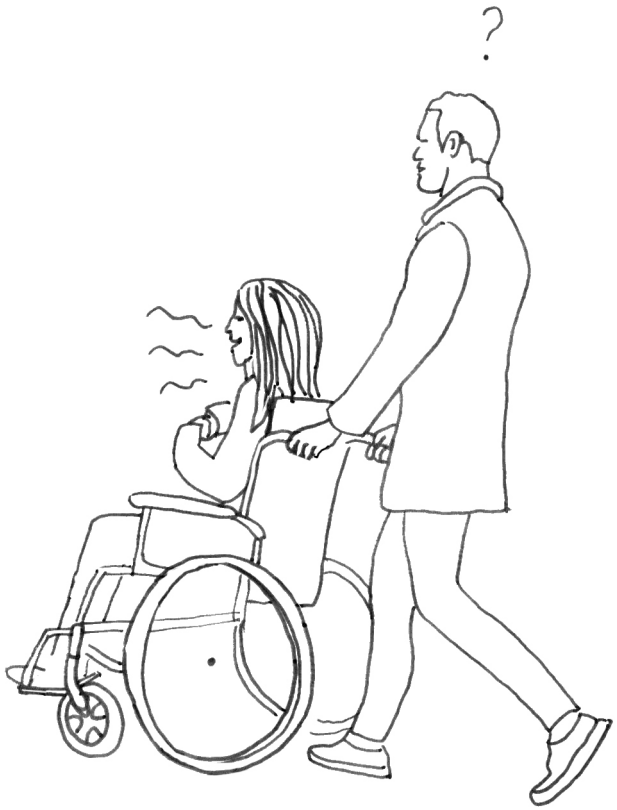


Fig. 3.72 Impact of urban public space on Positive Health

INTERVIEW MUNICIPALITY OF ROTTERDAM



CHAPTER 4

In this chapter, an answer is given to the research question:

'What problems does the municipality of Rotterdam encounter when working on wheelchair accessibility in urban districts (Tarwewijk)?'

All information in this chapter is gathered from the interview with the municipality of Rotterdam. For more details about the method of this interview see page 20. During the interview, we talked about the problems and chances for wheelchair accessibility in the Tarwewijk and urban districts in Rotterdam in general.

4.1 WHEELCHAIR ACCESSIBILITY IN URBAN DISTRICTS

In comparison with a Garden city (tuinwijk) which is set up more spaciously and multiple ambitions rarely cause conflicts, wheelchair accessibility in an urban district such as the Tarwewijk is way more complex. The streets are narrow, the building density high and there is a mixed use of functions. Spatial issues in urban districts like the Tarwewijk are complex, because there is limited space and different demands battle for this small amount of space. Examples are the amount of parking spaces, garbage collection points and greenery. The pressure on the limited space only rises as even more demands are placed on this limited amount of space. Examples of these demands are the ambitions to have more greenery, more bicycle parking spaces and circular waste management (thus more containers). All these different ambitions battle for the same space as (wheelchair) accessibility (fig. 4.1). This causes much debate and complex problems that are not easily solved.

In order to better understand these problems and design better accessible urban districts one should first know how the public open space is renewed. Secondly, what chances are there to improve wheelchair accessibility. Lastly, what problems the municipality currently faces when they try to improve accessibility in urban districts.

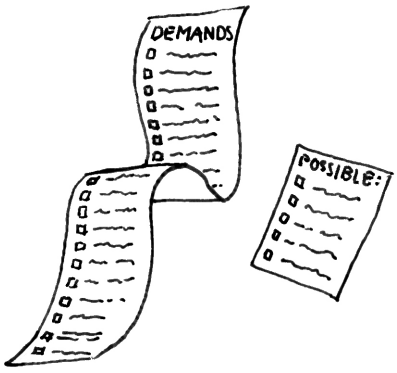


Fig. 4.1 Multiple demands and limited space

Fig. 4.2 Polderbaan broken open and redesigned to renew the sewer

CYCLE OF RENEWING THE PUBLIC URBAN OPEN SPACE

The cycle of the renewal of the urban open space takes approximately between 50 and 60 years with two major steps:

- Approximately 30 years (may vary between 20 and 40 years) after the construction of an urban open space the first round of maintenance must take place. The street will be broken open to extract all stones, level out the sandbed/cunet and all the old stones will be put back into place. In principle, the design of the streets does not change, however there is a small window of opportunity to make some minor adjustments.

- Approximately 60 years after the initial construction, the sewer and the old stones need to be replaced. The entire street must be broken open (fig. 4.2). Bigger changes can be made in the layout of the streets. For example, make a sidewalk bigger or smaller, add an extra side street or plant trees.

4.2 CHANCES WHEELCHAIR ACCESSIBILITY

Beside the maintenance cycle of approximately 60 years there are several other opportunities to address the accessibility of the public urban open space. Those are listed below:
Some prominent places in the city are more frequently renewed than the maintenance cycle, to beautify the cityscape. Those places are significant for the image and reputation of the city and thus are given a higher priority. Examples of this in Rotterdam are the Coolsingel, Hemelsingel and the Euromast Park. Unfortunately, the Tarwewijk is not eligible. Yet in a neighborhood like the Tarwewijk it is sometimes possible to get a budget to upgrade places that have a high significance for the entire neighborhood. Such as a square on a prominent route.
The municipality of Rotterdam has started a pilot in Overschie to construct a 'Plus route'. A 'Plus route' is a route where the focus is put on addressing important places to stay and important walking routes for elderly people. For this reason, it is possible to prioritize maintenance, management and budget to keep elderly people mobile longer and thus live independently longer. Key values on the 'plus routes' are: the footpaths must be accessible for everybody, they must be safe (so without obstacles or sagging pavement) and have a positive influence on the living environment and thus on the people of Rotterdam. In addition, water-permeable materials should be used to make the city more resilient for climate change. The pilot is evaluated in order to determine the added value of those specific routes. If the value is significant 'Plus routes' can be created at other places.
A specific chance for the Tarwewijk is the construction of city heating (stadsverwarming). The existing buildings of the Tarwewijk are difficult to improve with isolation. Connecting the neighborhood to the city heating network is there for a logical step to make the neighborhood more sustainable and eco friendly. The entire street will have to be broken open in order to construct the city heating network. So, in principle you could start over and redesign the public open space. That is a big opportunity to make the neighborhood more accessible. However, a side note that must be made. Completely renewing the streets will probably come with a very high price tag. Often people at the municipality underestimate the price tag of ambitious plans and go back upon one's word to renew the entire neighborhood. At the moment, a pilot with city heating is done in another neighborhood. The municipality is waiting for the test results to evaluate the benefits of city heating for other urban districts. If the results are positive, the Tarwewijk qualifies for city heating. This will open up an opportunity to renew the urban public space to make it more accessible.
Plans that have an added value for tourism in the city are stimulated within the municipality. The question is if the Tarwewijk has potential for this.
The neighborhood committee (buurtbestuur) can be an important link between residents and the municipality to improve certain streets. Each year an evening with residents is organized where people can give their opinion about their residential street. Accessibility can be addressed in these meetings as well.
Smaller problems can be reported through the Buitenbeter-app. Small defects like a loose tile can easily be reported by sending a picture, location and description of the problem. The reported problems will be addressed within 48 hours. This is faster than reporting a problem by phoning or emailing the municipality.

4.3 PROBLEMS WHEELCHAIR ACCESSIBILITY

In theory, there are enough opportunities to renew or adapt the public open space in order to make the entire city accessible within the next 60 years. However, in practice it is not as straightforward due to the following reasons:

During the 30-year management and maintenance period there is no overall vision, design or strategy implemented on the urban public space. The initial designer of a space does not stop by anymore and random objects are placed within the public realm. This is done by residents, but also by stadsbeheer (urban management team). Objects are added or removed, for example a container or some flowerpots. In this maintenance period, strange and problematic situations for wheelchair accessibility come into existing due to this lack of supervision.

Another problematic point is when plans are made for the public open space, about 90% of the plan is constructed like it should and the other 10% goes wrong. Unfortunately, those mistakes are not fixed.

Ten years ago, new guidelines were developed for the accessibility of the city. The first five years after the implementation of these guidelines people did not know that they needed to work with them. Moreover, it turns out that in practice some of these guidelines are not very practical. For example, to link drainage with dropped curbs. The drainage works best when it is put on the corner of the street, however this means that people in a wheelchair end up in the middle of an intersection when they go off the dropped curb to cross the road. This causes unsafe situations and less comfort for the person in the wheelchair. Also, the link between the dropped curb and the marking tiles for people with a visual impairment is not practical. Because the structured tiles cause shaking of the wheelchair and this complicates going up the dropped curb. In the new guidelines, the guidelines from the examples have changed however in the past ten years those guidelines are already implemented in public space. The guidelines with my evaluation based on the phenomenological rolls of chapter 3 can be found in appendix A.

This brings us to another important point. To optimize accessibility for people in a wheelchair, ideally you would want a quite smooth surface. A logic design strategy can be found in shared space in which the surface is level and cars share space with pedestrians and bicyclists. However, shared space causes big problems for people with a visual impairment for two reasons. Firstly, they cannot orientate themselves with their white canes due to the lack of guidance lines. Secondly, they cannot see the other users. This can create unsafe situations because safety in shared space is based on the theory that you look out for each other. People with a visual impairment must also be taken into account when designing wheelchair accessible spaces.

Safety also causes discussion in other areas as can be seen in the example below.
A standard crosswalk has a width of 5 meters and has a dropped curb with a width of 1 meter. As a result of this design, people who walk fastest cross first, secondly people who walk a slower pace, then the people with a stroller and at last the people in a wheelchair. Before you know it, the traffic light turns red and people in a wheelchair have to wait for a second time in the middle of the road for the traffic light to turn green again. A logic thought will be, why don't we just extend the dropped curb from 1 meter to the entire width of 5 meters to ensure that people in a wheelchair, a stroller or tourist with a trolley can cross more quickly and easily. But in practice this causes a lot of problems. Cars ride onto the curb causing unsafe situations and broken tiles due to the weight of the cars. The safety of pedestrians is compromised, the risk of being run over by a car is way bigger. Safety of all users is thus another big issue to keep in mind when making the city wheelchair friendly.

As I mentioned before, in the old guidelines from 10 years ago there are rules that turned out to be insufficient in practice. The municipality of Rotterdam is renewing the guidelines to address these insufficiencies. For example, in the new guidelines there will be a rule that curbs have to be 1,80 meter in width and only can have a few points where they are allowed to be narrower. In the new guideline book of the municipality accessibility will get its own chapter with better guidelines than before. However, this is a period in which many big transitions need to take place such as climate adaptation, energy transitions

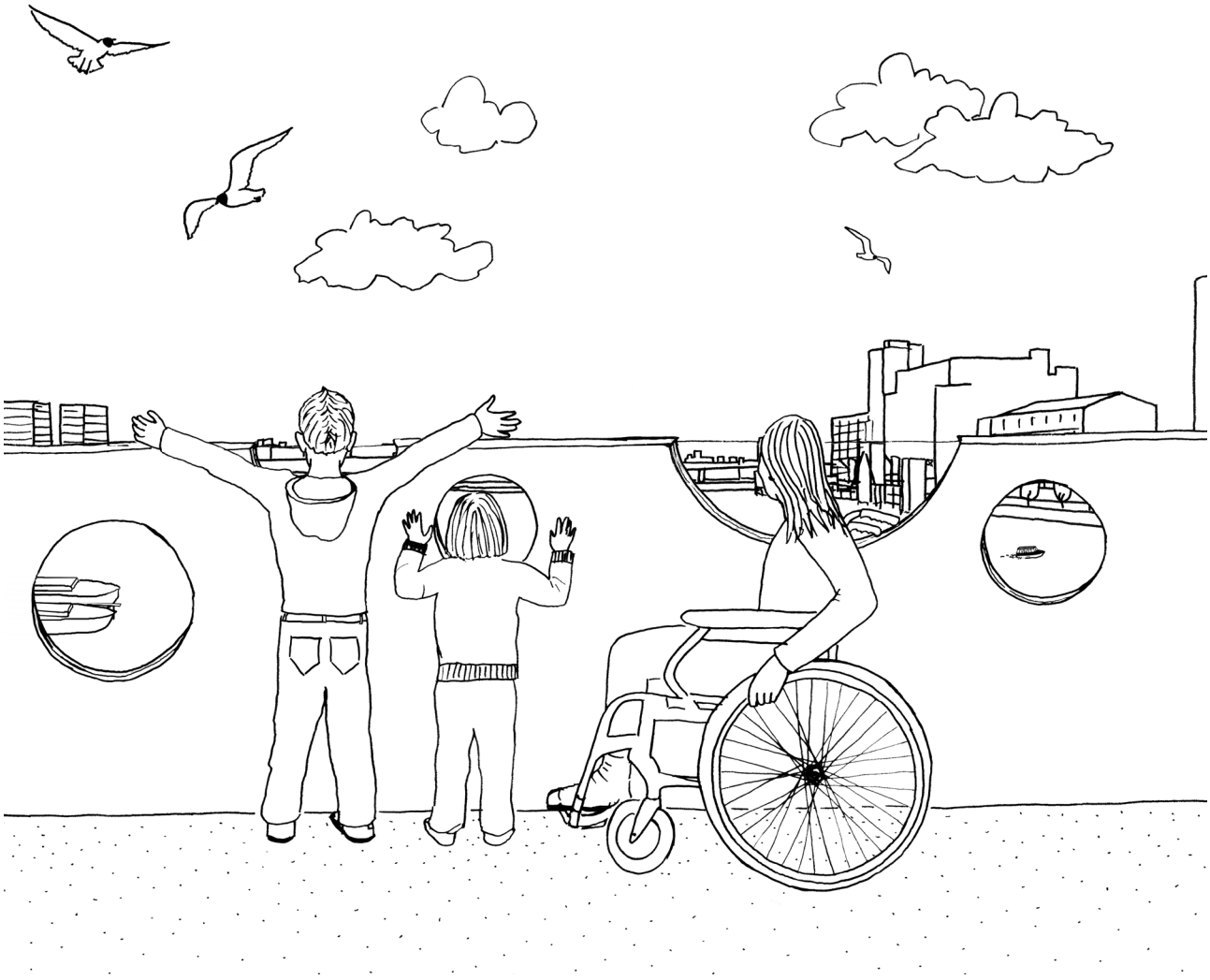
and mobility transitions. Those points are also put into the new guideline book. The problem will be that those guidelines are conflicting for space with accessibility. There is a big list of demands and only limited space. Consequently, some demands are ignored. An example of this is the construction of façade gardens. In Rotterdam people are allowed to remove a row of pavement tile of the sidewalk directly in front of their houses and plant them. For the municipality of Rotterdam this is a cheap way to achieve the goal of creating greener streets to minimize the effects of climate change. The municipality has no cost for the maintenance, because the residents are responsible themselves. As a result, plants often hang over the sidewalk and people in a wheelchair cannot pass.
It is important that accessibility gets a higher priority in the list of demands, even more so in a neighborhood like the Tarwewijk in which space is limited and problems in accessibility often occur. Whether accessibility will get this higher priority is a question that cannot be answered right now. A tensive political game has to be played to try and achieve this.

Nonetheless, it is rather difficult to convey the relevance of accessibility to colleagues. Everything that is written down or drawn about accessibility hardly works to let sink in the message to others. This is because the municipality of Rotterdam makes a lot of policies. If a person would start reading at the beginning of the year, he would still be reading when the next year starts without having done anything in practice. That does not take us anywhere. We need guidelines and policies, but the main point is to let people understand the importance of why we need to address accessibility. If they understand this, they directly understand how the guidelines and policies must be implemented. To let them understand the 'why', face to face conversations work best. You can compare it with old-fashioned missionary work or Jehovah Witnesses that pass along people's houses. Especially letting people experience what it feels like to sit in a wheelchair for themselves works well. Because sometimes you need to experience it yourself in order to really understand a problem. In Rotterdam we say: 'Niet lullen maar poetsen' which means less chit-chat, take action.
However, another problem arises since we cannot reach all the civil servants because the municipality of Rotterdam is too big to reach all of them face to face. This is also why it takes a long time before the implementation of new accessibility policies' take such a long time. A strategy must be formed to raise more awareness among people. That it becomes self-evident to make places accessible. Because at the moment when a place is not accessible after it is constructed, it stays that way and nobody cares. While it would be more prudent to invest a little more money, and fix those mistakes. Making places pretty is easy if you forget functionality. We need to turn it around and put function first. It is important to keep raising awareness for accessibility or it will easily be forgotten.

4.4 CONCLUSIONS

We can conclude the following about what problems the municipality of Rotterdam encounters when working on wheelchair accessibility in urban districts like the Tarwewijk. In urban districts the list of demands and the limited amount of space available cause conflicts. One of the biggest problems is convincing colleagues that wheelchair accessibility should get a higher priority above the other demands of the public open space.
Also, the implementation of the guidelines take time and have some errors in them. After a project is realized, mistakes during construction are not fixed and in the next 30 years there is no control on what happens in the public open space, this should be taken into account when designing. When designing solutions for wheelchair accessibility safety should always be kept in mind. This includes the safety of visually impaired people.
There are several chances to renew the public open space and improve wheelchair accessibility. The maintenance cycle of the public open space, the construction of the urban heat network and Plus Routes are the biggest chances. But also, tourism and important places to stay within a neighborhood can be a chance to renew the public open space.

DESIGN



CHAPTER 5

Answering the research questions provided the knowledge on what multi-sensory problems exist in the Tarwewijk (chapter 3). The problems the municipality encounters, the opportunities to improve wheelchair accessibility and what their guidelines for wheelchair accessibility are (chapter 4). Together with the theoretical framework (chapter 2) and the landscape analysis that will follow in this chapter they form the basis for a research based design in the Tarwewijk. To answer the design question *'How can wheelchair accessibility in the Tarwewijk be improved?'*
a research through design process took place and a design strategy was formed.

5.1 LANDSCAPE ANALYSIS

In order to design a thorough understanding of the landscape must be formed.

HISTORY

Rotterdam is a delta city with the largest port of Europe. The Maas river cuts through the middle of the city splitting the city in two. The city started developing in the 13th century next to the river the Rotte. In 1872, the Nieuwe Waterweg was dug, connecting Rotterdam directly with the North Sea. (Van der Bolt et al, 2010). On the north bank of the river were the first small harbours. The South bank used to be mainly farmland (fig. 5.1). When the harbour needed to expand the south bank was used for much larger scale harbours. Also, dwellings were built in the south for the harbour workers.
In 1895 the almost 2 km long Maashaven was dug, cutting off the network of logical routes in the landscape (fig. 5.2). The Maashaven became the economic centre of Rotterdam. Also for the local residents the Maashaven was an important place for recreation and a big market at the Maashavenkade where people locally bought their food (Stadmakerscongres, 2019).

In the period of 1937 till 1942 the Maastunnel was constructed forming an important connection between the northern and southern side of the city. In the beginning the tunnel was mostly used by bicycles, but when cars got a more prominent place in our society the Maastunnel was more frequently used by cars. Therefore in 1960 Maastunnel trajectory was established to reinforce this connection. This resulted into a highway (Doklaan and Pleinweg) in between the neighbourhoods in the south of Rotterdam (Stadmakerscongres, 2019).

After the 'watersnoodramp' (a big flood disaster in 1953 in the Netherlands) dikes were raised to prevent a repetition of the disaster. With the construction of the dikes, old lanes were replaced by roads (Brielselaan) for car traffic as an answer to the growing number of cars in the city. As a result, the direct connection between the Tarwewijk and the harbour was lost (fig. 5.4) (Stadmakerscongres, 2019).

In the 60s the Maasvlakte was being developed and more laborers were needed. As a consequence, migrant workers from South Europe, Africa and Turkey were brought to the Netherlands to work in the ever-growing harbours. Many dwellings in Rotterdam South were bought by harbour companies for their labourer migrants and they lived with many people in small houses. Conflict arose between migrants and locals about affordable housing. There was a lot of political turmoil and as a result big violent riots took place between 1960 and 1970 (Datema, 2015). Nowadays the south of Rotterdam has to deal with the bad image that was formed during this time period. It is still seen as a poorer, unsafe, multicultural area with lots of poverty and criminality. Even though Rotterdam South has drastically improved ever since.

With the opening of the Erasmusbridge in 1996 the second big highway (Postumalaan, Maashaven

Fig. 5.1 Rotterdam in 1890

Fig. 5.2 Rotterdam in 1907

Fig. 5.3 Rotterdam in 1937

Oostzijde, Dordtselaan) through the city was a fact (Stadmakerscongres, 2019).

As a result, the Tarwewijk nowadays lies like an island in between busy roads (Pleinweg, Brielselaan and Dordtselaan) and the dike and its connection to the harbour is lost (fig.5.4). We can see that overall the South of Rotterdam is very car oriented. Parked cars are a prominent element in the streetscape.

CURRENT LANDSCAPE

The Tarwewijk lies on an interesting location between the touristic Kop van Zuid, trendy Katendrecht and the Hart van Zuid (a busy shopping centre with Ahoy, a transportation hub and the Zuiderpark around the corner) (fig. 5.5 and 5.6). On the other side the Tarwewijk borders the Maashaven and the concert hall the Maassilo. Metro, tram and bus connections are at hand and the city centre of Rotterdam is only 3,5 km away. Yet, the Tarwewijk does not feel connected to those places. The way the houses are situated, the dike and road patterns all play a part in this. It is not inviting to go into the neighbourhood.

Moreover, if you look at tourist maps of Rotterdam you can see that they all stop at the Kop van Zuid and focus mainly on the north side of Rotterdam. It is as if the South is forgotten and still suffers from their imago of the past. If you take the time to look into these neighbourhoods you can see that there are a lot of hidden gems. The proximity to the harbours, artistic initiatives and a mix of cultures makes Rotterdam South a lively and interesting, yet neglected, part of the city. There are many architecturally interesting buildings. For example in the middle of the Tarwewijk lies the expressionism national monument school building designed by architect van der Steur (Gemeente Rotterdam, 2020)

As explained before in the introduction of this thesis the Tarwewijk scores low on the ‘leefbarometer’ and is labelled as a forgotten neighbourhood. An improvement of the public open space is necessary to improve this (Uyterlinde and van der Velden, 2019). However spatial design in urban districts like the Tarwewijk are complex, because there is limited space and different demands, including wheelchair accessibility, battle for this small amount of space. The municipality of Rotterdam has a wish to attract young families, tempt people to settle down in the Tarwewijk, and grow old here. So, the Tarwewijk will evolve into a diverse and dynamic neighbourhood where people are proud about and feel connected to. There is already a process going on of creating a more diverse mix of housing types (Wijkcomité Tarwewijk, 2018). Also, they wish that the streets become greener and the neighborhood better connected by a fine slow infrastructure network connecting the waterfront of the Maashaven and the Zuiderpark and that the facilities in the neighborhood increase (NPRZ, 2019). These goals also stroke with the aim of this design to improve the (wheelchair) accessibility.

The guidelines for accessibility from the municipality of Rotterdam and remarks based on the problems encountered during the phenomenological rolls can be found in appendix B on page 96.

