

# **Accessibility for physically disabled within a cycling city centre.**

**Tensions of shared infrastructure; a Groningen case study.**

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2020-2021.

*Keywords: Accessibility, Infrastructure, Disabled, Cycling, Groningen.*

## **Summary**

This thesis explores the accessibility of physically disabled pedestrians within the inner-city of Groningen. As Groningen is known for being a cycling city, the affects of bicycles and cyclists upon the accessibility of physically disabled pedestrians are explored, as currently there is a knowledge gap here within the planning literature. By means of a mixed methods case study, which uses online surveys and walking & talking interviews, accessibility for mobility impaired is explored. Bicycles are a bigger issue than cyclists, although both affect the accessibility of physically disabled pedestrians. Furthermore, the accessibility of the built environment is improving with every new (re)development that takes place in the city centre. However, the future transport plan could reduce the accessibility of mobility impaired, as they can no longer get close enough to the inner-city by car. It is advised that the working group for physically disabled pedestrians (Toegankelijk Groningen) get a right of consent on public plans. Furthermore, the municipality should implement solutions that are usable, reachable **and** accessible, this will improve the accessibility for physically disabled citizens in Groningen's inner-city.

## **Content**

1. Introduction	5
1.1 Policy framework	7
1.2 Relevance	9
1.3 Research objective	11
2. Case study: Groningen	12
3. Theory	16
3.1 Definitions	16
3.1.1 Types of accessibility	18
3.1.2 Components	19
3.2 Factors	22
3.3 Levels of accessibility	26
3.4 Conceptual model	29
4. Methods	31
4.1 Design choice	31
4.2 Semi-structured interview	33
4.3 Surveys	36
4.4 Ethics	37
5. Results	39
5.1 Data Overview	39
5.2 Bicycles and cyclists	41
5.3 Inaccessible areas	45
5.4 Accessible areas	50
6. Conclusion	54
6.1 Subquestions	54
6.2 Main research question	55
7. Reflection	56
8. References	59

9. Appendices	64
Appendix A-I	64
Appendix A-II	66
Appendix B-I	67
Appendix B-II	69
Appendix C*	71

# 1. Introduction

In June 2021, the social and cultural planning office of the Netherlands released a report stating that the Netherlands was not accessible for people with physical disabilities (Vermeij & Hamelink, 2021). Since 2018, the Netherlands has tried to enable people with physical disabilities to participate in society on equal terms through the ‘Unhindered Participation!’ program (ibid). However, according to Vermeij & Hamelink (2021), many people with physical disabilities do not feel to be on an equal footing to others. Historic city centres were found especially inaccessible by physically disabled people because of cramped buildings, pavements and squares that are difficult to navigate (ibid).

The city of Groningen, located in the North of the Netherlands, is one of these historic cities that can also suffer from the cramped buildings and squares in the inner-city (de Jong, 2018). Yet that is not the only accessibility consideration for physically disabled people within the city of Groningen.

Groningen is home to many cyclists and cycling infrastructure, so much so that it has been nicknamed *the world’s cycling city* (Fietstad, 2015). Unfortunately, the increasing volume of bicycles can interfere with the city’s accessibility (Van Ketwich, 2019). Bicycles are considered to be a growing challenge within the city as they are contributing to accessibility issues of (physically disabled) pedestrians (ibid). With an increasing number of cyclists within Groningen there are increasing complaints of bicycles being parked out of bicycles racks, all across the pavement, hindering people from walking undisturbed (see fig. 1) (Binnenstad 050, n.d.; Van Ketwich, 2019).



Fig. 1: Bicycles parked on the pavements in Groningen.

Cyclists in Groningen are given more space and leeway than motorised modes of transport (Fietstad, 2015; Binnenstad 050, n.d.). This means that cyclists, above other transport modes, have the ability of getting from one side of the city centre to the other in a fast and efficient manner (Goodyear, 2013). This might normally be considered a good thing, however not if it impedes physically disabled people.

This thesis will focus on the accessibility of people that are physically disabled and are thus mobility impaired. This group includes wheelchair users, mobility scooter users, people that make use of crutches, rollators and/or walking sticks and people who cannot walk long distances easily due to for example, old-age, a back or leg injuries etc. It also encompasses temporary physical disabilities and permanent ones.

However, people that are, for example, blind or deaf are excluded from the focus of this research. Each disability requires different facilities and considerations, hence only focussing on mobility impaired disabled citizens will lead to clearer suggestions and advice. There will be attention paid to the way cyclist and bicycles affect the accessibility of this group within the cycling city Groningen, as often the cycling and pedestrian infrastructure is shared. Furthermore, Groningen has been chosen because it is an historic city, which can be problematic for physically disabled pedestrians. It is a city that is already trying to improve the accessibility within the city centre by working to translate the existing policy framework (more on this below) into the built environment (Vereniging Nederlandse Gemeenten, n.d.; Binnenstad 050, n.d.).

## 1.1 Policy framework

There are many levels to the policy framework regarding accessibility for disabled citizens. Starting at an international level, then a national level, and finally a municipal level. Below, each level is discussed.

### *International*

The United Nations' New Urban Agenda prioritizes certain principles, such as equity and inclusion (Saha et al., 2020). The New Urban Agenda '*lays out standards and principles for the planning, construction, development, management, and improvement of urban areas along its five main pillars of implementation: national urban policies, urban legislation and regulations, urban planning and design, local economy and municipal finance, and local implementation*' (United Nations, 2016, p. iv). This agenda provided by the United Nations is meant to inform governance institutions from international level to local level (United Nations, 2016). Furthermore, the New Urban Agenda places the responsibility of implementing accessibility measures to public spaces at the feet of the municipalities. The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines a public space as follows: '*A public space refers to an area or place that is open and accessible to all peoples, regardless of gender, race, ethnicity, age or socio-economic level. These are public gathering spaces such as plazas, squares and parks. Connecting spaces, such as sidewalks and streets, are also public spaces* (UNESCO, 2017, *Inclusion Through Access to Public Space*).' Thus, the municipalities are responsible for making sure that public spaces and infrastructure is equally accessible to all.

Additionally, the European Union had a disability strategy which ran from 2010 - 2020 (European Commission, 2010). This disability strategy was to make sure that all disabled people within the EU member states would be able to exercise their right to equal opportunities (Priestley, 2007). This also includes access opportunities within the built environment as touched upon by UNESCO (ibid).

### *National*

Article 1 in the Dutch constitution states: '*All who are in the Netherlands are treated equally in equal cases. Discrimination on the grounds of religion, beliefs, political opinion, race, sex or any other ground is not allowed* (Nederlandse Grondwet, 1999, Article 1).' This means that physically

disabled citizens should also not be subject to discrimination in the form of unequal access opportunity to public spaces.

The Netherlands has taken measures to ensure that disabled people do not experience discrimination. In 2003, the Dutch government passed an *action plan equal treatment in practice*, for physically disabled citizens. This plan specified that mobility and building access would be among the issues addressed throughout the whole country (“Handreiking inclusief beleid”, 2003). This document aims to affect future policy in a beneficial way for disabled by considering the impact that society is having on disabled society members (“Handreiking inclusief beleid”, 2003). The plan provides a framework of things to take into account, ranging from access facilities (ramps, lift etc.) to parking facilities. However, it is the local municipalities that can choose how quickly, and to what extent, they wish to implement this policy. This means that in reality the change that this policy wishes to initiate for disabled people is very slow going.

More recently the Dutch government has started the Unhindered Participation program which allows municipalities to apply for funding and advice when attempting to improve the accessibility of their towns or public buildings. This was an attempt to encourage municipalities to do more for the accessibility of disabled people (Vermeij & Hamelink, 2021).

### *Local*

The Groningen action plan to include further accessibility or physically disabled is mostly influenced by the New Urban Agenda (see above)(Vereniging Nederlandse Gemeenten, n.d.; Toegankelijk Groningen, 2021b). Any changes to the public realm have to provide access to physically disabled. Within the inner-city this is taken one step further with a disabled sounding group to look over the plans before these plans are implemented (Binnenstad 050, n.d.(a))

## 1.2 Relevance

### *Practical relevance*

Roughly 9% of adults living independently have a severe or moderate physical disability, another 15% live with a mild disability (Putnam et al., 2016). This means that nearly a quarter of independent adults in the Netherlands are living with some kind of physical disability. Within the Province of Groningen there are more disabled people than elsewhere in the Netherlands (Weel, 2014). Furthermore, 22% of the population of the city of Groningen has a mobility impairment (CBS, 2016). Thus it is necessary that the city is accessible to these people if keeping in line with the policy framework.

Furthermore, in terms of traffic safety of a cycling centric city it is worth knowing how much these two modes, cycling and walking, influence each other. It is helpful when planning new or upgrading old infrastructure within the city. Knowing what creates a safer environment for physically disabled pedestrians and cyclists simultaneously will help create the perception of a safer infrastructure system for the users.

Finally, although this research focuses on the context of Groningen's city centre, there are lessons to be drawn for other small European historic cities that wish to move away from polluting modes of transport towards less polluting modes, such as walking and cycling, whilst also creating an accessible space for physically disabled citizens (Moradi & Vagnoni, 2018).

### *Scientific relevance*

Many cities are exploring a mobility transition away from motorised vehicles towards less polluting transport modes, such as cycling and walking (Moradi & Vagnoni, 2018). Encouraging cycling and walking as modes of transport within a city takes many infrastructural changes and development (Pucher & Buehler, 2008). Infrastructural changes and development cost a lot of time and money for cities, thus ideally 'big' changes and developments are done to last a number of years. When balancing both of these transport modes, understanding what works well will be helpful for many cities to get it right the first time, saving cities time and money in the long-run.

Additionally, with the COVID-19 pandemic more attention has shifted to the elderly and more vulnerable, physically disabled citizens in particular (Pineda & Corburn, 2020). There is a push to ensure disability rights (equal rights to opportunities) and inclusion within society; accessibility is a big part of this (ibid). If physically disabled citizens do not have equal access

opportunities, then they cannot access certain activities or locations within the public realm, automatically excluding them from these areas and activities of the public realm.

Although, merely understanding the balance between cyclists and pedestrians, or improving accessibility for physically disabled has been thoroughly covered by urban planning literature (Goldsmith, 2000; Imrie, 1999; Bromley et al., 2006; Bennet et al., 2008; Pulcher & Buehler., 2008; Ripat et al., 2015). Researching the balance of accessibility for physically disabled with an infrastructural network that focuses on bicycles and able bodied pedestrians has not yet been covered sufficiently within the urban planning literature; even though an aging population is likely to provide more mobility impaired citizens using the infrastructure. This thesis will aim to explore the knowledge gap and provide necessary insights for cities that wish to be inclusive and focus on more movement demanding transport modes, such as walking and cycling, in the future.

### 1.3 Research objective

Cyclists are already too much for able bodied pedestrians to cope with within the inner-city of Groningen (Sorgdrager, 2020). With 22% of the population of the city of Groningen having a mobility impairment, it is a considerable chunk of the population whom could be affected by these two wheeled tyrants; Potentially imposing inaccessibility on mobility impaired individuals by having a cycling centric city. The main problem is creating a balance of being accessible and inviting to both physically disabled pedestrians and cyclists at the same time.

To discover if Groningen can retain its inherent historic nature and its cycling city reputation, whilst also aiming to achieve the sentiment of the New Urban Agenda (all citizens being on equal footing), this thesis will answer the following questions:

#### **To what extent is Groningen's cycling city centre accessible to physically disabled citizens?**

To answer this question the following will be determined;

- What is accessibility?
- To what extent do cyclists affect the accessibility of physically disabled pedestrians within the inner-city?
- How accessible is the built environment of the inner-city for physically disabled pedestrians?

This thesis explores whether the various levels of the policy framework to ensure equal opportunities for physically disabled people is implemented effectively in the inner-city of the world's cycling city, Groningen. Exploring the influence of cyclist on pedestrians within the inner-city of Groningen will lead to useful insights for other (historic) European cities wishing to promote more movement-based transport modes, such as walking and cycling. This thesis aims to discover to what extent Groningen's cycling city centre is accessible to physically disabled citizens.

First of all the context of Groningen will be explored as a case study in chapter 2. This will be followed by the literature review in chapter 3. The literature review will aim to answer the first subquestion; *what is accessibility?* The methods used to answer the remaining subquestions and the main research question will be explained in chapter 4. Chapter 5 will explore the data collected from both the qualitative and quantitative research, before drawing conclusions in chapter 6. Within chapter 6 measures and tools to ameliorate the accessibility of the inner-city for physically disabled citizens will also be discussed. Chapter 7 will reflect on the research process as a whole.

## 2. Case study: Groningen

Groningen, located in the North of the Netherlands, is known as one of the world's most cycling oriented cities (Binnenstad 050, n.d. (a); Bruntlett & Bruntlett, 2018). This all started with the ground breaking Traffic Circulation Plan (TCP) in the 1970s (Bruntlett & Bruntlett, 2018). The new TCP meant that cars were no longer able to traverse the city centre. Cars were slowly removed from the city-centre to make space for cyclists and pedestrians.

### *Outcome of the TCP*

Since the introduction of the TCP, cycling numbers have grown within the city of Groningen. So much so that it boasts the most cycled kilometers annually per capita in the Netherlands (Pucher & Buehler, 2008; Valkema & Walraven, 2019). Since the plan was first implemented in the 1970s, cars have been pushed further and further outside the city centre (Bruntlett & Bruntlett, 2018; Kwik & MacFarlane, 2014).

Additionally, more and more students have been drawn to the University of Groningen and the university of applied sciences. This has led to over a quarter of the overall population being students (Groningen, 2021a). More students bring even more bicycles with them, testing the capacity of the infrastructure within the inner-city, as much of the inner-city has narrower roads due buildings being located closer together, making roads more cramped in general (Vermeij & Halsemink, 2021). Narrower roads and the absence of a cycle-path mean that at times cyclists stray onto the pavement to pass an obstacle or slow moving traffic on the road. This can put physically disabled pedestrians in danger, or at the very least make them feel unsafe (ibid).

