How to become a cycling city?

A comparison between Amsterdam, Groningen and Geneva

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List with abbreviations

ANBO : Dutch advocate for seniors (in Dutch: Algemene Nederlandse Bond van Ouderen)

CHAMP : Cycling Heroes Advancing sustainable Mobility Practice

GIS : Geo Information Systems

PPP : Purchasing Power Parity

SAC : Student Advisory Council

UNECE: United Nations Economic Commission for Europe

VVD : People's Party for Freedom and Democracy (in Dutch: Volkspartij voor Vrijheid en Democratie)

List with definitions

Median : The middle point in the distribution of scores (Norušis, 2011).

Mode : The value that occurs most frequently (Norušis, 2011).

Purchasing Power Parity : The rate at which the currency of one country would have to be converted into that of another country to buy the same amount of goods and services in each country (OECD, 2014).

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[1] The name Anna is a pseudonym

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Abstract

What can be done in order to become a cycling city? This paper explores the conditions to be perceived as a cycling city, the influences of demographic, spatial and travel behavior characteristics of city dwellers on calling a city a cycling city and the measures which are perceived as required to be taken in order to become a cycling city. A review on the conditions that determine the bicycle use in a city, has served as a basis for researching the conditions to be perceived as a cycling city. The research methods applied for this study are 2 surveys (n=291) and 3 focus group discussions and the study population consists of people aged 15-74 years old living in Amsterdam, Geneva and Groningen. The research findings demonstrate that the amount of cyclists in a city and the quality of cycling in a city matter for perceiving a city as a cycling city according to respondents. The results also reveal that the place of residence of respondents has an influence on perceiving a city as a cycling city or not. The measures which should be taken in order to become a cycling city according to respondents and focus group participants are related to the road infrastructure, the image of the bicycle and the socio-safety situation in the city. For future research, it is recommended to further test the researched and newly identified conditions to be perceived as a cycling city and the measures which may be perceived as required to be taken in order to become a cycling city on a representative sample.

Key words: *Amsterdam; bicycle use; bike city; conditions; cycling city; Geneva; Groningen; measures*

1. Introduction

In this chapter, the research topic and the relevance of this study are introduced, as well as the structure of this thesis. The background of this research is described first (paragraph 1.1). In the next paragraph, the goal of this study and the research questions are addressed. In paragraph 1.3, the societal and academic relevance of this study are described. Finally, an overview of the structure of this thesis is provided in paragraph 1.4.

1.1 Study background

Various cities in the world are called cycling cities by local authorities and cycling organizations (i.e. bike cities), such as Portland (United States), York (England), Rotterdam, Veenendaal, Groningen, Houten, 's-Hertogenbosch and Zwolle (Netherlands) (City of York Council, 2016; Fietsersbond, 2015a; Rotterdam, 2016; Yardley, 2007). In a large number of other cities in the world, local authorities want to take measures in order to become a cycling city, e.g. in Atlanta, Chicago (United States), London (England), Paris (France) and Tel Aviv (Israel) (City of Chicago, 2016; Giddings, 2016; Johnson, 2014; Mairie de Paris, 2015; Van der Zee, 2016). Being a cycling city contributes to the feeling of pride among inhabitants, entrepreneurs and the City Council. Moreover, it is a symbol of status and it stimulates cycling since the bicycle becomes undisputed (Fietsersbond, 2015b).

When policy makers of a city aim to become a cycling city, appropriate measures should be taken in order to become one. These measures can be derived from the conditions in order to be considered as a cycling city. However, the conditions to be considered as a cycling city have never been determined. Nevertheless, a definition of an 'active' cycling city is given by Jansen et al. (1997). They defined an active cycling city as a city in which the bicycle is the main transport mode. The relationship between the relative amount of cyclists in the city and considering a city as an active cycling city suggests that this relationship exists for considering a city as a cycling city as well. The conditions for being considered as a cycling city might therefore (partly) coincide with the factors influencing bicycle use. However, the Dutch Cyclists' Union uses other criteria than the amount of cyclists in a city in order to determine whether a city deserves the title of being called a cycling city. These criteria differ for each election. A couple of criteria are; whether people can cycle without obstacles in the city (election in 2011), whether cycling is promoted and a convenient network of bike paths is present in the city (election in 2014) and whether local authorities recognize the benefits of cycling (election in 2016) (Fietsersbond, 2011; Fietserbond, 2014; Fietserbond, 2016a). As these and other literature do not clarify which conditions are required in order to be considered as a cycling city, primary data has to be collected in order to identify and understand which conditions are needed in order to be considered as a cycling city according to people.

Internet sources show that the opinions on whether a city is called a cycling city, differ. For example, Rotterdam is sometimes also not perceived as a cycling city or is called the 'cycling city

of the future' (De Roos & Toorenaar, 2016; Mobiliteit & RO, 2014; Rijsdijk, 2015). Certain characteristics of city dwellers might explain whether a city is perceived as a cycling city or not. The characteristics of city dwellers which are related to whether or not a city is called a cycling city may have an influence on the measures which should be taken in order to become a cycling city. When it, for instance, turns out that there is a reverse relationship between the ages of city dwellers and calling a city a cycling city, more measures or measures with more emphasis on quality should be taken in a city with many elderly compared to a city with many youngsters in order to become a cycling city. Information has to be gathered in order to examine the relationships between the characteristics of people and perceiving a city as a cycling city or not. Subsequently, conclusions can be to drawn about the measures required in order to be considered as a cycling city.

Furthermore, some cities might have a very limited potential to become a cycling city, even though measures are taken in order to become a cycling city. The (almost) unsurmountable barriers towards becoming a cycling city have never been defined by scholars and therefore, research has to be conducted to these barriers. Based on these findings, local authorities of a city and other stakeholders can be advised about the possibilities of becoming a cycling city.

1.2 Objective and research questions

The objective of this study is threefold: (a) to identify and understand the conditions (required or barriers) to be perceived as a cycling city by those living in cities; (b) to examine the effects of demographic, spatial and travel behavior characteristics of city dwellers on calling a city a cycling city; and (c) to advise, based on these findings and the measures proposed by those living in cities, which measures should be taken in order to become a cycling city. The main question for this research is: '*Which measures are perceived as required to be taken in order to become a cycling city and to what extent is the perception of whether a city is a cycling city or not influenced by demographic, spatial and travel behavior characteristics of those living in cities?'* In order to answer the main question, the following sub-questions have been formulated and will be addressed in this paper:

1. What are the conditions (required or barriers) to be perceived as a cycling city according to those living in cities?

2. What are the influences of demographic, spatial and travel behavior characteristics of city dwellers on calling a city a cycling city?

3. Which measures are perceived as required to be taken in order to become a cycling city, based on the previous research findings and the measures proposed by those living in cities?

1.3 Relevance of the study

Previous studies have been conducted to the factors influencing bicycle use (key literature: Handy et al., 2010; Heinen et al., 2011; Pucher & Buehler, 2008; Rietveld & Daniel, 2004[2]). Moreover, papers have been written about measures to promote cycling (Pucher & Buehler, 2008; Yang et al., 2010). It is unclear whether the factors affecting bicycle use also in order to be perceived as a cycling city and whether the measures to promote cycling are perceived as required to be taken in order to become a cycling city, as the conditions to be considered as a cycling city and the measures needed in order to become a cycling city according to people are not known. Only one study – about how to become an active cycling city – indicates that there is a relationship between the amount of cyclists in a city and becoming a cycling city. Isn't it strange that some cities in Europe and in the United States are called cycling cities and that other cities want to take measures in order to become a cycling city, while the conditions for being called a cycling city have never been determined (City of Chicago, 2016; City of York Council, 2015; Fietsersbond, 2015a; Giddings, 2016; Johnson, 2014; Mairie de Paris, 2015; Municipality of Rotterdam, 2015; Yardley, 2007; Zee, 2016)?

As mentioned earlier, being called a cycling city contributes to the status of the city, stimulates the use of the bicycle in the city and makes city dwellers feel proud about their city (Fietserbond, 2015a). Becoming a cycling city also stimulates the livability and safety of a city and reduces the health risks of city dwellers in case there is a positive relationship between calling a city a cycling city and the amount of people using the bicycle in the city (Marshall & Garrick, 2011; Popkin et al., 2005).

Different stakeholders can benefit from the data collected and analyzed in this study. Whereas governments among others invested money in projects in order to become a cycling city, the actual contribution was not known. These findings provide additional knowledge on the effectiveness of investments aimed at becoming a cycling city and this information can be used by a wide variety of stakeholders (e.g. city architects, governments, marketeers and urban planners). Governments on different levels and spatial planners can use the obtained knowledge to intervene in the right way in the urban environment in order to become a cycling city. In addition, based on the knowledge obtained, cycling policies contributing to becoming a cycling city can be made by governments. (City) marketeers and cycling organizations may also benefit from the results on this study, as they might influence the image of cycling in a city in such a way that a city can become a cycling city. Besides, in order to become a cycling city, the civil society can change the social norms about cycling in a city through taking measures which are mentioned in this paper. In this paper, schools are also advised to undertake action in order to make cycling among children more common and thereby contributing to becoming a cycling city. Furthermore, international organizations can exchange the information on how to become a cycling city to government representatives, as becoming a cycling city may improve the physical and mental

[2] For a full list of the literature which has been used, see the literature review in chapter 2

health situation of city dwellers. As a consequence, the rise of healthcare costs might be reduced. Finally, scholars, as well as other stakeholders, can use the obtained knowledge for more effective debates on the conditions to be perceived as a cycling city and the measures which should be taken to become a cycling city among others.

1.4 Structure of the thesis

This paper consists of 6 chapters. The first chapter is the introduction. In chapter 2, the theoretical framework is described, consisting of a literature review, a conceptual model and propositions. In the methodology section (chapter 3), the case selection, study design, study population and the data collection and analysis of the surveys and focus group discussions are described. In chapter 4 – that is, the results section – the survey and focus group results are presented. These results are analyzed in the analysis section (chapter 5). The last chapter, which is the conclusion, comprises of a summary of the thesis, a reflection on the propositions and on study conducted, recommendations for future research and policy recommendations.