Fig. 5.4 Traffic analysis

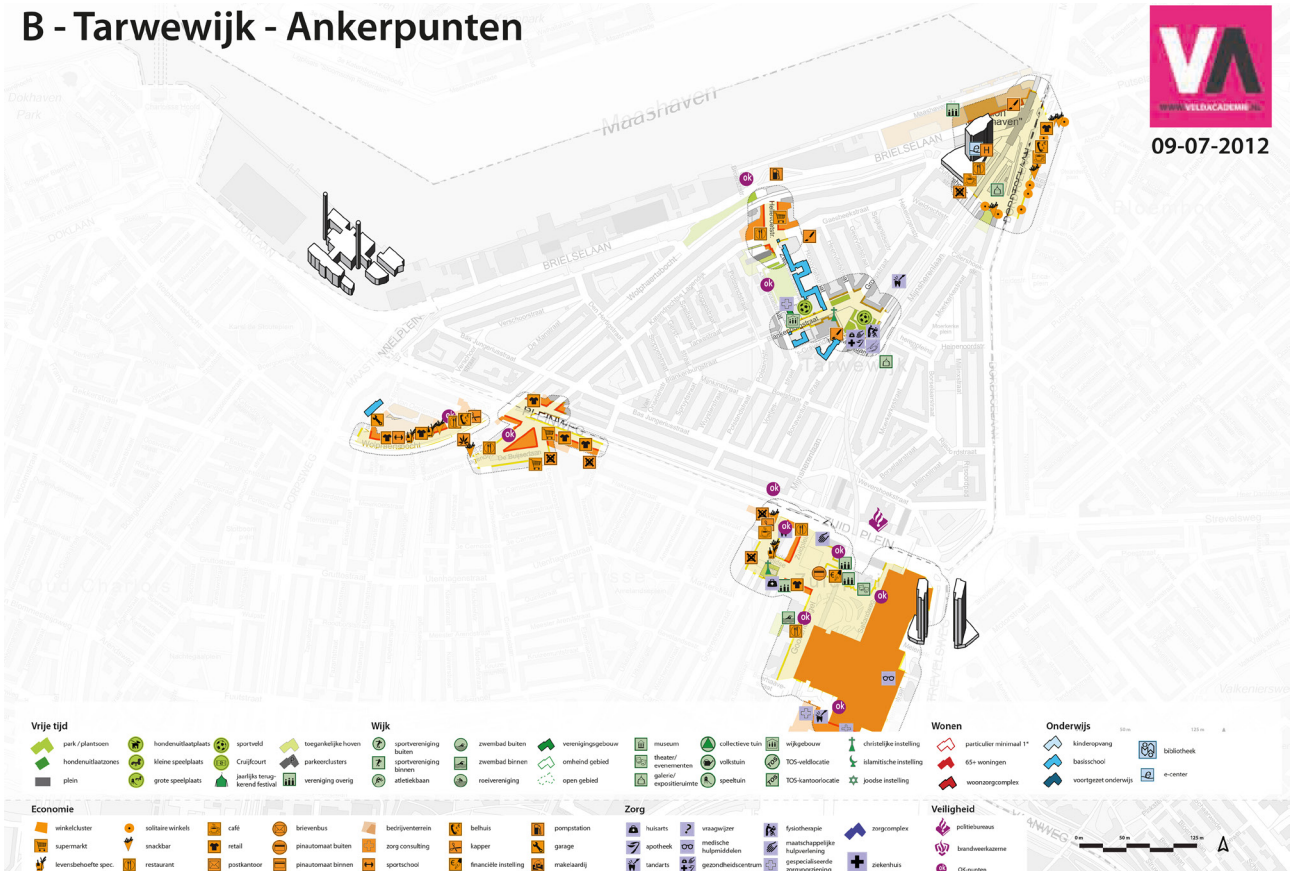


Fig. 5.5 Places to stay in the Tarwewijk

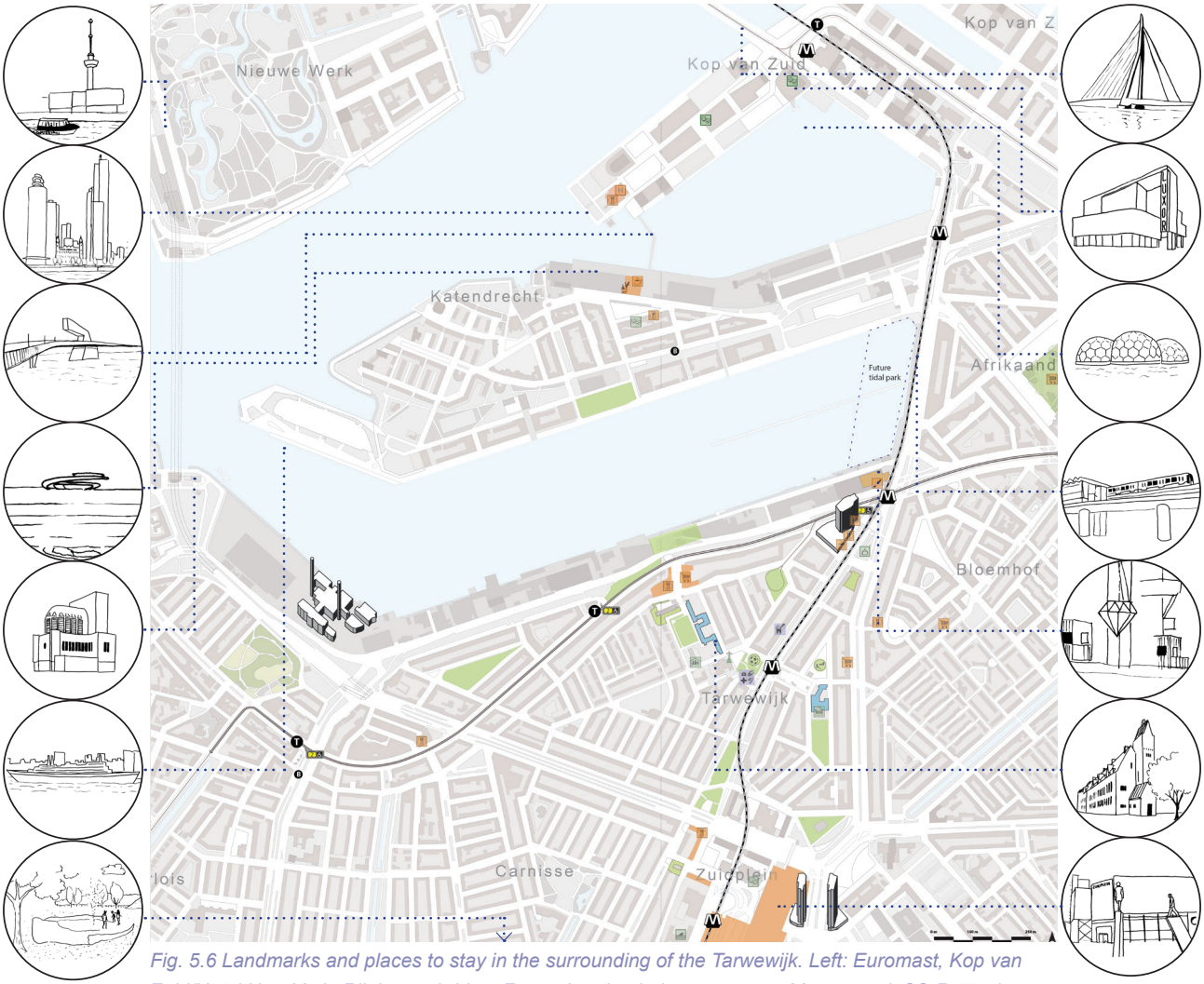


Fig. 5.6 Landmarks and places to stay in the surrounding of the Tarwewijk. Left: Euromast, Kop van Zuid/Hotel New York, Rijnhaven bridge, Future Landverhuizersmuseum, Maastunnel, SS-Rotterdam, Zuiderpark. Right: Erasmus bridge, Luxor theater, Drijvend Paviljoen, Metro, Event space Maassilo, national monument school, Shopping center Zuidplein/Hart van Zuid/Ahoy.

5.2 DESIGN STRATEGY

The aim is to make a realistic design for an accessible Tarwewijk. The Design takes into account the other spatial demands (add more green, parking, bicycle parking, space for emergency transport, streetlights, traffic signs, electrical car loading points etc.) on the urban space but with accessibility as the main priority. It (the design) can be used as a tool for discussion and shows the relevance and importance of accessibility in relation to other demands in the urban open space.

The design strategy has three steps:

Step 1
(Fig. 5.7) Create Plus Routes that connect important places and in which accessibility and slow infrastructure are the main priority. Bearing in mind the concept of positive health.

Step 2
(Fig. 5.8) Connect the other/adjacent streets to these Plus Routes when the opportunity arises because each obstacle is one to many.

Step 3
(Fig. 5.9) Improve the public transport to improve the accessibility of the Tarwewijk and discourage car usage.

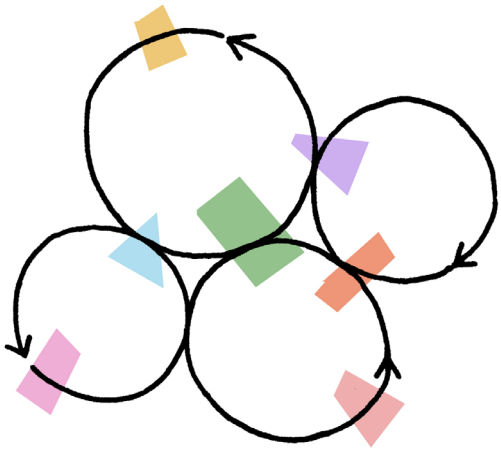


Fig. 5.7 Step 1 Create Plus Routes that connect important places

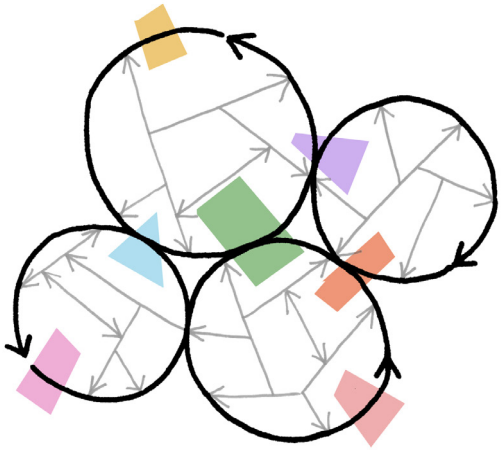


Fig. 5.8 Make other streets wheelchair accessible

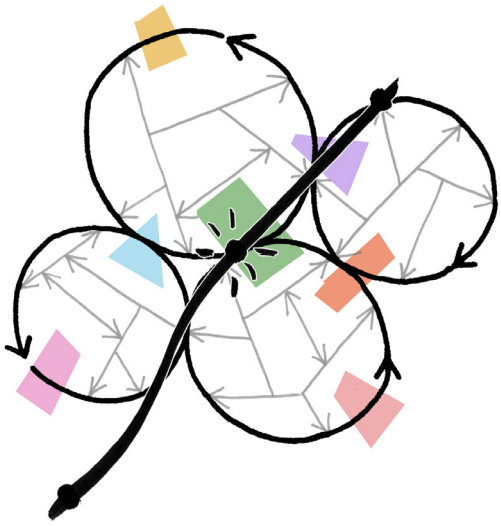


Fig. 5.9 Improve public transport

STEP 1 PLUS ROUTES

On the map (fig. 5.10) you can see the four different Plus Routes that are important to improve the accessibility in the Tarwewijk. By creating those Plus Routes a slow infrastructure network of 2 a 3 km rounds comes into existence. It provides the opportunity to make a route as long as you like by combining different routes. This is beneficial when you like to go for a run, a walk or a roll. But important is that 2 a 3 km is the distance in which it is comfortable to be outside while sitting in a wheelchair during winter like experienced during the phenomenological rolls.

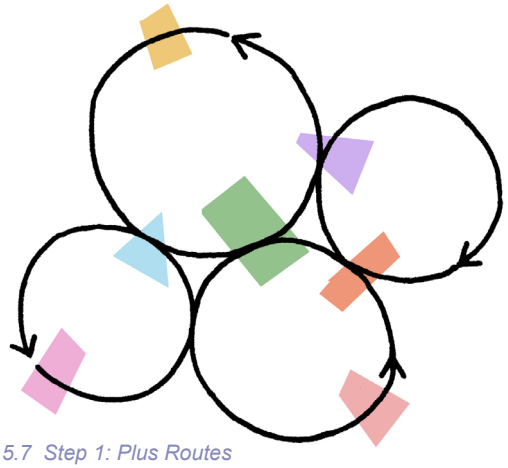


Fig. 5.7 Step 1: Plus Routes

1

The first route (green), restores the historical connection over the Maashaven towards Katendrecht (Deliplein with restaurants, theater Walhalla, the Fenix food factory etc.) and the Whilhelminapier/ Kop van Zuid (Hotel New York, photo museum etc.). From there on you can easily go to the Erasmus Bridge towards the city center. In the Tarwewijk it connects the Maashaven Zuidzijde kade, a small shopping area, schools, the Mijnsherenplein with the church and apothecary, more schools and a playground, towards Bloemhof. This offers an alternative, more pleasurable and faster route towards the city center that is free of traffic lights and does not lie next to a busy road. At the same time it also works the other way around and can seduce people and tourists further into Rotterdam South.

2

The second route (orange), connects to the first route in the middle of the Tarwewijk. On this junction, cars will be cut off and on this square a new metro station will be created. This restores the frequency of metro stops just like in the city center. The route will start at the Maas silo and will lead to the shopping center Zuidplein (Hart van Zuid/Ahoy) and can, from there on, connect to the Zuiderpark.

3

The third route (blue), is based on a plan formed by Mecanoo architects (fig. 5.11), the slow line: a design for a future green route in Rotterdam South from west to east, between the Waalhaven Zuid to the new neighborhood Feyenoord city (and NS train station Rotterdam Zuid). The aim is to restore the connection between the harbours and the city. On this route existing places to stay can be linked and new functions like education, cultural initiatives and places to sport can be developed. This route also connects to the Maastunnel, a less known icon in Rotterdam that connects the north and south bank. A new kind of bus, the fast bus, will improve the public transport system on this route. The fast bus will make it easier and quicker to get to multiple neighbourhoods in the South of Rotterdam. By turning the Ns train station Rotterdam Zuid into an intercity station Rotterdam South will be easier to reach. (Stadmakerscongres, 2019).

4

The fourth route (yellow), makes the network in the Tarwewijk complete by connecting the second (orange) and third (blue) route. It provides a sheltered route towards the Maastunnel and the Waalhaven instead of the route next to the busy regional road the Pleinweg. It also connects the playground on the crossing with the Manstraat and the park at the Wevershoek. At the Bas Jungerius straat this route will provide the opportunity to boost some life into small retail premises that are currently empty.

Together they will form the basis for an accessible neighbourhood. The Plus Routes can be recognized by the orange asfalt bicycle lane and the use of rectangular 30x60 cm smooth (not washed out top layer) anthracite colored concrete tiles in the walking direction on the sidewalk (fig. 5.12).

Let's zoom in to two important points that are on these Plus Routes to show how these Plus Routes can help to make the neighbourhood accessible.

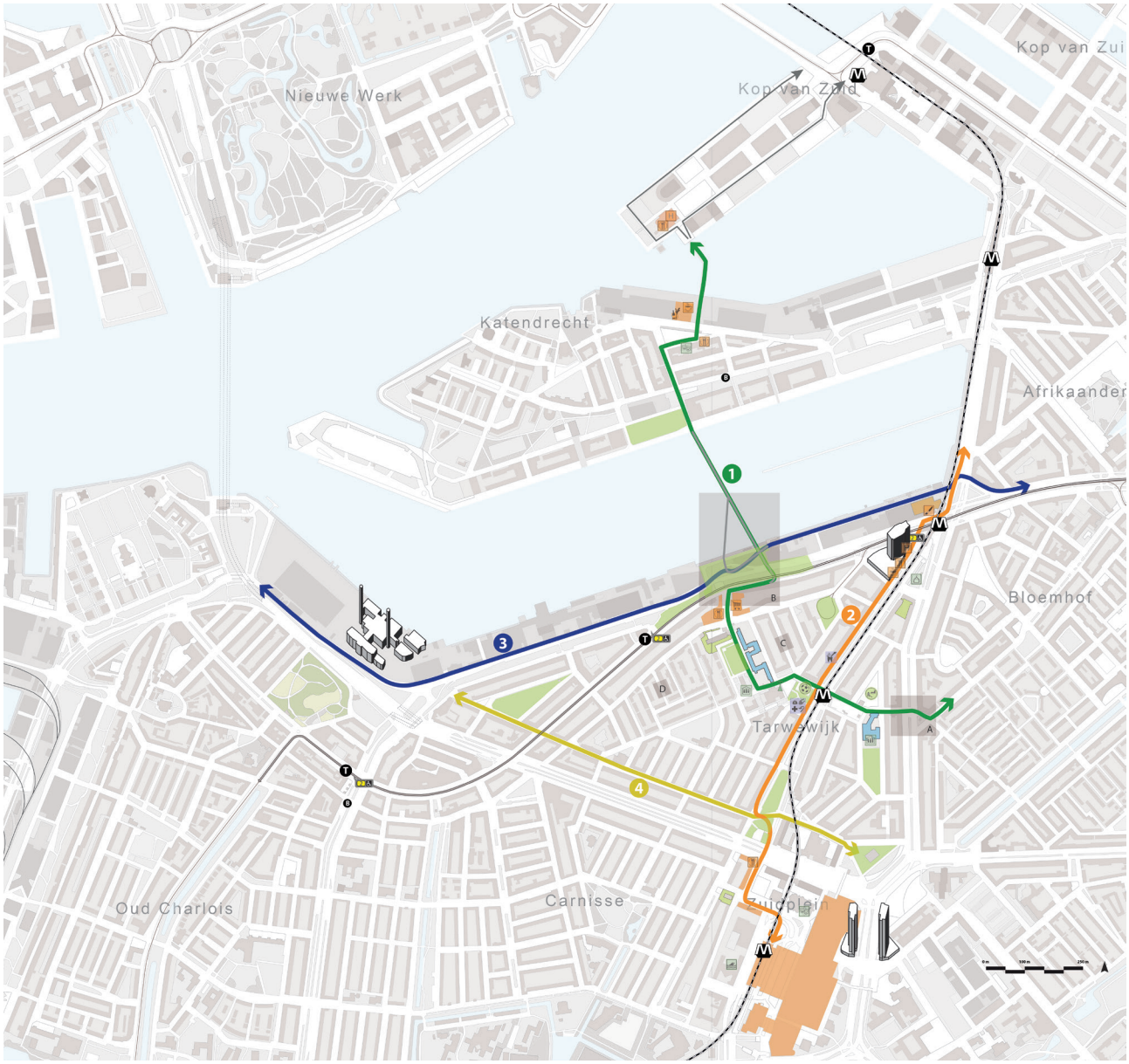


Fig. 5.10 Plus Routes - Design details: A Dordtselaan, B Brielselaan, C Heenvlietstraat, D Speltstraat

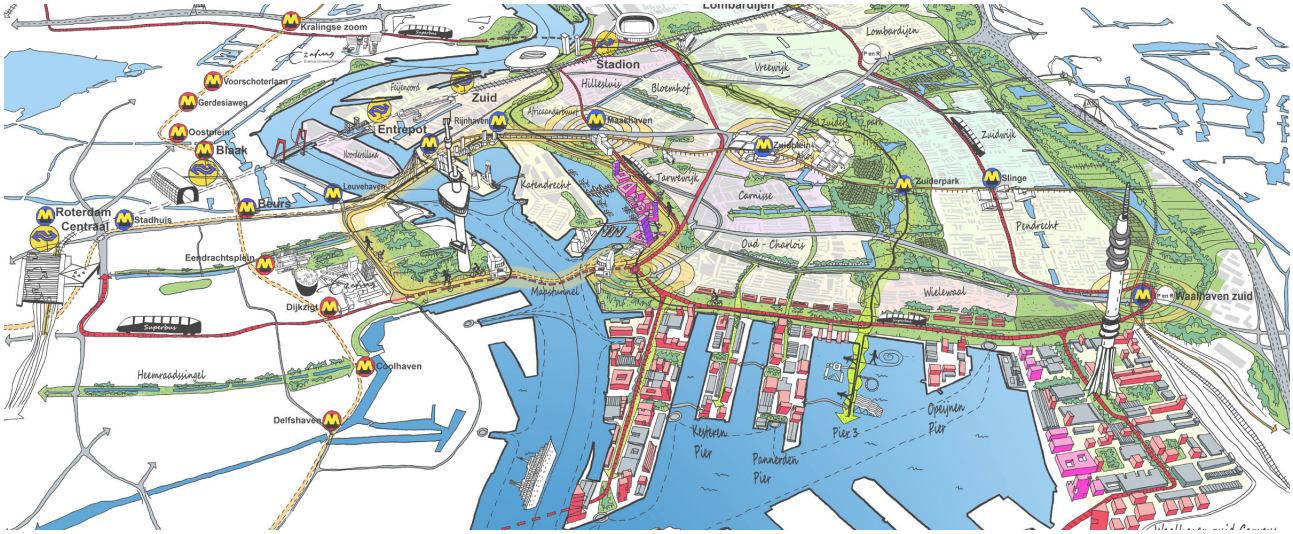


Fig. 5.11 Plan Slow line Mecanoo

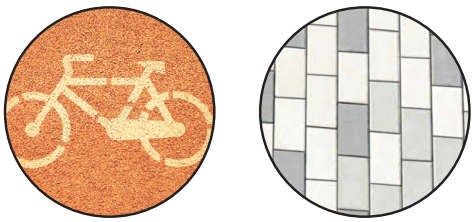


Fig. 5.12 Orange bicycle lane on Plus routes, 30x60 smoot concrete tiles on the sidewalk (niet uitgewassen) length in walking direction

SITE ANALYSIS

The first detail is at the crossing of the Dordtselaan with the Putsebocht. There are a lot of similar crossings like this in the Netherlands. It is an unsafe situation for people in a wheelchair because of the amount of fast traffic, too steep ramps and a blocked view on the road by parked cars.

(fig. 5.12)
1. Blocked view, you can not see the traffic coming: people in a wheelchair cannot see if it is safe to cross the street and cars cannot see the people in the wheelchair.
2. Too steep ramps: this causes definitely an unsafe situation in combination with fast traffic and blocked views. A person in a wheelchair has to throw themself off the dropped curb and can hardly control the speed.
3. No dropped curbs: you are forced to go over the bicycle lane when sitting in a wheelchair.
4. Garbage collecting points not accessible because the wheels slip on the alluminimum diamond plate

DESIGN CONSIDERATIONS

What is not possible:

1. Shared space, as this high frequency of cars will create unsafe situations for people in a wheelchair and children because they are easily overlooked and visually impaired since they can not look out for the traffic.
2. Cut off the traffic completely, because it is an essential road in the traffic system of the city (fig. 5.4).

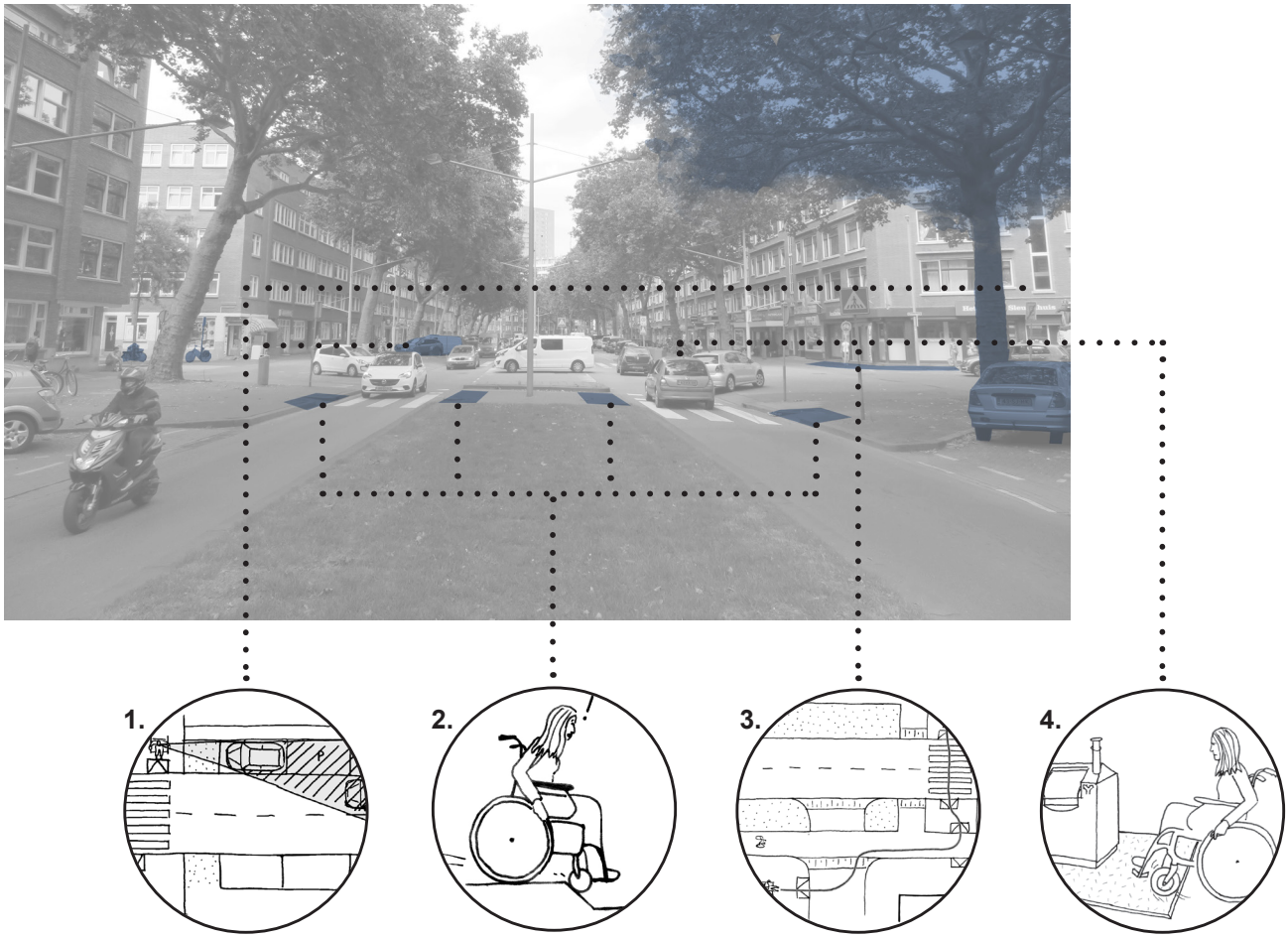


Fig. 5.13 Current situation and problems for wheelchair accessibility at the crossing of the Dordtselaan and Putsebocht

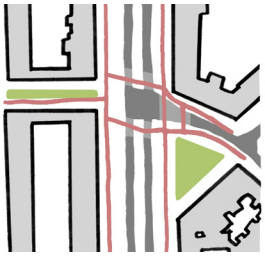


Fig. 5.14 Concept design minimum crossing Dordtselaan

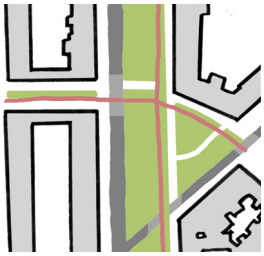


Fig. 5.15 Concept design maximum crossing Dordtselaan

DESIGN MINIMUM

(Figures on page 61) A minimum solution to make this type of crossing accessible is to raise the crossing for the pedestrians and cyclists and to remove trees and parking places within 20 m of the crossing at the side where the cars come from. A person in a wheelchair can see the cars coming and cars have to slow down. This makes it safe and easy to cross the street for wheelchair bound people, pedestrians, children and cyclists. It is important to note that measures should be taken that cars cannot ride onto the sidewalk to ensure the safety of the pedestrians. This minimum design makes the crossing accessible with a small design intervention. This minimal design solution is relevant because there are many similar crossings like this in the Netherlands that can be made wheelchair accessible by this small intervention.