### *Dealing with bicycles*

There has been a percentage rise in the amount of bicycle traffic over the last couple of years (Valkema & Walraven, 2019). As well as a small rise in pedestrian numbers (ibid). Normally, this should be good news. However, because cyclists can be perceived as a threat to pedestrians, it is concerning for this research (Goodyear, 2013; Van Ketwich, 2019). The roads are full of cyclists speeding through, without stopping for anyone or anything (Goodyear, 2013). That is why the municipality of Groningen tried out a couple of 'no cycling' streets in the Summer of 2020 (Sorgdrager, 2020; Brouwer, 2018). These zones, although unpopular with cyclists, were intended

to make the city centre more accessible to pedestrians as they no longer felt safe in some areas of the inner-city (Sorgdrager, 2020).

Additionally the municipality of Groningen implemented cycle routes that reroute cyclists away from the inner-city and around the perimeter. This has been done to reduce the weight of capacity on the cycle paths within the inner-city to alleviate the peak-time capacity of the cycle path within the historic centre as these can be unpleasant for both pedestrians and cyclists according to Fietsstad Groningen (2015).

When it comes to stationary bicycles, these also pose a problem. There are many bicycles parked on the pavement making it difficult to pass by for physically disabled pedestrians (Van Ketwich, 2019; Brouwer, 2018). Physically disabled people tend to need slightly more room to manoeuvre and are often hindered by obstacles in the shape of people and objects (Vermeij & Hamelink, 2021; Han et al., 2002). Therefore, in 2021, another 1500 bicycle parking spaces were added to the city centre (Valkema & Walraven, 2019). This has been done to reduce the amount of bicycles that are parked outside on the pavement for long periods of time (ibid).

### *Current pedestrian Infrastructure*

The current infrastructure within the Groningen city centre is not always ideal for physically impaired people (Gemeente Groningen, n.d.(a)). There is a desire to make the city centre more accessible by redesigning many of the streets and squares. Currently the Vismarkt (see fig. 2, the red dot) is relatively inaccessible due to the step up onto the square, meaning that a physically disabled person has to approach the square from a certain direction to gain access to it. Furthermore, the cobbles that cover the Vismarkt makes it difficult to traverse for physically impaired people.

The Grote Markt (see fig. 2, the blue dot) on the other hand is very flat and accessible, however, the bus service that currently runs there will be moved to outside of the city centre



Fig. 2: The locations of Groningen's squares.

(Binnenstad 050, 2017). Meaning that people who are mobility impaired will have further to walk if they choose to take public transport. Having further to walk is not necessarily an issue for all mobility impaired travellers, however they do require tertiary seating at regular intervals (United Nations, 2004). Tertiary seating is public seating that one does not need to pay for (Ruiz-Apilanez & Arnaiz, 2015).

### *Toegankelijk Groningen*

In general, the municipality of Groningen takes the opinions of disabled citizens seriously. There is an access group called *Toegankelijk Groningen* that is actively involved in the creation of municipal policy plans that affect people with disabilities (see below). Toegankelijk Groningen has various groups to encompass as many disabilities as possible:

- People with a physical handicap, chronic illness and/or mobility impairment,
- Blind and visually impaired,
- Deaf,
- Intellectually challenged,
- Psychologically challenged.

This research will mainly focus on infrastructure issues that affect the people with a physical handicap, chronic illness and/or mobility impairment, as this is within our target group of physically disabled, mobility impaired pedestrians. The municipality of Groningen works under the name of *Binnenstad 050 - ruimte voor jou* to tackle the inner-city. This group consists of the various stakeholders including Toegankelijk Groningen and the municipality itself (Binnenstad 050, n.d. (a)). The inner-city changes are pushed through Binnenstad 050. Thus, physically disabled people have a say on plans before they are implemented within the city centre. Binnenstad 050 has a ten year plan, the current one runs from 2015 - 2025. Improved accessibility for all is one of their aims within the ten year plan (Binnenstad 050, 2017).

### *Policy plans*

Currently policy plans state that the municipality of Groningen want as many journeys to be taken on foot or by bike (Groningen, 2021b). A few changes are proposed to help people to feel more inclined to take journeys on foot or by bike. However, if the main part of the journey is done by bike, the proposed changes encourage the last mile to be done on foot. The last mile is from your

transport mode to your destination. For example from where your bicycle is parked to the restaurant you are eating at.

Additionally, the municipality is very aware of the bicycle parking issue (Valkema & Walraven, 2019). As stated above, the municipality is increasing the bicycle parking facilities in the city centre. These bicycle parking facilities will be situated underground or under large buildings. The bicycle parking will have a central location, mostly situated close to the Grote Markt. The Vismarkt as yet does not have any bicycle parking garages within a similar proximity.

Furthermore, the municipality is introducing more 'No Bicycle Parking' zones on the streets in the inner-city of Groningen. This is hoped to alleviate the issue of having bicycles parked in the way on the pavement. Meaning that walking somewhere becomes easier for (physically disabled) pedestrians, thus making walking a more attractive option. The fact that cyclists can no longer park right outside the shops without running the risk of their bicycle being confiscated, should also be a deterrent to park your bicycle on the street, instead of in a parking rack.

#### *Future plans*

Next on the cards for Groningen's inner-city centre is the removal of all busses from the centre (Binnenstad 050, 2017). All motorized vehicles would then be removed from the centre entirely. This would mean that the inner-city is only accessible on foot or by bike. Physically impaired people could find accessing the inner-city more difficult with this new plan. Many disabled pedestrians try to get as close to their destination before walking, basically making their 'last mile' as short as possible. By moving bus stops so far outside the city centre, the last mile might be perceived as too long for them.

To conclude, Groningen is a cycling centric city with an increasing number of cyclists (Groningen, 2021b). The infrastructure is designed to accommodate cyclists over others (Goodyear, 2013). The municipality is already aware of the threat that cyclists pose to physically disabled citizens, as such there are multiple measures in place; No cycling streets, cycling (re)routes, additional bicycle parking.

Furthermore, vehicles are going to be removed from the city centre, both cars and buses, meaning that the last mile will become longer for some physically disabled travelers in the future. This was decided in conjunction with Toegankelijk Groningen, an access group representing disabled citizens in Groningen.

### 3. Theory

This chapter will outline the theory that has been collected from literature study. First of all the definition of accessibility will be set and the components of accessibility are explained. Then the factors that affect accessibility will be discussed. Thirdly the levels and their effects will be brought to light, before providing a couple of solutions for the issues at every level. Finally, the conceptual model will provide a brief visual summary of the concepts discussed.

#### 3.1 Definitions

There are multiple definitions of accessibility within the literature. In general there are two factors to an accessibility definition; the impedance factor and the destination factor (Bhat et al., 2000). An impedance factor is the travel time or costs. Whereas the destination factor focuses on less measurable things, like necessity or willingness. So, needing to reach the destination and wanting to.

Bertolini et al. (2005) for example, exercise an economics approach to the impedance factor of accessibility. They describe accessibility as *'the amount of places or destinations that could be reached within a certain travel cost or within a certain cost threshold'* (Bertolini et al. 2005, p. 209). Travel is only related to the cost of covering that distance. The costs do not necessarily have to be monetary ones, they could also be another type of cost. There are investment costs (the amount you initially invest in taking your journey), time costs (the amount of time it takes you to complete your journey), and comfort costs (Rli, 2014). Comfort costs are the costs of the travel experience in terms of enjoyment and comfort, or effort and discomfort (Rli, 2014). These costs are subjective and individual to each person. However, for a mobility impaired individual these costs can be higher as the effort that goes into traversing an area is also higher (ibid).

This definition does not include sufficient destination factors or account sufficiently for variations introduced by the traveler and the perception of the traveller. Therefore, this definition falls short for this thesis as there is a focus on understanding the perceived accessibility of physically disabled pedestrians.

Guy (1983) created a definition that focused on the destination factor as perceived by the traveller. He describes accessibility as the size of opportunity at the destination in relation to the total distance and the distance at which the journey becomes more difficult and thus, less enjoyable (Guy, 1983).

This shows a marked improvement on the definition by Bertolini et al. as it accounts for personal perception of awkwardness. Therefore the experienced ease of reaching a destination is included into the definition. However, a temporal aspect is still lacking in this definition, even though this could affect the ease of reaching a destination. The time of day at which one takes a trip, can affect ease and time that it takes to complete the trip. If one travels during peak time when the roads and streets are busy, the ease with which one would reach the destination could be affected. Furthermore, if the streets are busy, it might take longer if one needs to cross the road (Botticello et al., 2014). Thus, this definition is also not comprehensive enough to be used throughout this thesis.

Guida & Caglioni (2020) provide a definition which contains a more even balance of impedance and destination factors. They define accessibility as the ability for an individual to participate in a desired activity, at a desired location, using a transport mode of choice, at a time of choice (Guida & Caglioni, 2020). Here, the temporal aspect which was lacking in Guy's definition is present. Furthermore, travelers' desires are included more apparently than in Bertolini et al.'s definition, which is a step forward. By recognizing the variations in people's personal preferences there is a deviation from simply thinking about accessibility in terms of costs. However, Guida & Caglioni's definition does not go far enough in this regard. There is still no direct recognition of the variations in people's *ability* to travel from one place to another.

One could argue that this might be accounted for by personal preference, as if someone cannot reach a destination *easily*, then it will not be a desired location. If this were the case, and hard to reach locations were no longer 'desired destinations', then the locations that mobility impaired people could not reach would not be included in the definition of Guida & Caglioni. Therefore, this definition is unsuitable to use within this thesis.

All of the definition mentioned above have positive aspects, yet fall short when trying to use them for this thesis. Therefore, a new definition is proposed for accessibility within this thesis, which is built up of all the positive aspects of the definitions listed above; resulting in the following definition.

***ACCESSIBILITY IS A MEASURE OF PERCEIVED EASE OF AN INDIVIDUAL TO PARTICIPATE IN ANY DESIRED ACTIVITY, AT ANY DESIRED LOCATION, USING A TRANSPORT MODE OF CHOICE, AT A PERSONALLY CHOSEN TIME WITHIN A PERSONAL COST THRESHOLD.***

### 3.1.1 Types of accessibility

Although the preceding definitions were well thought through, they do not make a distinction between the different types of accessibility. This is an issue because *accessibility* is used by all the authors mentioned above, however it could actually mean something slightly different for each definition. Furthermore, the different types of accessibility are measured differently, hence one type of accessibility will be maintained throughout this thesis. Below is a quick summation of the different types of accessibility and the one which will be used throughout this thesis.

#### *Relative Accessibility*

Relative accessibility is the accessibility between two points (Bhat et al., 2000). It is often also referred to as distance-based accessibility, as the commonly used measure between the two points is distance (and not costs) (Saghapour et al., 2017). Euclidean distance is most commonly used when measuring the distance between two points (ibid). This is the distance measured in a straight line between two points, not measured as the actual route one might take (Saghapour et al., 2017).

#### *Integral Accessibility*

Integral accessibility is the accessibility from one point to any and all other points in a designated area (Bhat et al., 2000). For examples, from your house (starting point) to anywhere in your neighbourhood (designated area). Bertolini et al. (2005) use a definitions that refers to integral accessibility and the ‘designated area’. In their case the designated area is the zone within the cost threshold (ibid).

#### *Perceived accessibility*

Perceived accessibility is similar to integral accessibility with one major difference, the element of personal perception. Knox (1978) argues that the only accessibility measure that is important is the accessibility of a person in a zone. As in, the integral accessibility is of little consequence if the individual does not perceive it as accessible (ibid). Furthermore, if a destination is deemed inaccessible by one route, it is unlikely that someone will take the effort to access it via an alternative route (Lättman et al., 2018).

This thesis will focus on the perceived accessibility of physically disabled individuals to get a deeper understanding of their practical, day to day infrastructure requirements. Throughout this chapter the various building blocks of perceived accessibility will be explained (see fig. 3).

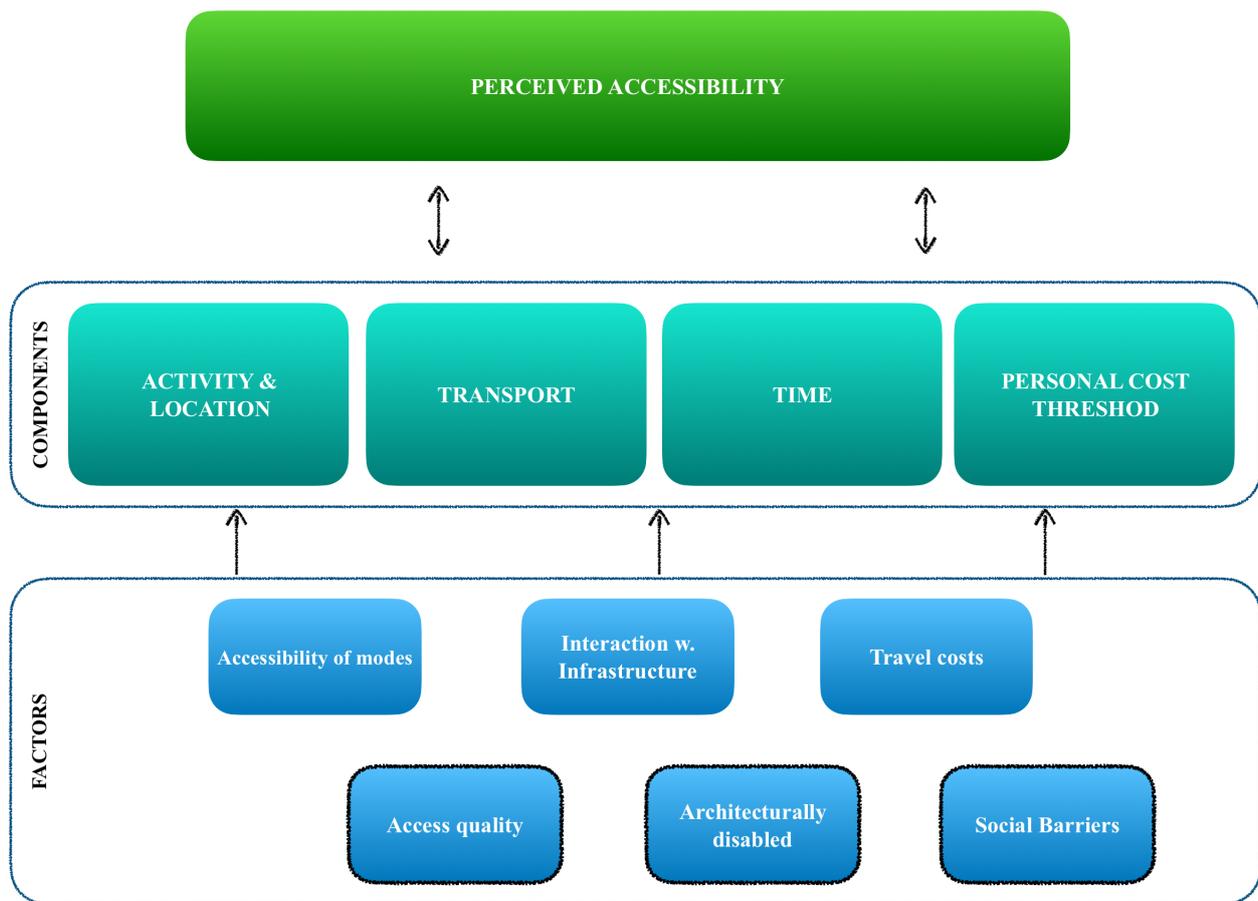


Fig. 3: The relationship between components and factors, uniquely disabled factors outlined.