2. Theoretical framework

Based on the definition of an active cycling city as given by Jansen et al. (1997), it is expected that the conditions that determine the bicycle use in a city are also the conditions that determine whether a city is perceived as a cycling city or not. However, there might also be other conditions (required or barriers) in order to be perceived as a cycling city, such as conditions related to the cycling convenience in the city and the recognition of the benefits of cycling in the city by local authorities (Fietsersbond, 2011; Fietsersbond, 2014; Fietsersbond, 2016a). As the Dutch Cyclists' Union uses different criteria for each cycling city election, these criteria are not taken into account in the theoretical framework.

In paragraph 2.1, a literature review of the conditions that determine the bicycle use in a city is provided. In the next subparagraph, it is explained which individual characteristics might influence whether a city is perceived as a cycling city or not on the basis of literature. In paragraph 2.3, it is described to which extent the conditions that determine the bike usage can be influenced by people.

2.1 Conditions: bicycle use

The choice of the bicycle as a means of transportation in a city is related to spatial conditions, socio-cultural conditions, economic conditions, demographic conditions and socio-safety conditions. Further explanation about each of these conditions is given in paragraph 2.1.1 until 2.1.5.

2.1.1 Spatial conditions

Various studies show the relationship between the environment and bike usage in cities. These factors are:

- **Road infrastructure** – Bike paths, street lights, bicycle racks
- **Traffic regulation** – Car-free city center
- **Urban design** –Urban density, mixed-land use
- **Weather** – Freezing temperatures, rainy days, wind
- **Terrain** – Hilly topography

- **Road infrastructure**

One of these factors is road infrastructure. A study of Buehler and Pucher (2012) reveals that cycling lanes and cycling paths in 90 of the 100 biggest cities in the United States have a significantly positive effect on the bike commute rates. Pucher and Buehler (2008) show that the presence of cycling lanes and cycling paths are also important in small and big cities in The Netherlands, Denmark and Germany, in particular on busy roads and intersections. Moreover, an entirely connected network of bike paths is positively associated with bicycle use (Dill, 2009;

Mekuria et al., 2012). Winters et al. (2012) explain that safe cycling infrastructure encourage cycling, whereas a lack of safety is a major deterrent to cycling. Road infrastructure which are perceived or observed as safe are bike lanes, cycle tracks at roundabouts and separate bike lanes, whereas shared lanes and cycling between tram tracks are perceived or observed as dangerous (Deunk et al., 2014; Teschke et al., 2012; Winters et al., 2012). The observed safety is lower on roads with an increasing speed limit, as the probability of a fatal cycling injury or accident increases (Kim et al., 2007; Stone & Broughton, 2003). Furthermore, bicycle use is found to be higher on lighted road sections compared to sections with no street lights. This association might be explained by the probability of a cycling accident, which is lower on lighted road sections compared to sections with no street lights (Klop & Khattak, 1999; Kim et al., 2007). Bicycle use is also higher on well-maintained roads compared to poorly maintained roads (Winters et al., 2012). Finally, bicycle parking areas stimulate bicycle use (Buehler, 2012; Hunt and Abraham, 2007). However, scholars have not given an explanation for the relationship found between bicycle parking areas and bicycle use. It might be that bicycle parking areas reduce the perceived risk of bicycle theft and vandalism. People might use the bicycle more often when bicycle parking areas are often provided in places, as might be more safe for them – in terms of social safety - to use the bicycle.

- **Traffic regulation**

There are different types of traffic regulations around the world, such as traffic calming, auto-free zones and motor vehicle turn restrictions (Pucher & Dijkstra, 2003). The academic literature reveals that one traffic regulation - that is, banning cars on roads in the city centre - stimulates bicycle use, as this regulation improves the position of the bicycle as compared to the car (Pucher & Buehler, 2008; Topp & Pharoah, 1994). Yet, no research has been conducted as to whether banning cars significantly contributes to a higher bicycle use or not.

- **Urban design**

Another factor is urban design. According to Coleman (1988, p.106), “urban design involves the creation or improvement of urban spaces and places to meet high standards of visual quality and functional efficiency. It is to do with ensembles, with arrangements of buildings and man-made artifacts in urban space, with the integration of man and nature in such settings”. Examples of urban design which have an influence on bicycle use in cities are: urban density and land-use variety. Several studies show a significantly positive effect of a higher urban density in cities on bike usage (Nijkamp & Rienstra, 1996; Maat, 2001; Rietveld & Daniel, 2004; Saelens et al., 2003). According to Nijkamp and Rienstra (1996), this relationship is explained by the reducing mobility of the car as urban density increases. Saelens et al. (2003) describe that the more compact the city is, the higher the bike usage since distances become shorter. In the Netherlands, the bicycle is most often used as a means of transportation for distances between the 1 and 4 kilometers. For distances longer than 4 kilometers, the car is most often used as a mode of transport (Fietsersbond, 2016b). Besides, land-use variety (the mixture of residential buildings,

commercial and public buildings and places for recreation such as parks) contributes to a higher bike usage (Cervero, 1996; Kockelman, 1997; Krizek, 2003). A reason for this finding might be that mixed land-use not only makes walking more appealing due to its aesthetic qualities, as planners believe according to Handy et al. (2002), but also makes cycling more appealing (Handy et al., 2002).

- **Weather**

Various studies show that the weather has a small but significant influence on bike usage in the United States and in Canada (Nankervis, 1999; Dill & Carr, 2003; Winters et al., 2007; Flynn et al., 2012). Bicycle use reduces significantly as the days of freezing temperatures per year increases (Flynn et al., 2012; Winters et al., 2007), the number of rainy days per year increases (Dill & Carr, 2003; Flynn et al., 2012; Winters et al., 2007) and the wind speed increases (Flynn et al., 2012). However, according to Cervero and Duncan (2003) the rainfall per day in the United States does not have a significant effect on bike usage. Heinen et al. (2010) assume that differences in these outcomes can be explained by the manner in which rainfall is measured: in the total number of rainy days per year, the rainfall per day etcetera.

- **Terrain**

Finally, the hilliness of the landscape is strongly negatively associated with cycling usage (Rietveld & Daniel, 2004; Handy et al., 2010). The more hilly the terrain, the more effort is required in order to cycle and the more difficult cycling therefore becomes (Heinen et al., 2010). Probably, this is the reason why the bicycle is less often used when the difference in altitude of the landscape increases.

2.1.2 Socio-cultural conditions

A number of socio-cultural factors stimulate or reduce bike usage in a city according to scholars. However, it is often difficult to explain how and why some socio-cultural factors matter for the usage of the bicycle (Pelzer & Te Brömmelstroet, 2010). These socio-cultural factors are:

- **Religion** – Major religion of people
- **Nationality** – Nationality of people
- **Political preferences** – Voters for political parties
- **Image of the bicycle** – Perception of the bicycle, perception of the car
- **Social norms** – Direct and indirect social environment

- **Religion**

According to a study of Van Boggelen (2000), more people cycle in places with a mostly Protestant population compared to places with a mostly Catholic population in the Netherlands. A possible explanation for this result might be the Protestant ethic of solidarity and frugality

according to Graumans et al. (2011), which may imply that the Protestant population do not want to buy and use expensive products – such as cars – as often as the Catholic population if they do not have to use these products. The Protestant population might want to use cheap products, i.e. the bicycle, more often than the Catholic population.

- **Nationality**

In two studies, it is found that immigrants cycle less often than nationals in the Netherlands (Muconsult, 1997; Bruijn et al., 2005). This finding might be explained by the perception towards the car; immigrants more often perceive cyclists as people who are too poor to drive the car compared to nationals (Muconsult, 1997). Moreover, Pelzer and Brömmelstroet (2010) mentioned in their study that people with a non-Western background cycle less often than individuals with a Western background in the Netherlands.

- **Political preferences**

A few studies show that the voting behavior of people at political elections has an effect on the usage of the bicycle (Pelzer & Te Brömmelstroet, 2010; Rietveld & Daniel, 2004). In the Netherlands, the right-wing, conservative VVD[3]-voters cycle less often than the left-wing, progressive GroenLinks[4]-voters according to Pelzer & Te Brömmelstroet (2010). Moreover, Rietveld and Daniel (2004) demonstrated that there is a significant negative correlation between the share of VVD-voters in the Dutch municipalities and bike usage. A possible reason behind these relationships has not been provided by scholars. It might be that VVD-voters are richer than voters for other political parties in the Netherlands – as they have achieved a higher level of education than voters for other political parties (CBS, 2015) - and want to show their status through making use of an (expensive) car instead of a bicycle. GroenLinks (2016) stated on their website that they want to fight for clean air and voters for this party might chose to use the bicycle more often as a means of transport for environmental reasons than voters for other political parties.

- **Image**

The image of the bicycle, which is socially constructed, has an influence on bicycle use (Handy et al., 2010; Heinen et al., 2011; Stinston & Bhat, 2005). Handy et al. (2010) concluded that there

[3] VVD is a liberal party in the Netherlands. This party is often perceived as a centre-right, free market or conservative liberal party.

[4] GroenLinks is a socialist party in the Netherlands. The core ideals are democracy, respect for the environment, social justice and international solidarity.

is a positive correlation between people who think that most bicyclists look like they are too poor to own a car and non-regular bicycling. People who view the bicycle as comfortable, flexible, are aware of the environmental effects of cycling and the health benefits for themselves, use the bicycle more often (Heinen et al., 2011). In another study, a positive relationship was found between perceiving the bicycle as a preferred mode of transport and bicycle use (Trapp et al., 2011).