However, in this particular place/design we are on a Plus Route in which slow infrastructure and accessibility are the main priority and cars take a less prominent place. Therefore a second maximum design is made to show how this crossing can be further improved for slow infrastructure and turned into a place to stay.

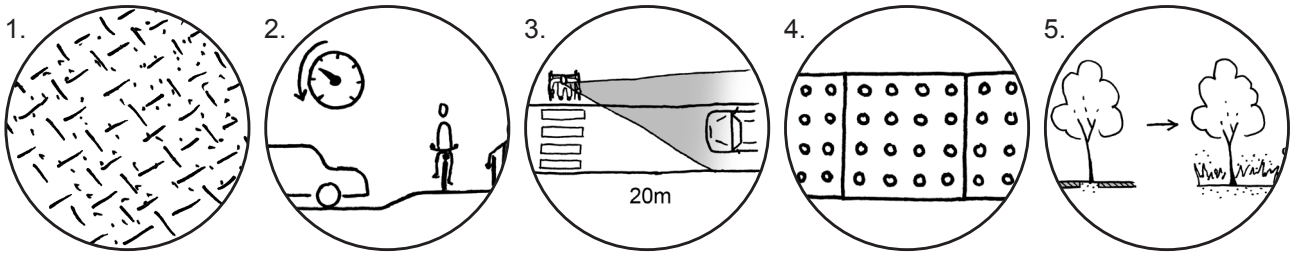
DESIGN MAXIMUM

(Figures on page 62) In the maximum design, the design guidelines of the raised crossing from the minimum design are also applied. Further, by adapting the street profile of the Dordtselaan more space comes available for slow infrastructure and greenery. This is done by pushing the two separated drivelanes against each other. Also, by reducing the amount of parking places and only allow temporary parking for loading and unloading stock for the multiple shops in the street.
The space that comes available can be used for more greenery, broad sidewalks and more bicycle racks. This is better for wheelchair accessibility because there is less chance that the sidewalk will be blocked by obstacles.

Moreover the crossing becomes safer and clearer for people in a wheelchair because of the simplified street profile. The routing is more clear and there are less traffic flows to monitor.
This maximum design turns a busy road and an unused and hardened square into a place to stay.
This design shows that when giving priority to slow infrastructure over cars, the urban public space and wheelchair accessibility can improve drastically (fig. 5.16).

Fig. 5.16 Visualization maximum design crossing Dordtselaan and Putsebocht

DESIGN MINIMUM



Explanation design guidelines minimum and maximum design

1. Add anti slip coating to diamond plate from the underground waste containers
2. Add a raised crossing to slow down cars and allow wheelchairs to cross the street without obstacles
3. Clear 20 of the view on the road of obstacles
4. Add tiles for visually impared to mark the raised crossing
5. Turn paved areas into greenery to reduce heat stress
6. Adapt street profile
7. Reduce the amount of parking spots and make them only available for temporary parking for loading and unloading the stock for the shops. Turn 45 degree parking into parrallel parking.
8. Create broad sidewalks (6m) with dedicated areas for bicycle parking and displays for shop to prevent obstacles for wheel-chairs

Fig. 5.17 Design guidelines minimum design crossing Dordtselaan

Fig. 5.18 Map minimum design crossing Dordtselaan

DESIGN MAXIMUM

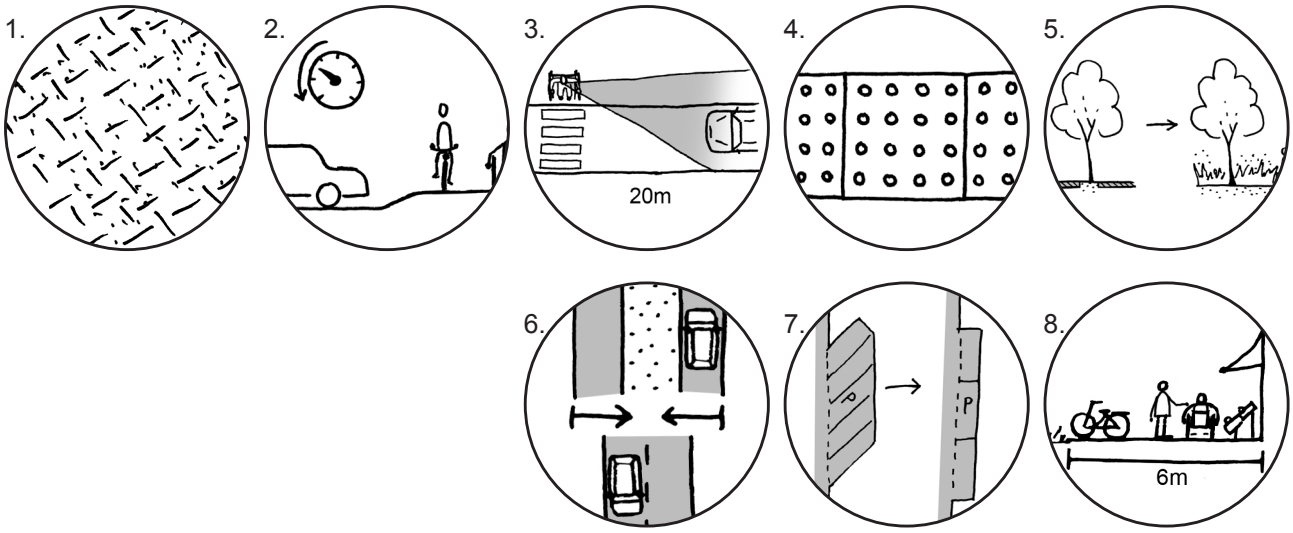


Fig. 5.19 Design guidelines maximum design crossing Dordtselaan

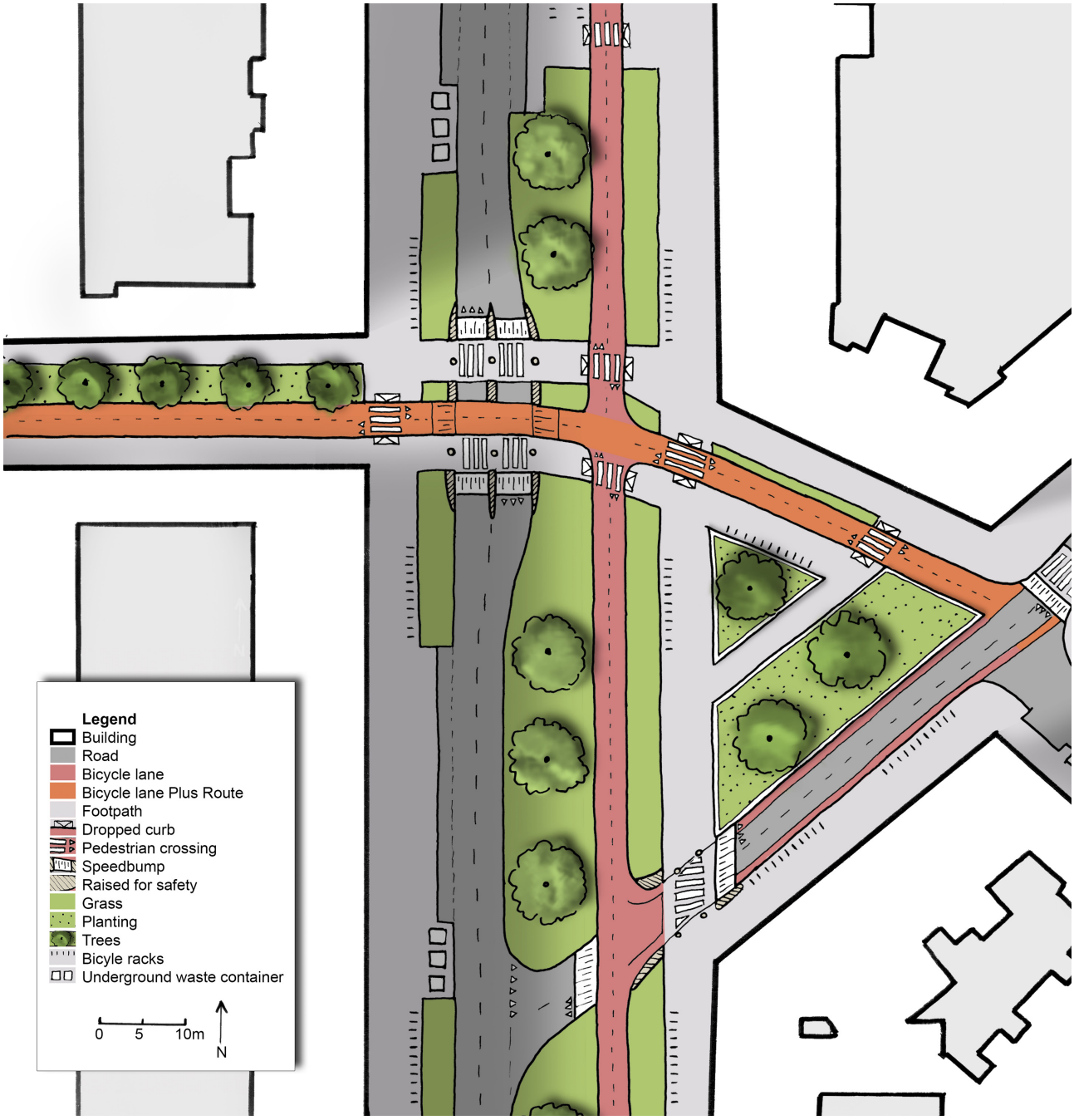


Fig. 5.20 Map maximum design crossing Dordtselaan

SITE ANALYSIS

Sometimes places are so complex that an easy solution is not possible. Such is the case at the North side of the Tarwewijk at the Brielselaan (fig. 5.21). To create a connection between the Tarwewijk, Maashaven and Katendrecht a big intervention is necessary. I talked about this particular point with Pieter Graaff from the Veldacademie and he told me the following:

"Rotterdam has the ambition to realize a slow infrastructure river crossing over the Maashaven. In this ambition the water of the Maashaven isn't even the biggest barrier. Several urban planners and traffic experts racked their brains over the question how a good connection can be established over the Brielselaan. A main road, a primary dike and an important tramline come together at that point. This is already a big design challenge when you do not take into account people with a mobile impairment. The realization of this slow infrastructure connection is seen as an important step to let the urban districts in Charloise benefit from the urban renewal of the Kop van Zuid and Katendrecht."

A Brielselaan (3.5m NAP)
B Dike (5.2m NAP)
C Tramline (3m NAP and wiring at 4.9 m)

For wheelchair accessibility the following problems occur:
1. Unsafe waters edge: There is no barrier between the sidewalk and the water and the existing pavement causes too much shaking with the wheelchair.
2. Obstacle: The dike is a big barrier of 2.2 meter height. At this specific point it is only accessible by stairs and further on with too steep ramps. It is inaccessible with a wheelchair (seen in movie fragments 9. sight - Less to enjoy at 0.00 and 5. Touch - Sloping and sagging at 1:15) and the height differences in the area provide challenges to make it wheelchair accessible.
3. No dropped curb to cross the street/Brielselaan.

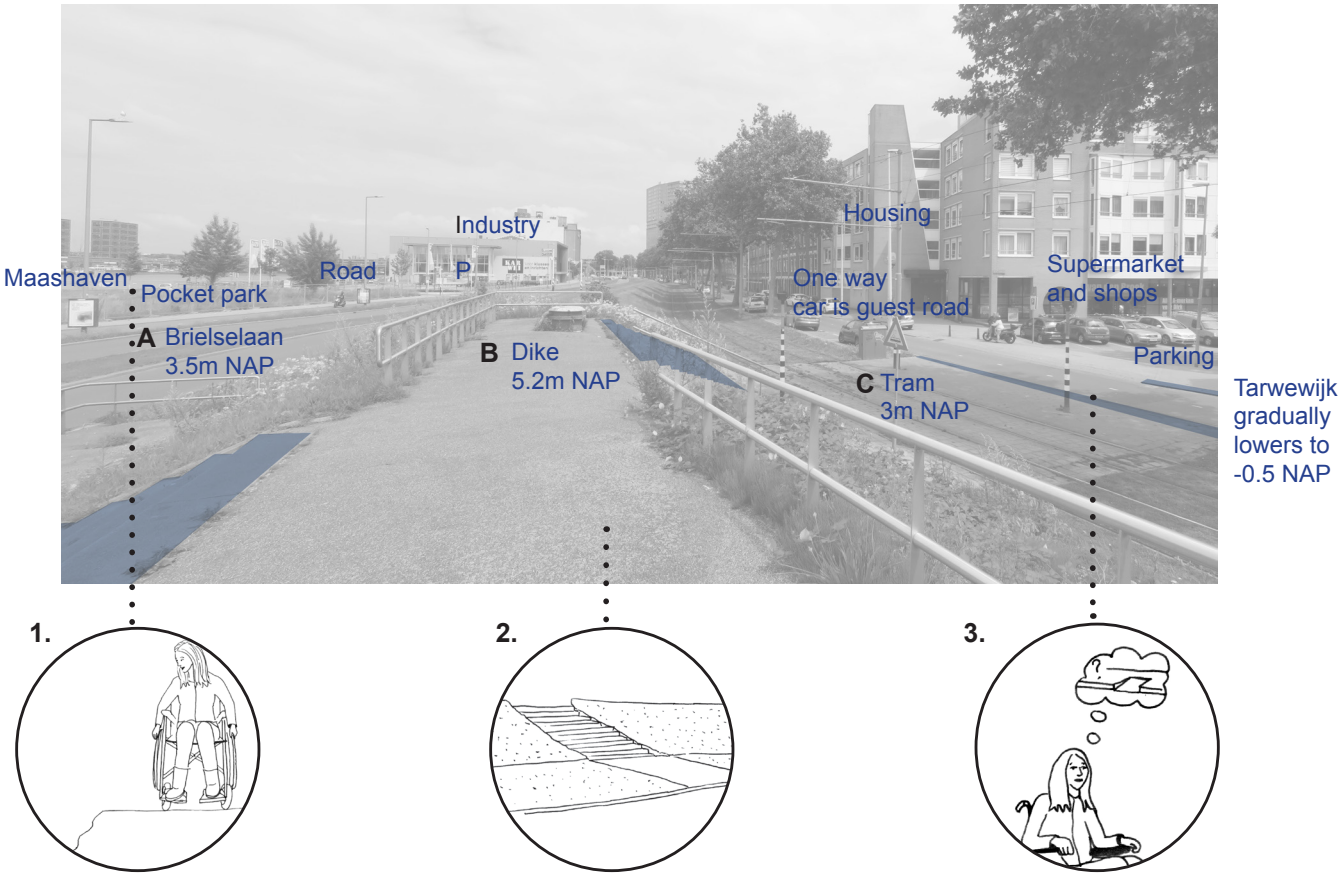


Fig. 5.21 Current complex situation Brielselaan, dike and tram.

DESIGN CONSIDERATIONS

What is not possible:

The low level of the Tarwewijk (-0.5m NAP) makes it impossible to go straight onto the dike with a slope (5.22).

Also, going up and turning at the same time is for wheelchairs very hard, especially when the distance to go up is long, as it would be in this particular case. Therefore a design with rotations on the slope is not an option (fig. 5.23).

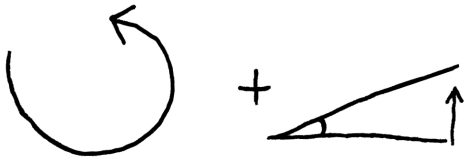


Fig. 5.23 Sloping and turning at the same time is not comfortable for people in a wheelchair

Thirdly, the bridge needs to be high enough to enable passing underneath (Fig. 5.24).

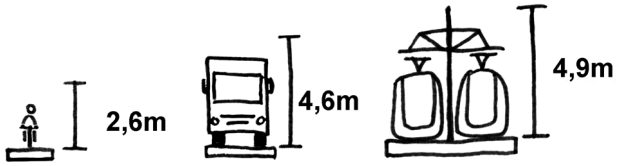


Fig. 5.24 Heights for underpassing

Fourth, going over the tramline is not possible because the wiring of the tram is 4.9 meter high (fig. 5.24). The length of the slope to pass over the tram would become too long (258,5 meters). Beside it is uncomfortable to take such a long slope in a wheelchair, there is also not enough space available to realise this.

Fifth, the Brielselaan can not be cut off because of its important function in the city network (fig. 5.25 and fig. 5.4).

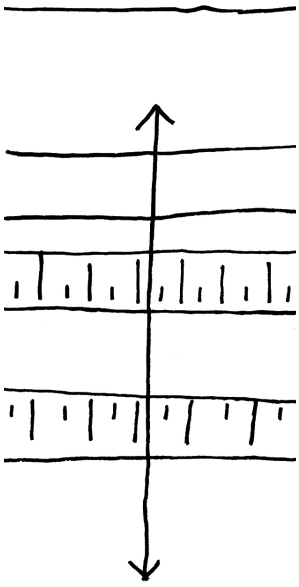


Fig. 5.22 Not possible to make a bridge straight over the dike due to the big height difference

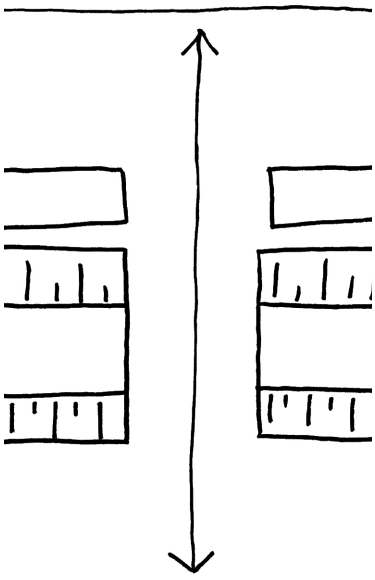


Fig. 5.25 Not possible to break open the dike and cut off the Brielselaan

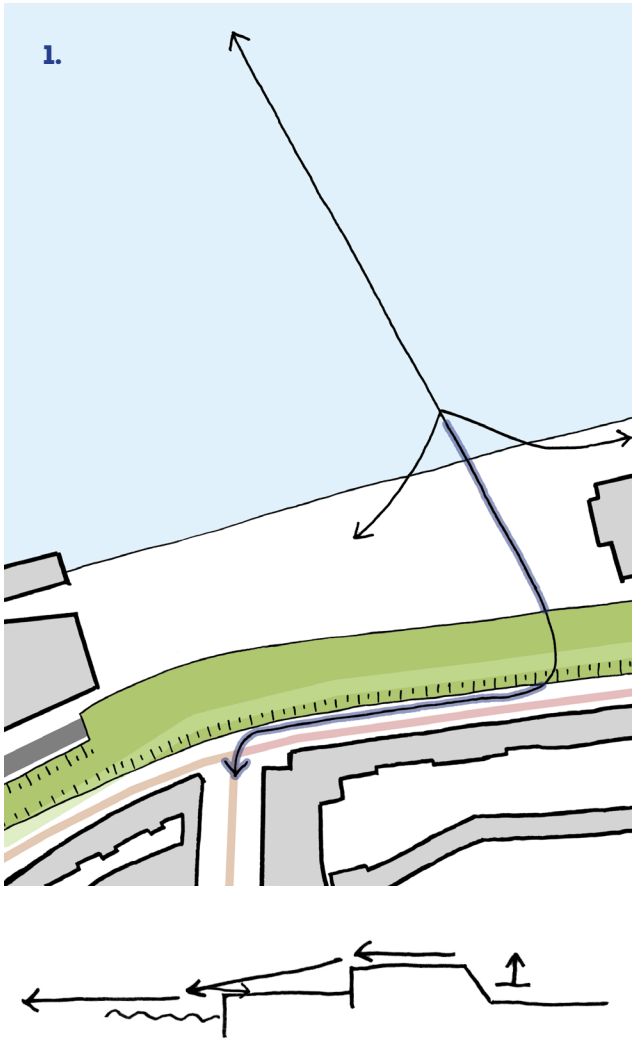


Fig. 5.26 Concept 1

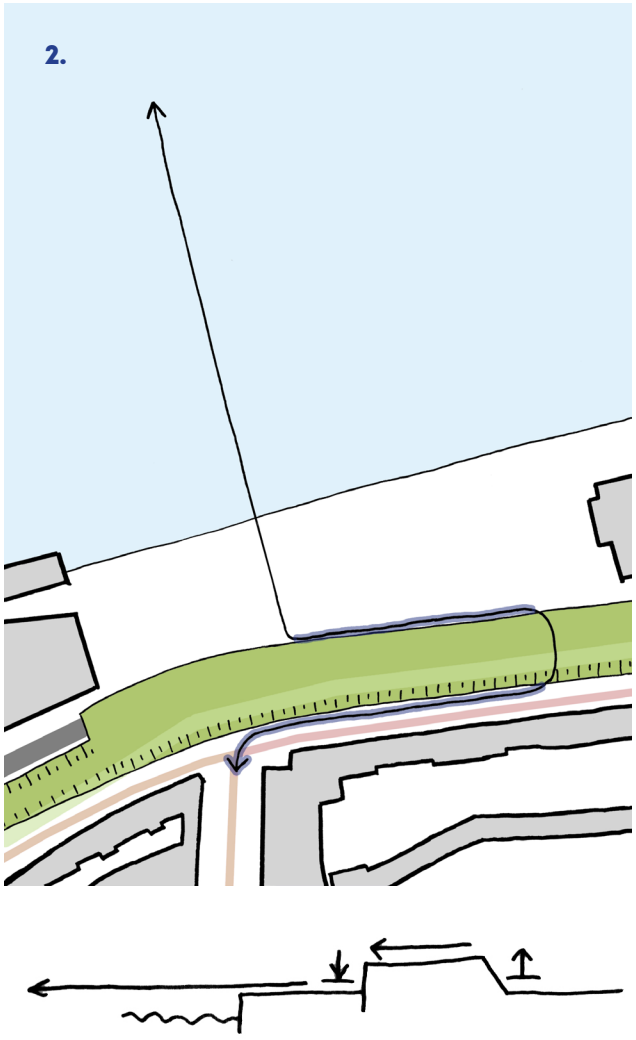
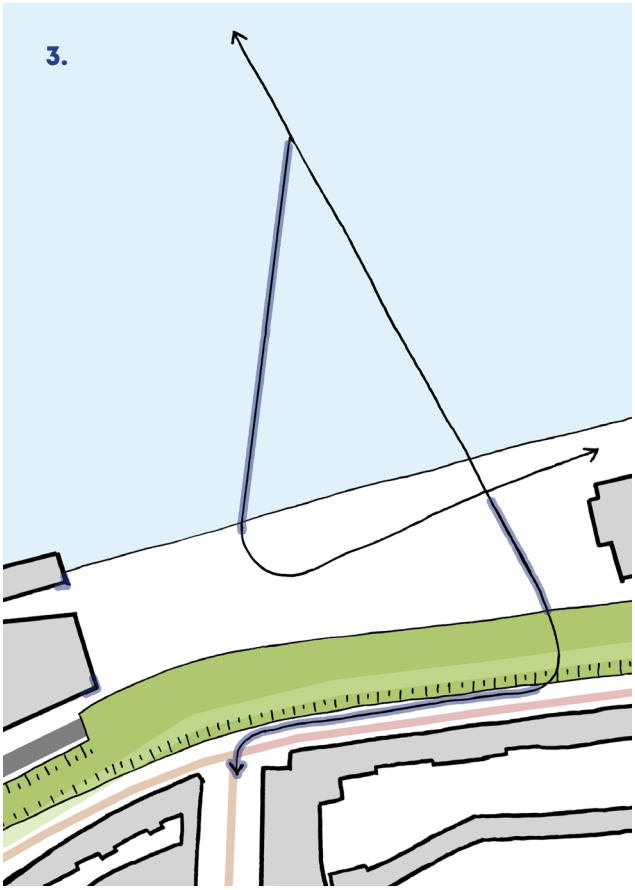


Fig. 5.27 Concept 2

3 design concepts

In all three concepts the design guidelines on page 66 are taken into account to make the design wheelchair accessible (fig. 5.29 till 5.31) and the north side of the bridge (not shown in the images) can open for bigger ships and. However, option 1 and 2 (fig. 5.26 and 5.27) lower directly back to the level of the quay, while option 3 stays higher above the water (fig. 5.28). This allows smaller boats to still pass under the bridge in option 3 to keep the waterway accessible without opening the bridge and thus stopping the traffic. Moreover, in this option the bridge stays accessible at high water levels since the kade is outside the protection of the dike. Also, the different spaces that are created by the form of the bridge make it a more interesting and iconic design. For these reasons concept 3 is the prefferred option. However, you can see that the routing in option 3 is longer. A solution for this is found in creating a new cultural center on the quay. The rooftop of this building is accessible from the bridge from where you can take the elevator. People (in a wheelchair) both have the option to take the scenic walk/roll over the bridge or the shortcut with the elevator. This is further shown on the next pages where the third concept is designed in detail.