### 3.1.2 Components

Within the definition created for this thesis there are four components that are crucial to accessibility, namely; activity & location, transport, time and personal cost threshold (see fig. 3). These four components are described best by Guida & Caglioni (2020). Later in section 3.2, the factors will be discussed, as these are often the measurable attributes of the components that are used in the built environment (see fig. 3). The components are the tangible expression of activity & location, transport, time and the personal cost threshold.

#### *Activity & Location*

The activity and location are often combined within literature and referred to as the Land-use component. This component combines the *supply system features* and *demand characteristics* (Guida & Caglioni, 2020). Supply system features in this case would be the activities of someone's

day-to-day life, e.g. their job, services etc. Whereas demand characteristics are when circumstances demand that people are in a certain location due to necessity (Guida & Cagliani, 2020). In other words, the land-use component is the balance between activities at the corresponding locations that one *needs* to do (supply system futures), and the activities at the corresponding locations that one *wants* to do (demand characteristics). Meaning that people tend to choose areas to live where they can participate in activities they need and activities they want (Guida & Cagliani, 2020).

### *Transport*

The transportation component is made up of demand (people wanting to use a certain transport-mode) and supply (the various necessities being available for that mode). Using Groningen and the target group as an example, this would translate to the demand for cycling being high so many people cycle. Yet, there is not enough infrastructural supply in terms of bicycle parking, leading to littering of bicycles on the pavements making it difficult for mobility impaired pedestrians to use the pavements. The lack of supply for one mode (bicycle) could in turn lead to a decrease of demand to go by foot for physically impaired pedestrians. Due to the decreasing demand to go by foot within the city, there is little attention paid to the supply side of pedestrian travel (Penn et al., 1998). It is important for cities not to only focus on one transport mode within a city or area, as the other transport modes will likely suffer from inconsideration (ibid).

### *Time*

The temporal element can be important if the time of day of a journey affects the perceived accessibility. This can be as simple as not traveling at peak times as the roads and streets will be busier with users. For physically impaired people this could create an added difficulty of traversing a busy pavement, yet it also might make them feel like they are in the way of others (Botticello et al., 2014). Furthermore, time can also be linked with the transport component in terms of timetables and bus schedules, for example to be at a destination for a certain time one might have to catch a particular train, this in itself would dictate the time of your journey (Guida & Cagliani, 2020).

### *Personal cost threshold*

The personal cost threshold is an individual component which takes into account an individual's personal circumstances, such as age, gender, income etc. The circumstances of a person often

influences how much travel costs that person can bear. Travel costs are not only monetary, but also in terms of (dis)pleasure and (dis)comfort (Rli, 2014).

Age for example, has a bearing on what transport modes are available. If one is younger than 18 in the Netherlands then they are unlikely to drive anywhere independently. Having said that, if one is older than 90 they might also be uncomfortable driving somewhere independently.

Finally, income plays a part in accessibility for various reasons (Rli, 2014). Taking our target group of physically impaired pedestrians (which also includes wheelchair users), the income of an individual will also influence the mobility aids which one can afford or has access to. For example, a higher powered, more expensive wheelchair will be able to scale steeper slopes, however larger wheelchairs might cause issues once inside a small shop. Another difference that income can have on accessibility is the choice of destination (Rli, 2014). Someone with a lower income might look at a different range of shops than someone in a higher income bracket.

## 3.2 Factors

There are various factors that contribute to accessibility and the perception of accessibility. Sometimes these are concrete and tangible aspects of space, sometimes these factors are grounded in the social, intangible aspects of space. Discussed below are the main factors that play a part for pedestrians. Some factors are the same for both abled bodied and disabled pedestrians as there are few distinctions made within the planning literature (Vale et al., 2016; Legacy et al., 2019; Guida & Caglioni, 2020; Hansen, 1959; Bennet et al., 2008; Saha et al., 2020). Fig. 3, shows the factors that are uniquely for physically disabled pedestrians by their bold outline (Goldsmith, 2000; Imrie, 1999; Imrie & Kumar, 1998; Han et al., 2002; Bromley et al., 2006).

### *Accessibility of modes*

There are aspects of accessibility which are the same for both cycling and walking, such as the place- and topology-based aspects (Vale et al., 2016). Place- and topology-based aspects refer to the fact that cyclists and pedestrians often use the same infrastructure and travel to the same areas within a city (ibid). This means that pedestrians and cyclists often get grouped within the planning literature but also in the minds of decision-makers (Vale et al., 2016). This results in pedestrians being one of the last thing that gets considered. Furthermore, physically disabled people are often even further down that list, but that is discussed more fully later on in the text.

### *Interaction with infrastructure*

Cities often have a good level of accessibility if the inhabitants live close to their desired locations of activities (Legacy et al., 2019). However, this is also true the other way around. People can live somewhere with a really advanced mobility network, yet still struggle to access some of the most basic urban services (Guida & Caglioni, 2020). This is referred to by Guida & Caglioni (2020) as the accessibility paradox. This paradox illustrates that accessibility issues cannot be solved solely by proximity or an infrastructure network. How travelers interact with the infrastructure is a large part of the perceived ease (Hansen, 1959). For example, if someone using a rollator were to go to a shop during a peak time in the afternoon. They can choose two options; the shop near a busy road where it is flat, yet cyclists often were onto the pavement because it is flat, or the shop in a quieter area where the pavement is slightly uneven but with little chance of a cyclist using the pavements. The choice would be based on whether they prioritized their own interaction with the infrastructure (flat and even, yet could be hit by a bicycle) or whether they prioritized not having to cope with

someone else's interaction with the infrastructure (thus opting for the uneven pavement). This example shows that an individual's accessibility is not just affected by their own interaction with the infrastructure, but also other travelers' interactions (Hansen, 1959). Basically, the interactions of others can affect the comfort travel costs of the journey of the individual affecting their perception of accessibility.

#### *Travel costs*

Although mentioned above, travel costs are an important factor when it comes to accessibility. There are the monetary costs of for example, mobility aides (e.g. wheelchairs, rollators, etc.) which will affect the perceived accessibility of places for mobility impaired travelers, as mentioned earlier. However, there are still important aspects to travel costs that have been explained less thoroughly, namely comfort costs. The tricky thing about comfort costs is that they are grounded in the perception of the traveller and dependent on the journey's context. For example, if it was pouring down with rain when one wanted to go to the shop, one might decide to wait until it had stopped raining. Meaning that the comfort costs were perceived as too high to embark on the journey immediately. Thus, it is important to realize that comfort costs for the same journey can change over time depending on the situation (Rli, 2014). Continuing with the same example, say one had guests coming over within the hour and the milk from the shop was an absolute necessity, then the comfort costs would be outweighed by the time costs of the journey.

The 'time costs' are how long it takes to get from your starting point to your destination. These can often be higher for physically disabled people as they often take a route that is as flat as possible (Bennet et al., 2008). Once they reach their destination there is also the requirement for access quality (Saha et al., 2020).

#### *Access quality*

Access quality is one of the main issues for physically disabled people (Saha et al., 2020). The absence of lowered curbs at crossings for example, can lead to wheelchair users taking a substantial detour just to end up on the pavement on the other side of the street (Bennet et al., 2008). It is important to remember that reaching the destination is still a substantial part of the journey for physically disabled people (ibid). There are many places within the inner-city of Groningen that cannot provide access to physically impaired people because there is no even, flat way of entering.

Furthermore, if there is a lowered curb, yet there is a bicycle parked close to it

rendering it useless for the disabled traveller; then the access quality will be perceived as poor for that disabled traveller. If this happens multiple times then disabled travelers will perceive it as inaccessible and not consider it as a viable option in the future (Saha et al, 2020).

The absence of ramps can render elevated or lowered public areas useless to anyone who is not able to take stairs (Bennet et al., 2008). In Groningen there are many historic buildings that are built on a plateau with stairs leading up to the entrance. This makes such buildings inaccessible unless there is a lift fitted. Retrofitted ramps are often too steep and unscalable for mobility aides, still resulting in poor access quality (Imrie, 1999).

### *Architecturally disabled*

Areas that are disabled friendly yet inaccessible are examples of space being architecturally disabled (Goldsmith, 2000). Meaning that the space was designed with only certain users in mind, whilst excluding other sectors of society (ibid). As mentioned above, retrofitting disabled facilities can often lead to awkward and uninviting solutions (Imrie, 1999). Ramps that are too steep are unsafe but also uninviting as cyclists can use them to get even closer to their destination.

Imrie (1999) believes that architecturally disabled spaces stem from a systemic flaw of limited awareness of those designing the public space. This leads to necessary facilities being absent from the pedestrian infrastructure in the first place. The inconsideration shown to this sector of society points to larger social barriers.

### *Social barriers*

Imrie & Kumar (1998) believe that it is a general social failing that the sector of physically impaired people gets forgotten by the governing bodies. The built environment can often be *disablist* as infrastructure accommodating this sector is the exemption and not the rule. This way physically disabled people are at a disadvantage before they have even left the house (Imrie & Kumar, 1998). A building would not be subject to heavy criticism on the ground of inaccessibility if space was designed with mobility impaired people in mind from the get go. Furthermore, the terminology creates a certain division; *disabled, handicapped and invalid* implies that someone is incapable or less than others, whereas this is not the case (Imrie, 1999).

The factors mentioned above show the interplay between travelers and how mobility impaired travelers can be affected by other travelers, especially cyclists. With an aging population the

Netherlands, as well as Groningen needs to be more aware of mobility impaired individuals. Demographically speaking the elderly sector of society is growing (Blais et al., 2012). An increasing amount of elderly means an increasing amount of vulnerable pedestrians using walking aids (Bromley et al., 2006). It is no longer an option to think about them as exceptions to the rule (ibid).

Additionally the number of cyclists within the city is growing year upon year, meaning the interaction between the potentially growing sector of physically impaired citizens and cyclists will be increasing in the coming years.

### 3.3 Levels of accessibility

This section discusses the various levels (macro, meso & micro) and corresponding instruments that are available to planners and municipalities in general for approaching accessibility as an issue. This has been compiled using the NATO model (Hood, 1983). *Nodality* which refers to information, *Authority* which refers to the legal frame that it is in, *Treasure* which means the money and funding of such initiatives and finally the *Organisation* of it all (Hood, 1983).

Table 1; NATO scheme inspired by Hood (1983; Hood & Margetts, 2007).

TOOL	DETECTING	EFFECTING	LEVEL
<b>NODALITY</b> (information collection)	<ul style="list-style-type: none"> <li>- Gathering complaints and creating an overview of the accessibility issues.</li> <li>- A reporting app to report damage to the infrastructure which needs mending.</li> </ul>	<ul style="list-style-type: none"> <li>- Organising information evenings and advice session to gather information from the (physically disabled) public.</li> <li>- Informing physically able people about the infrastructural needs of physically disabled people; unobscured curbs, at least 1m. wide width of pavement etc.</li> </ul>	Macro & micro level
<b>AUTHORITY</b> (command & control regulation)	<ul style="list-style-type: none"> <li>- Bicycle wardens that move and direct cyclists to suitable parking areas.</li> <li>- Thoroughly checking planning applications and development plans, making sure that they stick to the disability regulations.</li> </ul>	<ul style="list-style-type: none"> <li>- An advisory committee (with a weighted say in the plans), like Toegankelijke Groningen.</li> <li>- Again, thoroughly checking planning applications and development plans (with the advisory committee).</li> </ul>	Meso level
<b>TREASURE</b> (grants, loans & taxes)	<ul style="list-style-type: none"> <li>- Setting up a fining system for illegally parked bikes.</li> </ul>	<ul style="list-style-type: none"> <li>- Providing grants for people to place a bicycle rack outside their dwelling or business.</li> </ul>	Macro & micro level
<b>ORGANIZATION</b> (government reorganization)	<ul style="list-style-type: none"> <li>- Using Toegankelijke Groningen to describe common problems they encounter.</li> <li>- Give Toegankelijk Groningen's voice more weight and power within the planning process.</li> </ul>	<ul style="list-style-type: none"> <li>- Using Toegankelijk Groningen to prevent problems, by giving them more of a say in planning decisions.</li> <li>- Give Toegankelijk Groningen's voice more weight and power within the planning process.</li> </ul>	Macro & meso

### Macro level

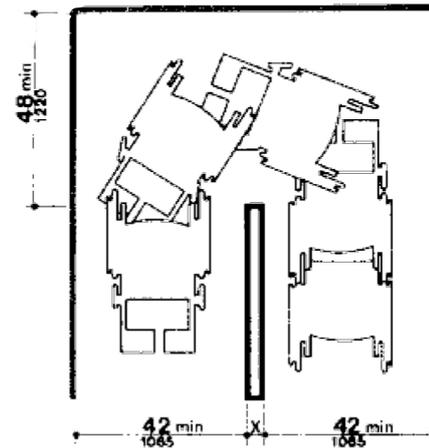
The macro level in this case, would be the society of the inner-city of Groningen. This level is concerned with providing an accessible space and environment whilst being considerate to the historic heritage of the city. This level has an issue, which is a bias towards physically able people (Goldsmith, 2000). This bias is born from thoughtlessness. In Groningen for example, there are bicycles parked on the pavement. This is not necessarily due to there being a lack of bicycle parking spots, as there are over 3730 parking spots available for bicycles (Valkema & Walraven, 2019). It shows a lack of thought for anyone that might need to get past (safely).