- **Social norms**

Furthermore, social norms might have an influence on the choice of the bicycle (Dill & Voros, 2007; Sherwin et al., 2014). "Social norms can be defined as norms held by a society, or by smaller groups, which influence and regulate behavior by functioning as informal social controls" (Heinen et al., 2010, p.71). Dill and Voros (2007) conclude that people who have colleagues who cycle to work, live in a house with people who also cycle or see adults cycling on the street once a week or more are more likely to be frequent cyclists. According to them, an explanation for these outcomes might be that the social environment stimulates the bicycle use of an individual. Another possible reason is that cyclists pay more attention to other cyclists than to the ones who do not cycle and, subsequently, observe more cyclists in their environment (Dill & Voros, 2007). The last explanation probably does not explain the relationship between the number of people using the bicycle in a household and being a frequent cyclist, as the individual most probably knows who use the bicycle in his/her own house. Based on a qualitative study, Sherwin et al. (2014) describe that some participants should not have considered cycling if family members, colleagues or friends had not supported bicycling.

2.1.3 Economic conditions

A few economic factors influence the usage of the bicycle in a city, that is:

- **Transportation costs –** Public transport expenses, car parking costs, costs of car use
- **Income** – Household income

- **Transportation costs**

Two studies show associations between cycling usage and the costs of alternative means of transport. Free public transport, car lease and free car parking have a significant negative effect on bicycle use (Bamberg et al., 2003; Heinen et al., 2013). Heinen et al. (2013) explain that these policies reduce the competitiveness of the bicycle relative to motorized transport modes. As a consequence, less people might use the bicycle.

- **Income**

It is unsure in what way bicycle use is associated with the income of city dwellers (Buehler, 2011; Dill & Carr, 2003; Dill & Voros, 2007; Rietveld & Daniel, 2004; Goetzke & Rave, 2010; Jara-Diaz & Videla, 1989; Plaut, 2005; Schwanen & Mokhtarian, 2005). According to Buehler (2011), a higher household income makes car ownership more likely. The car is a faster mode of transport than the bicycle and therefore, more attractive to be used than the bicycle (Buehler, 2011). Other studies have been conducted that contradict this conclusion. Dill and Carr (2003) conclude that the average income of households in 35 cities in the United States is not correlated to bicycle use. Other studies reveal that households with a low income (less or equal to €1500 per month) significantly more often use the bicycle for recreation purposes compared to households with an income higher than €1500 per month and lower than €3000 per month in Germany (Goetzke & Rave, 2010). In Portland, a positive relationship between household income and bicycle use is found (Dill & Voros, 2007). Heinen et al. (2010) assume that this is because richer people attach more value to their health than poorer people and, subsequently, they use the bicycle more often.

2.1.4 Demographic conditions

The following demographic factors have an effect on the bike usage of city dwellers:

- **Number of inhabitants –** Number of inhabitants living in a city
- **Age –** Teenagers, retired people
- **Household size –** Number of people per household
- **Sex and the interaction between sex and age –** Sex, working-age and retired people

- **Number of inhabitants**

Lastly, a higher number of inhabitants living in a city is significantly negatively correlated with bicycle use. An increase of 100.000 inhabitants in a city decreases the share of the bicycle trips on short distances by more than 8% (Rietveld & Daniel, 2004). One explanation for the relationship found might be that “the size of the city, represented by the number of its inhabitants, is a proxy for the quality and level of development of the public transport network. Thus, in large cities, it might lead to less use of bikes.” (Rietveld & Daniel, 2004, p.539). Another explanation might be that commute distances are larger in cities with a large population size compared to cities with a small population size, which makes it more difficult to use the bicycle in cities with a large population size relative to cities with a small population size, since it takes a longer time and more effort to get somewhere by bicycle. People might thus prefer to use faster and more convenient modes of transport than the bicycle in larger cities.

- **Age**

Various studies describe a significant negative correlation between age of people and bicycle use (Dill & Voros, 2007; Pucher et al., 1999; Moudon et al., 2005; Xing et al., 2008). According to Nijland and Van Wee (2006), Dutch teenagers cycle the most. An explanation for this finding is that teenagers do not have a driver's license and schools are often located within a distance which can still be reached by bicycle (Pelzer & Te Brömmelstroet, 2010). At a fairly old age, bicycle usage reduces strongly (Nijland & Van Wee, 2006). Half of the people between 65 and 75 years old never cycle or cycle less than one hour per week in the Netherlands and among people aged 75 years and over, 80% of the Dutch people never use the bicycle (Van Loon & Broer, 2006). One explanation for finding a negative relationship between the age of people and the usage of the bicycle is physical and sensory problems which occur more often at an older age. Due to these problems, it is more difficult for older people to use the bicycle than for younger people (Guralnik & Simonsick, 1993; Picavet & Hoeymans, 2002; Webber et al., 2010).

- **Household size**

Xing et al. (2008) found a negative association between the household size and bicycle use. A possible explanation for this outcome has not been provided in the academic literature. Perhaps, larger households more often use the car instead of the bicycle as larger households more often own a car compared to smaller households according to Van Acker and Witlox (2010) and might prefer to use the car rather than to use the bicycle. It might also be less dangerous for households with several children to travel by car or public transport instead of by bicycle to destinations, since it might be difficult for a parent to keep an eye on all children while using the bicycle. Subsequently, the higher the number of children in a household, the less often the bicycle might be used.

- **Sex and the interaction between sex and age**

A number of studies show that women in countries with a low cycling percentage use the bicycle significantly less often compared to men (Buehler, 2011; Garrard et al., 2008; Pucher et al., 1999; Rodríguez & Joo, 2004; Stinson & Bhat, 2005). In countries with a high bike ridership, such as the Netherlands, Denmark and Germany, the percentage of cyclists does not significantly differ from each other for men and women according to Witlox & Tindemans (2004) and Buehler (2011). According to Garrard et al. (2008), the difference in bike ridership between men and women is the result of the more negative perception of women with regard to safety risks. In countries with a higher percentage of cyclists, the bicycle infrastructure is better in general and the safety risks are lower. Subsequently, more women cycle in these countries. Van Loon and Broer (2006) and Witlox and Tindemans (2004) noticed that more women than men of the

working-age population cycle in the Netherlands and in Belgium. In the older age category, more retired men than retired women cycle in the Netherlands. In the academic literature, an explanation for this finding has not been provided.

2.1.5 Socio-safety conditions

A few social safety factors are related to the usage of the bicycle in a city. These factors are described below:

- **Socio-safety –** Bicycle theft, vandalism
- **Socio-safety**

According to several studies, there is a relationship between social safety and bicycle use (Rietveld & Daniel, 2004; Rietveld & Koetse, 2003; Heinen et al., 2013). Rietveld and Daniel (2004) describe a significant negative relationship between the risk of bicycle theft (which may also include the risk of vandalism) and bicycle use. If the risk of bicycle theft is high, a person might be reluctant to use the bicycle as a means of transport or use a high-quality bicycle that could stimulate people to make longer and more frequent trips (Rietveld & Koetse, 2003).

2.2 Individual characteristics and perceiving a city as a cycling city or not

Possibly, demographic characteristics, spatial characteristics and travel behavior characteristics have an influence on whether or not a city is considered as a cycling city. In paragraph 2.2.1 until 2.2.3, these possible relationships are described and substantiated with literature.

2.2.1 Demographic characteristics

Maring and Van Schagen (1990) explained that cognitive, physical and sensory functions reduce when adults get older. As a consequence, the number of (fatal) cycling accidents occur significantly more often among older adults relative to younger adults (Maring & Van Schagen, 1990; Nyberg, 1996; Rivara et al., 2015; Rodgers, 1998; SWOV, 2010). Given that older adults face more cycling difficulties compared to younger adults, more spatial interventions in the build environment, such as developing wider paved bicycle paths, are probably needed before elderly feel safe in traffic as compared to younger adults. The age of inhabitants may therefore have an effect on whether or not a city is perceived as a cycling city; elderly might have higher criteria than youngsters for considering a city as a cycling city and might therefore perceive a particular city less often as a cycling city relative to youngsters.

2.2.2 Spatial characteristics

Legal documents and articles regarding the city Portland (United States) provide an example about the way the place of residence may have an effect on the different views about whether Portland is seen as a cycling city or not.

Legal documents and also Twitter messages reveal that some people living in a country or in a city with a higher percentage of people travelling by bicycle than in Portland were negative about calling Portland a cycling city. Car-Sick Glasgow (2014) mentioned on Twitter that Portland is not a cycling city when comparing the percentage of persons traveling by bicycle in Portland with Edinburgh (United Kingdom) or Bristol (United Kingdom): *"Portland. A failed cycling city. Despite hype, no better than Edinburgh or Bristol in modal share terms"*. Moreover, in another Tweet, it was reported that people from Groningen didn't perceive Portland as a cycling city according to Stormin' Norman (2015): *"Heh, sounds like when Groningen peeps didn't like the cycling city idea at all. Sounds like Portland has work to do"*. Voerknecht (2009), a member of the Dutch Cycling Embassy, referred to America as a car country and was skeptical about calling Portland a cycling city, as the percentage of people travelling by bicycle in the city is 6% against 27% in the Netherlands.

Some people living in Portland, the government of Portland and the university located in Portland have (quite) a positive opinion on whether Portland is a cycling city (also called bike-friendly city and bike city, although the meaning of these words may slightly differ from the term cycling city) (City of Portland, 1998; Hazel, 2015; Philips, 2015; Portland State University, 1998). Hazel (2014) perceives his place of residence (which is Portland) as America's leading cycling city. Yet, he also reported that bicycle commuting in Portland still has to gain mainstream acceptance and access to public infrastructure dollars. Another person living in Portland was also not very positive about Portland's current cycling status. Philips (2015) mentioned in his Tweet the following: *"Portland may be bike city USA – but we still have our challenges"*. According to government of Portland, Portland is already a bicycle-friendly city (City of Portland, 1998). Portland State University (1998) mentions on its website that Portland has become known as "Bike City USA".