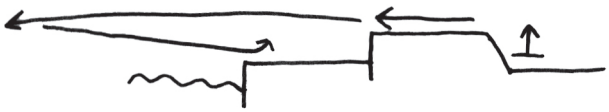


Fig. 5.28 Concept 3, this design is the design that is further designed in detail

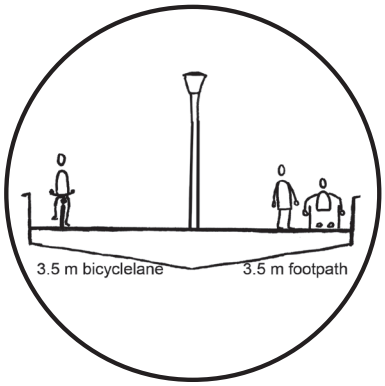


Fig. 5.29 Dimensions slow infrastructure bridge

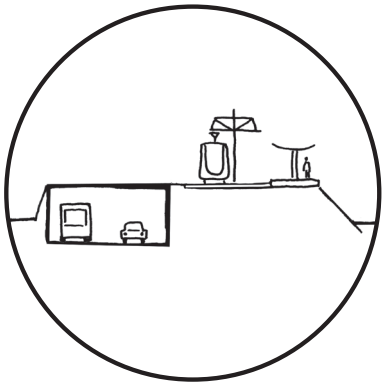


Fig. 5.30 Broader dike, tunnel Brielselaan & tram on the dike

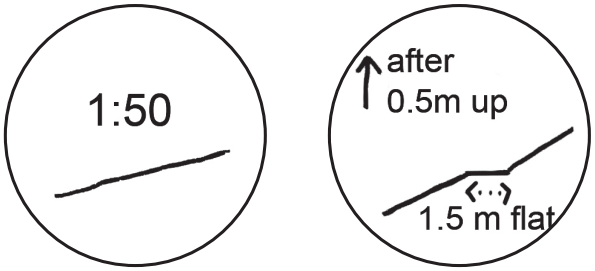


Fig. 5.31 Design guidelines bridge: Slope 1:50 (2%), after each 0.5m rise 1.5m flat surface

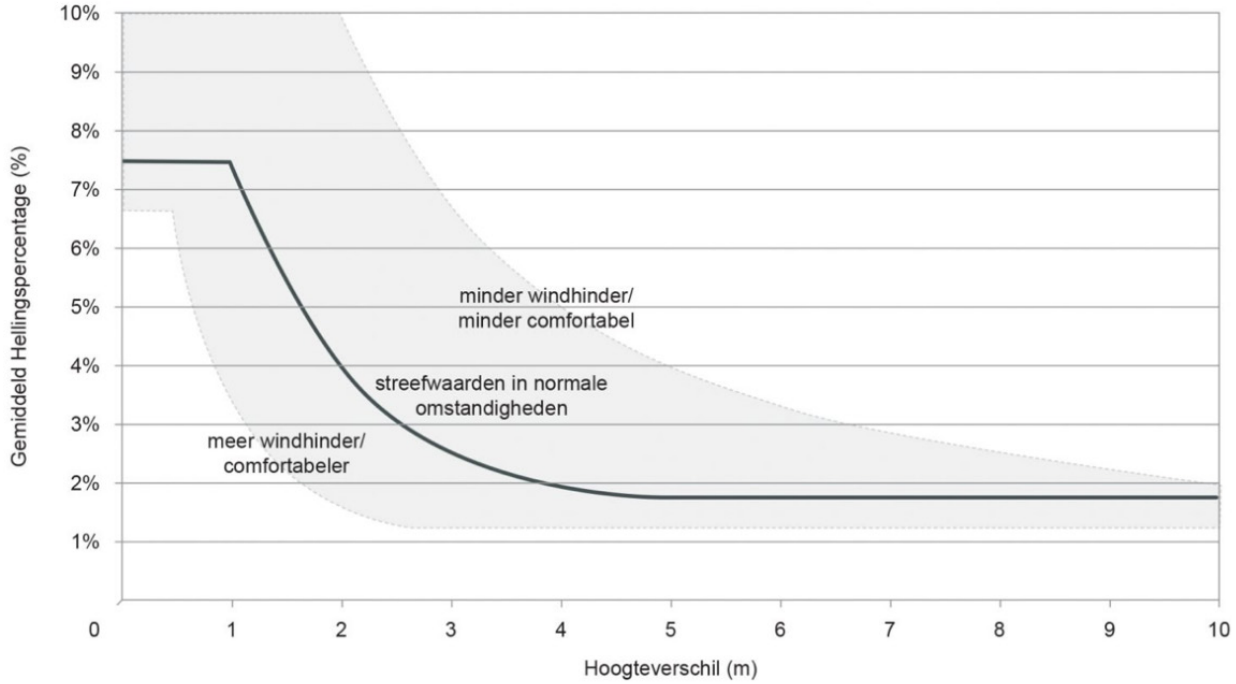


Fig. 5.32 Cycling comfort on slopes, comfortable in windy areas = 2%: this matches the demands for people in a wheelchair

DESIGN SOLUTION

A solution to (re-)connect the Tarwewijk to the Maashaven and Katendrecht is to start the slow infra bridge on the south side of the dike and place the slope parallel to the dike. The slope is 1:50, has a flat resting point after each 0.5m rise according to the design guidelines for wheelchair accessibility and smooth but sturdy composite pavement for grip (Figures on page 66 and fig. 5.35 and 5.38). This is both comfortable for people in a wheelchair and cyclists. The Brielselaan is partly lowered into a tunnel, turning the dike into a broader dike with enough space to place the tram on top, provide a place for a picnic with a view, and a field to walk the dogs.

The bridge continues to rise a bit further, you roll between the treetops and have views over the Maashaven onto the SS Rotterdam, the skyline and the pattern of tarwe on the square below referring to the history of the harbor (fig. 5.41).
You can choose to stop (and park your bike) on the roof of the new cultural center with café, take the lift down towards the terrace (fig. 5.34) and square or continue on towards Katendrecht. You can also take the junction that slowly lowers towards the active square or the city retreat.

The active square with its patterned asphalt provides opportunities to watch people passing by on the bridge and bicycle lane, take the yellow water taxi or waterbus (new stops), invites to linger, play, skating, music, sport and is of course wheelchair accessible (fig. 5. 39 till 5.41). It is a place to meet, to see and be seen (prospect). Where you are embraced by the bridge (fig. 5.47).

Or you can go to the city retreat (refuge), a quiet place to enjoy the views on the water, the bridge, the SS Rotterdam and the Rotterdam skyline and roll between flowerbeds, sit in the shade of the trees or the water edge (fig. 5.42 till 5.44).

You can continue your journey by passing under the bridge and on to the boulevard where you can see the other side of the bridge and Maashaven.

By creating this bridge different experiences and places are created.

There are no stairs in this design, since it is not wheelchair accessible and people in general rather take slopes than stairs (Gehl, 2010). By not putting stairs in the design the routing for all users is made the same. This suits the wish of people in a wheelchair to not stand out. People in a wheelchair don't mind taking a longer route as long as it is the same as other people and it offers the same integrated experience (Seeland and Nicole, 2006).

There lies a chance in combining the needs of children and people in a wheelchair, since people in a wheelchair sit on the same eye-level as an average 6-year-old. You can make their experience of the city more interesting by focusing on what is attractive on their height, e.g. creating transparent railings at certain points on the bridge can create viewpoints for kids and people in a wheelchair, since normally they look against railings (fig. 5.45).
Children and people in a wheelchair are closer to the ground. Therefore, a pattern on the asphalt makes it more interesting to explore and stimulate to invent games for kids (fig. 5.41).
But also, elements like fountains can be designed in such a way that I can reach the fountain from my wheelchair and it is fun to play for kids (fig. 5.40).
Placing flowerbeds not in raised beds but on ground level enables people in a wheelchair and kids to enjoy touching, smelling and seeing the plants and flowers (fig. 5.42). Focusing on designing for both, kids and wheelchairs, is not only interesting on this specific location, but on the Plus Routes in general. It can add an extra opportunity to seduce people to be more active and not take the car. Especially at the Plus Routes where schools and playgrounds are situated this should be a focus point. The Plus Routes also provide a safe route to go to school since children have less overview and are easier overlooked by cars, just like people in a wheelchair.

The iconic slim cortent steel and concrete bridge suits the architectural image of Rotterdam (with all the iconic bridges), and can seduce people into Rotterdam South. The bridge piers (5.35) are illuminated during the evening hours. The bridge is a new icon for Rotterdam South, an experience to roll over, that provides different views and places to stay, it reconnects the Tarwewijk to the harbour and makes the neighborhood accessible to everyone. It is a connection that can invite people in to further explore Rotterdam South.

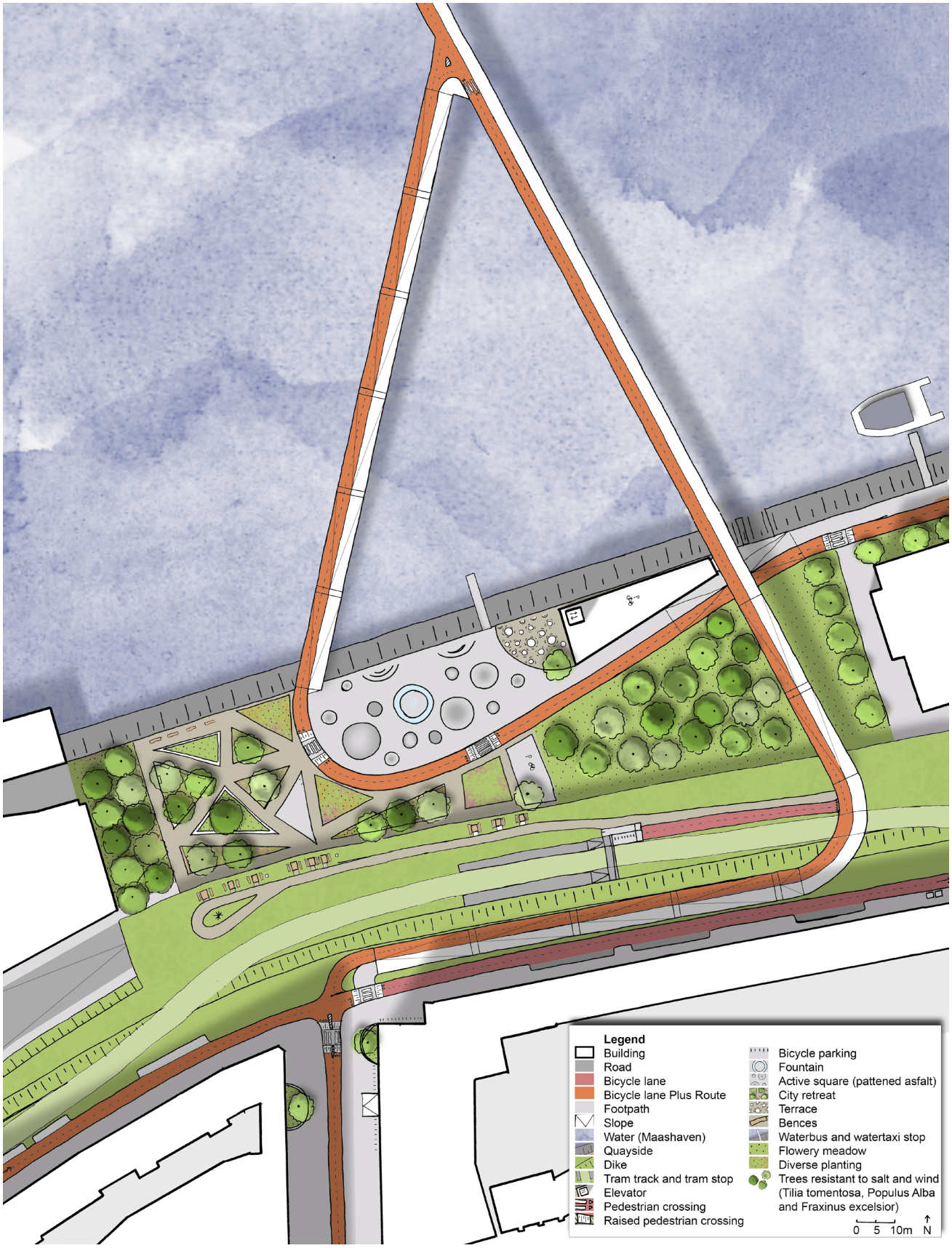


Fig. 5.33 Map design solution Brielselaan

The bridge

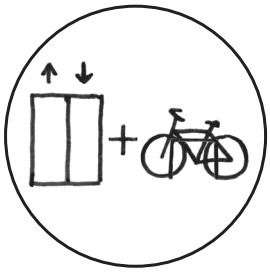


Fig. 5.34 Elevator and bicycle parking on roof of new cultural center that makes it possible to go directly to the active square.

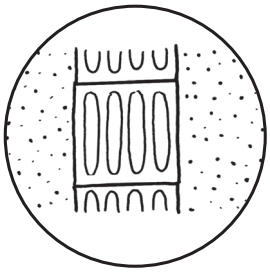


Fig. 5.35 Visually impared marking on composite surface bridge.

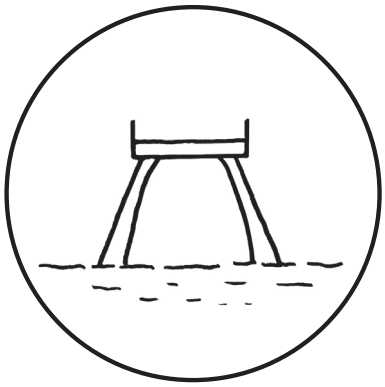


Fig. 5.36 Bridge piers every 50 m

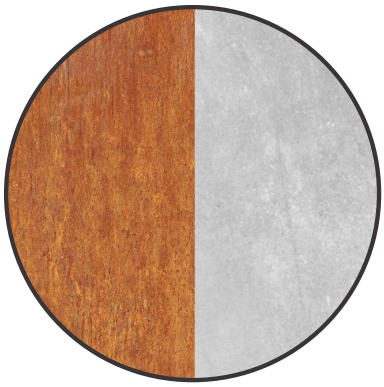


Fig. 5.37 Materials bridge corten steel and concrete. Robuste materials that suit the roughness of the harbour and Rotterdam South

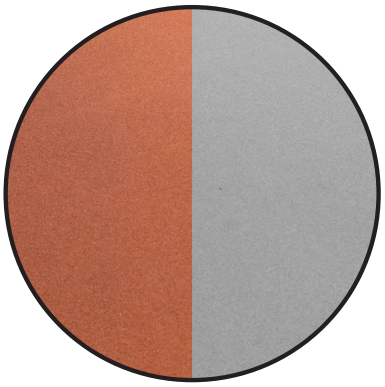


Fig. 5.38 Composite cycle lane (orange) and footpath (grey) on bridge.

Active square

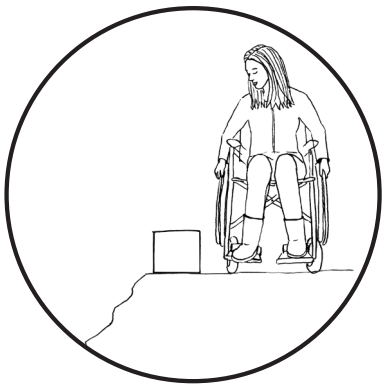


Fig. 5.39 Adapted water edge for safety

Fig. 5.40 Fountain, easily to reach in a wheelchair

Fig. 5.41 Pattern Tarwe on the asfalt referring to the history of the harbour and initiating play

City retreat

Fig. 5.42 Enjoying the planting

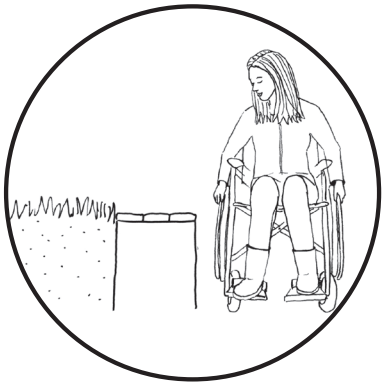


Fig. 5.43 Enjoying the grass

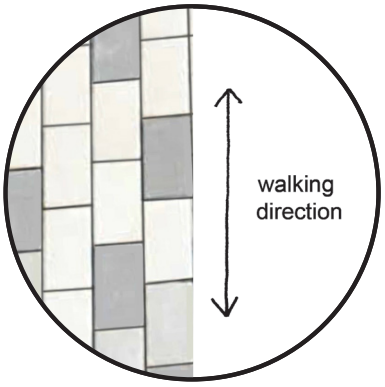


Fig. 5.44 Pavement 30x60 concrete tiles

The bridge

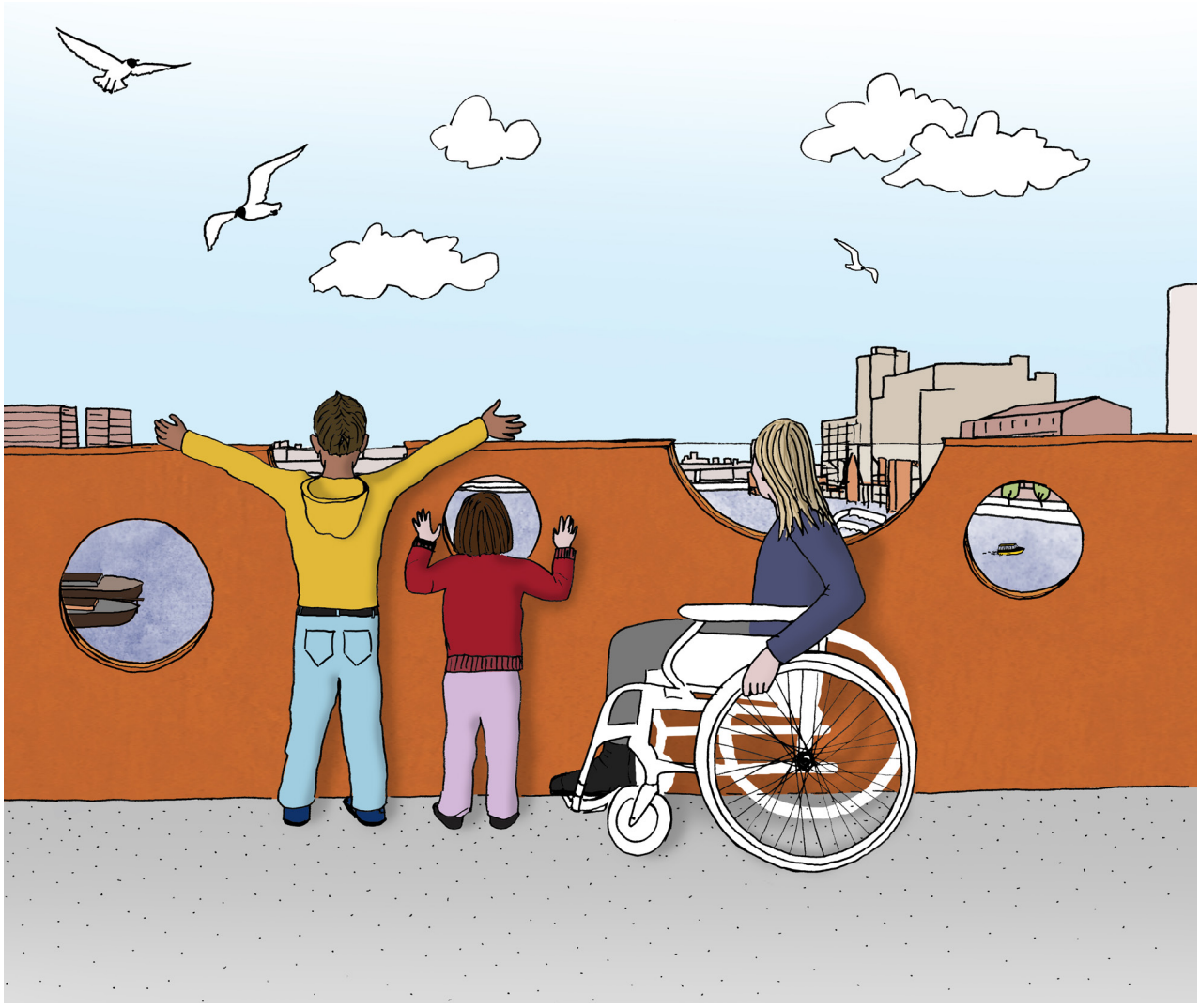


Fig. 5.45 View from the bridge

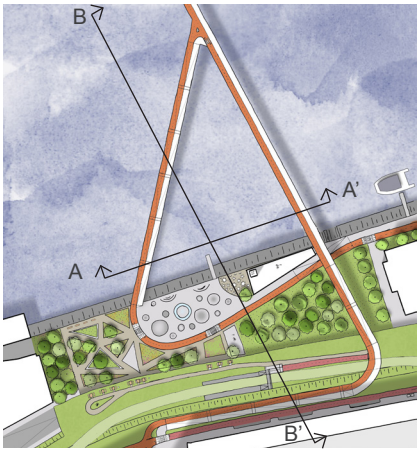


Fig. 5.46 Location sections

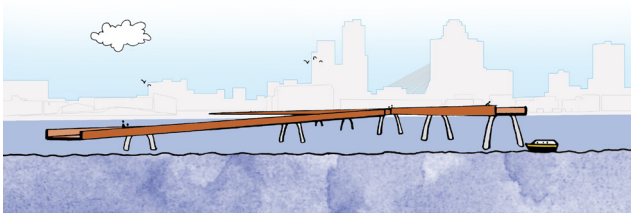


Fig. 5.47 Section A-A'

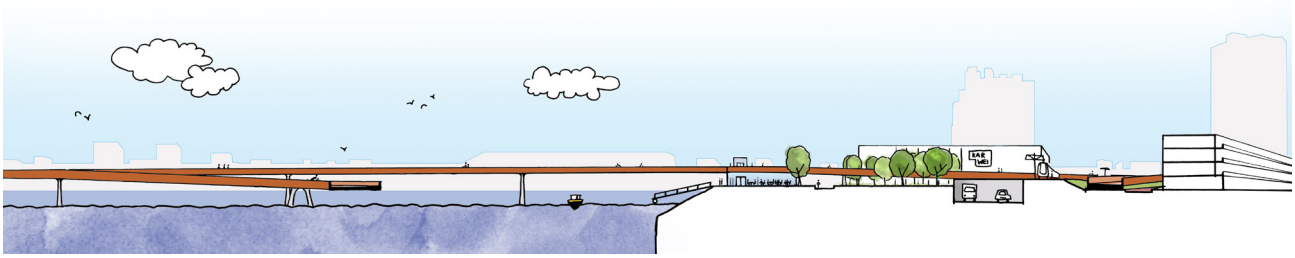


Fig. 5.48 Section B-B'

DEMANDS

The other streets also need to be connected to the Plus Routes when the opportunity arises (fig. 5.49). Because each obstacle is one to many for people bound to a wheelchair.