Additionally, physically disabled people are treated as an exception to the rule. They are the outliers of society (Imrie & Kumar, 1998). This creates an exclusion from the offset. Furthermore, it creates a dependence for the physically disabled person. They have to rely on others to think about and consider them when planning or designing a space.

Ignorance and thoughtlessness can both be combatted by education. Education could be implemented at any time, in schools or as awareness campaigns throughout the city. Furthermore, enforcement of a new rule or regulations is important.

### Meso level

The meso level is the rules and regulations within the planning arena of the inner-city of Groningen, in this case. Issues at the Meso level are often related to the macro level. Certain design standards were set decades ago in the 60s, and they haven't been overhauled since (Robinson & Foel, 2003). Even with new planning regulations to make public buildings disabled friendly, the designs have not been overhauled. When municipalities design a disabled access route, they use standardized measures which are the minimum required width for a wheelchair user. For example, if a ramp is constructed in such a way that a wheelchair user needs to do a U-turn (see fig. 4), then the minimum width is 1.065 meters (Han et al., 2002). This calculation is used for a generic wheelchair. Electric



NOTE: Dimensions shown apply when  $x < 48$  in (1220 mm).

#### Accessible Route Turns around an Obstruction

A U-turn around an obstruction less than 48 inches (1220 mm) wide may be made if the passage width is a minimum of 42 inches (1065 mm) and the base of the U-turn space is a minimum of 48 inches (1220 mm) wide.

Fig. 4: Measurements required for a wheelchair U-turn (Han et al., 2002).

wheelchairs on the other hand tend to be larger and heavier, meaning they might need more room to manoeuvre them. Meaning that new buildings are not guaranteed to be accessible, even with all the guidelines in place.

Additionally, physically disabled people are not often asked what they want, what they *need* from space. Take ramps for example, simply placing a ramp for access is not enough. Ramps need to have the correct slope for it not to be too steep for electronic mobility aides to cut out. Electronic mobility aides automatically switch off if the driver attempts to take a ramp that is too steep, it is considered a safety feature to stop the user from hurting themselves (Blais et al., 2012). This means that people can get stuck on a ramp with a mobility aide that will not move. An able bodied planner might never know this if they do not ask what mobility impaired people need. Thus, physically disabled people need to be part of the planning process.

The main issue with the planning realm is that physically disabled people do not have a voice within the process (Bromley et al., 2006). Getting people involved from an early stage in the planning process means they are more likely to get a result that is deemed acceptable by the involved stakeholders (Burby, 2003). This also combats the societal issue of feeling like an afterthought, as they are involved and heard at an early stage. It is important not to just use this as tokenism, where people get to say what they think without anything being done with the input (Arnstein, 1969). This also leads to more dissatisfaction over a longer period of time (ibid).

The municipality of Groningen allow Toegankelijk Groningen, the sound-boarding group, to view their plans and provide input and feedback. However, more steps could be made in getting this group involved earlier on and giving them more remit to reject a proposal if deemed insufficient.

### *Micro level*

The micro level is the individual's perceived accessibility. This level is affected by the previous two level, especially meso. This is the embodiment of how other people's decisions can affect physically disabled people. Sometimes, in well thought through areas, this effect is positive. However in less thought through, architecturally disabled areas, the effect is less positive.

Furthermore, the built environment is relatively permanent. It costs a lot of time, money and effort to demolish something or change it. Therefore, the path dependence set out by society in the past, is difficult and expensive to rectify for individuals now. Although the city of Groningen is trying to rethink their approach to physically disabled people and implement more disabled friendly measures (Gemeente Groningen. n.d.(b)).

### **3.4 Conceptual model**

The conceptual model shows the relationship between the various terms discussed (see fig. 5). Starting from the left-hand side moving rightwards, the first term is perceived accessibility. Here you can see that the perceived accessibility and the accessibility factors influence one another. If the accessibility increases, then it is likely that one of the factors has improved too.

Furthermore, the factors are also influenced by the various levels that deal with accessibility. A change in availability of modes, for example, could lead to changes at the meso level. Such as when electric kick-scooters started being readily available, the traffic laws were soon changed to make them illegal. It also works the other way around too, a change in rules can affect accessibility factors. For example, the one way shop systems that has come into play with the corona pandemic could affect the interaction with infrastructure.

Instruments are the tools used to initiate a change in the levels discussed, or a change to influence and affect a factor, leading to an overall change in perceived accessibility. Instruments are needed to help improve accessibility factors where possible. The instrument used can vary per level and per desired effect and outcome. For this case study in particular, the instruments that will influence cyclists' behaviour is an important one. As the bicycle parking issue affects so many of the accessibility factors, such as; accessibility of modes, travel costs, interaction with infrastructure, access quality and independence. Bicycle parking affects so many factors, it also has a direct effect on the perceived accessibility (see fig. 5).

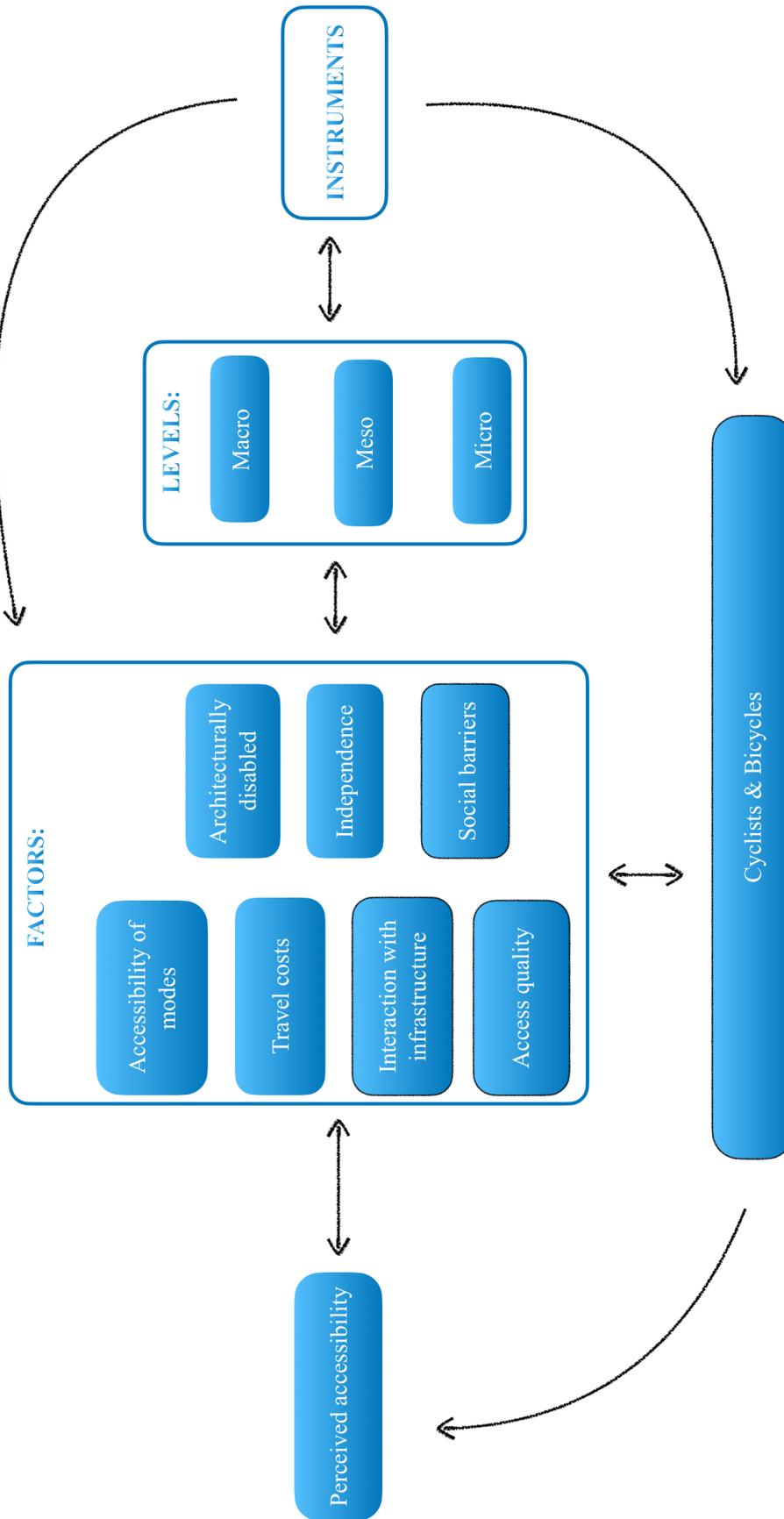


Fig. 5: Conceptual model

## 4. Methods

### 4.1 Design choice

This thesis aims to answer *to what extent is Groningen's cycling city centre accessible to physically disabled citizens?* Accessibility plays a central role within this research question. There is a qualitative and a quantitative side to accessibility which are addressed.

First of all, the focus throughout this thesis is perceived accessibility. Therefore, it is important to research how people and individuals experience the accessibility within the inner-city. To assess the subjective, personal matter of how people experience the accessibility of the inner-city, a qualitative approach was used in the form of walk along interviews, where the interviewer and interviewee were walking & talking. By using semi-structured walking & talking interviews (see fig. 6), the interviewee was able to show the interviewer what the main issues are that they encounter on a daily basis. This gave deeper insights for the interviewer as they could see what was wrong and why certain areas were not accessible for the interviewees. The interviews mainly answered the subquestion: *How accessible is the built environment of the inner-city for physically disabled pedestrians?*

Secondly, there are aspects that benefit from a quantitative approach for discovering what are widely shared problems among physically disabled citizens within the inner-city. To discover whether bicycles and cyclists were a problem shared by many physically disabled citizens an online survey was conducted; this was done by means of Maptionnaire (see fig. 6.), an online tool which allows respondents to include spatial data in their responses. The advantage was that respondents could say whether cyclists and/or bicycles were an issue and why, but then they could also indicate the worst areas within the inner-city. Furthermore, a Likert scale using ordinal data was used to gauge varying levels of nuisance caused by bicycles and cyclists for physically disabled people. The online survey mainly answered the subquestion: *To what extent do cyclists affect the accessibility of physically disabled pedestrians within the inner-city?*

Furthermore, both the Maptionnaire and the walking & talking interviews contained some questions pertaining to the other subquestions. This meant that triangulation of the data could take place. Once all the data had been analyzed, it was compiled together per factor, to compare findings with theory. This meant that, for example the findings from the surveys could reinforce the findings from the literature review and the walking & talking interviews and vice versa. This showed up any outliers that could be context specific to Groningen, or would need to be researched further.

Otherwise, the findings were grounded in three different data sources, which improves the overall reliability of the findings.

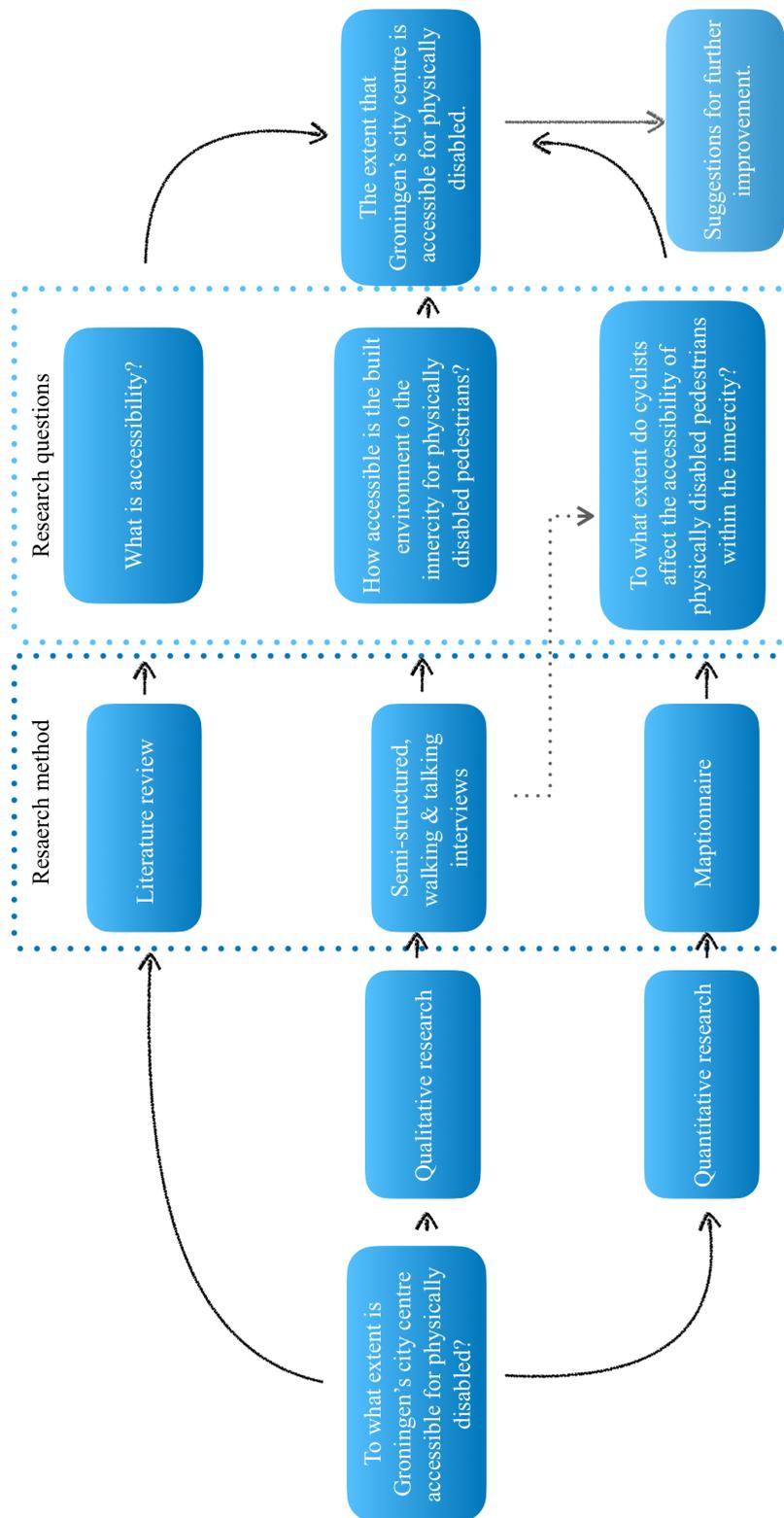


Fig. 6: Research design.