A couple of persons living in a city with a lower percentage of people travelling by bicycle compared to the percentage of people travelling by bicycle in Portland, have a (very) positive view on whether Portland is a cycling city or not. Webster (2016) from London (United Kingdom) wrote in a Tweet: *"Portland PDX is one awesome cycling city"*. Omni (2015), living in Los Angeles (United States), mentioned on Twitter: *"LA isn't very bicycle-friendly. I miss Portland. Haha"* Smith (2014), living in San Francisco (United States), did not explicitly referred to Portland as being a cycling city in her article, but mentioned that Portland was not a motor city and summed up reasons why Portland became a bikers utopia.

The first results in this subparagraph indicate that a city might less often be perceived as a cycling city by city dwellers living in cities with a higher percentage of people traveling by bicycle compared to people living in the city concerned. The opposite might also be true; a city might more often be perceived as a cycling city by city dwellers living in cities with a lower percentage of people travelling by bicycle than by city dwellers living in the city concerned. This might be explained by the frame of reference people have.

2.2.3 Travel behavior characteristics

Dill and Voros (2007) explain that cyclists might be more aware of other cyclists than people who do not cycle and, subsequently, cyclists observe more cyclists in their environment. Besides, people who do not cycle at all or only cycle once in a while may not always observe as many cyclists as people who use the bicycle regularly, because they do not often cycle on paths which are only meant for cyclists. As a consequence, there might be a positive relationship between the travel time spent on a bicycle by city dwellers and perceiving the place of residence of these city dwellers as a cycling city (as city dwellers who spent more time on the bicycle may perceive more cyclists in their place of residence). The use of the bicycle as a mode of transportation has an effect on whether or not the place of residence of these city dwellers is perceived as a cycling city.

2.3 The extent to which bicycle use can be influenced

In paragraph 2.1, the conditions that determine the bicycle use in the city were described. Diverse stakeholders (e.g. the City Council, urban planners, marketers, civil society) can use these conditions in order to develop measures which can be taken to increase the bicycle use in the city. However, not all conditions that determine the bicycle use in the city can be influenced through taking feasible and morally acceptable measures. As a consequence, not all cities that want to increase its bicycle use are able to achieve this goal (easily). Below, it is described whether measures can be taken to achieve the conditions that determine the bicycle use.

2.3.1 Spatial conditions

- **Road infrastructure**

In many legal documents and academic articles, it is mentioned that bicycle paths are built in cities (Australian government, 2009; Gemeente Oss (2010), Krizek et al., 2007; Pucher & Buehler, 2012). Moreover, various documents show that street lights and bike racks are installed in cities (Denver, 2016; Durham Country Council, 2014; City of St. Matthews, 2016; New York City, 2016). Based on these sources, it is concluded that measures can be taken to change the number of bicycle paths, street lights and bike racks in a city.

- **Traffic regulation**

In many cities in the world, traffic regulations have successfully been introduced to make city centers or some parts of the city car-free (Cathcart-Keays, 2015; Nieuwenhuijsen & Khreis, 2016; Topp & Pharoah, 1994). From these experiences, it is derived that parts of the city and even city centers can be made car-free through taking measures.

- **Urban design**

Various studies show that measures can be taken in order to change the urban density in the city. Measures to change the urban density in a city are, among others, zoning regulations, providing planning and building standards and providing public transport in a city (UN-Habitat, 2014). In some cities in the world, one or more of these measures have been taken that contribute to a higher urban density (Ministerie voor Infrastructuur en Milieu, 2011; UN-Habitat, 2014). Furthermore, land-use policies can be developed in order to further develop mixed land-use in cities (Agrawal, 2015; Louw & Bruinsma, 2006; Karan, 2015; UN-Habitat, 2014). Based on this information, it is concluded that the usage of land in cities can be influenced.

- **Weather**

In the literature, no information about feasible measures which can be taken in order to change the weather circumstances in the city have been found. These findings clarify that the weather circumstances in a city can, most probably, be changed to a very limited extent through taking feasible measures.

- **Terrain**

Legal documents and academic papers do not give examples of feasible measures which have been taken or can be taken to change the hilliness of the city. Therefore, it is concluded that the hilliness of an area can, most probably, only be changed to a very limited extent in a city.

2.3.2 Socio-cultural conditions

- **Religion**

There are no documents found which explain how the religion of people can be changed through taking measures which are morally acceptable. These findings clarify that the religion of people can probably be influenced to a minor extent.

- **Nationality**

Realistic measures which can be taken to change the nationality of city dwellers have not been found in the literature. Therefore, it is concluded that the nationality of city dwellers can most probably be influenced to a very limited extent.

- **Political preferences**

Measures are taken to influence people's political preferences (Fietserbond, 2015c; Villa & Drabold, 2016; Zak, 2012). According to Zak (2012), presidential candidates are able to attract undecided voters during public appearances. Moreover, interest groups and political parties sometimes recommend to vote for a political party (Fietserbond, 2015c; Villa & Drabold, 2016). An example is the Dutch Cyclists' Union, an interest group which tries to influence political preferences through specifying in the their news reports to vote for the political party GroenLinks (Fietserbond, 2015c). Based on these findings, it is concluded that (effective) measures can be taken to influence political preferences.

- **Image**

According to Van Oijen et al. (2011), marketing and communication instruments prove to be effective strategies to change the image of the bicycle. Based on this research, it is concluded that the image of the bicycle can be influenced through taking measures.

- **Social norms**

Van Oijen et al. (2011) stressed that bicycle lessons at a young age are considered as an important element in order to make the usage of the bicycle for short distance transport a social norm. People who learn to cycle from a young age onwards might also stimulate others to use of the bicycle. Subsequently, bicycle lessons may also strengthen the use of the bicycle as a mode of transport in the society on the long run (Dill & Voros, 2007).

2.3.3 Economic conditions

- **Transportation costs**

In various documents, it is shown that measures have been taken in cities in order to change the costs of (using) the car and public transport (e.g. introducing congestion charges, vehicle excise duties and train tickets which differ in price) (Degryse & Verboven, 2000; Schlag & Teubel, 1997; Transport for London, 2016). These measures clarify that transportation costs can be influenced.

- **Income**

Legal documents reveal that (some) governments take measures in order to change the household incomes of city dwellers who meet certain requirements; for instance, people may receive parental and childcare benefits from the government (Canada Revenue Agency, 2016; European Commission, 2016; Nordic insurance portal, 2016). From these findings, it is derived that measures can be taken to change the household income of city dwellers.

2.3.4 Demographic conditions

- **Number of inhabitants**

No documents have been found in which feasible and morally acceptable measures are described which can be taken to change the number of inhabitants living in a city. Therefore, it is concluded that the number of inhabitants living in a city can probably only be influenced to a minor extent.

- **Age**

No literature has been found in which measures are described which are feasible to be taken in order to change the age of city dwellers. Based on these findings (and based on rational thinking), it is concluded that the age of people cannot be influenced through taking measures.

- **Household size**

In the academic literature and in other documents, no measures are mentioned which are feasible and morally acceptable to be taken in order to change the household size of city dwellers. The lack of data on the measures which can be taken to change the household size clarify that the household size can probably only be changed to a minor extent.

- **Sex and the interaction between sex and age**

The lack of data on measures which can be taken to change the biological sex of a person (as well as rational thinking), clarify that the biological sex of a person cannot be changed.

2.3.5 Socio-safety conditions

- **Social safety**

In cities, measures are taken to reduce bicycle theft. Two examples of interventions – which appear to be effective for reducing bicycle theft - are: displaying watching eyes and a message related to 'Cycle Thieves, We Are Watching You' above bicycle parking facilities and installing (guarded) bicycle racks in the city (Johnson et al., 2008; Nettle et al., 2012). These measures may also be taken to reduce damage to bicycles, although it is not known whether these measures are effective to be taken. Based on these findings, it is concluded that bicycle theft can be influenced through taking measures and perhaps, damage to bicycles due to vandalism can also be influenced.

2.3.6 Conditions to be perceived as a cycling city

Assuming that the bicycle use in the city is an important indicator to be considered as a cycling city (see paragraph 2.1), the literature findings in paragraph 2.3.1 until 2.3.5 indicate that some cities may have a limited potential to become a cycling city; some possible conditions to be perceived as a cycling city may only be influenced to a minor extent and when these conditions are not present in a city, a city probably has a minor potential to become a cycling city.

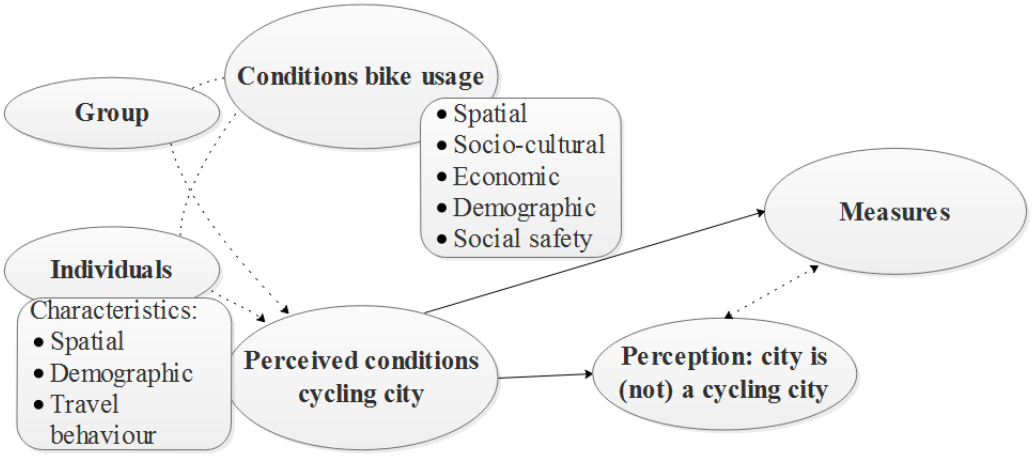
2.4 Conceptual model

In the conceptual model in Figure 1, the main elements of the literature review are illustrated. The model consists of two types of arrows: a dotted arrow, which implies that the relationship shown with this arrow is yet unknown and will be researched; and a solid arrow, which is a known relationship between 2 elements.