To research how wheelchair accessibility can be improved in the other streets, detailed designs were made for two different streets (Heenvlietstraat 12 meter wide and Speltstraat 9 meter wide). These streets are chosen because there are many similar streets like this in the Tarwewijk (as well as in other urban districts in the Netherlands) and multiple wheelchair accessibility problems occur in the limited amount of public space. For each street 3 designs are shown that improve the wheelchair accessibility: a minimum, medium and maximum design intervention.

When designing I asked myself the following:
What happens if we put accessibility first on the priority list, how will the design of residential streets look like?

The demand on the open space while designing were the following:

- 1,80 m wide obstacle free footpath, allowing approaching wheelchairs (strollers, etc.) to pass safely

- Opportunities to safely cross the road

- Assured 3,5 m passage for emergency transport

- More green (climate adaptive measures where possible)

- Integrated/Well arranged Bicycle parking

- Streetlight, street signs and street furniture

- Cars and parking

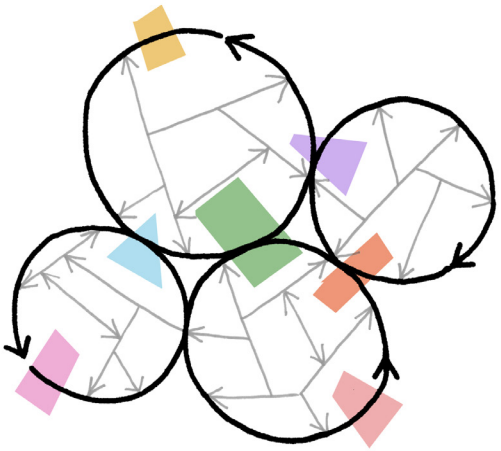


Fig. 5.49 Concept connect other streets

MATERIALS

The kind of pavement used on the sidewalks is also important for the comfort of rolling in a wheelchair. The pavement needs to be smooth but sturdy. When the pavement is too slick (for example natural stones) a wheelchair slips on the stones. Regular concrete pavement is a good option for residential streets. Larger tiles are preferred because less seams cause less shaking. If a tile or brick is rectangular it important to place the length in the walking direction. Moreover, it is important to note that a closed top layer(gesloten toplaag) is preferred over a washed out top layer (gewassen toplaag), since it causes less shaking (fig. 5.50). An exception for this rule is when the streets are sloping. The wheels of the wheelchair need enough grip in order not to slip both when going up and down. Therefore on slopes it is better to choose a tile or brick with a washed out top layer. There are enough wheelchair friendly options when it comes to pavement choice for different residential streets.

Fig. 5.50 closed top layer, washed out top layer, place the length of the stones in the walking direction

SITE ANALYSIS

The Heenvlietstraat is a 12 meter wide street in which multiple problems occur when it comes to wheelchair accessibility (as seen in the movie fragment: 5. Touch - Sloping and sagging at 3.23 and fig. 5.51).

1. Sagging of the pavement: it is uncomfortable and potentially dangerous to roll here
2. Obstacle: Parked bicycles to lamppost block the sidewalk
3. Obstacle: Parked car blocks possibility to cross the road over the speed bump
4. Obstacle: The height difference by sunken wells cause too much shaking
5. Obstacle: Step into house is not accessible with a wheelchair

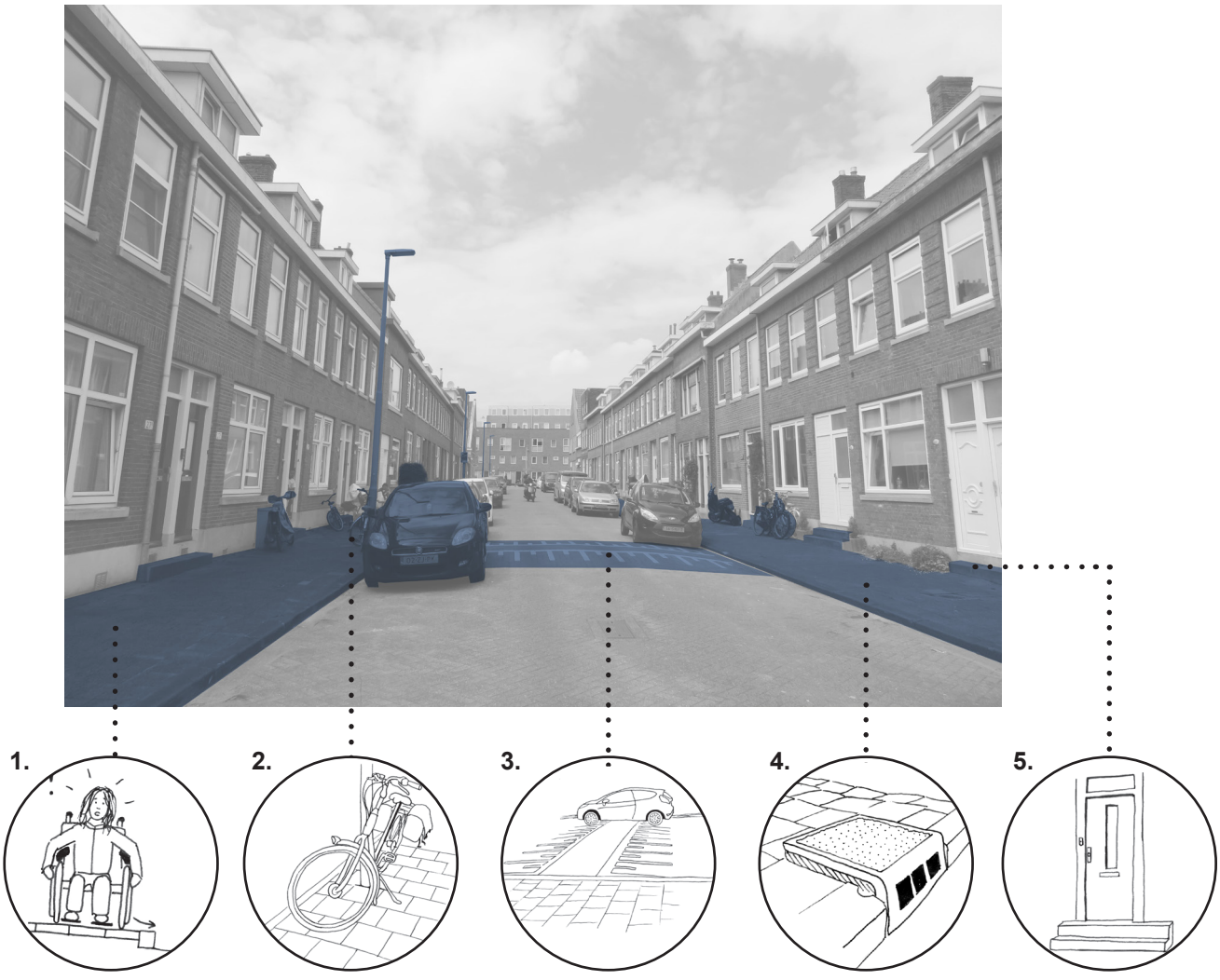


Fig. 5.51 Wheelchair accessibility problems in the Heenvlietstraat

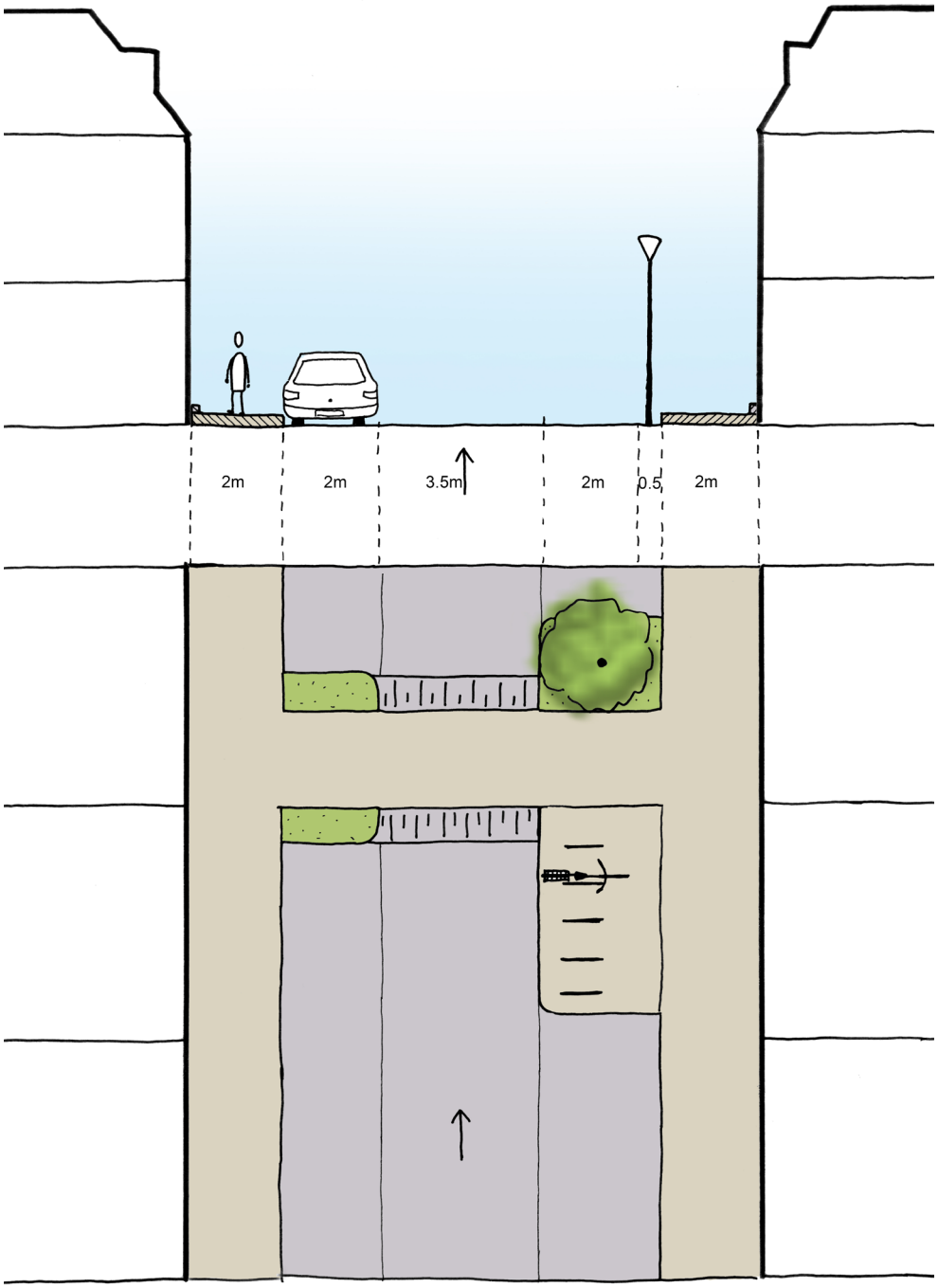


Fig. 5.52 Section minimum design Heenvlietstraat

MINIMUM DESIGN

In the minimum design only a few changes significantly improve the wheelchair accessibility. Broader sidewalks facilitate the passing of people in wheelchairs and other passerby, while a connected speed-bump, sacrificing two parking spots, creates a safe crossing. To keep the sidewalks free and accessible the small amount of greenery and bicycle parking spots are integrated in line with the zone for car park. Also street lights and traffic signs can be put in the designated area off the sidewalk.

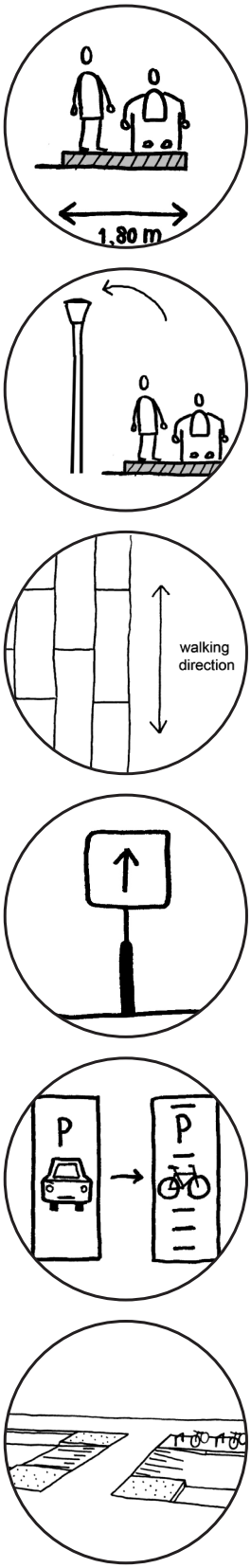


Fig. 5.53 Design guidelines minimum design Heenvlietstraat

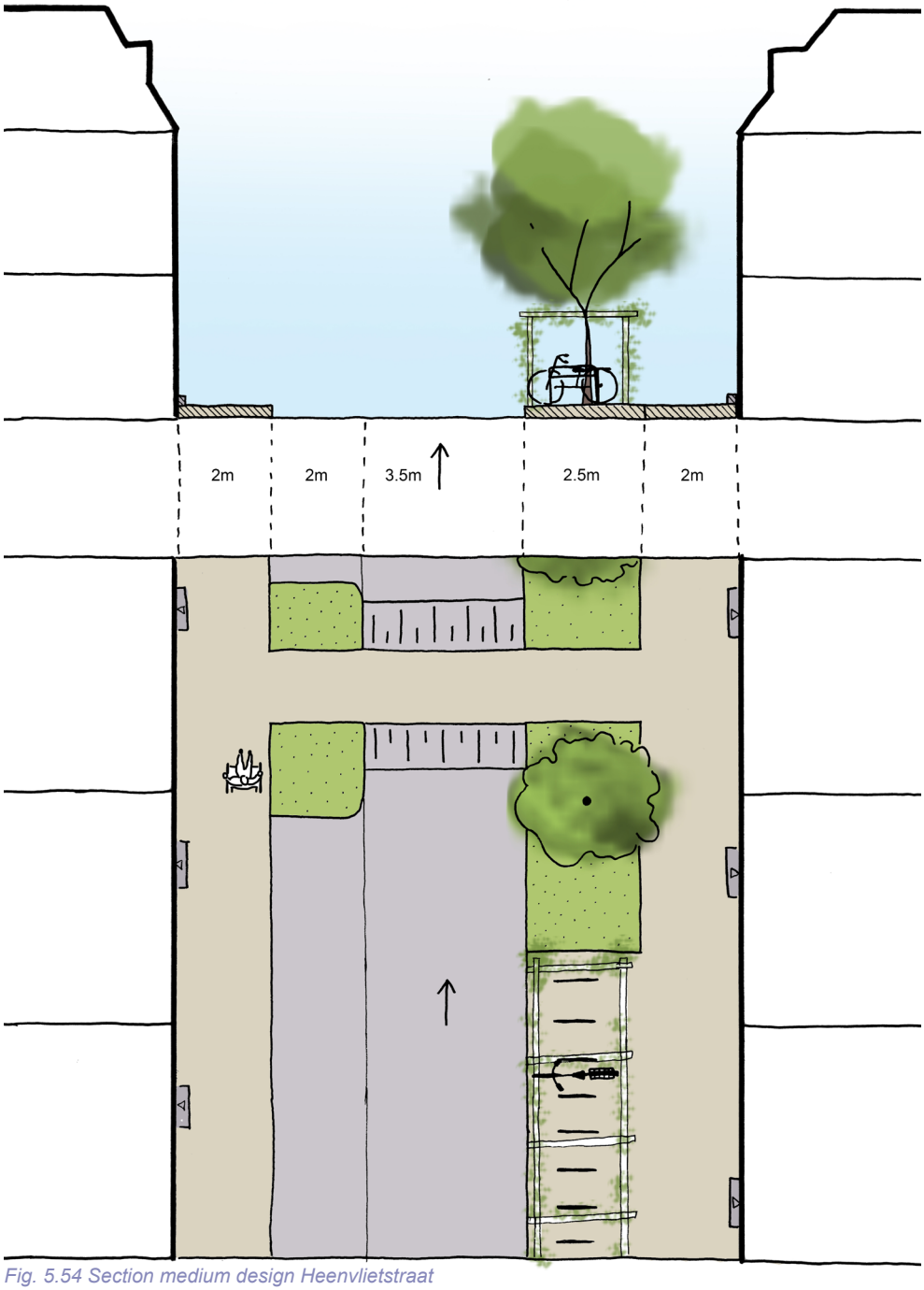


Fig. 5.54 Section medium design Heenvlietstraat

MEDIUM DESIGN

In this design on one side the parking spots are replaced for greenery and bicycle parking, to assure that objects can be placed out of the way from the walking route. Placing the trees on the east side of the street reduces heat stress on the hottest moment of the day. By creating this border zone of green it reduces the risk of falling off the sidewalk with the wheelchair when the sidewalk would sagg in the future. Moreover, a broad sidewalk prevents it from being completely blocked in cases where people do place objects in front of their houses. The traffic bump will be turned into a safe place to cross the street.

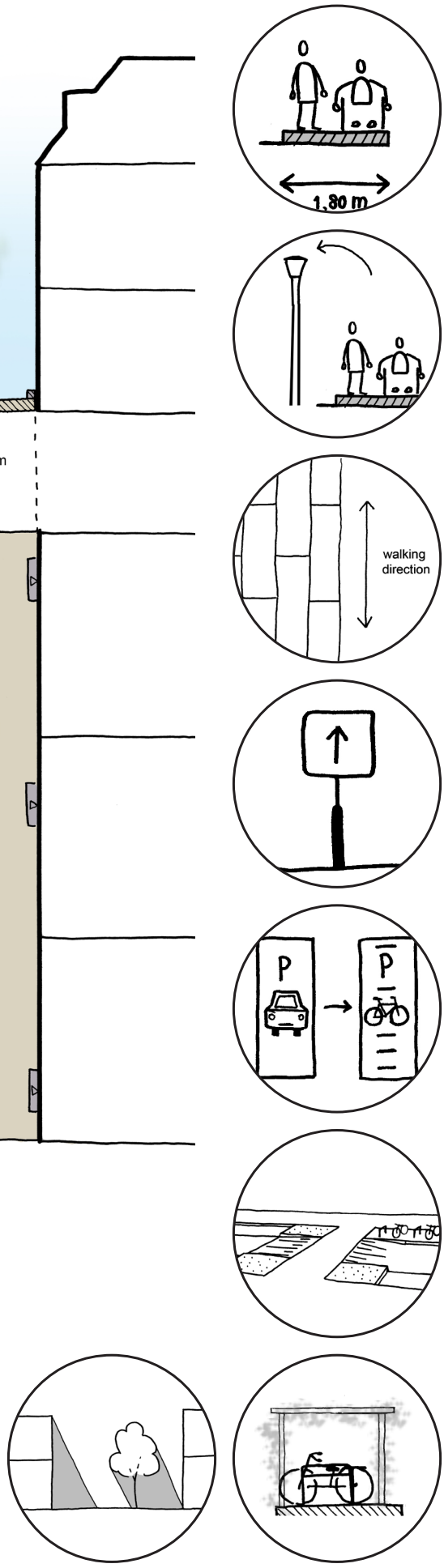


Fig. 5.55 Design guidelines medium design Heenvlietstraat

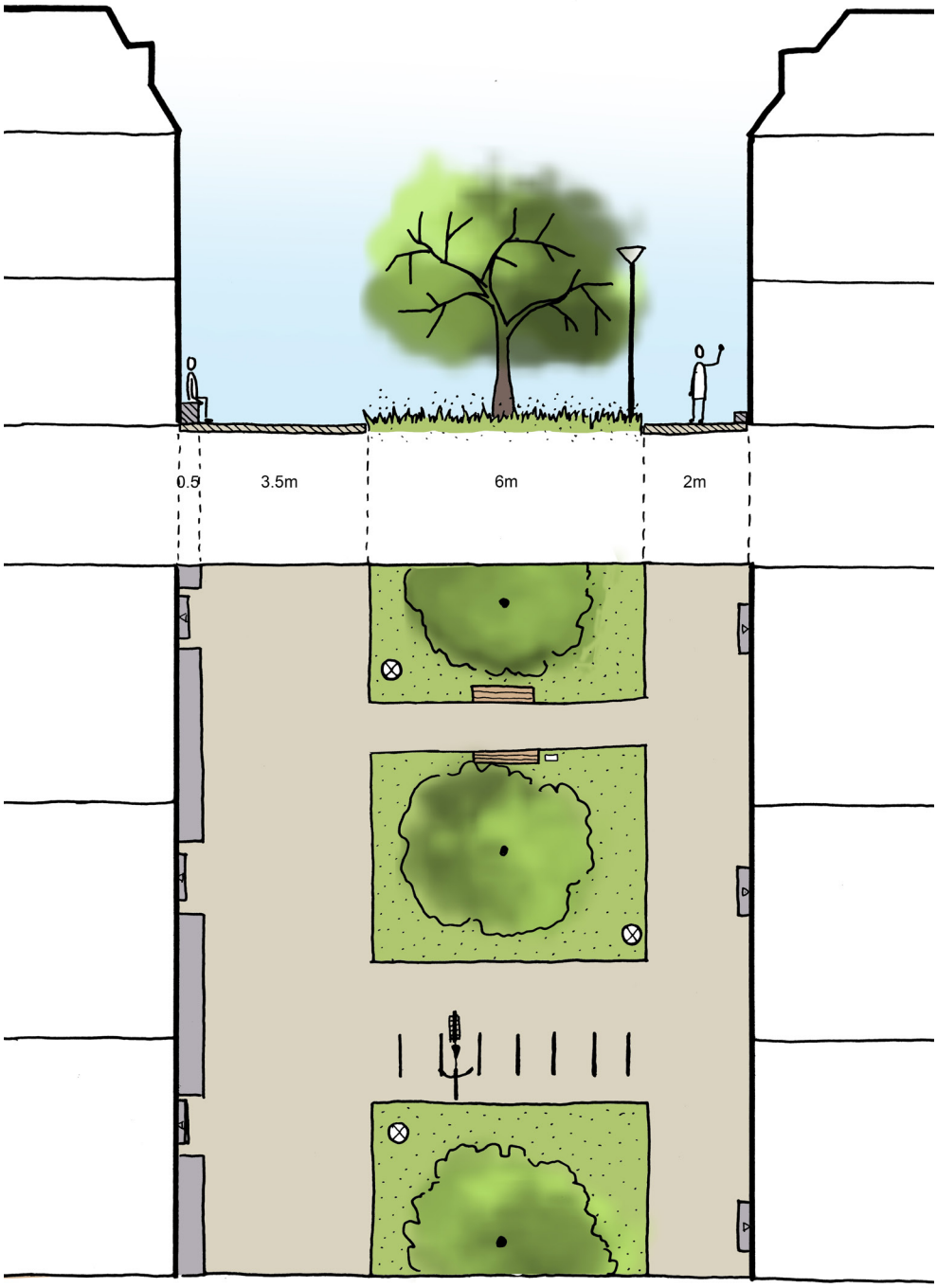


Fig. 5.56 Section maximum design Heenvlietstraat

MAXIMUM DESIGN

In the maximum design cars will completely be banned and turned into a pedestrian only street, although emergency transport can still pass through the street. There are designated bicycle parking areas, places to sit and socialize and greenspaces that provide shading. The pavement will be an even surface with no obstacles or height differences.