## 4.2 Semi-structured interview

To gain deeper insights into the accessibility issues of physically disabled pedestrians in the inner-city of Groningen interviews have been conducted. The interviewees had a range of mobility impairments among them, and thus a range of mobility aides that they used (see table 2). This creates a diversity in needs and insights. Furthermore, there was also a mix of existing knowledge of planning processes within Groningen (see table 2). This is important to ascertain whether the interviewee understands the priorities, but also the limits, of options when it comes to the accessibility of public space in the inner-city of Groningen.

These interviews took place both physically and virtually. All interviews were semi-structured so that there was room to let the interviewee deviate and talk about what they found important in relation to accessibility (see appendix B). The physical interviews were done by *walking & talking*. This provided additional insight as the interviewer can *see* the obstructions and how the interviewee is affected by them as they traverse the inner-city. This made it easy for the interviewee to explain what they mean if they could not find the right words.

The virtual interviews were conducted by going through the interviewees' 'normal' inner-city experience and discussing the highs and lows. When interviewees *describe* how an inaccessible place affects them, they tend to be more emotive in their answer. Interviewees explain what the issue is, why it is an issue and then they often go on to say how that makes them feel. The combination of online and in person interviews creates a depth of insight into the pragmatic, utilitarian side of accessibility, but also the emotional side of accessibility.

Much of the existing literature studying accessibility for physically disabled through case studies use interviews (Imrie, 1999; Imrie & Kumar, 1998; Bromley et al., 2006; Botticello et al.,

Table 2: Overview of Interviewees

Interviewee	Gender	Mobility aide	Knowledge of planning process	Virtual or physical interview
1	Male	Walking stick	No	Physical
2	Female	Mobility scooter	No	Virtual
3	Female	Zimmer frame/ crutches	Yes	Virtual
4	Female	Electric wheelchair	Yes	Physical
5	Male	None	Yes	Physical
6	Male	None	Yes	Physical

2014; Saha et al., 2020) or surveys (Ripat et al., 2015; Bennet et al., 2008; de Jong, 2018). However, these studies are looking on a bigger scale, they do not provide the correct data to narrow down problematic areas. By using walking & talking interviews alongside spatial data collected by the Maptionnaire it allows the researcher to identify areas within a neighbourhood; in this case, narrowing down the issues at play within the inner-city of Groningen. Providing much more detailed, street specific results. Meaning that the researcher can assess what the main problematic areas are within the inner-city of Groningen that most people struggle with; whilst also recognizing the areas that are deemed to be accessible by most physically disabled people. Thus, providing insights as *to what extent* Groningen's cycling city centre is accessible to physically disabled citizens.

#### *Interview coding*

The interviews were coded using two different types of coding; analytic and axial coding. This provides a clear link with the literature discussed earlier, as most of the code tree is deductive coding inspired by the literature study, with inductive coding added as new insights emerge (see fig. 7). Atlas Ti software was used to analyze the interview transcripts (see appendix C).

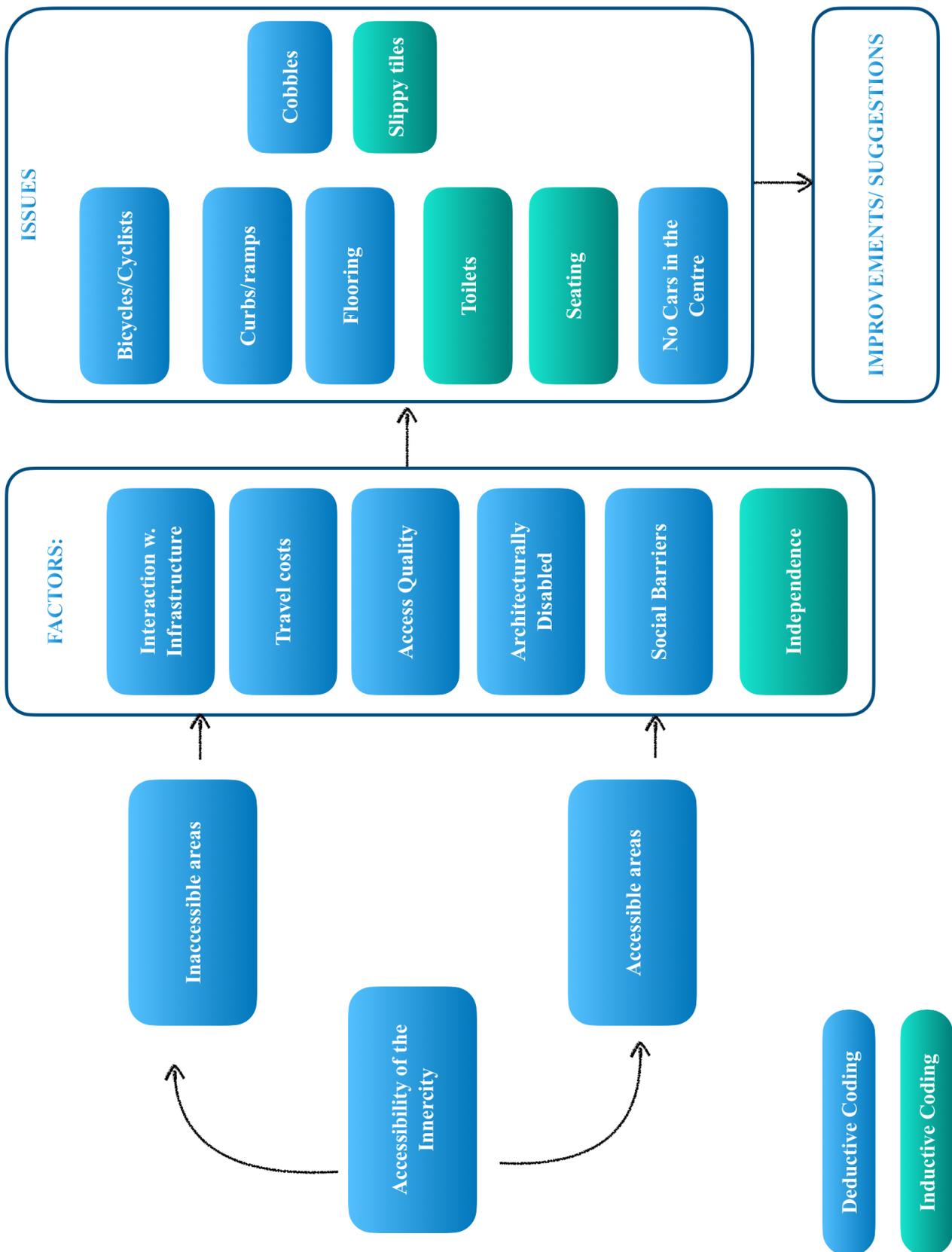


Fig. 7: Code tree

### 4.3 Surveys

The quantitative data collection is conducted by means of an online survey. This online survey, filled out by physically disabled pedestrians that are familiar with the inner-city of Groningen, questions if bicycles and cyclists are a general accessibility issue for physically disabled pedestrians (see appendix A). First of all respondents are asked if they find bicycles bothersome, and whether they find cyclists bothersome. When they say *yes*, they can say why they find bicycles or cyclists bothersome from a list of options. Listed are options deduced from literature study and issues highlighted in the press.

The data concerning cyclists and bicycles is nominal data as it is used to identify issues that affect most of the population of physically disabled pedestrians in the city of Groningen.

The online survey is conducted via Maptionnaire (see appendix A). Maptionnaire provides an online survey where spatial data can be included. This is a well-established method for collecting spatial data such as locations and routes that respondents do (or do not) like to take. The respondents are asked about the accessibility of the inner-city in general (using a 5-step Likert scale), followed by more location-specific questions. By using the spatial data feature, troublesome locations as well as accessible spots, are identified. Furthermore, by means of a pop-up menu respondents are able to clarify which factors make the chosen location either good or bad for them. Finally, respondents are able to map out their preferred, accessible routes. Revealing where people choose to walk when traversing the inner-city. As well as spatial data, this section of the survey provides nominal data and ordinal data for the general accessibility of the inner-city. In total, the survey was filled out by 31 respondents (see appendix A-II).

Initial responses and results from the survey were used when to formulate questions during the interviews; the survey did stay open until all after all the interviews were conducted. This meant that triangulation of the data was possible at the end of the process due to the overlap between the methods. Overall, leading to more reliable results.

## 4.4 Ethics

There are five main principles of research ethics; minimizing the risk of harm, obtaining informed consent, protecting anonymity and confidentiality, avoiding deceptive practices and providing the right to withdraw (Smiths, 2003). In general, there were few ethical problems that presented themselves when conducting the research.

### *Minimizing the risk of harm*

Due to the COVID-19 pandemic which was ongoing at the time of this research, there was social distancing in place at the time of the walking & talking interviews. However, as most of the interviewees were in a 'vulnerable' health group, contact was established over the phone before meeting in person. This was to discuss how the interview would ideally take place and whether they were comfortable with that. As a result, two of the interviews were conducted virtually instead of physically.

The maptionnaire however, posed no risk of harm to the respondents.

### *Obtaining informed consent*

As mentioned above, interviewees were approached over the phone initially to establish the order of proceedings and attain the interviewee's consent; at the beginning of each interview this was repeated and confirmed again by the interviewee.

Maptionnaire respondents were provided with an informative introduction encompassing the research aim and how the data would be used for the research. By continuing with the maptionnaire consent was granted. The survey ended with the option to leave an email address if the respondent wished to participate further in the research.

### *Protecting anonymity and confidentiality*

There is a risk that anonymity among the target group was compromised as there are not that many physically disabled people within Groningen, thus if the disability and mobility aide were described in the interview the interviewee could possibly be recognized. Furthermore, the municipal officials also come from a relatively small pool of possible candidates. Meaning that their anonymity could be compromised. Therefore, all the interview participants were asked if they wished to remain anonymous within the research; they all responded that remaining anonymous was not essential for their continued participation.

The maptionnaire survey was totally anonymous, unless respondents left their email address or if they divulged information within their answers to the open questions. However, this data was not shared, thus did not pose an anonymity risk within the research.

*Avoiding deceptive practices*

As stated above, interviewees were informed of the research aim. Furthermore, all interviewees were given the option to receive the finished interview transcript for approval, as well as the final research thesis.

The survey respondents were informed on the opening screen as to the aim of the research and where they could ask questions and/or request the finished thesis.

*Providing the right to withdraw*

All the participants (both interview and maptionnaire) were given the right to withdraw at anytime.

To conclude, the main research question will be answered with a combination of qualitative research, in the form of walking & talking interviews, and quantitative research, in the form of a maptionnaire online survey. By using the spatial data that these methods provide, the results will be more location specific and provide an overall view of how accessible the cycling city centre of Groningen is for physically disabled. The main principles of research ethics were upheld whilst conducting this research.

## 5. Results

The data collection results will be discussed in three sections. The first being the results of the online surveys, what was unexpected, what was not. Then the second section will delve deeper into the results from the interviews. Surprising outcomes will be discussed, but also whether there were contradictions in what the mobility impaired pedestrians said compared to the municipal officials. Finally, all the results will be brought together and discussed in relation to the theory and conceptual model as outlined on page 30.

### 5.1 Data Overview

In total there were 31 respondents to the online survey. Half of the survey respondents were male, while 43% were female (see fig. 8a). The age of the respondents ranged from 24 to 83 years of age, however 8 respondents did not fill in their age (see appendix A-II). Furthermore, 69% of respondents were Dutch, with the remaining 31% being from elsewhere around the globe (see fig. 8b). In terms of the frequency with which the respondents visit the inner-city, there were not many people that admitted to visiting the inner-city more than five times a week (see fig. 9).