As mentioned in paragraph 2.1 and displayed in the conceptual model, the conditions that determine the bicycle use are divided into spatial conditions, socio-cultural conditions, economic conditions, demographic conditions and socio-safety conditions. The conditions that determine the bicycle use might be similar to the conditions to be perceived as a cycling city, since the amount of cyclists as compared to people using other means of transport in a city determines whether a city is called an 'active' cycling city and an active cycling city sounds quite the same as a cycling city (Jansen et al., 1997). The conditions to be perceived as a cycling city are based on the opinion of a group of people, although the perception of the conditions to be considered as a cycling city might differ according to individuals with certain demographic, spatial and travel behaviour characteristics, as decribed in paragraph 2.2 and shown in the model. The solid arrows illustrate that once the conditions to be perceived as a cycling city are known, it can be assessed whether a city is a cycling city. For cities which are not a cycling city yet, measures can be taken in order to become a cycling city through using of the conditions to be perceived as a cycling city. When these measures are realized in a city which is not perceived as a cycling city yet, the

perception of whether a city is a cycling city may change, as shown with the dotted arrow. In paragraph 2.3, it is explained that the extent to which the conditions that detemine the bicycle use are influential, differ. In case the conditions that determine the bicycle use are the same conditions as the conditions to be perceived as a cycling city, some cities have a high potential to become a cycling city and other cities have a limited potential to become a cycling city if measures are taken.

Fig. 1 - Conceptual model



2.5 Propositions

Based on the literature review and conceptual model, the following propositions have been formulated and will be tested in this thesis:

1. That bicycle use is an important indicator in order to be perceived as a cycling city. Factors stimulating or significantly positively influencing bicycle use are conditions which are perceived as required in order to be considered as a cycling city, whereas factors which are significantly negatively influencing bicycle use or discouraging bicycle use are barriers towards being perceived as a cycling city and should not often be present in a city in order to be perceived as a cycling city.
2. That demographic, spatial and travel behavior characteristics have an effect on perceiving cities as cycling cities:
    a. That there is a negative relationship between the age of people and whether or not a city is perceived as a cycling city.
    b. That a city is more often perceived as a cycling city by persons living in cities with a lower percentage of people travelling by bicycle relative to persons living in the city concerned. The opposite is also true; a city is less often perceived as a cycling city by persons living in cities with a higher percentage of people travelling by bicycle relative to persons living in the city concerned.

c. That there is a positive relationship between the travel time spent on a bicycle by persons living in a city and perceiving their place of residence as a cycling city.

3. That some cities have a limited potential in order to become a cycling city. Some conditions which are required to be perceived as a cycling city can only be influenced to a minor extent and when these conditions are not present in a city, a city has a minor potential to become a cycling city.

3. Methodology

This methodology chapter consists of several parts. In the first paragraph (paragraph 3.1), the cases selected for research are described. In paragraph 3.2, the study design is presented. In the next paragraph, the study population for this research is described. The data collection and analysis of the surveys are explained in paragraph 3.4, followed by a description of the data collection and analysis of the focus group discussions in paragraph 3.5. In the final paragraph – which is paragraph 3.6 – the ethical considerations during this research process are mentioned.

3.1 Case selection

In this paragraph, the criteria used for selecting the cities for research are described, followed by a more detailed evaluation of the compliance of each selected city to these criteria.

3.1.1 Selection criteria

For this study, research has been conducted in the following cities: Amsterdam (Netherlands), Groningen (Netherlands) and Geneva (Switzerland). The following criteria were used for selecting these cities: differences in being called a cycling city by the local authority of the city and by other relevant stakeholders, different percentages of people using the bicycle in the city, different numbers of inhabitants living in a city, the ambition of local authorities to increase the bicycle use in the city in cities which are not called cycling cities yet (through taking measures to increase the bicycle use in the city, the city might become a cycling city) and, finally, whether it is feasible to conduct research in the cities or not (see Table 1 and 2).

Table 1 - Results that show that the cities Amsterdam, Groningen and Geneva comply with the selection criteria, for the criteria 'city is called a cycling city', the 'percentage of travelers using the bicycle' and the 'number of inhabitants'

	City is called a cycling city by various stakeholders	Percentage of travelers using the bicycle in the city	Number of inhabitants
Amsterdam	yes	25 (in 2014)	834.713 (in 2016)
Groningen	yes	31 (in 2008)	201.270 (in 2016)
Geneva	no	11 (in 2011)	201.164 (in 2015)

Sources: City of Amsterdam, 2014; EPOMM, 2016; Fietsersbond, 2002; Gemeente Amsterdam, 2015; Gemeente Groningen, 2015; Gemeente Groningen, 2016; Office cantonal de la statistique, 2015; Pel, 2015; Redactie Het Parool, 2013; Ruimte en Duurzaamheid/IOS, 2016; University of Groningen, 2016

Table 2 - Results that show that the cities Amsterdam, Groningen and Geneva comply with the selection criteria, for the criteria 'ambition of local authorities to increase its bicycle use' and 'is it feasible to conduct the study?'

	Ambition of local authorities to increase its bicycle use	Is it feasible to conduct the study?
Amsterdam	yes	25 (in 2014)
Groningen	yes	31 (in 2008)
Geneva	yes	7 (in 2013)

Source: Ville de Genève, 2014

3.1.2 Case selected: Amsterdam city

For Amsterdam[5], it is wondered whether this city is perceived as a cycling city by people. The local authority of Amsterdam and some news reporters call Amsterdam a cycling city, but Amsterdam never received the title 'cycling city' from the Dutch Cyclists' Union (Fietsersbond, 2015a; Gemeente Amsterdam, 2016; Pel, 2015; Redactie Het Parool, 2013). The percentage of people using the bicycle in Amsterdam is also still quite low compared to the percentage of travelers using the bicycle in Groningen[6]. However, it is also more difficult for Amsterdam to have a high percentage of people using the bicycle in the city compared to Groningen, as the number of inhabitants in Amsterdam is four times as high as in Groningen (Rietveld & Daniel, 2004). As a consequence, the required percentage of people using the bicycle in a city in order to be considered as a cycling city according to city dwellers might be lower for Amsterdam than for Groningen (although it is still unsure whether the percentage of travelers using the bicycle in the city matters in order to be considered a cycling city). In Amsterdam, the percentage of people using the bicycle is lower than the percentage of people using the car, which makes Amsterdam not an 'active cycling city' (Jansen et al., 1997). This might be an indication that Amsterdam is also not perceived as a cycling city.

The city Amsterdam can make use of good-practice examples in order to become a (better) cycling city. A good-practice example might be Groningen, since Groningen has a higher percentage of travelers using the bicycle and this might be the consequence of the measures taken in this city. Amsterdam can also draw lessons from cities which are not perceived as cycling cities yet, which might be Geneva among others. Furthermore, selecting a city with a larger population size than Geneva and Groningen, i.e. Amsterdam, might be useful in order to understand the differences in the conditions in order to be perceived as a cycling city for cities with a small and large population size.

[5] Throughout this thesis, Amsterdam refers to the city of Amsterdam
[6] Throughout this thesis, Groningen refers to the city of Groningen

3.1.3 Case selected: Groningen city

For Groningen, it is not completely sure yet whether this city is perceived as a cycling city. The local authority of Groningen, the Dutch Cyclists Union, the University of Groningen and a news reporter of the Guardian among others call Groningen a cycling city (Fietsersbond, 2002; Gemeente Groningen, 2015; University of Groningen, 2016; Van der Zee, 2015). These opinions indicate that Groningen is perceived as a cycling city. Moreover, the percentage of people using the bicycle is very high in Groningen city compared to the percentage of people using the bicycle in other cities in the world (EPOMM, 2016; Pucher & Buehler, 2008; Ministry of Transport, 2013; World Bank, 2015). However, the percentage of people using the car in Groningen city is higher than the percentage of travelers using the bicycle in Groningen city. Groningen should therefore not be classified as an active cycling city when the definition of Jansen et al. (1997) is being used. This result makes it a bit unsure whether Groningen is perceived as a cycling city.

In case the data collected in this study reveal that Groningen is perceived as a cycling city by city dwellers, cities which are not perceived a cycling city yet might use Groningen as a good practice example in order to become a cycling city. Cities which might use Groningen as a good practice example are Geneva and Amsterdam among others (depending on whether these cities are perceived as cycling cities). Groningen can also draw lessons from cities which are not perceived as cycling cities; for instance, about the measures which should not be taken in Groningen in order to become a (better) cycling city. The cities Geneva and Amsterdam might be used to draw lessons from.

3.1.4 Case selected: Geneva city

Geneva is probably not perceived as a cycling city yet, since it is not called a cycling city by the local authority of Geneva and also not by other relevant stakeholders. Geneva also has a very low percentage of people using the bicycle in the city as compared to Groningen and Amsterdam. Yet, local authorities in Geneva have the ambition to increase the usage of the bicycle in the city and they have undertaken measures as well (Ville de Genève, 2014). Geneva might be an upcoming cycling city through taking these measures.

In case Geneva is not perceived as a cycling city yet, Geneva can learn from the measures taken in cities which are already perceived as cycling cities in order to become a cycling city. These cities might be Groningen and Amsterdam.

3.2 Study design

In this paragraph, the classification of this study is described first. Afterwards, the research phases are briefly mentioned.

3.2.1 Research classification

This research is classified as exploratory and explanatory. It is exploratory, because no research has been conducted to any of the required conditions in order to be considered as a cycling city yet. It is also explanatory, since the aim is to explain the conditions in order to be perceived as a cycling city, the measures to be taken in order to become a cycling city and the relationships between demographic, spatial and travel behavior characteristics and whether or not Groningen, Amsterdam and Geneva are perceived as cycling cities.