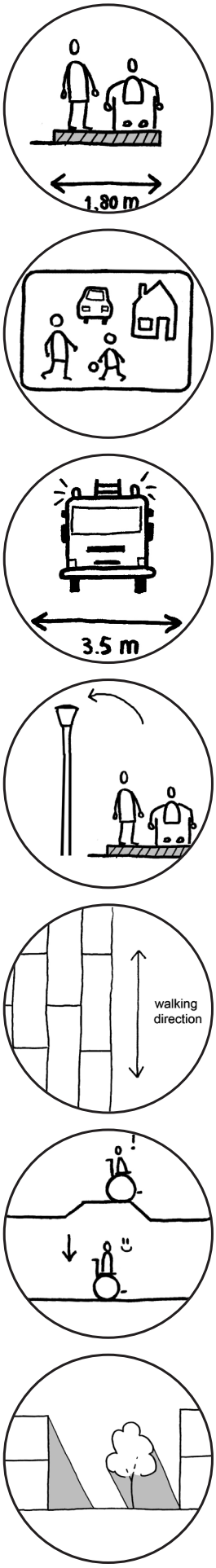
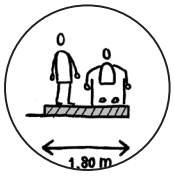
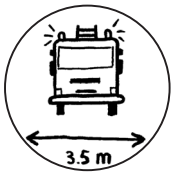


Fig. 5.57 Design guidelines maximum design Heenvlietstraat

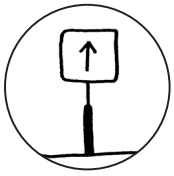


Explanation design guidelines

The sidewalks are at least 1.8 meter broad and with no obstacles within this 1.8 meter zone.

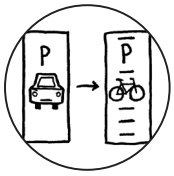


Even though the street is not accessible for cars it must remain accessible for emergency transport. This requires an obstacle free zone of 3.5 meter.



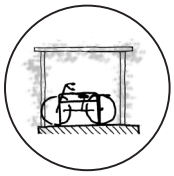
This is a one way road.

This street is a ‘woonerf’



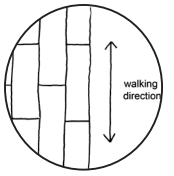
Parking spaces are turned into bicycle parking spaces

Speed bumps are connected on both sides of the street to cross the road in a wheelchair. Next to the speed bump greenery or bicycle parking is created to prevent cars from parking on top of the speed bump

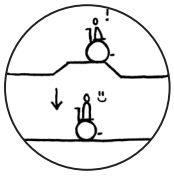


Bicycle parking combined with a pergola with climbing plants. This adds extra shading in the street.

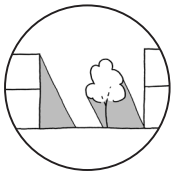
Street furniture is put off the sidewalk to prevent obstacles on the sidewalk for people in a wheelchair



The length of the pavement is placed in the walking direction to reduce shanking of the wheelchair.



There are no height differences, all surfaces are on the same level. This makes it easier for people in a wheelchair to navigate.



Trees are placed in such a way that they provide extra shade in the streets to reduce heat stress.

Fig. 5.58 Explanation of all the design guidelines

EVALUATE FEASIBILITY AND GENERALIZABILITY

In each design parking space needs to be sacrificed. In the maximum design where cars will be completely banned, the impact on the traffic system would be very big. This is perhaps not realistic in the near future and therefore does not help to make the Tarwewijk accessible as soon as possible.

The minimum design does improve accessibility but does not help to improve the overall quality of the street. Besides there is very limited space for bicycle parking and therefore there is still a risk for wheelchair users that bicycles will block the sidewalk.

Therefore the medium design is seen as the most realistic and prefered design. This design improves the overall quality of the street and the wheelchair accessibility.

There are a lot of similar streets like this in the Tarwewijk, but also elsewhere in the Netherlands. Therefore the designs offer relevant interventions showing how this kind of street could be improved.

SITE ANALYSIS

The Speltstraat is narrower than the Heenvlietstraat.

The Speltstraat is a narrow street in which multiple problems occur when it comes to wheelchair accessibility.

1. Sidewalk too narrow
2. Obstacle: Trash bins on the narrow sidewalk
3. Obstacle: Bicycles parked on the narrow sidewalk
4. No dropped curb to get on the sidewalk

DESIGN

In all three designs: At the end of the street a collective underground waste container instead of loose bins.

Fig. 5.59 Wheelchair accessibility problems in the Speltstraat

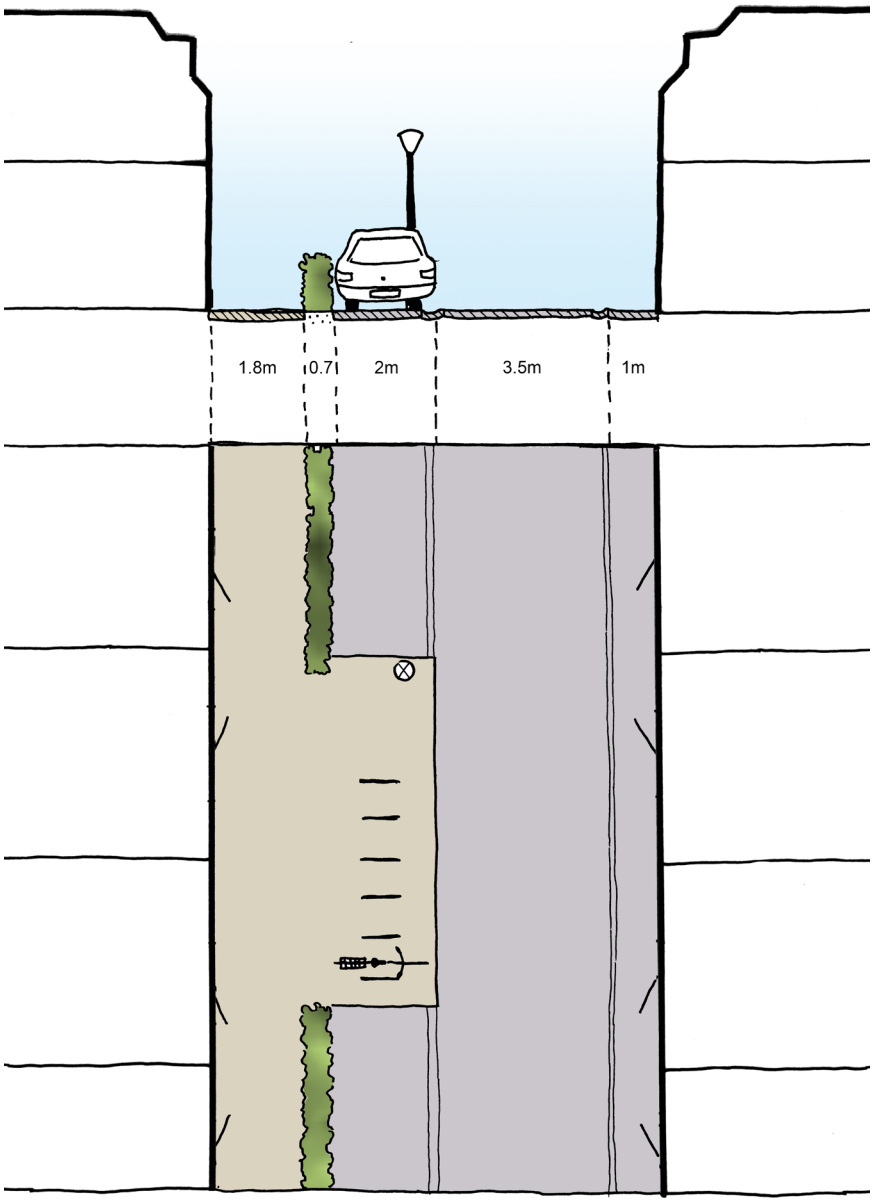


Fig. 5.60 Section minimum design Speltstraat

MINIMUM DESIGN

In this design the broad and obstacle free sidewalk is on the same level of the street and only distinguished by another type of pavement. This is possible because of the low amount of traffic. Some parking spaces are sacrificed and replaced by bicycle parking spots and designated areas for lamp posts. A small hedge next to the parking spots adds a little bit of greenery to the street.

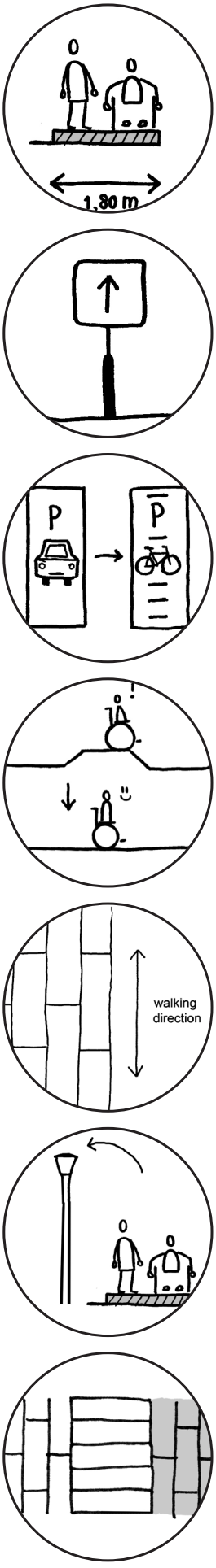


Fig. 5.61 Design guidelines minimum design Speltstraat

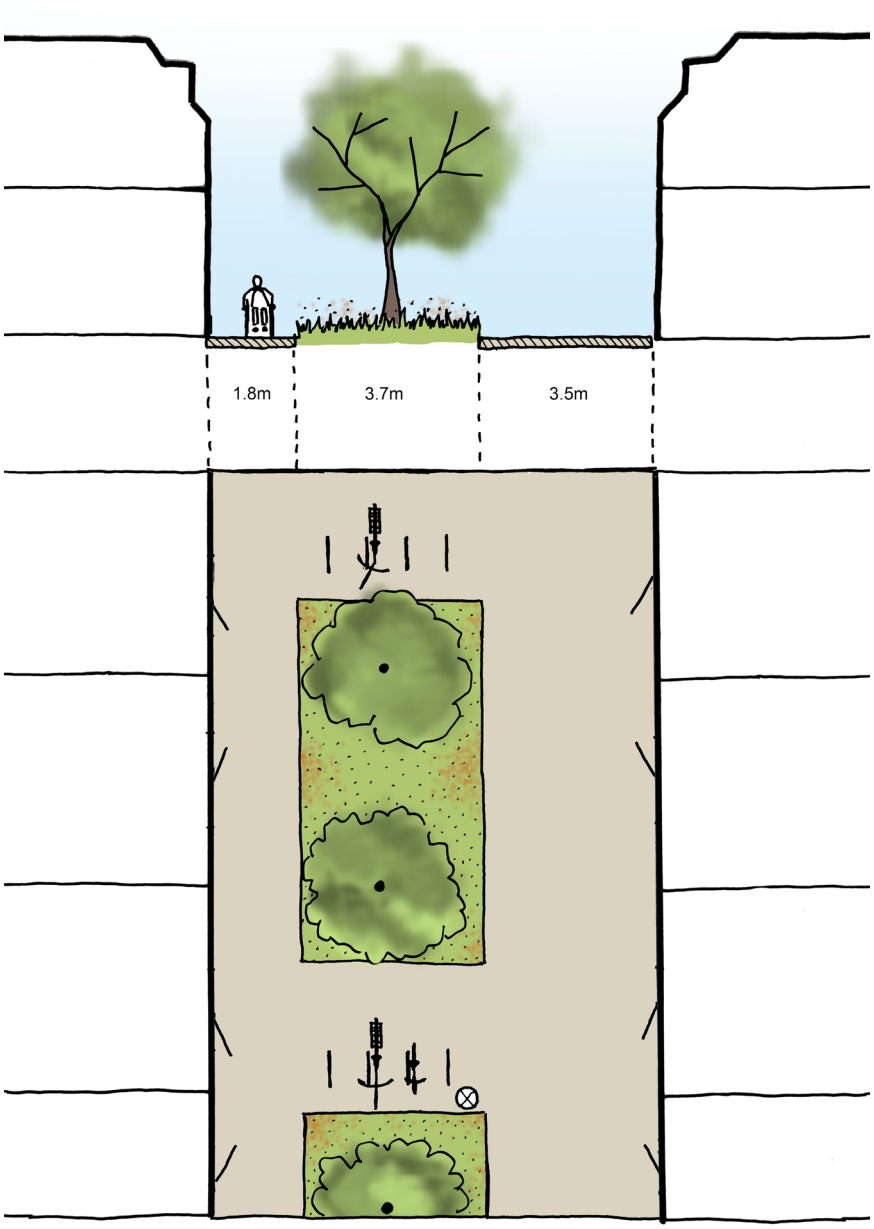


Fig. 5.62 Section medium design Speltstraat

MEDIUM DESIGN

This design bans cars completely and is only accessible for emergency transport. The green border in the middle of the street provides shade and places to put objects (street furniture, lamp posts and bicycle parking) out of the way. The pavement will be an even surface with no obstacles or height differences.

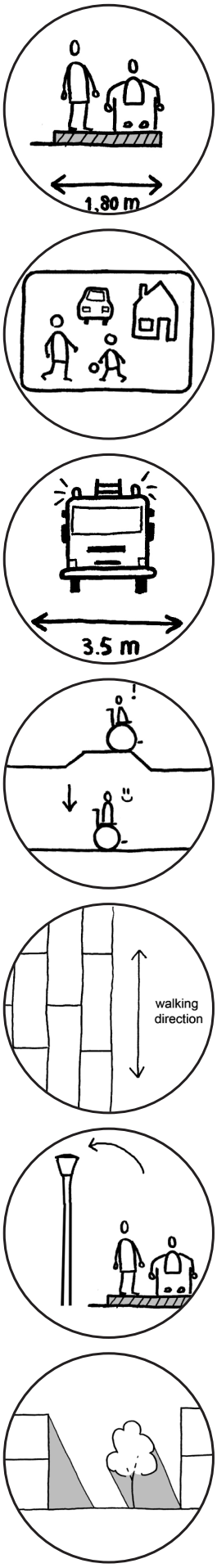


Fig. 5.63 Design guidelines medium design Speltstraat

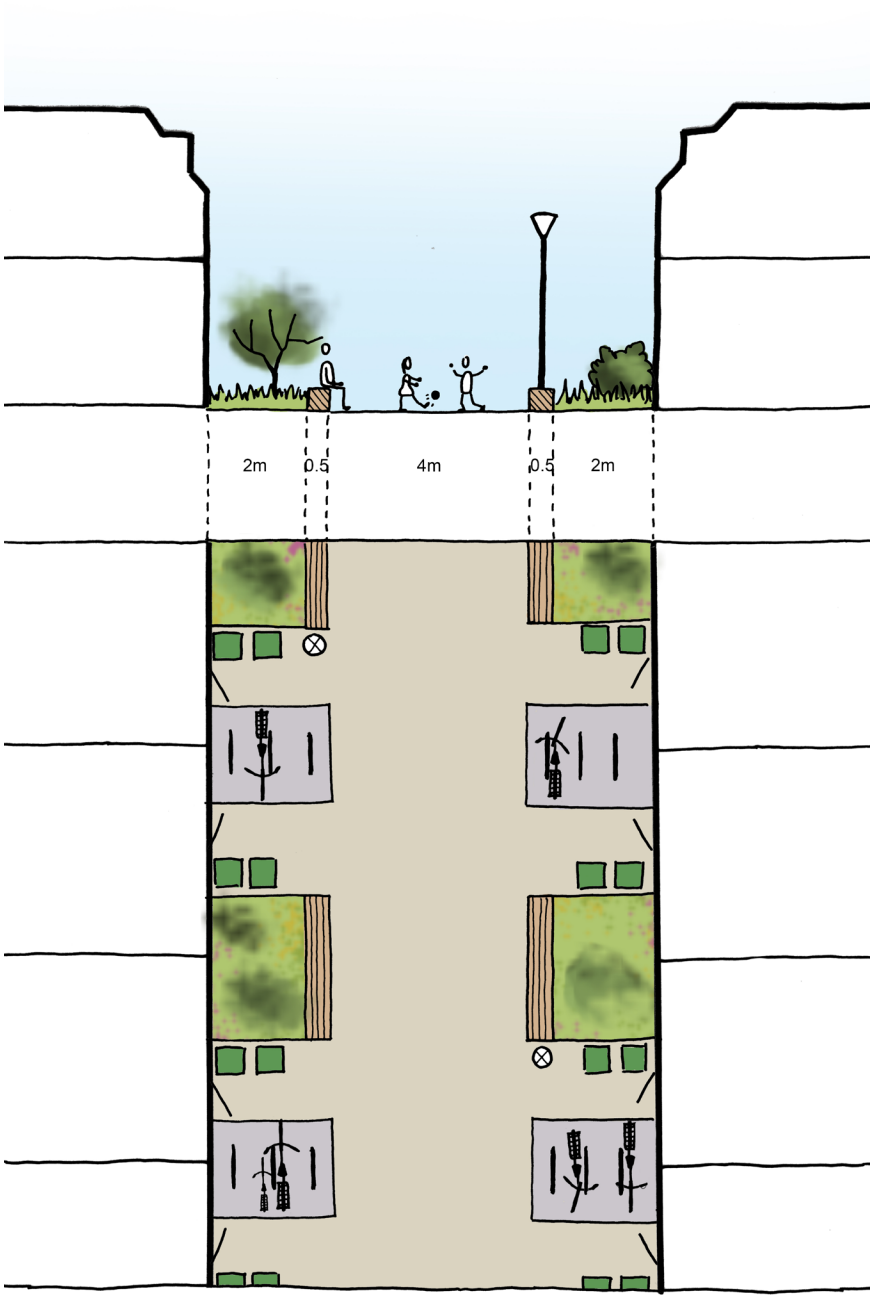


Fig. 5.64 Section maximum design Speltstraat

MAXIMUM DESIGN

This design also bans cars completely and is only accessible for emergency transport. On each side it has designated areas to put street furniture like flowerpots and areas for bikes in front of each house. This prevents people from being lazy and park elsewhere in the street. The integrated bench provides opportunity to socialize and the street provides a safe place to play. The pavement will be an even surface with no obstacles or height differences.

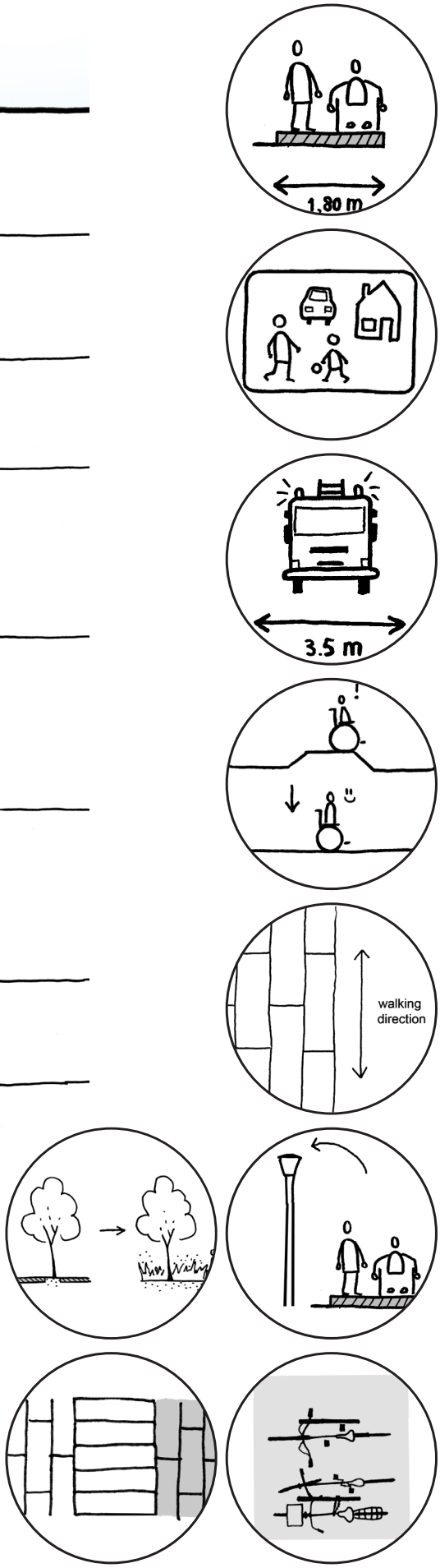
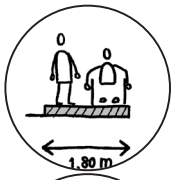
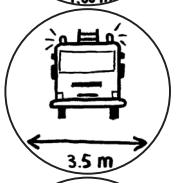


Fig. 5.65 Design guidelines maximum design Speltstraat

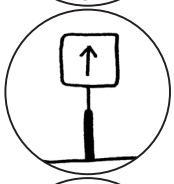


Explanation design guidelines

The sidewalks are at least 1.8 meter broad and with no obstacles within this 1.8 meter zone.

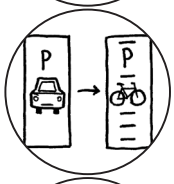


Even though the street is not accessible for cars it must remain accessible for emergency transport. This requires an obstacle free zone of 3.5 meter.

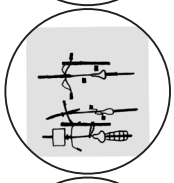


This is a one way road.

This street is a ‘woonerf’

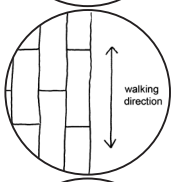


Parking spaces are turned into bicycle parking spaces

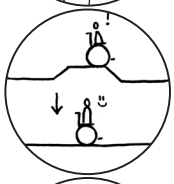


Bicycle parking in dedicated zones.

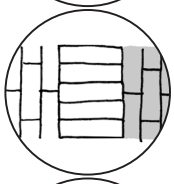
Street furniture is put off the sidewalk to prevent obstacles on the sidewalk for people in a wheelchair



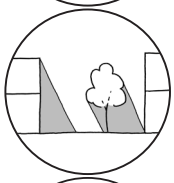
The length of the pavement is placed in the walking direction to reduce shanking of the wheelchair.



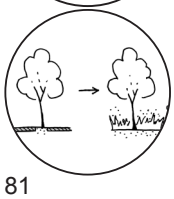
There are no height differences, all surfaces are on the same level. This makes it easier for people in a wheelchair to navigate.



Pavement marks the different zones in the street



Trees are placed in such a way that they provide extra shade in the streets to reduce heat stress.



Turn paved areas into greenery to reduce heat stress

EVALUATE FEASIBILITY AND GENERALIZABILITY

In narrow streets like the Speltstraat it is not possible to combine room for cars, the demands of wheelchair accessibility and to improve the overall quality of the street in a comfortable way. This can be seen in the minimum design that still feels a bit cramped with the hedges squeezed in between the parking spots. Moreover, parking space needs to be sacrificed to make room for bicycle parking and lampposts. You can debate if the few parking spots that are still left in the minimum design are worth it compared to improving the overall comfort of the street in the other two designs.

The impact of the maximum design on the traffic system is as big as the medium design but the space created functions better as a place to stay. Therefore the maximum design would be preferred.

There are several similar narrow streets like this in the Tarwewijk, but also in other urban districts all over the country. Therefore it is relevant to know how this kind of street could be changed to improve wheelchair accessibility in a way that stimulates the overall quality.

Fig. 5.66 Explanation of all the design guidelines

STEP 3 IMPROVE PUBLIC TRANSPORT

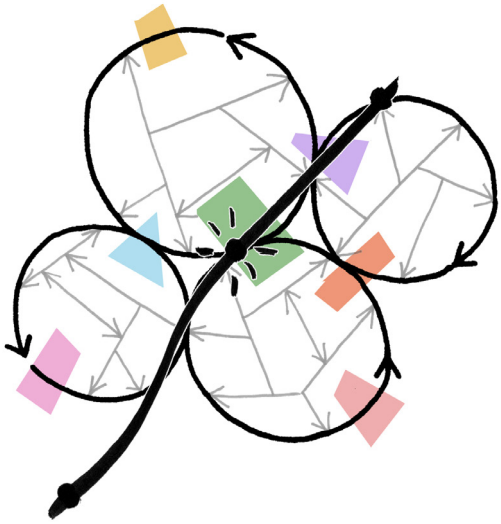


Fig.5.67 Concept improve public transport

RESTORE METRO FREQUENCY

To restore the frequency of the metro stops just like in the city center, a metro stop is added on the crossing of the Mijnsherenlaan and the Mijnsherenplein. At this point the car traffic of the Mijnsherenlaan will be blocked (see appendix C for a traffic analysis). So the Mijnherenplein can become a well functioning square instead of the fragmented place it is now. A detailed design was not made for this metro station, since it lies outside my field of expertise (architecture) and is less relevant for this research.

WATER TAXI AND WATER BUS

Watertaxis are unfortunatly not wheelchair accessible. But the waterbus is wheelchair accessible and by adding a new stop in de Maashaven it gets easier to get from Rotterdam South to many places in the surrounding of Rotterdam with your wheelchair.

PARKING

In all the designs a lot of parking spaces are removed. Solutions for this can be found in multiple interventions (fig. 5.68 and 5.69). These interventions help to reduce cars in the city and stimulate the use of healthier options like cycling, walking, public transport and shared cars.