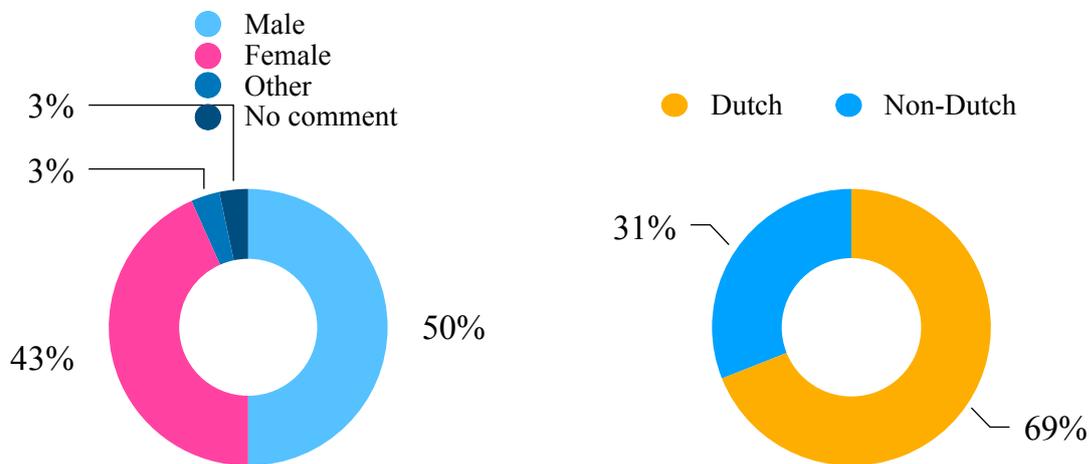


Fig. 8a) Gender division of sample.

Fig. 8b) Nationality division within the sample.

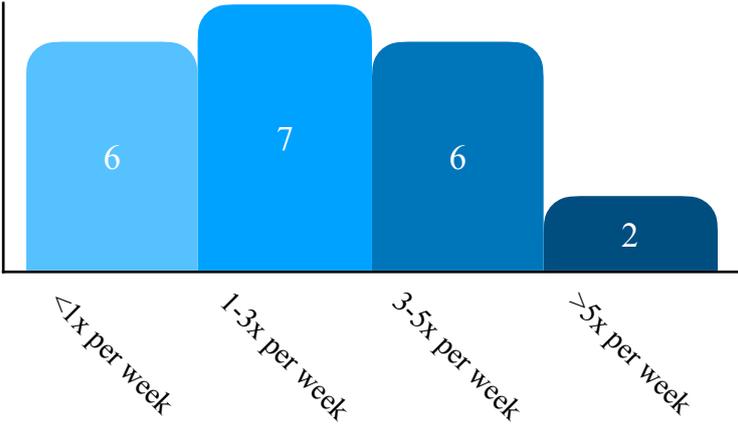


Fig. 9: The average frequency of inner-city visits per week of the respondents.

## 5.2 Bicycles and cyclists

88% of the respondents thought that bicycles and cyclists could be bothersome, while 13% did not (see fig. 10a). The most mentioned reason for bicycles being a nuisance is that bicycles are often parked loose on the pavement with little room left to pass (see fig. 10c). Whereas nearly a quarter of respondents found bicycles that were parked within a rack to still be problematic.

### Bicycles

The interviewees also found bicycles to be a nuisance. All six interviewees mentioned them being parked in the way. Bicycles reduced the access quality for some interviewees, as they are often placed in front of doors. Furthermore, bicycles can reduce the usable width of the pavement so much that the pavement is no longer a viable route for the interviewees. With the pavement no longer an option, the only way is via the road. Interviewee 4 said *‘I don’t mind using the road, it’s the only viable option for me. As long as I can get to it [via a lowered curb], it doesn’t matter. ... The cyclists will just have to deal with it. I’m allowed to be here too.’* This shows that the interaction

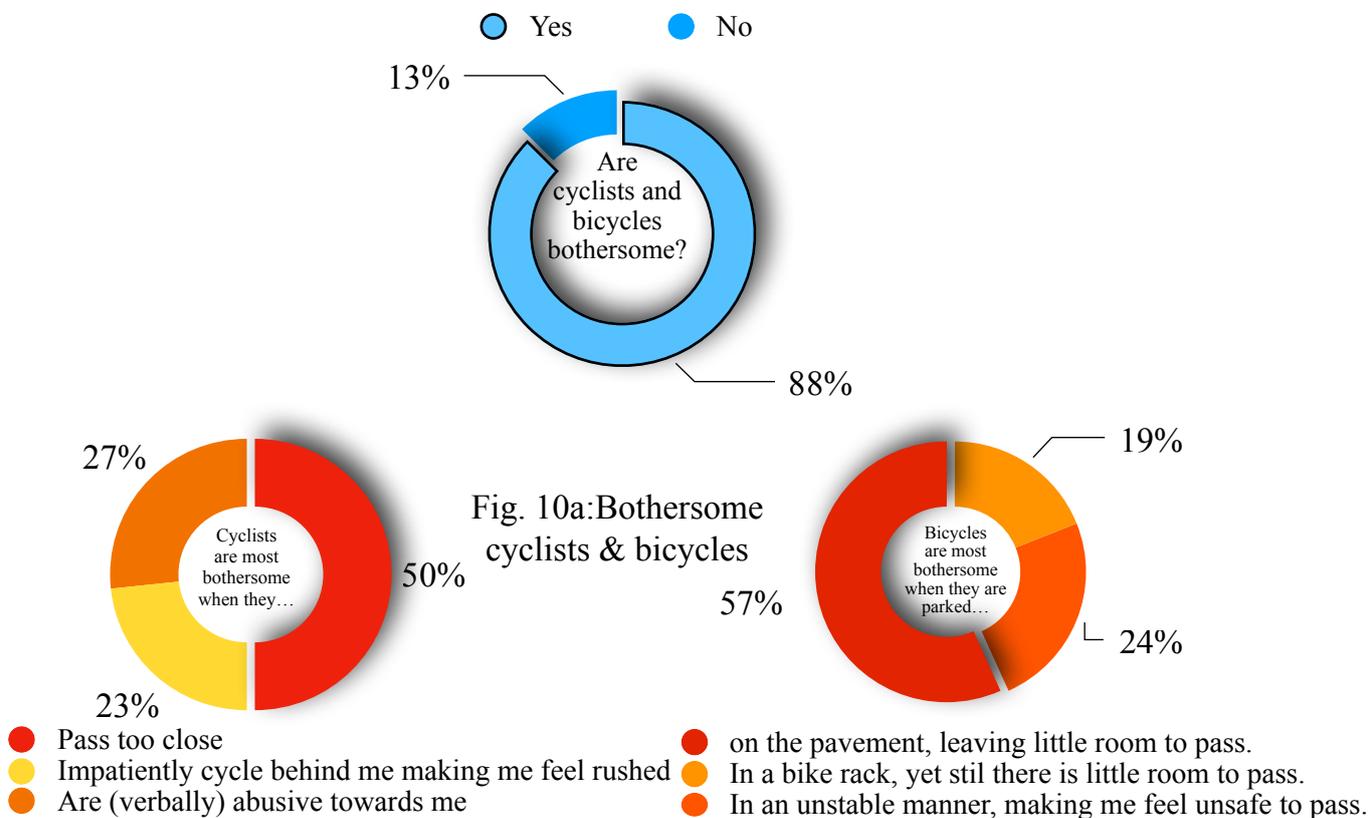


Fig. 10b: why respondents find cyclists an issue

Fig. 10c: why respondents find bicycles an issue

of physically disabled with the infrastructure can be flexible. However, other interviewees did not share her resolute approach to using the road instead of the pavement and thus, changing their interaction with the infrastructure. Interviewee 1 stated that: *'...you can't venture onto the road there [T-junction on the Oude Kijk in 't Jatstraat] because there are so many cyclists so you have to stand on pavement.'* This shows that the cyclists can be perceived as a barrier against changing how one uses the available infrastructure, like the road.

Interviewee 5 and 6 both agreed that stationary bicycles on the pavements were a big problem for the city of Groningen. *'That is why the municipality of Groningen introduced no bike parking zones,'* according to interviewee 5. *'The first day it was implemented the bicycle stewards must have moved hundreds of bikes,'* added interviewee 6. As a further deterrent to bicycles parkers, the municipality of Groningen is allowed to confiscate bicycles after 15 minutes of illegal parking (see appendix C-V). This has been shortened considerably from the 2 hours that bicycle stewards previously had to wait, according to interviewee 5. *'Ideally, we want to be able to move them straight away, but that still a way away.'* -Interviewee 5.

Not all the interviewees still found bicycles to be an issue when parked in a bicycle rack. Interviewees 1 and 2 did not find them to be particularly problematic when placed in a bike rack. Whereas Interviewees 3 and 4 found they could be problematic on occasion.

Interviewee 3 found that where the bicycle parking was in the length of the pavement, the pavement was the too narrow for a person, let alone a person with a mobility aide. *'It's ridiculous, the pavement is so narrow that I have seen people walk into a dead end because there is just nowhere to go. You have cars parked on one side, bicycles on the other, with no pavement remaining.'* - Interviewee 3.

Interviewee 4 found bicycles to be a barrier for accessing the pavement along the Akerkhof road. The bicycles are lined up so as not to obstruct the pavement or the road, whilst separating the two (see fig. 11) . *'If they are still there then I cannot get onto the pavement.'* - Interviewee 4.

The literature calls this reduced access quality (Saha et al., 2020; Imrie, 1999). By having bicycles (or obstacles) in the way of disabled facilities such as ramps, or simply the pavement, the presence of those facilities becomes superfluous as the physically disabled user cannot use the facilities (Saha et al., 2020; Imrie 1999). No parking zones will only make a limited impact as the problem will continue outside of these zones. Real behaviour change in bicycle parking attitude, is

required to ameliorate the problem across the whole inner-city and combat the (unconscious) disablist attitude (Imrie & Kumar, 1998; Imrie, 1999).



Fig. 11: Bicycles used to separate the road and pavement.

### *Cyclists*

Cyclists were considered to be a nuisance when passing too closely to the physically disabled pedestrians. In particular, however, cyclists being (verbally) abusive towards physically disabled pedestrians is an issue experienced by over a quarter of the respondents. Cyclists making mobility impaired people feel rushed is recognized as just under a quarter of respondents.

According to interviewees 5 and 6, the municipality of Groningen does want people to feel safe, however, they do not want to lose the cycling accessibility that they have created within the city. They are excited about how the city is thriving as a cycling city, but also trying to find ways to make people park further from their destination. Respondent 5; *“You just have to get people used to it. I’ve lived here for years, and yes, I do use my bicycle. If I go to the shops, I always forget to park it elsewhere and do the last mile on foot.”* The municipality was particularly concerned by how fast cyclists traverse the city centre. *“They can just fly past without having made a noise,”* says respondent 6, *“It gets really dangerous with possible added mass on a bicycle if we start to use*

*cargo bikes. Accidents could start getting serious.*” The balance will be maintaining a safe traffic environment to accommodate these changes.

The respondents also flagged up another issue. Cyclists being (verbally) abusive towards physically disabled pedestrians is an issue experienced by over a quarter of the respondents. Cyclists making mobility impaired people feel rushed is recognized as just under a quarter of respondents. When asked whether cyclists were verbally abusive, Interviewee 4 said: *‘You can’t pay any heed to what they say.’* Interviewees 1 and 2, did not find cyclists *particularly* abusive. The answers given by the interviewees indicate a level of ‘acceptable abuse’, it shows that there is some form of social barrier that means that abuse is a regular occurrence. None of the respondents said *‘No, they are not abusive’*, it was answered from a *‘No, not compared to others,’* perspective. This ties into the literature that propose that physically disabled are treated as less than others due to social barriers (Vermeij & Hamelink, 2021; Imrie, 1999; Imrie & Kumar, 1998).

Thus, cyclists and bicycles do affect the accessibility of physically disabled pedestrians within the inner-city of Groningen. However, bicycles appear to be more of an issue than the cyclists themselves. This is evident from the surveys and then the interviewees who put more emphasis on bicycles over cyclists. This is also logical when linking it back to the theory, as the obstruction caused by the bicycles influences multiple accessibility factors. Thus decreasing the overall perceived accessibility for physically disabled pedestrians.

### 5.3 Inaccessible areas

When it comes to inaccessible areas the spatial data collected by means of the survey resulted in two inaccessible places within the inner-city (see table 3). One being at the foot of the Korenbeurs and the other being the junction leading onto the Grote Markt from the Vismarkt.

Table 3: Accessible and inaccessible areas of the innercity of Groningen according to

	INACCESSIBLE	ACCESSIBLE
WHERE?		
WHY?	<ul style="list-style-type: none"> <li>● Ground is uneven</li> <li>● Pavement is too narrow</li> <li>● Too many objects on the pavement</li> <li>● No pavement present</li> <li>● Space is too crowded</li> <li>● No disabled friendly facilities</li> <li>● Other</li> </ul>	<ul style="list-style-type: none"> <li>● Ground is even</li> <li>● Pavement is wide enough</li> <li>● No objects on the pavement</li> <li>● Not crowded</li> <li>● Disabled friendly facilities</li> <li>● Other</li> </ul>

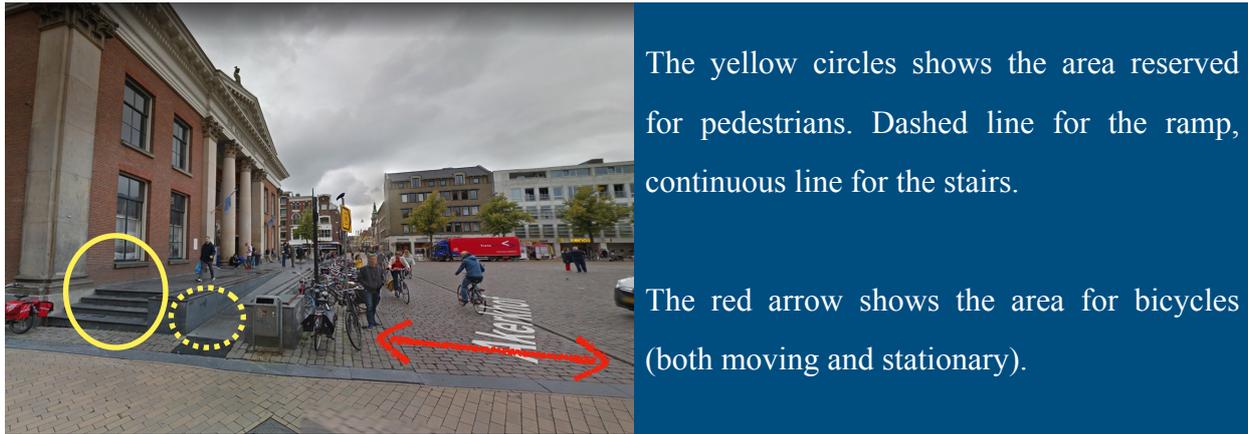


Fig. 12: The division of space on the Korenbeurs-Vismarkt junction.