3.2.2 Research phases

This study consists of the following 3 phases, that is:

- **Phase 1: Desk research**
- **Phase 2: Internet surveys**
- **Phase 3: Focus group discussions**

- **Phase 1: Desk research**

During the first phase of this study, various sources of primary literature have been read in order to obtain information about the existing theories and ideas in relation to the research objective. The primary literature used for this research is derived from (digital) scientific journals, websites of the government, research institutes, other official authorities, advocacy organizations, newspapers and Twitter. The literature cited in this paper is mainly scientific literature. The quality of the academic articles was first assessed through checking the citation counts for articles and/or the h-index (Donkers, 2014). High-quality academic articles were primarily used in this paper, although low-quality articles were also sometimes used when relevant information on certain aspects was missing in high-quality articles. Research findings in low-quality journals were also used to support the findings published in high-quality academic articles. Besides, it was assessed whether the content of the journals could still be used, as science is time- and culture-bound (Themaat, 1989). For the other primary literature (the grey literature), the objectivity (neutrality) of the texts was assessed through identifying whether different perspectives on issues were mentioned in the texts and whether the sources cited by the author(s) are reliable (Bryan, 2008).

- **Phase 2: Internet surveys**

In the second phase of this research, two internet surveys (one in Dutch and one in English) were conducted on a small subset of the study population. The goal of this internet survey is to collect data in order to test the propositions (see paragraph 2.5). Data can relatively easily be collected

with an online survey as compared to other research methods (Babbie, 2013). However, unintended persons - outside the study population - can fill out an online survey as well and some persons might not be reached due to a lack of online experience (Evans & Marthur, 2005). Moreover, the reasons behind the answers given on the survey questions could not only be derived from the survey answers to a very limited extent. For a better understanding of the survey outcomes, qualitative data were collected in the third phase of this research.

- **Phase 3: Focus group discussions**

Three focus group discussions were conducted in the third phase of this study in order to interpret the survey findings (Hennink et al., 2011). Conducting focus group discussions, in addition to conducting a survey, can also be valuable as issues can be raised during the focus group discussions which were not tested in the survey. The issues raised might be important conditions in order to be perceived as a cycling city or measures which are perceived as required to be taken in order to become a cycling city.

It was preferred to conduct focus group discussions instead of in-depth interviews for this study, as focus group discussions generate more valuable data than in-depth interviews would do with the same number of participants included in the study according to Hennink et al. (2011). This is because a direct feedback from the focus group participants is given after an issue is raised by a participant and this type of feedback is missing when in-depth interviews are conducted. Moreover, during a focus group discussion, the moderator of the focus group discussion can examine whether the views of a focus group participant are shared by other focus group participants and this cannot be done during in-depth interviews (Hennink et al., 2011).

3.3 Study population

The study population for this research consists of inhabitants living in the cities Amsterdam, Groningen and Geneva of both sexes aged 15-74 years old. The age of 15 and older is chosen since people should be competent to answer the survey questionnaire and the focus group questions and statements (Babbie, 2013). Seventy-four years is chosen as the maximum age, as people aged 75 and older did not fill out the online survey. The study population comprises 984.856 persons in total; of them, 158.812 inhabitants live in Groningen on the first of January 2016, 667.486 inhabitants live in Amsterdam on the first of January 2016 and 158.558 inhabitants reside in Geneva on 31 December 2015 (Office cantonal de la statistique, 2016; OIS Amsterdam, 2016; O&S Groningen; 2016).

3.4 Surveys: data collection and analysis

Paragraph 3.4 comprises a description of the recruitment of respondents, the content of the surveys and the ways in which the survey data are analyzed.

3.4.1 Survey sampling

- **Recruitment of respondents**

The method for recruiting respondents for the surveys was reliance on available subjects. Respondents for the surveys were recruited by the following social media: my own Facebook, Twitter and LinkedIn page, the Facebook page and Newsletter of the Cyclists' Union of Groningen, the Facebook page of the Student Advisory Council Groningen, the Twitter account of Groningen Bike City, the Intranet pages of the municipalities of Groningen and Amsterdam, the Facebook page of the Cyclists' Union of Amsterdam, the Facebook page of Amsterdam Smart City, the Twitter account and Facebook page of the UNECE, the forum on the expats website of Switzerland www.glocals.com and the Facebook pages of the Geneva Interns Association and UNECE Interns. Furthermore, emails were sent to the Dutch advocate for senior citizens ANBO to increase the number of elderly people participating in the survey, all UNECE staff members, the Volleyball Club of the United Nations Office at Geneva and the municipality of Geneva. Some of the Facebook posts were shared by a few persons/organizations, e.g. Geneva Environment Network – Reseau environment de Genève, UNECE staff members and friends of mine. On Twitter, my own tweet was retweeted 8 times, the tweet of the UNECE was retweeted 41 times and the tweet of Groningen bike city was retweeted 11 times, i.e. by Accessible Groningen (which is a partnership of northern governments and the business world), Bike Europe (which is the trade journal for the bicycle, E-bike and scooter market), the Cycling Embassy of Denmark and the Executive Secretary of UNECE Mr. Christian Friis Bach.

- **Recruitment barriers**

Several barriers were faced while recruiting respondents. First of all, residents of Geneva who do not speak English (well) could not be approached for filling out the survey, as the language of one survey is Dutch and the language of the other survey is English. It is assumed that inhabitants of Geneva who can fill out the survey are higher educated and more internationally oriented as compared to those living in Geneva who are part of the study population (on average). Second, Twitter was not only seen a useful medium to approach the study population, but also as problematic since the online survey was retweeted by people who were not part of the study population. Third, people aged 75 years and over do not often use the internet as a medium to communicate (Van Slyke, 2008). As a consequence, approaching them via internet was difficult.

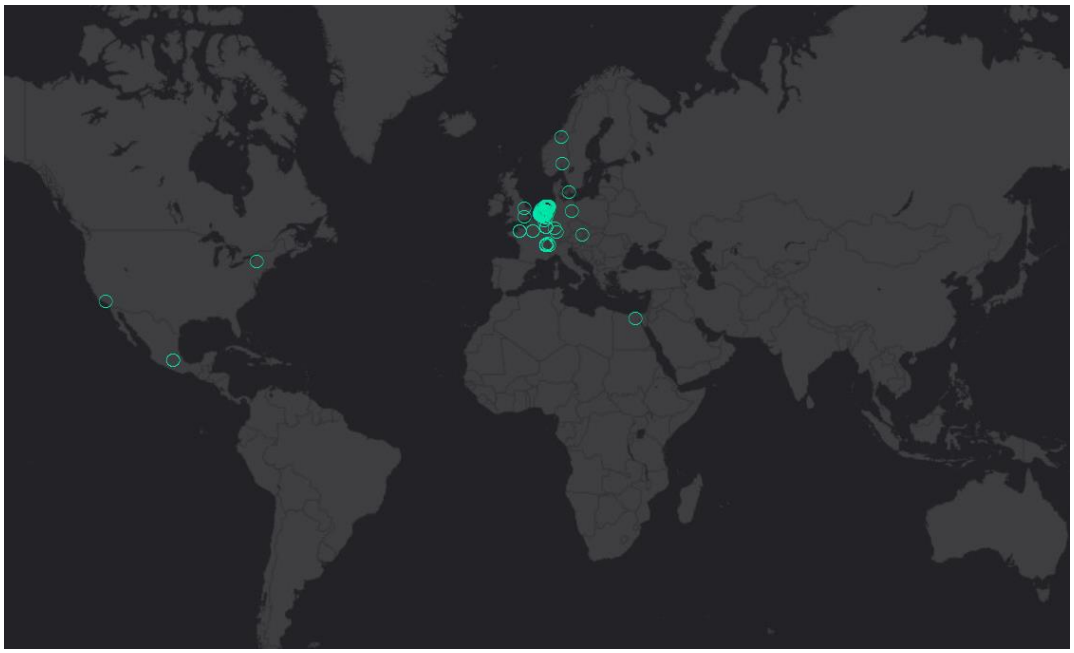
Finally, the representativeness of the sample could not be controlled with the sampling method used (Babbie, 2013).

3.4.2 Determining the sample size

The survey was filled out by 554 survey respondents and 416 of them filled out all required survey questions. The complete case analysis method was used to only include the cases with complete data on the required questions in the data set. This method has the advantage of not having to change the size of the data set for every single explanatory variable that will be tested. The statistical power of the test reduces when cases are deleted from the data set though (Knol et al., 2010). In order to avoid the problem of statistical power loss, data can be imputed for the missing values. However, variance is weakened or estimates are biased when data is imputed and therefore, a data imputation method was not applied for this research (Allison, 2001; Little & Rubin, 2014).

The survey respondents who filled out all required questions in the survey live in different parts of the world, as is shown on Map 1. Out of the 416 respondents, 124 respondents have another place of residence than Groningen, Amsterdam or Geneva and are therefore not part of the study population. Subsequently, they were deleted from the data set. However, their data is still valuable and will be saved in a separate dataset. One respondent was deleted from the dataset because this person did not give accurate and truthful responses on the survey questions. After deleting these survey respondents, 291 survey respondents remained in the final data set. This number of respondents is the sample size for this study.