1. Parking on the street is mainly for temporary parking. However, people who are less mobile can apply for a parking spot on the street nearby their homes.
2. Create neighborhood mobility hubs. In these mobility hubs there is mainly parking space available for shared cars, which reduces the amount of cars drastically. The mobility hubs do not only function as parking facilities, but can facilitate bike storage and multiple social functions as well. Think about underground parking and a playground on top. Or new buildings with parking on higher levels and social activity spaces on the street level and rooftop.
3. Extra parking solutions for visitors and tourists are parking boats on the Maashaven. From these points it is easy to get onto a Plus Route by foot or bike to your final destination. On top of the parking boat a park can be created. These parking boats provide the flexibility to create more parking spaces when big events take place in Rotterdam South.
4. Create large transferiums on the city edge near the motorway. Residents that still want their own car can park over here. These transferiums are designed to make it easy to step over to another mode of transport such as bicycle or public transport.

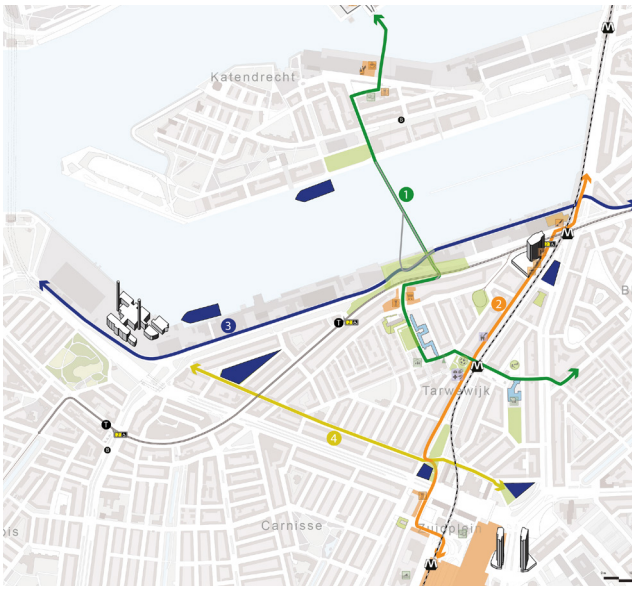


Fig.5.68 Map transport hubs and parking boats in the Tarwewijk (Dark blue)

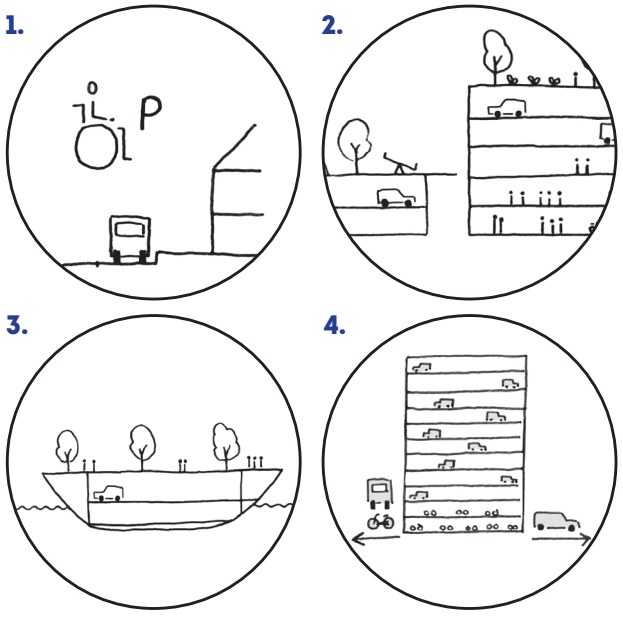


Fig.5.69 Four parking interventions on different levels

5.3 EVALUATION DESIGN

If you apply the concept of Plus Route to other neighbourhoods/urban districts you can create a widespread accessible slow infrastructure network. This can help improve the overall accessibility and health of all citizens. People are invited to move more and take healthier routes that do not lie next to polluted car routes. The slow infrastructure network also provides opportunities for tourism and can help to improve the image of Rotterdam South. For example, an architecture route can be made and the populair route round of bridges can be expanded. Rotterdam becomes more popular for tourists. By seducing the urban visitor to go to Rotterdam South as well, this can help to spread out the tourists and help prevent scenes like in Amsterdam (Elsinga, 2017).

However, each place is unique and therefore a design needs to be custom-made for each location/ neighbourhood. The design principles can help to form this design process but are not a prefab solution (see page 84). The bold rounds are principles that can easily need to be applied to other similair locations to make the public open space accessible and do not require much location specific design adaptations.
Moreover, the designs made during this research can be used as an inspiration and conversation starter on how to design wheelchair inclusive.

The Research Through Design process also showed me that designing for wheelchair accessibility can be very challenging, especially when height differences occur and when limited space is available. The multiple demands on the public open space make it difficult to achieve wheelchair accessible public open spaces. The designs show that a shift in thinking is necessary, cars must get a lower priority or it is not possible to create enough space for accessibility.
In the (re)development of new neighbourhoods/public open spaces I would recommend to take wheelchair accessibility into account from the beginning of the design process and not as an afterthought.
Unfortunately, some (existing) public spaces will be extremely hard or impossible to make accessible. For example, the phenomenological rolls showed that the Erasmus bridge is not very wheelchair friendly and the metro can be quite scary/challenging as well in a wheelchair. Making it hard for people in a wheelchair to cross the barrier of the Maas that splits the city in two. Those barriers will still exist even though the public open space of urban districts is improved. Improvement of the public transport (metro and new water bus line) can help to improve this. It is in such cases necessary to think out of the box to solve those problems and also work interdisciplinary, outside of the field of landscape architecture to make the city wheelchair accessible.

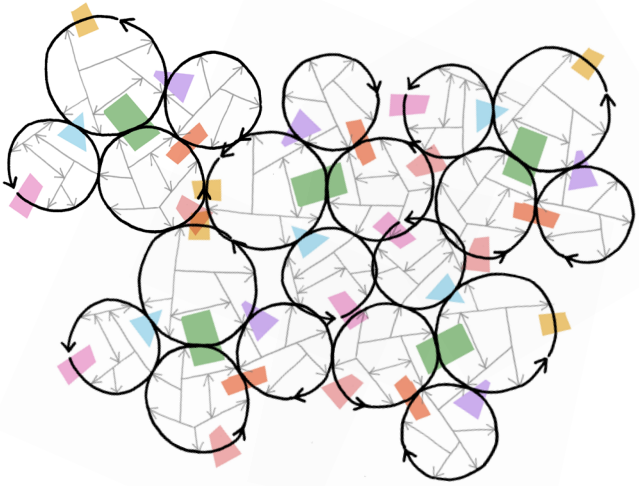


Fig. 5.70 Slow infrastructure network through Rotterdam by applying Plus Routes to other neighbourhoods

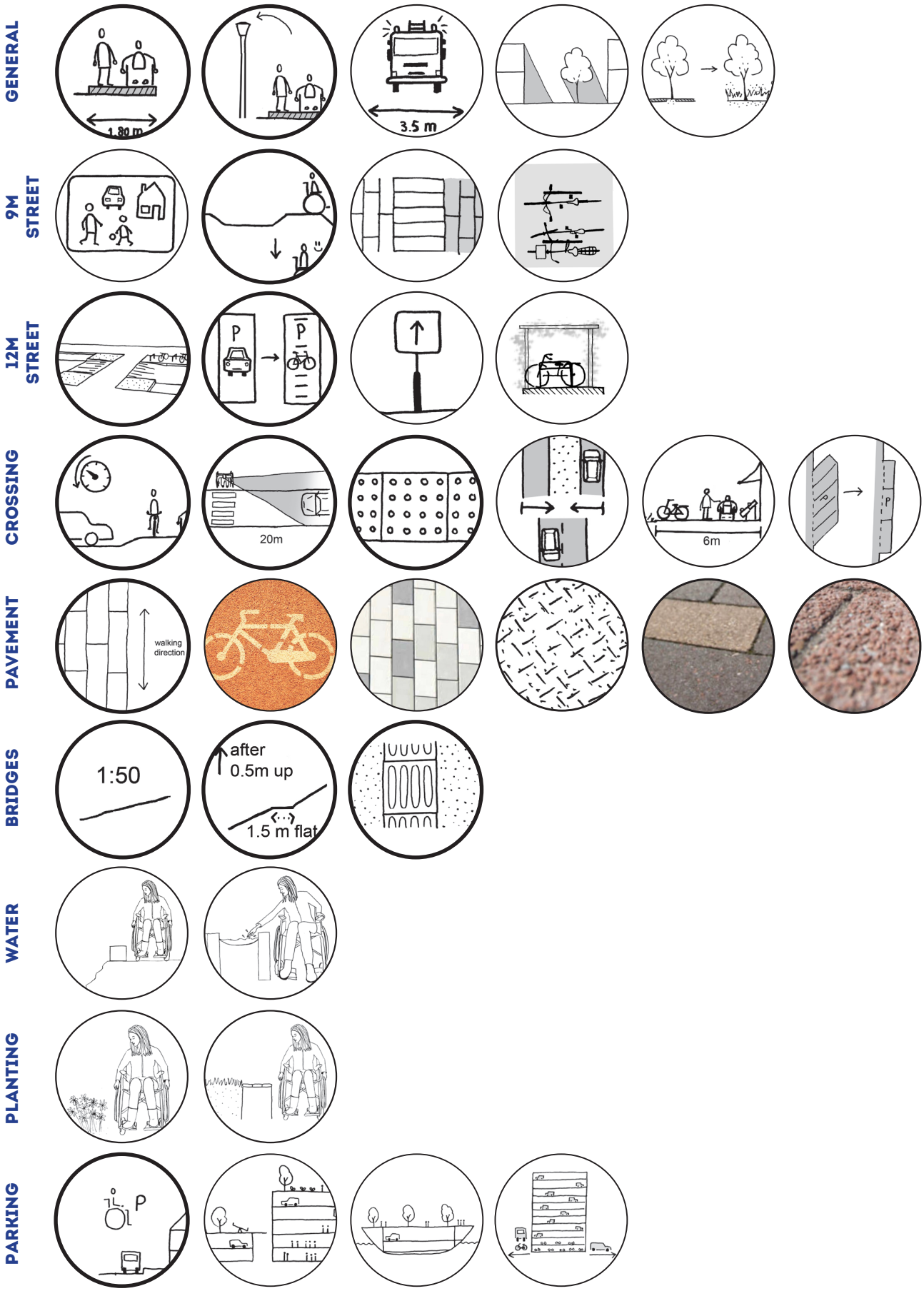
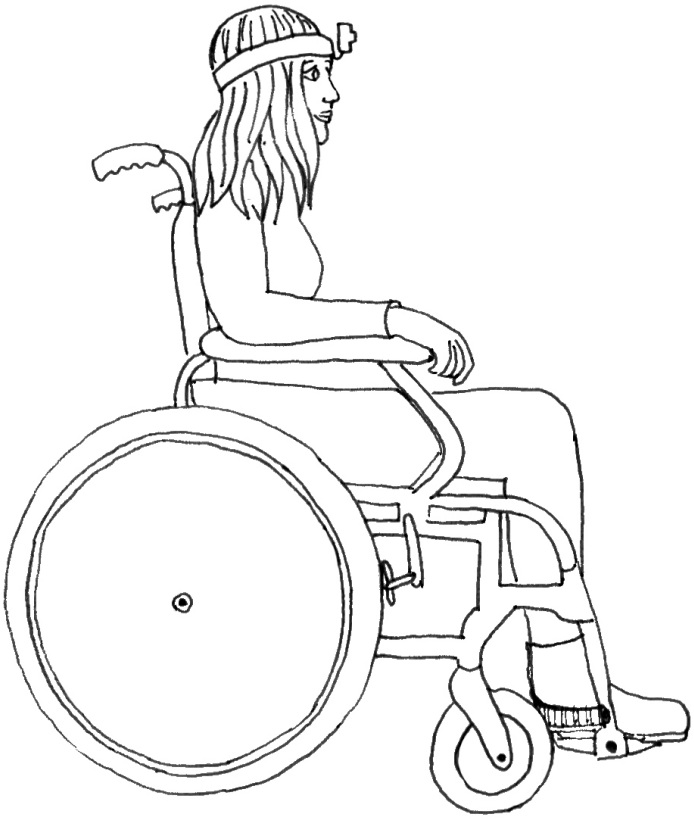


Fig. 5.71 Design principles wheelchair accessibility

EVALUATION



CHAPTER 6

In this chapter, the main research question will be answered:

What interventions could improve the wheelchair accessibility of urban districts?

The outcomes of the sub research and design questions will be discussed and overall conclusions drawn.

6.1 DISCUSSION

METHODS

The outcome of this qualitative research is location (Tarwewijk), time (November and December 2019) and research specific (me). It is not positivistic. Therefore the outcome of this research can only be partially transferred to other locations. This is also true for the design part of this research. Each location is unique and will need a unique design solution for wheelchair accessibility, however the design principles can be a way to still use this research in other locations. Also, the outcome of this research can be used as a tool for discussion and to educate others about wheelchair accessibility.

The step from design guidelines to design principles is a theoretical one. The design principles are not tested in another design process on another location to evaluate their applicability (van Etteger, 2016).

There are limits to the method of the **phenomenological rolls**:
Firstly, some elements of wheelchair accessibility may be missing, because I did not come across them during the phenomenological rolls in the Tarwewijk. This is due to the routes that I predetermined behind my desk or because certain problems simply do not exist in the Tarwewijk. It is also possible that certain problems did not occur at that specific moment of time. An example of this can be seen in figure 6.1. A recent development in Rotterdam are shared scooters you can rent you pay for each minute you use them. A downside is that they can be parked anywhere. People park them in random places instead of logical places to reduce costs. I have frequently encountered them placed in the middle of the sidewalk or even in front of a dropped curb. The elderly people in my flat could not pass them. This shows that new developments can create new obstacles for wheelchair accessibility.

Secondly, another person may experience certain elements differently. For example, a person in a wheelchair with rheumatism or MS may experience more pain while going over uneven pavement. A person with a car may experience problems with parking on handicapped spots. Or a kid in a wheelchair may come across certain problems on playgrounds.

Fig. 6.1 Shared scooters parked in the middle of the sidewalk

Further, there are limits in the material that I used for the phenomenological rolls:
- I used only one type of wheelchair, while there are many different models and sizes. I used one of the smallest wheelchairs. By using another wheelchair, the experience and conclusions may slightly differ.
- The GoPro was placed slightly higher on my forehead, the fish-eye lens of the GoPro recorded a broader view than what I experienced and it does not capture my eye movement. Therefore the movie fragments do not show the exact experience.

While collecting and analyzing the data I tried to stay as objective as possible. However, I cannot guarantee that I was not slightly biased. This can be solved by letting an external person analyze the data or to repeat the research. Due to the time limitations of this thesis, this was not possible.

The conclusions of the rolls are a representation of an experience. Some things cannot be grasped by

text, drawings or movie fragments. I wish you could have been rolling with me and experiencing it for yourself.

The methods used and conclusions are thick in description because in constructivist research it is important to work systematically and to write down all the steps taken conscientiously (Lenzholzer et al, 2013). However, these long texts make it harder to communicate the findings to others and convince them of the relevance of making wheelchair inclusive designs. In that sense, it is not very accessible.

RESEARCH PROCESS

The development of the methodology and analysis of the phenomenological rolls was very complex and time consuming. The timespan of this thesis has taken longer than originally planned. But due to this extra time it was possible to gain the insights that helped to fill the knowledge gap on how to design wheelchair accessible urban districts that could not have been obtained otherwise.

During the research process of this thesis I struggled to not make the research too broad. A lot of interesting information about the relationship between landscape architecture health, accessibility, navigating through the city and the demand for different users of slow infrastructure did not make it into the final thesis because I needed to narrow down the research.

Originally, I planned to do a participatory design process to answer my research questions. During a thesis guidance, I was introduced to the theory of phenomenology. It intrigued me and seemed like a logical step to take for this research because it would provide me with knowledge that a participatory design process could not provide me. However, I had no previous experience with this theory and method. Therefore it took time to understand this complex philosophical theory. Moreover, the data I wanted from the phenomenological methods that already existed was not a complete match. Therefore I developed a new method by combining the method of Sandra Costa and Rudi van Etteger and adding a video component. As a result, there was no exact prescribed guide to follow. It was sometimes a time consuming process of trial and error. Especially the coding and editing of the movies was a very time consuming process, which I severely underestimated.

Due to the big research part of this thesis there was only limited time to design. A lot more points in the area of the Tarwewijk would have been interesting to explore in a research through design process. Even though I tried to narrow the amount of design to a minimum I still took on a bit too many points for a detailed design for the time available. But each design detail shows another problem that needs to be solved in wheelchair accessibility and therefore adds value to this research. Moreover, the design of the bridge at the Brielselaan was very challenging. During the design process a lot of problems kept popping up. Each time I thought I solved it, the next problem arose. Perhaps this was not the best location to make a detailed design in the limited time available. On the other hand, you can argue that if you can make this point wheelchair accessible (and a good slow infrastructure connection) you can make any place accessible. Also, this location shows how challenging it is to make places with height differences wheelchair accessible and on which points you need to pay attention to when doing this.

In the end, due to limited time available and the Corona crisis I did not evaluate my research findings and design with an external party or expert on wheelchair accessibility. If this was done triangulation of the different data sources was created (literature, phenomenological rolls, interviews and reflection of the data and design by an external expert) this would have made the outcome of this research more reliable (Lenzholzer et al, 2013). The designs are now evaluated by my own educated guess.

BROADER CONTEXT

The aim of this thesis is to contribute to the research to make more wheelchair accessible urban districts. However, in order to do this a shift in thinking is necessary not only in the field of landscape architecture but in our entire society. Cars should get a less dominant place in our cities. Such a shift in thinking and designing is not easily made. But the recent Corona crisis and the 1,5-meter society has shown the importance of creating more space for pedestrians and

cyclists (AD, 2020). Also environmental awareness and nitrogen problems in the Netherlands are topics in which cars get less space. This provides opportunities to stimulate this shift in thinking.

There is a limit to what extent landscape architecture can influence health inequalities within a city. A physical change in the public urban space of a problematic neighborhood does not suddenly fix everything. There are four layers of intervention to remove health inequalities (fig. 6.2). Those interventions should take place simultaneously and over a longer period of time. Therefore the design of the Tarwewijk in this thesis will not solve all the problems in the Tarwewijk (Uyterlinde and van der Velden, 2019 and Utrecht University Studium Generale, 2015).

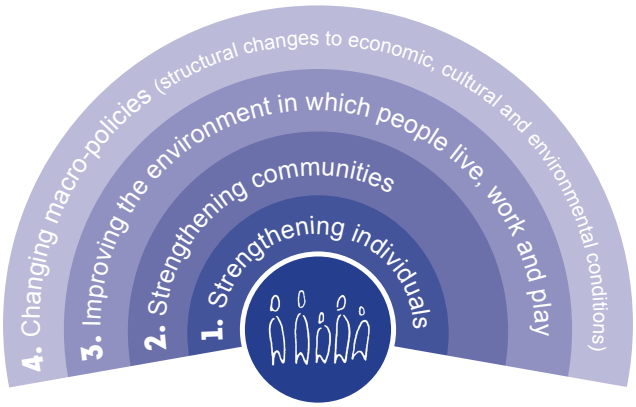


Fig. 6.2 Levels of action to tackle health inequalities

RECOMMENDATIONS FURTHER RESEARCH

This research does not have an answer to all the problems the municipality encounters that are addressed during the interview (chapter 4). Some of these problems need to be solved outside the field of landscape architecture or need to be further researched. Questions that need to be answered are:
How can wheelchair accessibility be managed after a design is realized and during the maintenance period?
How can the knowledge gained during this research be spread among other professionals in the field of landscape architecture, urban planning and design? Perhaps design education can play an important role into this in the future, since you can argue that designing for vulnerable groups is not integrated into design education. Therefore there is a lack of knowledge on how to integrate their needs into general designs and how this emotionally affects these people. As a result of this one can assume that's also why professionals do not have enough knowledge to design for such people (Rodermond, 2016).

Moreover, I would recommend using the method of phenomenological rolls or walks more in practice. Although it is a very time consuming method, it is a good time investment since the knowledge gained helps to really understand a problem, landscape, phenomenon or group of people. This makes it easier to communicate to other people what the relevance of certain priorities, design measures or policies are. Also, the concept of Positive Health can be a tool to help and show the impact of the landscape on minority groups in our society.

In this research, the main priority was wheelchair accessibility. However, accessibility is an issue for more minority groups of people in our society, such as people who are deaf, have a visual impairment or are mentally limited. Due to the time limit of this research it was not possible to include them all, however it would be interesting to research the demand of the public space for these people as well and compare how these conflict or complement each other.

In this research, I only researched wheelchair accessibility in urban districts and during winter. It would be beneficial to also research wheelchair accessibility in different types of landscapes and seasons to see what kind of problems occur there. For example, playgrounds, city centers, nature areas or historical city centers like Delft.

In this research I developed a new method, the phenomenological roll, in which I added a video component. I did not do a thorough research on the theory and relevance of video in landscape architecture. This would be an interesting topic to do further research on.

Due to the time limit of this research, not for all the problems encountered during the phenomenological rolls a design solution could be made. Further design research could be done in the future.

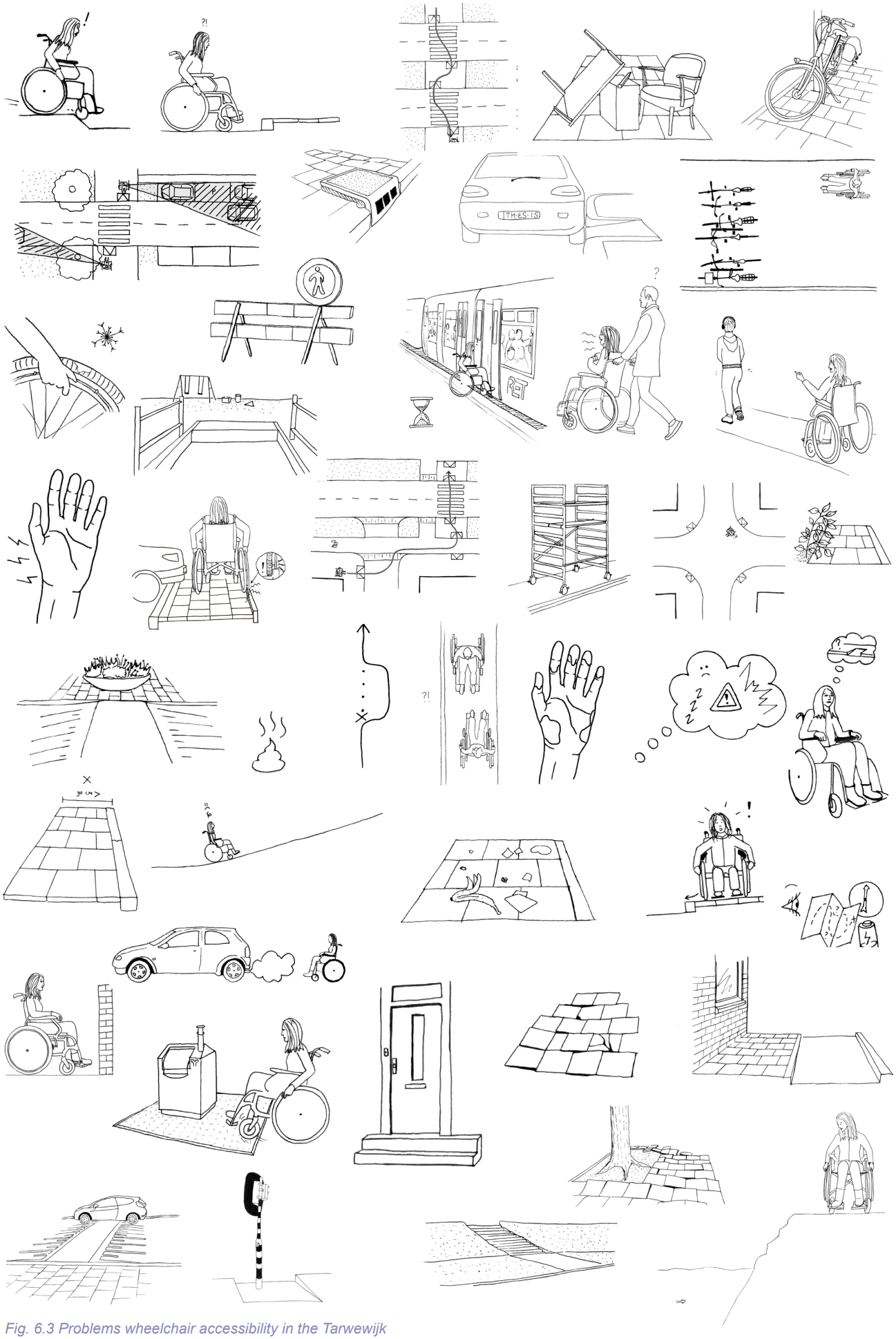


Fig. 6.3 Problems wheelchair accessibility in the Tarwewijk

6.2 CONCLUSION

What spatial elements in the Tarwewijk influence the 'Positive Health' of people in a wheelchair?