### *Korenbeurs*

Starting with the Korenbeurs location, there many respondents found that the pavement was too narrow, the ground was uneven under foot, and finally that there were too many obstacles on the pavement. Thus it was deemed inaccessible by respondents.

Interviewee 1 also found the Korenbeurs to be an issue, located on the West side of the Vismarkt (see fig. 12). There is a ramp up to the entrance, as well as stone stairs. However, due to the floor covering of both of these features, they become slippery when wet. There is also no handrail next to the stairs. *‘As a pedestrian you have to use either the slope or the stairs to pass the korenbeurs building. The paved area at the front has bicycles and the path in front of that is a bicycle path.’* As the bicycle path is busy most of the time and so are the shops within the Korenbeurs, the respondent feels rushed by others when passing here. This was mentioned within the literature as comfort costs being context dependent (Rli, 2014). The (dis)comfort costs increase when the weather has been wet, as it then creates a slippery floor covering. Additionally, the feeling of being rushed will further increase the comfort costs for the traveller.

The difficulty with areas such as the Vismarkt and the Korenbeurs is maintaining a balance between providing accessibility and maintaining the historic heritage of the area, according to interviewee 5. *‘These are historic monuments. We cannot just rip it all up and replace it with modern alternatives. The character of the centre would be lost’*, - Interviewee 5. The Korenbeurs being built with a slippery floor covering when wet, deeming the slope inaccessible for certain physically disabled users. This is an example of what Goldsmith (2000) calls architecturally disabled building. With the Korenbeurs being an historic monument the architecturally disabled

nature of the building most likely stems from a societal ignorance for physically disabled users (Imrie, 1999; Vermeij & Hamelink, 2021).

This example of the Korenbeurs also brings the temporal component in of perceived accessibility. As interviewee 1 stated, *when it rains*, the steps become slippery. Meaning that in summer, during long, warm, dry days, the flooring here might not be an issue. Furthermore, The times at which one visits this junction could also influence the perceived accessibility. For example, if one were to visit the Korenbeurs during rush-hour on a market day it would be much busier and thus seem even less accessible (Botticelli et al., 2014).

#### *Grote Markt - Vismarkt crossing.*

This junction was deemed inaccessible by the survey respondents as there were too many objects on the pavement, which has the knock-on effect that the pavement is too narrow. As stated by Saha et al. (2020) when physically disabled people are not able to access facilities such as ramps and pavements due to low access quality, they will deem it inaccessible and unviable. It is worth noting that many of the respondents are not in the inner-city more than three times a week. This could mean that some of the respondents were unaware of the recent ‘no bike parking zones’ that have been implemented at this junction. These zones have been implemented to free up the pavement to make it more pedestrian friendly, according to interviewees 5 and 6.

When conducting the interviews this junction was not mentioned in particular in regards to the built environment, only in terms of the bicycles and cyclists. Thus more research would have to be done to discover whether, now the objects (in this case bicycles) have moved, the access quality has also improved. This is an inconclusive inaccessible area.

#### *General perceived accessibility of the inner-city*

When asked about the general accessibility of the inner-city the respondents did not deem it easy to navigate (see fig. 13). The majority stayed neutral, they did not find it particularly accessible or inaccessible. The second biggest majority disagreed that the inner-city was easy to navigate. This does not mean that the inner-city is necessarily inaccessible, but it does not make it accessible either. When asked if respondents could go where they needed to, the majority agreed they could.

This could possibly be explained by the fact that most respondents felt that they could access the places the *needed* to, yet not the places they *wanted* to, for the most part. This means that

there are limitations to the perceived accessibility of physically disabled pedestrians within the inner-city of Groningen.

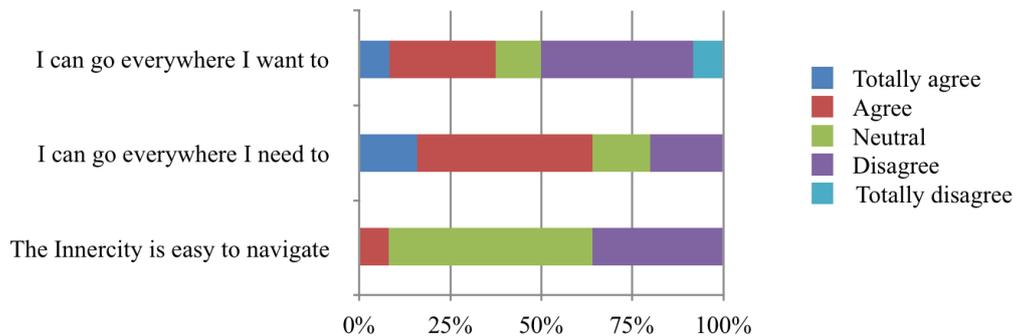


Fig. 13: Survey response to general inner-city accessibility.

Interviewee 3 made a point of the accessibility from disabled car parking spaces. As the car is being moved further and further out of the centre, it does not make sense to also subject disabled drivers to this. *‘You can try to induce a behaviour change in transport choice among people, but for people like me, there is no ‘choice’. I have to use my car to access the inner-city.’* By removing the vehicles from the inner-city and thus, also the option for interviewee 3 to get into the inner-city by car, she explained that she will no longer be able to maintain her volunteer work and it will feel to cost her her independence.

Interviewee 1 and 2 were both critical of the decision made by the municipality to remove the bus service from the city centre. Respondent 1 thought the A-kerk bus stop should not have been removed and he felt it affected his accessibility within the city centre. Furthermore, he believed that removing the bus stops at the Grote Markt would further reduce his accessibility within the inner-city in the coming years. He uses the busses to get into the city centre after parking his car at one of the various park and rides situated outside of the city.

Respondent 2 also agreed that not having a bus stop that went directly into the centre would be detrimental to physically disabled travelers that use the park and ride. However, she also added that *‘physically disabled people cannot get close enough to the centre for it to be convenient,’* matching the sentiment of interviewee 3. Interviewee 2 travels by car mostly and then retrieves her disability scooter out of the rear of the car. Part of this is due to convenience, but part of it is out of practicality. As many motorized mobility aides are electric, and thus battery powered, they have a limited range. Recharging in the city would take a couple of hours and taking a spare battery is not

an option as they are too heavy and often awkward to exchange if doing it yourself. Thus, respondent 2 concluded that removing buses from the centre would also remove the independence of physically disabled people that used electric mobility aides to visit the inner-city on their own.

Interviewee 1 also showed some concerns about removing vehicles from the inner-city entirely, as it already affected his accessibility when the A-kerk busstop was discontinued. *'There are shuttle busses, however these are so inaccessible. No one ever knows when and where they will be, they are not user-friendly at all.'* This does not look favorably on the suggestion posed by interviewee 5 of introducing *'some sort of shuttle service, just to get people closer to the centre. Otherwise people have to walk a long way to get into the centre.'* Interviewee 6 agreed that it is too far at the moment from the planned bus route to the city centre. *'It's at least 300 meters, all of it up a slight incline. That's nothing to laugh about.'* - Interviewee 6. Thus the municipality is already trying to think of a solution to transport people into the centre of Groningen once the busses have been removed.

It is clear that for these interviewees the last mile of their journey becomes too long when they cannot gain access to the inner-city by means of a vehicle (be it by bus or by car). It is important for perceived accessibility that the last mile is not perceived to be too long by the traveller (Tight et al., 2016; Ruiz-Apilanez & Arnaiz, 2015).

This ties into the core concept of this research. If people do not believe they can access the inner-city (e.g. because the bus is no longer running to the centre) then they are likely to perceive the whole of the inner-city as inaccessible (Ruiz-Apilanez & Arnaiz, 2015).

To conclude, the Korenbeurs area on the west side of the Vismarkt is deemed an inaccessible area. This is down to the architecturally disabled nature of the building leading to highly changeable comfort costs depending on the weather conditions (wet or dry) and the time of day (busy or quiet) (Goldsmith, 2000; Rli, 2014; Botticello et al., 2014). In terms of the general perception of accessibility, the main issue is the length of the last mile. This was an issue experienced by most of the interviewees already, yet it is only going to get worse with the new plans for the inner-city. With vehicles being further removed from the inner-city, the last mile will become even longer for many physically disabled people, decreasing the perceived accessibility of the inner-city (Ruiz-Apilanez & Arnaiz, 2015; Tight et al., 2016).

## 5.4 Accessible areas

In terms of accessible places, there were three spots in particular that were mentioned. The Grote Markt itself, the Heerestraat, which is the main shopping street, and the A-Kerkhof junction (see table 3). Something all these three areas have in common is that the ground is even.

There were also a couple of respondents that found the Vismarkt to be an accessible area. However, unlike above, this was the centre of the Vismarkt square and not the crossings leading onto it.

### *Grote Markt*

The respondents found the Grote Markt to be an accessible place. They found the ground to be even, the pavement was wide enough and there were no objects on the pavement. Some of the respondents even elaborated saying that the seating is a good addition to the square as it can function as a meet-up point; it no longer matters if you're waiting a long time, if you can sit down whilst waiting. This is in line with what the literature states; an important factor of perceived accessibility is access quality. When there are no objects on the pavement and physically disabled people are given enough space to manoeuvre, then the area is deemed (more) accessible (Saha et al., 2020; Han et al., 2002). Furthermore, the tertiary seating has made the area seem more accessible for physically disabled people as suggested by Ruiz-Apilanez & Arnaiz (2015).

Interviewee 2 said she loved the Grote Markt because of how flat it was. *'It makes everything so easy!'* The only issue that interviewee 2 had with the Grote Markt was the lack of a public disabled toilet. However, as Interviewee 4 explained, there is a public toilet, however one needs to know it is there, first of all. Secondly, the entrance is often blocked by bicycles.

Interviewee 5 was very excited for the imminent redevelopment of the Grote Markt. *'Accessibility for disabled people has been really considered within the designs and Toegankelijk Groningen has also been included in the process.'* - Interviewee 5. Both Interviewee 5 and 3 suggested that the Toegankelijk Groningen group should be given right of consent on (redevelopment) plans as standard. This would be a similar arrangement to how, for example the fire department have a right of consent. If the plans do not pass their inspection, then they are rejected and would have to be resubmitted in order to be reconsidered.

According to the literature, true participation is an effective way to get stakeholders (such as physically disabled people) involved (Burby, 2003). Giving physically disabled people a voice within the decision-making process would lead to better solutions (Bromley et al., 2006); so long as it is participation and not tokenism (Arnstein, 1969).

#### *Heerestraat*

The Heerestraat is the main shopping street. This street also has even ground, it is a wide pedestrian zone. There is a line of grey cobbles down the side of the street which marks the demarcation of where shops are allowed to place objects, such as signs or flags. Interviewee 6: *‘The municipality is now rather strict on maintaining the line. You receive a hefty fine if your sign is over the line.’*

These fines, paired with the efforts of the bicycle stewards, does imply that the municipality of Groningen is actively trying to improve access quality for (physically disabled) pedestrians, as set out in their plan (Binnenstad 050, 2017).

#### *A-kerkhof*

This is a divisive area. The survey respondents love it; it is flat, there’s a lot of space, the pavements are clear of objects in general. Interviewee 6 explained that the A-kerkhof was redesigned just a few years ago. *‘It used to be so cramped for the buses coming through. I remember getting hit in the shoulder by a bus wing mirror. It was so dangerous.’* The pavements used to be cramped and bordering onto the road. Now it is more open, smooth and even, and bicycle parking creates a border between road and pavement (see fig. 11). *“This junction works off the fact that no one knows what they are doing. So you’ve got to be very aware of other road users and your surroundings.”* Respondent 6 added.

However, not everyone is satisfied with this change. Interviewee 4, finds the pavements of the A-kerkhof area, uncomfortable to traverse. The slope towards the road is relatively severe so as to keep the surface continuous. This means that for a wheelchair user to use the pavement, they end up rolling along on an angle, an uncomfortable angle.

Furthermore, Interviewee 3 took exception to the floor covering of the junction. *‘The yellow bricks used for the road and pavement are lovely and smooth. However, this means that as they get wet, they become extremely slippery.’* Although she did agree that it was an improvement on cobbles. When it comes to implementing an idea or project aimed at improving the accessibility of an area, Interviewee 3 suggested to ask yourself three important questions. Is the solution usable? Is

it accessible? And finally is it reachable? This is the Holy trinity of accessibility solutions, according to her. The yellow bricks are an example of a solution being accessible, reachable, but not 'usable' for disabled when wet.

The accessibility factors that have changed for this junction are the travel costs and the interaction with infrastructure. The interaction with the infrastructure has changed as road and pavement are all one level, the opposite side of the street is more connected for pedestrians. Before the redevelopment, it would have been ill advised for a physically disabled pedestrian to cross the busy, cramped road with no dropped curbs. However, now it has been redeveloped physically disabled pedestrians use the space differently than before. This case shows that the change in interaction with the infrastructure can have a positive effect on the accessibility as suggested by Hansen (1959).

Furthermore, the travel costs, comfort costs in particular, are influenced by the redevelopment. In general the costs are improved in terms of feeling safe, and the floor is easier to traverse in terms of smoothness (Rli, 2014). Yet, on the other hand it is also the comfort costs that are affected when the yellow bricks feel too slippery, or too sloped to walk on them.