Map 1 - Places of residence of respondents who filled out the survey completely



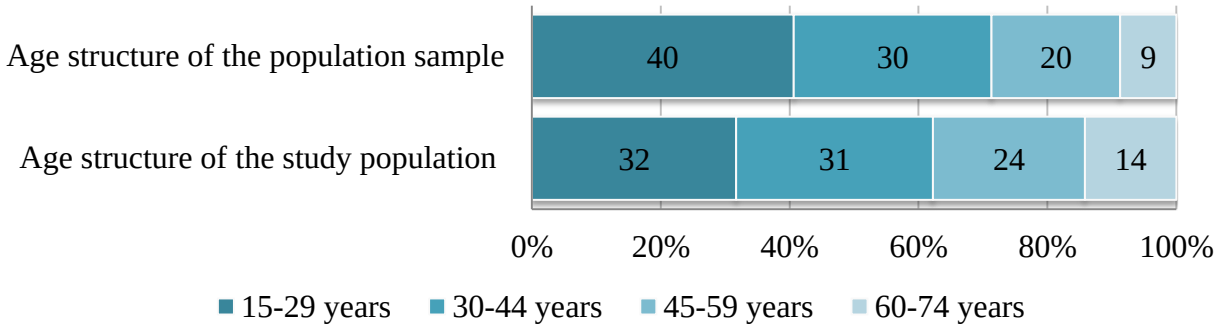
3.4.3 Representativeness of the population sample

The representativeness of the population sample can be determined through comparing the aggregate characteristics of the sample of the population with the aggregate characteristics in the study population for the characteristics that are relevant for the substantive interests of the study. When the characteristics of the sample of the population match with the characteristics of the study population, the study is seen as representative and a sampling bias is avoided (Babbie, 2013). Based on the propositions, 3 characteristics of the sample of the population and the population are compared, that is the age structure, the place of residence and transport modality used.

- **Age structure compared**

In Figure 2, the age structure of the study population and the population sample are displayed (Office cantonal de la statistique, 2016; OIS Amsterdam, 2016; O&S Groningen; 2016). A comparison between the data of the population sample and the study population reveals that younger people - aged between 15 and 44 years old - are overrepresented in the sample of the population relative to the study population and people aged 45 to 74 years old are underrepresented in the sample of the population.

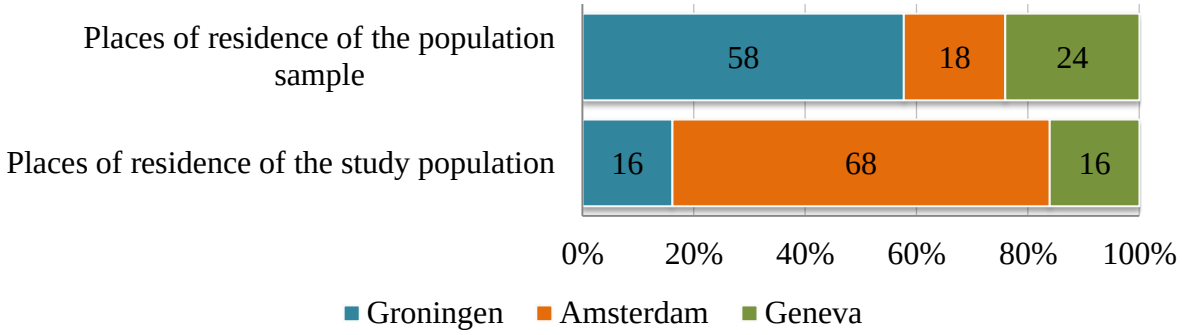
Fig. 2 - Age structure of the population sample and the study population, by age groups



- **Place of residence compared**

In Figure 3, the places of residence of the population sample and the study population are displayed. From this Figure, it can be derived that people living in Groningen are largely overrepresented in the population sample relative to the study population. People living in Amsterdam are largely underrepresented in the population sample compared to the study population.

Fig. 3 - Places of residence of the population sample and the study population



- **Transport modalities used compared**

Based on the propositions, it should have been proper to compare the travel time spent on a bicycle by the study population with the travel time spent on a bicycle by the population sample. However, these data is missing for the study population. Therefore, the transport modalities used by the sample of the population and by the study population are compared through making use of the survey outcomes on the transport modalities most often used and the modal split data for the cities Groningen, Amsterdam and Geneva (as these data is available for all selected cities).Two remarks should be made about the comparison of these data; first of all, the modal split data are difficult to compare, because the modal split data are not always reliable and are collected in different ways (EPOMM, 2016); and second, people aged younger than 15 years old and 75 years and older, living outside the Groningen, Amsterdam or Geneva but visiting one of these cities, are counted in the modal split data, while not being counted in the survey data. Thus, the survey data and study population data on the transport modality used are not completely comparable. When the data for the transport modality most often used by the population sample and the modal split data are compared with each other (as shown in Figure 4, 5 and 6), it is striking that people who use the bicycle most often are largely overrepresented in all selected cities in the population sample relative to the study population and that people who use the car or walk most often are largely underrepresented in the population sample relative to the study population.

Fig. 4 - Transport Modes Used by respondents living in Groningen and the modal split of Groningen[7]

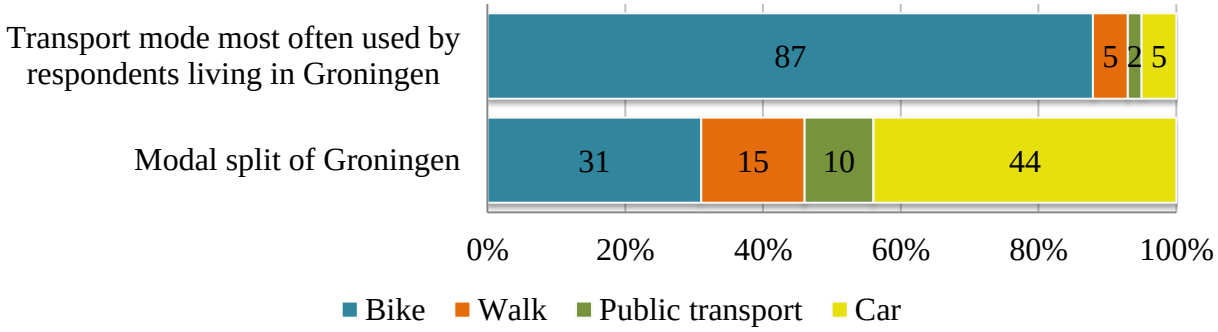


Fig. 5 - Transport modes used by respondents living in Amsterdam and the modal split of Amsterdam[8]

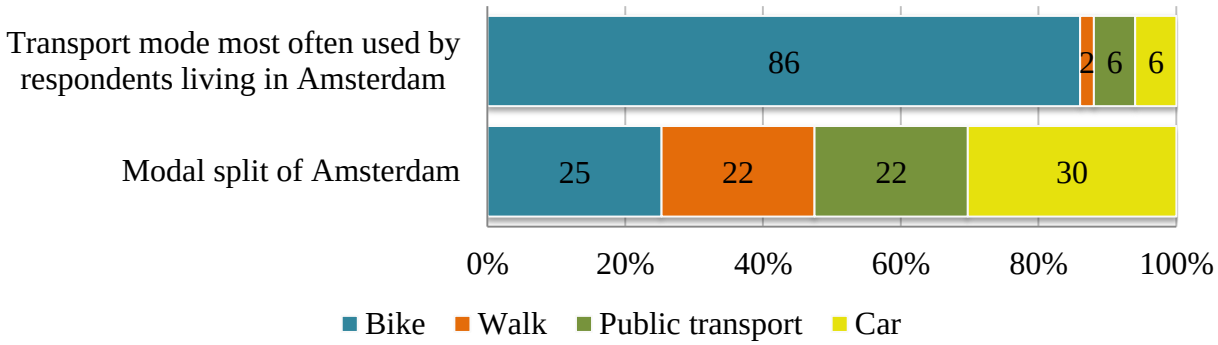
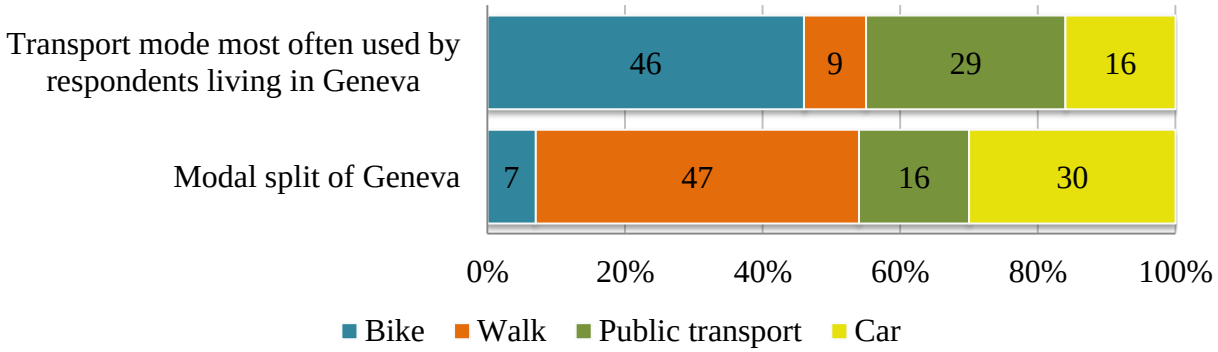


Fig. 6 - Transport modes used by respondents living in Geneva and the modal split of Geneva[9]



[7] Source: EPOMM, 2016
[8] Source: Gemeente Amsterdam, 2015
[9] Source: Civitas, 2013

- **Overall comparison between the population sample and the study population**

After comparing the sample and the study population on 3 characteristics which are assumed to make a difference in the perception of a cycling city, it can be concluded that the sample of the population is not representative for the study population.

Furthermore, due to the low response rate on the survey compared to the size of the study population, type I and II errors could be made when the survey results are generalized. A type I error is a false rejection of the null hypothesis and a type II error is the failure to reject the null hypothesis. The sample size should at least be 384 for a study population of 984.856 when Cochran's sample size formula is used to calculate the sample size, with an alpha level of 0.05 and a population variance estimate of 0.25[10] (Kotrlik et al., 2001). However, due to a limited amount of time for collecting the data, it was not possible to build a data set of 384 respondents who are part of the study population. The number of respondents currently included in the data set – that is, 291 respondents – was the best result possible.

Although no conclusions can be drawn on the population level from the survey data collected, useful insights in the required conditions in order to be perceived as a cycling city by the study population can be provided (Babbie, 2013). As this study is an explorative study, this sampling method seems fitting; the goal of an explorative study is to produce preliminary findings which still needs long periods of fieldwork before theories can be build (Stebbins, 2001). A follow-up study could therefore be conducted with the survey outcomes produced in this study in order to test the survey outcomes on a more representative subset of the population. Subsequently, (more) general conclusions can be drawn.