The current public space in the Tarwewijk is not wheelchair accessible. The phenomenological study shows that in the entire neighbourhood problems frequently occur (fig. 6.3). Even in a small amount of space, a variety of problems can occur for the wheelchair. A short roll in a wheelchair can therefore have a high amount of challenges, which negatively influences the positive health of a wheelchair bound person. These challenges are multi-sensory (fig. 6.4) and affect the five pillars of positive health as can be seen in fig 3.81 on page 44.

Fig. 6.4 Multi-sensory design

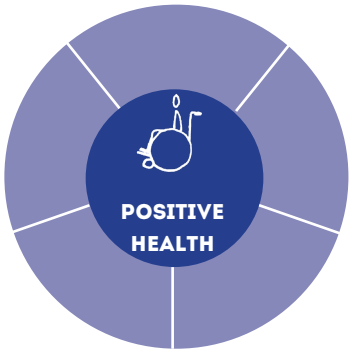


Fig. 6.5 Positive Health as evaluation and communication tool

What problems does the municipality of Rotterdam encounter when working on wheelchair accessibility in urban districts?

The municipality of Rotterdam encounters multiple problems when it comes to wheelchair accessibility. There are too many demands in the limited available space in dense urban districts. And it is hard to convince colleagues of the importance of designing more wheelchair inclusive and giving it a higher priority over other demands.

Design solutions for wheelchair accessibility should be safe and should also include the visually impaired. This makes finding design solutions harder. After a design is constructed in real life, mistakes in construction are not fixed and there is no control on the public open space for the next 30 years.

There are opportunities to improve wheelchair accessibility in the public open space. The biggest chances to improve wheelchair accessibility are: The maintenance cycle of renewing the public open space, constructing the heat network (Stadswarmte) and creating Plus Routes that focus on accessibility. Also, a combination with tourism is stimulated in Rotterdam.

How can the wheelchair accessibility in the Tarwewijk be improved?

The outcomes of the research questions informed the research through design process. The current guidelines for wheelchair accessibility from the municipality are very technical and do not touch upon the multi-sensory experience of people in a wheelchair. This should change.

A strategy that can improve wheelchair accessibility in the Tarwewijk is creating four Plus Routes that connect important places to stay within the neighbourhood and to the surrounding neighbourhoods. On these Plus Routes, slow infrastructure and wheelchair accessibility are a priority (fig. 6.5). After the construction of the Plus Routes the other streets should be connected and made accessible when the opportunity arises, since each obstacle is one too many.

Several design details with different concepts and design guidelines show how these routes and other streets can be made wheelchair accessible. When the concept of the Plus Routes is also implemented in other neighbourhoods a slow infrastructure network through the city can be created. By combining opportunities for other groups like children, elderly, tourists and slow infrastructure in general in the design, more support for wheelchair accessibility can be created and the entire population can benefit from the design. As a consequence cars get less space.

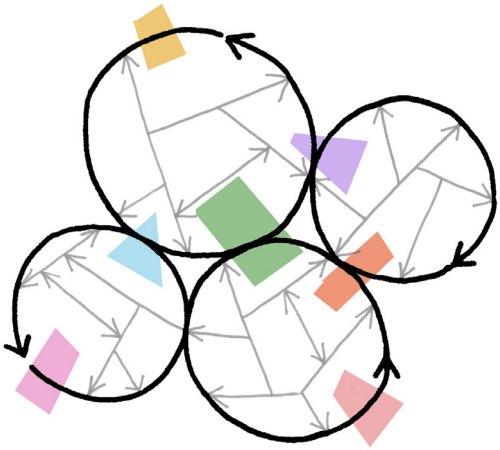


Fig. 6.6 Design strategy Plus Routes

What interventions could improve the wheelchair accessibility of urban districts?

The research and design questions above together answer the main research question and we can conclude the following:
The design principles that were formed during the research through design process (page 84) can help to make other urban districts wheelchair accessible, however each place is unique, should get a customized solution and form needs to follow function. Making a place aesthetically pleasing is more than the visual component of making it pretty, a designer should take into account the multisensory experience of people in a wheelchair (fig. 6.3 and 6.4). Moreover, designers need to put the people (slow infrastructure) and their multi-sensory experience before cars (fig. 6.4 and 6.6). This requires a shift in thinking while designing.

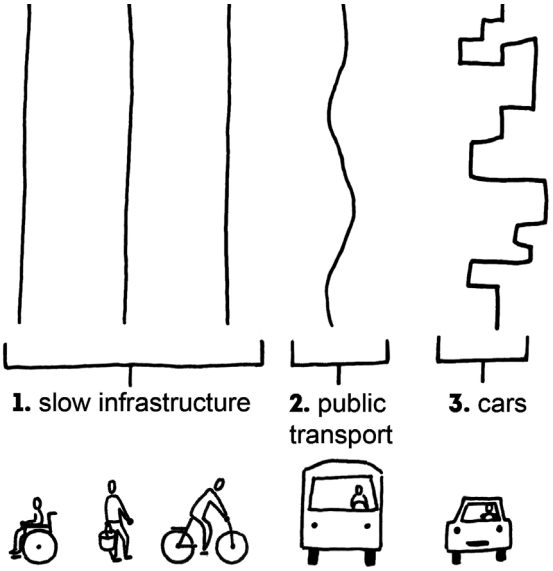


Fig. 6.7 Shift in thinking slow infrastructure first cars last

It is important to educate other designers and urban planners about the importance of designing more inclusively for people in wheelchairs (fig. 6.8). The framework of positive health and phenomenological methods can help landscape architects and urban planners understand and communicate the importance of inclusive design (fig. 6.3 till 6.5). I hope this research can help to spread the knowledge about wheelchair accessibility and the design can be used as a tool for discussion about prioritizing the multiple demands on the public open space.
However, this understanding can best be created by experiencing it yourself. I wish you were rolling with me.

Let's make Rotterdam ready to roll!

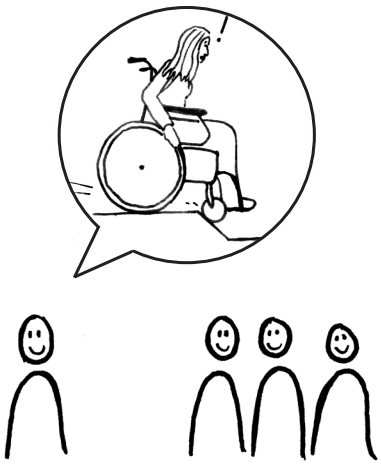


Fig. 6.8 Educate others about wheelchair accessibility

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Fig. 2.1 Karl Jilg (2017) Businessinsider This ingenious illustration reveals how much space we give to cars https://www.businessinsider.nl/car-illustration-karl-jilg-2017-4?international=true&r=US [Accessed 14 July 2020]

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Fig. 2.10 Screen shot from Strava app on mobile phone download at: https://www.strava.com/mobile

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Fig. 5.5 Veldacademie (2012) LEEFVELDENANALYSE BLOEMHOF - TARWEWIJK https://www.veldacademie.nl/img/Document/c9/af/c9afd121-1efd-4a99-9dd3-5bf6dd95a65c/Eindrapportage%20leefveldenanalyse_Bloemhof_Tarwewijk_120712_LS_LQ.pdf [Accessed 10 May 2020]

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Fig. 5.32 IPV Delft (?) Fietshellingen - deel 1: Hellingspercentage Available: https://ipvdelft.nl/fietshellingen-deel-1-hellingspercentage/ [accessed 17 Jun 2020]

Fig. 1.1, 2.9, 5.4, 5.6 and 5.10 are based on illustrator Leefvelden analyse maps provided by Pieter Graaff from the Veldacademie.

APPENDIX A INTERVIEW GUIDE MUNICIPALITY OF ROTTERDAM

- What are your policies about wheelchair accessibility?

- What are the most common problems and complaints you perceive or hear about wheelchair accessibility?

- Can people report their problems about accessibility somewhere?
    - Is this frequently done?
    - Is this stimulated by the municipality of Rotterdam?

- What kind of projects are currently done about accessibility and inclusivity at the municipality of Rotterdam?

- Are new plans/designs being tested on accessibility?
    - If so, how?

- How important is accessibility in spatial projects?
    - Has it a high priority or not?

- When plans are being realized does the contractor get specific guidelines for accessibility?

- Do you notice if there are people that lack certain knowledge about accessibility? For example, designers, landscape architects, architects, urbanists, planners, contractors or other professionals?

- Is accessibility underrated/underestimated with the municipality of Rotterdam?

- Which spatial plans are planned for the Tarwewijk/ Rotterdam South?

1. Parkeren

Gehandicaptenparkeerplaats

- Er dient er tenminste één algemene gehandicaptenparkeerplaats aanwezig te zijn op elke 200 parkeerplaatsen. Deze dient op een logische plek gelokaliseerd te worden; bijvoorbeeld binnen 50 m van de hoofdingang van een gebouw met een openbare, publiekstrekkende functie.
- Er dient op een parkeerterrein tenminste 2% van het totaal aantal parkeerplaatsen een algemene gehandicaptenparkeerplaats te zijn.
- Naast de auto dient aan één lange en één korte zijde een vrije gebruiksruimte van 1,5 m breed te zijn, op hetzelfde niveau als de parkeerplaats en gesitueerd buiten de rijbaan en/of fietspad; Dit is mogelijk op een vrije ruimte van 6 m x 3,5 m;
- Als de parkeerplaats zich op een hellend vlak bevindt, mag deze niet steiler zijn dan 1:50;
- Indien aan één of meer zijden een trottoirband aanwezig is dan moet binnen 5 m een oprit aanwezig zijn;
- Verkeersbord E6 (algemene gehandicaptenparkeerplaats) aanbrengen;
- Kruismarkering op de bestrating aanbrengen.
- Langsparkeren bij voorkeur in een verhoogd parkeervak
- Bij langsparkeren op rijweg niveau is een breedte van 3.50 niet haalbaar; hierbij moet de ruimte op het trottoir worden gebruikt en daarvoor gereserveerd (obstakelvrij).
  NB Deze variant wordt ook toegepast bij toewijzen van bestaande parkeerplaatsen tot parkeerplaats invaliden (algemeen of kenteken)

Plusrichtlijn: geen

Stalling voor fiets en scootmobiel

- Fietshekken zoneren buiten de looproute.
- Bij een gebouw met een openbare, publiekstrekkende functie dient rekening gehouden te worden met opstelruimte om scootmobielen te kunnen parkeren binnen 50 m van de hoofdingang.
- Maatvoering hiervoor: naast de vrije doorgang van minimaal 180 cm op het trottoir dient een vrije breedte van 90 cm beschikbaar te zijn voor het stallen van een scootmobiel. De lengte van de opstelplaats is 135 cm.
- Een opstelplaats voor scootmobiel wordt niet gemarkeerd.

Plusrichtlijn: geen

Oriëntatie fietsnietjes is ook van belang (zie figuur 3.38 op pagina 36)

2. Route

Loopoppervlak

Het loopoppervlak van elke route dient stroef, vlak en obstakelvrij te zijn. Hellingen moeten goed begaanbaar zijn. Zowel voor mensen met rollend materieel als bijvoorbeeld voor slechtzienden en blinden zijn er eisen:

- Ontworpen hoogteverschillen in bestrating zijn niet groter dan 2 cm, anders zijn ze voorzien van een helling. Onregelmatigheden in bestrating door verzakking en schade mogen niet hoger zijn dan **3,0 cm**
- Maaswijdte van roosters, putdeksels, kolken en dergelijke zijn bij voorkeur niet breder dan 2 cm;
- Kolken liggen in principe niet in de looproute behalve wanneer er geen alternatief is. In die gevallen geldt een maximale maaswijdte van 2 cm.
- Op cruciale punten, en bij voorkeur elke 200 meter, dienen er trottoirafritten in de route aanwezig te zijn;
- bij voorkeur zijn dit verlaagde trottoirbanden met een helling van maximaal 1:12;
- Trappen: breedte minimaal 120 cm. Bij trappen dient altijd een mogelijkheid te zijn om binnen een redelijke afstand het hoogteverschil met een helling te overbruggen.
- Trappen hoeven niet voorzien te zijn van een leuning, mits er een helling met leuning binnen 50 m aanwezig is.
- Hellingen hebben een vrije breedte van 120 cm en een gebruiksruimte onder en boven van 200 x 200 cm. Hellingshoek is bij een hoogteverschil tot 25 cm maximaal 1:12, bij een hoogteverschil tussen 25 en 50 cm is de hellingshoek maximaal 1:16 en bij een hoogteverschil van 50 tot 100 cm is de hellingshoek maximaal 1:20.
- Indien het hoogteverschil bij hellingen in de lengterichting meer dan 25 cm is, dan is er een afrijdbeveiliging in de vorm van een balustrade nodig aan de open zijde. Er moet dan een leuning bij voorkeur 2-zijdig langs de helling zijn. Als het hoogteverschil met het aangrenzend vlak minder dan 25 cm bedraagt, dan dient er een afrijdbeveiliging te zijn in de vorm van een opstaande rand van minimaal 5 cm hoogte.
- De leuning dient een diameter van 30-50 mm te hebben en comfortabel omvatbaar te zijn; de aanloop naar de leuning moet altijd goed vindbaar en voelbaar zijn en dient daarom 30 cm door te lopen voorbij helling/trede, waarbij het uitstekende deel een afgeronde vorm heeft.
- Na elke 50 cm hoogteverschil dient er een horizontaal rustvlak van 150 cm diep te zijn;
- Hellingen dwars op de looprichting zijn maximaal 1:50. Ter plaatse van opgehoogd tegelwerk bij toegangen is een helling van 1:25 toegestaan indien het trottoir niet voldoende breed is voor een helling van max. 1: 50.
- Bij een looproute langs een talud, met een hoogteverschil van meer dan 25 cm tussen loopoppervlak en aansluitend lagergelegen gebied, dient, wanneer de looproute minder dan 2 m breed is, en er geen trottoirband of kadebalk is, er een afrijdbeveiliging te zijn in de vorm van een balustrade.
- Bij een talud dient altijd een deugdelijke risicoanalyse maken samen met ervaringsdeskundigen

3 cm is al een te groot obstakel, pas deze richtlijn aan naar 2 cm.

Het liefst vaker. Wanner er een rolstoel hellinkje/verlaagde trottoirbanden geblokkeerd is, hoef je niet meteen 200 meter om te rijden. Het aansluiten van verkeersdrempels kan uitkomst bieden om midden in straten ook een oversteek punt te maken.

De verwoording 'bij voorkeur' laad ruimte voor sjoemelen, benoem 1:12 als maximale helling.

Het heeft de voorkeur om helemaal geen trappen in het ontwerp te hebben, dit geld zowel voor mensen in een rolstoel als mensen die goed ter been zijn. Integreer de oplossing zodat mensen in een rolstoel zich niet buitengesloten voelen. Wanneer dit niet mogelijk is, definieer wat precies een redelijke afstand is. Zorg er voor dat de helling te zien is vanaf de trap zodat mensen in een rolstoel niet hoeven te zoeken naar een mogelijkheid om over te steken.

Plusrichtlijn:
Voor plus gebieden zal de gemeente zich inspannen om bij oneffenheden eerder in te grijpen dan bij de standaard ingrijpmaatstaf van een oneffenheid van 3 centimeter, gestreefd wordt naar ingrijpen bij 2 cm in de looproutes.
Bij verzakkingen in de plusgebieden die in looproutes hinder op leveren streeft de gemeente naar ingrijpen binnen 3 weken na melding of constatering

Doorgang

.
De benodigde mate van doorgankelijkheid is afhankelijk van het aantal mensen dat de route passeert. Een vrije doorgang van 90 cm is voldoende voor 1 persoon, al dan niet met hulpmiddelen. Wanneer twee mensen elkaar moeten kunnen passeren is een breedte van 120 cm nodig. Op een druk gebruikte route is een minimale vrije breedte van 180 cm nodig

- Basisuitgangspunt: doorgang minimaal 180 cm;
- Plaatselijke vernauwing tot 120 cm over maximaal 10m: kinderwagens of rolstoelen kunnen voetgangers passeren;
- Minimum vrije breedte van 90 cm bij plaatselijke vernauwingen over maximaal 50 cm (lantarenpalen, bomen, verkeersborden, e.d. in de looproute);
- Over de gehele route een vrije doorgangshoogte van 230 cm, behalve bij verkeersborden, hiervan is onderkant 220 cm. (conform B.A.B.W.)

Dit zorgt voor problemen. Zeker bij lantaarnpalen waar mensen hun fietsen tegenaan zetten (zie figuur 3.37 op pagina 36). Zorg ervoor dat juist bij dit soort obstakels de stoep en vrije doorrij breedte breder is (bij voorkeur 1.80m) en niet smaller.

Plusrichtlijn:

- In een toegankelijke route dient ten minste elke 75m een ruimte te zijn die voldoende groot is om te keren met een rolstoel of scootmobiel. De draaicirkel van deze keerruimte is minimaal 210 cm;
- Bij plaatselijke vernauwingen in de looproute door een object wordt geen afwijkende bestrating, wel zoveel mogelijk kleurcontrast toegepast.

Zichtbaarheid en voelbaarheid

Het is belangrijk dat looproutes voor visueel gehandicapten bruikbaar zijn. Afwijkingen in de route of potentieel gevaarlijke punten kunnen voorzien worden van een waarschuwingsmarkering. Door de openbare ruimte logisch en eenduidig in te richten kan deze doelgroep zelfstandiger bewegen.

Gesloten geleidingssysteem:

- Binnen een OV knooppunt bij overstap van en naar vervoersmiddel, en vanaf knooppunt OV naar een publiekstoegankelijk gebouw, zoals een ziekenhuis, theater, gemeenteloket, Vraagwijzer, gezondheidscentrum, sporthal, multifunctionele accommodatie (MFA) etc. wordt de Richtlijn Toegankelijkheid CROW [2] aanhouden.
- Bij een gesloten geleidingssysteem worden de natuurlijk aanwezige gidslijnen zoals stoepranden, doorlopende gevels, randen van groenvoorzieningen aangevuld met voelbare geleidelijnen. Deze geleidelijn dient vanaf de halte door te lopen naar de dichtstbijzijnde oversteekplaats, en aan de overzijde van de straat aan te sluiten op een natuurlijke gidslijn
- Geen objecten in de vrije doorgang van de looproute plaatsen.
- Geen objecten op de looproute toepassen die lager zijn dan 70 cm. Objecten niet verspreiden over de ruimte maar in lijn toepassen.

[2] CROW Richtlijn Toegankelijkheid is standaard. Zie ook hieronder bij 'Plusrichtlijn'.

- Objecten in looproutes een contrasterende markering op een hoogte tussen 140 en 160 cm geven ten opzichte van hun omgeving;
- Lagere objecten zoals "kegelbinkies" in de looproute voorzien van zo hoog mogelijke attentiemarkering.
- Gebruik noppenmarkering (geen rubberen tegels) als waarschuwingsmarkering bij oversteekplaatsen (niet bij afritten zonder oversteekplaats)
- Gebruik noppenmarkering bovenaan trappen over de volle breedte van de trap.
- De eerste en de laatste trede van de trap dienen altijd een zichtbare contrasterende markering te hebben over de volle breedte van de trap.
- Bij geveltuinen, toegestane obstakels van bewoners in kindvriendelijke wijken (drempelzones) etc. worden **geen** extra voorzieningen voor blinden/slechtzienden aangebracht. Dit betreft meestal locaties incidenteel in woonwijken waar betreffende doelgroep ofwel bekend is, ofwel op een andere manier een geleiding of begeleiding zal moeten zoeken.
- Ter plaatse van winkelgebied i.v.m. uitstallingen langs de gevels; indien noodzakelijk een voelbare looproute aangeven voor blinden en slechtzienden, bijvoorbeeld in de vorm van een afwijkende bestrating of epoxy lijn. Deze route kan samenvallen met de precariolijn of grens winkelierszone.

Plusrichtlijn:

Geen

Oversteekplaatsen

Oversteekplaatsen vragen bij uitstek om een goed toegankelijke en bruikbare uitvoering. Eenduidigheid is hier erg belangrijk. In Rotterdam wordt het ontwerp van een oversteekplaats bepaald door de Standaard Wegenbouw Details. De volgende richtlijnen gelden:

- De afrit dient dezelfde breedte hebben als de oversteek
- Op drukke trajecten twee keer een band van 1m gebruiken, de afrit is dan 200 cm breed;
- Tussen trottoir en rijweg is een maximale helling van 1:12;
- Indien mogelijk een draairuimte van 2 x 2 m aan weerszijden van de oversteek (incl. afrit en markeringstegels);
- Oversteek loodrecht tussen trottoirbanden en zo kort mogelijk;
- De waarschuwingsmarkering moet loodrecht op oversteekrichting geplaatst zijn; deze hoeft niet gekoppeld te zijn aan een "invaliden" afrit.
- Bij drukke wegen (gebiedsontsluitingswegen) indien mogelijk gebruik maken van een verkeersregelinstallatie met voetgangerslicht, fietslicht en rateltikker;
- Voetgangerslicht afstemmen op verplaatsingssnelheid van maximaal 1,2 m/s;
- Bedieningsknop voetgangerslicht op 90-120 cm hoogte, bedieningsknoppen bij voorkeur groot, en in signaalkleur.
- Midden eilanden en stroken tot 6m1 breed in principe verlaagd uitvoeren

- Wanneer er geen niveau verschil is tussen rijbaan en trottoir worden waarschuwingstegels over de gehele breedte aangebracht.

- Bij Voetgangers oversteek plaatsen (VOP) en bij kanalisatie stroken moeten er waarschuwingsmarkering (noppentegels) worden aangebracht over de hele breedte van de oversteek.

Plusrichtlijn:

- Geleidelijn vanaf natuurlijke gidslijn naar de oversteek bij Toegankelijke routes

3. Voorzieningen

Bewegwijzering

- Bewegwijzering boven 220 cm plaatsen voor waarneming op afstand;
- Teksthoogte 1/100 van de leesafstand. (voorbeeld: leesafstand 10m => teksthoogte 0,1m)
- Verschil in reflectiefactor tussen tekst en achtergrond ≥ 0,3 voor voldoende kleurcontrast.
- Werk waar mogelijk met pictogrammen.

Bedieningselementen

bijvoorbeeld: bedieningsknoppen, geldautomaten, parkeerautomaten, deurbellen, gleuf brievenbus etc.

Voor bedieningselementen aan openbare voorzieningen geldt:

- Vrije opstelruimte voor bediening meer dan 90 x 140 cm;
- Vrij draairuimte bij gebruiksobject 200 x 200 cm;
- Hoogte bedieningselementen tussen 90 en 120 cm;
- Afstand bedieningselementen tot muur of ander object minimaal 50 cm;
- Bedieningselementen op een logische plek aanbrengen: aan de looproute. Wanneer er keuzemogelijkheid is in bedieningselementen; knoppen voorzien van tastbare markering, bijvoorbeeld reliëfknoppen.

Plusrichtlijn:

Langs Toegankelijke routes*:

- De afstand tussen zitgelegenheden maximaal 200 m;
- De zithoogte van banken tussen 45 en 50 cm;
- Het zitelement heeft rugleuning en armleuningen.

Halte Openbaar Vervoer:

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Halte Openbaar Vervoer

- Conform SWD

Advisering

Inrichtingsplannen dienen ter advies voorgelegd te worden aan de 010-toegankelijk wanneer.

- het een knooppunt OV betreft
- het een wijziging betreft die zowel openbare ruimte als een OV halte bevat
- het een nieuwbouwproject met openbare functie (zoals medisch centrum, multifunctionele accommodatie, sportgebouw, recreatieve functie) betreft waarvan de (private) buitenruimte aansluit op openbare buitenruimte
- het een multifunctionele buitenruimte betreft (zoals pleinen, parken en evenemententerreinen)

NB. Afgesproken is daarnaast dat de 010-toegankelijk alle IP's standaard ontvangt.

APPENDIX C MAP TRAFFIC ANALYSIS FOR NEW METRO STOP

Analysis of the impact on the traffic system when the road would be cut off at the crossing of the Mijnsherenlaan and Mijnsherenplein. To show that this intervention is possible and still enter the neighborhood by car and supply the pharmacy.