This might not be deemed an accessible space by all, however the respondents thought it to be an accessible space and the interviewees all thought it was *more* accessible than before. Thus the accessibility is improving for this area.

So, how accessible is the built environment of the inner-city of Groningen for physically disabled people? On balance, the built environment seems to be improving with every redevelopment. The areas that had been singled out by the survey respondents had all been redeveloped within the last 8 years according to Interviewee 6. Furthermore, according to Interviewee 5, there is plenty more redevelopment to come, starting with the Grote markt.

However, the physically disabled interviewees contribute critical insights that make the built-environment of the inner-city not seem so accessible anymore. Starting with the lack of access to the inner-city by car. Many physically disabled, mobility aide users need a car to transport themselves and their mobility aide to the destination. Currently, it is already a difficult task to park in the inner-city; this will only become worse with the intended future plans of removing all vehicles from the inner-city. If someone cannot reach the inner-city to gauge its accessibility, then the perceived accessibility will likely be very low indeed.

Additionally, although the survey was relatively optimistic when it came to the perceived accessibility of specific areas, it was less positive in regards to accessibility of the inner-city as a whole. Less than 10% deemed it easy to traverse (see fig. 13). The majority of respondents could not access the places they *wanted* to; only the places they *needed* to.

## 6. Conclusion

### 6.1 Subquestions

*What is accessibility?*

The literature review found that accessibility is a measure of perceived ease of an individual to participate in any desired activity, at any desired location, using a transport mode of choice, at a personally chosen time within a personal cost threshold (Bhat et al., 2000; Bertolini et al., 2005; Guy, 1983; Guida & Cagliani, 2020).

*To what extent do cyclists affect the accessibility of physically disabled pedestrians within the inner-city?*

Bicycles are seen as a bigger problem than cyclists in the inner-city of Groningen. The factor that is most influenced by the cycling city is the access quality, due to the parked bicycles. However, social barriers and verbal abuse have also been identified as significant issues, which are mainly related to cyclists. The municipality of Groningen is trying to amend its bicycle issue by developing bicycle parking garages. Furthermore, no cycle zones have been introduced within the busy pedestrian areas of the inner-city to improve pedestrian accessibility.

*How accessible is the built environment of the inner-city for physically disabled pedestrians?*

The built environment of the inner-city is becoming more accessible with every redevelopment for physically disabled pedestrians. However, the access to the inner-city in terms of transport modes (car, bus etc.) is being reduced. This means that in the future, a perfectly accessible inner-city could be void of disabled pedestrians because they cannot get there. This could create a last mile that will make the perceived accessibility too low (Tight et al., 2014; Ruiz-Apilanez & Arnaiz, 2015).

Furthermore, within the inner-city of Groningen it is often the materials that make areas architecturally disabled (Goldsmith, 2000). This was the case for the Korenbeurs and also for the Akerkhof junction. This means that these areas' perceived accessibility is dependent on temporal and contextual aspects (Botticello et al., 2014; Rli, 2014). Meaning it is not inline with the definition used for perceived accessibility within this thesis as the 'personally chosen time' would no longer be personally chosen, but partly dictated by others to stay within the personal cost threshold.

## 6.2 Main research question

*To what extent is Groningen's city centre accessible to physically disabled citizens?*

Groningen will never be one hundred percent accessible due to the historic monuments and heritage that the municipality wishes to preserve. Furthermore the municipality does not wish to impact its cycling city status. It wishes to maintain the cycle centric nature of the city.

All this being said, the municipality is committed to improving the accessibility within the city. Groningen is relatively accessible to physically disabled pedestrians, whilst still being a cycling city. However, this thesis has singled out a few reoccurring problems which decrease the perceived accessibility within the inner-city of Groningen:

- Parked bicycles compromising the access quality of facilities that physically disabled pedestrians use; such as ramps, pavements and disabled toilets.
- A social inequality in how physically disabled are treated (by cyclists) within the inner-city Groningen.
- The intended plans to remove vehicles from the inner-city of Groningen is likely to make the last mile to be perceived as too long.
- Areas can end up being architecturally disabled due to the materials used when an area is being developed.

Suggestions for improving these issues within the inner-city of Groningen are as followed:

- Organizational changes need to be made within the planning structure of the municipality of Groningen, to ensure that physically disabled pedestrians actually have a weighted say in public planning decisions (see table 1). This would prevent slippery materials being used that could make an area architecturally disabled; yet also create workable solutions for decreasing 'the last mile'.
- Implementing more no-bicycle zones throughout the inner-city, whilst placing specific bicycle routes elsewhere in the city; so that it is still possible to cycle through the inner-city quickly, yet also possible for physically disabled pedestrians not to be hindered by fast cyclists within the inner-city. This would maintain the ease of cycling (and the cycling city ethos) whilst not subjecting physically disabled people to the inconvenience and unpleasantness of parked bicycles and abusive cyclists.

As stated above, the municipality is clearly trying to improve its accessibility with each idea and each redevelopment. However, there is a long way to go before it is deemed *accessible*.

## 7. Reflection

This reflection will reflect on three aspects of this thesis; the methodological reflection, the theoretical reflection and the personal reflection. Each aspect will be discussed thoroughly, revealing what went well and what didn't, throughout the course of this research.

### *Methodological reflection*

Choosing to research accessibility was a relatively obvious choice for me due to personal experience however when it came to actually choosing my method of case study took more consideration.

For the quantitative data collection are used Maptionnaire. It is a software I was already familiar with and it is one that can collect spatial data. I specifically wanted to collect spatial data as at the time of starting the research I did not know whether physical interviews would be possible. Thus I needed a way of knowing which areas of the inner-city of Groningen were considered more accessible and which were considered less accessible. Unfortunately many of the survey respondents did not fill out the 'pin-drop' questions, which meant I had very little spatial data. However I had few respondents across the board, which was not ideal. This was down to the fact that it was difficult to reach my target group during the COVID-19 pandemic lockdown. The target group also happened to be the most vulnerable group for catching Corona. This meant that my target group was also extremely difficult to track down as they were not conducting their normal daily activities. Like many others they were staying indoors. Thus making it difficult to approach them.

For the qualitative data collection I ended up conducting walk along interviews. This was so that I could experience how the interviewee interacted with the space and the infrastructure. I was rather pleased with this method because it did deliver clear insight into how the interviewee engaged and interacted with the space. However, unfortunately not every interview could be conducted by means of a walk along interview.

Initially this was cause for concern; however, it turned out that the considerations of the interviews were different when it was a virtual interview compared to a physical interview. the virtual interviews seemed much more thought through as to the emotion behind the experience of going through the city centre. Whereas the walk along interviews focused more on how they

traversed the space. Both insights ended up being really valuable and I'm pleased that there was a balance between virtual and physical interviews. It gave the data more depth in my opinion.

### *Theoretical reflection*

Initially I planned to approach this from an interdisciplinary perspective, where I would focus on the planning and the medical maybe psychological aspects of disabilities as well. However when conducting a literature study I realized how much of the medical literature to do with disabilities was aimed at recovery of the ailment. It was very difficult to find literature based on what people **could** do in public spaces it was all based on what people **could no longer do**. Thus I switched tack.

I decided to do a planning-based literature study, which was all about perceived accessibility. This was quite difficult, as many of the literature sources approached accessibility from a very mathematical side whereas I wanted to explore a more experiences based, individual side of accessibility. This meant that I ended up studying various definitions and dissecting them to create what I felt was my definition of accessibility. This allowed me to make my research into accessibility as broad as my definition. In order to include all the elements.

Having dissected the various definitions of accessibility, it actually helped to understand how interrelated many of the accessibility factors are. This then also helped me understand how, for example, a bicycle parked in the middle of the pavement does not just affect access quality, but it also affects travel costs, interaction with infrastructure and the accessibility of the mode. If your infrastructure is no longer accessible then your mode which is walking, or rolling if you are in a wheelchair, also becomes less accessible. These connections really helped me comprehend the nuances of perceived accessibility.

One of the difficulties when looking for literature on accessibility, is that there is often no distinction made between cycling and walking accessibility in the literature. Whereas for this research it was crucial that cycling and walking accessibility were handled differently. To understand the tensions between the two modes you have to understand differences in requirements of accessibility. That was more difficult than expected just because of how the modes are treated within the planning literature.

Finally, I would have liked to have done more research into the social dynamic of the disability, understanding how exactly people are treated differently. It was briefly mentioned in the SCP report

that people with a disability automatically get treated differently. That is something I would have liked to have explored more within this research. It would be interesting to know whether certain sectors of society are more affected by mobility impairment than others, and whether that is reflected in the environment. Unfortunately that was outside the scope of Groningen's inner-city.

### *Personal reflection*

There were a few hurdles in completing this thesis. To start with my target group was relatively inaccessible, ironically. This led to small samples, however the samples that were achieved were gained by sheer hardwork and determination. Thankfully one of the interviewees took pity on me and helped reach out to various people that could help and some who could participate in the research.

I am pleased I chose a topic that I am so passionate about. However, the bad timing of the pandemic mixed with trying to reach out to a vulnerable group was very difficult. This research might have been better in a normal year. The data would also be more comprehensive and reliable. I am pleased that I continued with this research even though it was difficult at times. Wanting to research something from a certain angle and then not being able to do it does call for a certain creativity to then fill the gap. This call for creativity is something that I have never needed before when it came to research. This was the first time where the research had to adapt and evolve multiple times before ending in the finished form. I have learnt a lot from it and I am pleased that I have done it.

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## 9. Appendices

### Appendix A-I

#### Questionnaire Physically disabled

Descriptives	Answers (nominal)
[Age] How old are you?	Number
[Gender] Are you male, female or other?	Male, Female, Other
[Nationality] Are you Dutch or another nationality? (Dot know whether i need to ask this)	Dutch, Other
[Purpose] What brings you to Groningen frequently?	Work, Education, Live here, Treatment, Other, Not here frequently.

#### Main body

Questions	Data
How frequently are you in Groningen?	Ordinal (Likert)
Do you find Groningen a difficult city to traverse?	Ordinal (Likert)
Can you access all the places you need on a daily basis?	Ordinal (Likert)
Can you access all the places you want to visit within Groningen?	Ordinal (Likert)
Do you struggle with cyclists when out and about?	Ordinal (Likert)
What are the most inconvenient spots for you?	Nominal (on map)
Why are these spots so inconvenient?	Nominal (maybe with options)
What routes do you take to avoid these areas?	Nominal (on map)
Where are the most convenient spots for you?	Nominal (on map)
Why are they convenient?	Nominal (maybe with options)
What is the biggest overall problem when talking about the accessibility of the city centre for you?	Nominal (open question)

Closing

Questions	Data
Is there is anything you would like to add concerning your access to the city-centre?	Nominal (open question)
Would you be interested in taking part in an anonymous interview concerning this topic?	Nominal
Thank you for filling out this questionnaire!	

**Appendix A-II**

Appendix A-II: Overview of Respondents

Respondent	Gender	Age
1	Woman	24
2	Man	25
3	Other	-
4	Man	-
5	Other	-
6	Woman	68
7	Man	-
8	Man	40
9	Woman	-
10	Woman	-
11	Man	47
12	Other	71
13	Woman	-
14	Man	35
15	Man	26
16	Man	30
17	Man	29
18	Man	30
19	Man	70
20	Woman	58
21	Woman	83
22	Man	69
23	Woman	62
24	Woman	75
25	Man	62
26	Woman	68
27	Man	52
28	Woman	70
29	Man	45
30	Woman	-
31	Woman	60

## **Appendix B-I**

### **Interview Physically impaired**

*These interviews will be conducted whilst walking through the city.*

[Find research declaration thingy from website] + [specify terms, anonymity, data treatment etc.] This is a semi-structured interview

#### *Introduction*

Hello, welcome. My name is Freddy. Would you like to introduce yourself?

Thank you, ..., for taking part in this interview. I would like to begin by talking about your needs from the environment around you so you to access places freely. What do you need ideally?

#### *Body*

Are there many places within Groningen's centre that gives you this?

Do you prefer to use the road or pavement?

What are the worst areas for you?

Are cyclists a big issue for you?

What would be your ideal solution?

How do you feel when your infrastructure is unfit for you?

Do you feel safe/at risk when out? [falling, being hit by cyclist etc.]

Does this stop you going out unnecessarily (normally speaking)?

Are there places that are really convenient for you?

What makes them so convenient? [more space, more modern, more thoughtful, overall design?]

Are newly developed areas very accessible for you? [Forum]

The city centre is under construction at the moment, can you still get around road works?

*Closing*

Is there anything else you would like to share about your experience within Groningen?

Do you have any questions for me before we finish up?

Have you enjoyed it?

Thank you so much for taking part. If you want to get in contact with me please do so. I will send you an email with the transcript once it has been written up. ...

Bye!

## **Appendix B-II**

### **Questionnaire City official**

*These interviews will be conducted whilst walking through the city.*

[Find research declaration thingy from website] + [specify terms, anonymity, data treatment etc.] This is a semi-structured interview

#### *Introduction*

Hello, welcome. My name is Freddy.[explain research roughly] Would you like to introduce yourself?

What do you do within the municipality of Groningen?

#### *Body*

Do you think that the city centre is a cycle friendly area?

What does/has the municipality done to make it cycle friendly?

Do you think that the city centre is pedestrian friendly?

What about for physically disabled people?

How does the municipality approach shared spaces? Are there criteria that have to be upheld?

What are the main issues/challenges you face when creating or dealing with shared space?

Does the international component of the population make it trickier? Internationals not being used to cycling or cyclists maybe.

Do you receive many complaints from either cyclists, or pedestrians?

How do you attain feedback about the infrastructure for these modes?

What are possible future solutions that the municipality has for these modes?

*Closing*

Is there anything else you would like to share?

Do you have any questions for me before we finish up?

Have you enjoyed it?

Thank you so much for taking part. If you want to get in contact with me please do so. I will send you an email with the transcript once it has been written up. ...

Bye!

## **Appendix C\***

Request access via the author.