3.4.4 Survey design

The online surveys 'Wat is een fietsstad?' and 'What is a bike city?' were designed in order to examine the conditions (required or barriers) to be perceived as a cycling city and in order to examine whether spatial, demographic and travel behavior characteristics of city dwellers influence the perception on whether a city is perceived as a cycling city or not. The software program SurveyMonkey was used to publish the survey online. The survey 'Wat is een fietsstad' was conducted between 6 January 2016 and 4 April 2016 and the survey 'What is a bike city?' was held between 18 January 2016 and 4 April 2016. Both surveys are added as Attachments 4 and 5 in this thesis.

[10] The population variance estimate is derived from an estimate of the population proportion of 0.5. This population proportion produces the maximum sample size (Kotrlik et al., 2001).

- **Differences between the surveys**

The English version of the survey is similar to the Dutch one, although two additions were made in the answer categories of questions 6 and 7 in the English version of the survey. The first addition was the use of Swiss Francs in addition to Euros in the net income answer categories (question 6). For the currency conversion, Purchasing Power Parity adjusted incomes have been applied (OECD, 2014). The second addition was made in question 7 through adding the Swiss educational levels to the Dutch educational levels after comparing both education systems (UNESCO, 2014).

Furthermore, some words might be interpreted in a different way in Dutch than in English. For instance, bike city might be interpreted as a motorcycle city instead of as a cycling city. Yet, the survey answers do not show that there is a difference in the interpretation of the words used in English compared to the interpretation of words used in Dutch. The word 'bike city' was used in the survey as the more formal word 'cycling city' appeared to be not well known after a pilot study was conducted. Throughout this thesis, the more formal word 'cycling city' is used.

- **Content of the survey**

The survey is divided into 10 sections. In the first section of the survey, which is called 'Introduction', the purpose of the survey is stated and the confidentiality of respondents is guaranteed among others. The study population was not well described in the introduction though and this might be (one of) the reason(s) behind the high number of respondents who filled out the survey while not being part of the study population.

The survey continuous with the section 'Personal information'. The information collected in this section is used to test the association between the age of respondents, the place of residence of respondents and whether Groningen, Amsterdam and Geneva are perceived as cycling cities or not (see propositions 2a and 2b). To have a better insight in the characteristics of the respondents, questions about the sex, income and nationality of respondents and the level of education achieved by respondents have been added in the 'Personal information' section. The question about the income is included in the survey as an optional question, since respondents might be reluctant to answer this sensitive question. The personal information is also used in order to test whether the sex and nationality of respondents and the level of education achieved by respondents have an effect on whether Groningen, Amsterdam and Geneva are perceived as cycling cities or not, although no relationships are expected to be found.

In the third section of the survey – that is, 'Your usage of different modes of transportation and your opinion towards cycling' – data on the travel behavior characteristics of respondents were collected in order to test the influence of the travel behavior of respondents on whether Groningen, Amsterdam and Geneva are perceived as cycling cities (proposition 2c).

In the fourth section of the survey, called the 'general description of the bike city', the following 3 questions are asked to survey respondents: whether Groningen is a bike city (no/yes), whether Amsterdam is a bike city (no/yes) and whether Geneva is a bike city (no/yes). Three dependent binary variables are derived from these questions. These dependent variables are used for testing proposition 2. A disadvantage of only using two answer categories for these questions - which was done on purpose in order to perform binary logistic regressions with the data afterwards - is that respondents do not have the possibility to answer 'don't know' when they have never been in Groningen, Amsterdam or Geneva. These respondents could, however, make use of the table included in this section of the survey for answering the questions. In this table, the following information was provided: the modal split of Groningen, Amsterdam and Geneva and the number of inhabitants living in these cities. However, the information provided to respondents might not have been enough in order to give an adequate answer on these questions. One respondent replied by email: "[I] answered yes based on the photos from Google ;-). Not the most scientific way of answering, I know". Another question in the same section of the survey was not well formulated. This question was formulated as followed in the survey: "In your opinion, what should be the share of the bicycle in comparison to other transport modalities in order to call a city a bike city?". In this question, the words 'in a city' after the word 'modalities' is missing. The answer categories of this question could have been improved when not only the transportation use of city dwellers was taken into account, but also the transportation use of people visiting the city, as you do not know whether a person using a transport modality in the city is a city dweller or not. The answers provided on this question can still give an indication as to whether or not the amount of cyclists in a city matters in order to perceive a city as a cycling city and could therefore be used in order to test proposition 1.

Section 5 until 9 of the survey provide data on the spatial conditions, socio-cultural conditions, economic conditions, demographic conditions and safety conditions which are *at least* required in order to perceive a city as a cycling city. The questions and statements in these sections are derived from the conditions for a high bike usage (as described in the theoretical framework). It will be checked whether the same conditions are required in a city in order to consider a city as a cycling city according to respondents. Moreover, based on the theoretical framework, questions about the barriers towards becoming a cycling city are included in these sections. These data are collected in order to test propositions 1 and 3. However, questions about the influence of the sex of city dwellers on perceiving a city as a cycling city and questions with regard to the relationships between the social norms towards the bicycle and considering a city as a cycling city were not included in the survey, while being mentioned in the literature review. Furthermore, questions regarding the *optimal* conditions for a cycling city were asked in question 21 and 22. In these questions, data on the road infrastructure that respondents would like to see in the ideal cycling city and the road infrastructure that respondents do not want to see at all in the ideal cycling city were collected. Road infrastructure can easily be changed in cities and road infrastructure has a strong relationship with bicycle use as well (Pucher & Buehler, 2008). The

results on these questions can be used in order to take adequate road infrastructure measures in order to become an optimal cycling city.

In section 10 of the survey – which is the conclusion – respondents can report the aspects missing in the survey that determine whether a city is a cycling city and they can state whether they want to participate in one of the focus groups and whether they are interested in the analysis of the outcomes.

- **Types of survey questions and statements**

The survey consists of closed-ended questions and statements, open-ended questions and statements and half-open ended questions and statements. Question 3 in the survey – which is shown below - is an example of a half-open ended question. Since respondents can choose an answer from the list, this question is classified as a closed-ended question. However, respondents can also provide an answer in their own words and this is why this question is also classified as an open-ended question.

Question 3
What is your place of residence?
- Amsterdam
- Groningen
- Geneva
- Other: _____

3.4.5 Analysis of the survey data

For the analysis of the survey data, various research methods were chosen based on the types of survey questions and statements included in the survey. The results on the closed-ended questions and statements in the survey were analyzed with descriptive statistics and binary logistic regressions. The outcomes on the open-ended questions and statements in the survey were analyzed through making use of inductive coding. For the results on the half-open ended questions and statements in the survey, a combination of descriptive statistics and inductive coding were applied as research methods. Below, the research methods used for analyzing the survey data have been described in more detail.

- **Descriptive statistics**

Descriptive statistics were used in order to determine the characteristics of respondents, the view of respondents towards the bicycle and the conditions (required or barriers) to be perceived as a

cycling city. In order to describe, show and summarize the data in a meaningful way, a couple of steps were taken.

- Step 1: Coding the response categories

First of all, the answer categories on the questions and statements in the survey were coded into numbers in the software program SPSS before analyzing the survey data with descriptive statistics. For each answer category, another number was used. Question 32 in the survey is used as an example for describing the coding process (see below). In the software program SPSS, the first answer category – that is, "1 person" - is coded into 0, the second answer category – "2 persons" - is coded into 1, the third answer category – "3 or more persons" – is coded into 2 and the fourth answer category – which is, "The average number of persons per household does not matter" - is coded into 3.

Question 32
A city with the following average number of persons per household can become a bike city (multiple answers possible):
- 1 person
- 2 persons
- 3 or more persons
- The average number of persons per household does not matter

- Step 2: Determining the measurement scales

Second, the measurement scales of the answer categories included in the survey were examined. From the closed-ended questions and half-open ended questions in the survey, it can be derived that the questions and statements included in the survey have answer categories on nominal and ordinal scales. The measurement scale of the answer categories in question 32 is nominal for instance, since the codes given to the answer categories do not have a quantitative value. A statement in the survey with answer categories on an ordinal scale is question number 24 (see below), since the answer categories can be arranged in order from entirely disagree to entirely agree, whereas the differences between the data values (after coding) cannot be determined.

Question 24
A city needs to comply with the following spatial characteristics in order to be considered a bike city:

	Entirely Disagree	*Disagree*	*Neither agree nor disagree*	*Agree*	*Entirely Agree*
A small, compact city:	o	o	o	o	o

- Step 3: Analyzing the descriptive results

Third, the descriptive results are analyzed by making use of Tables and Figures (in which the percentages of respondents who provided a certain answer on a survey question are displayed), by analyzing the mode[11] (in case the type of data is nominal or ordinal) and/or by analyzing the median[12] (in case the type of data is ordinal and the mode is filled out by less than 50% of the respondents). In case the mode is filled out by the majority of the survey respondents, this answer is – depending on how the question was formulated - (not) interpreted as a required condition to be perceived as a cycling city or as a/no barrier towards being perceived as a cycling city by respondents. For instance, when the answer "2 persons" in question 32 is filled out by 51% of the respondents (see step 1 for the question), it is concluded that a city with an average number of 2 persons per household can become a cycling city according to survey respondents, whereas a city with an average of 1 person per household or 3 or more persons per household might not have a chance to become a cycling city according to respondents. When it is allowed to select multiple answers on a question, not only the mode, but also other answers given by the majority of the survey respondents (50% or more) were analyzed and interpreted in the same way as previously mentioned in this paragraph. For the variables on an ordinal scale ranging from 'totally disagree' to 'totally agree', the medians 'agree' and 'totally agree' were (not) interpreted as a required condition to be perceived as a cycling city or as (no) barrier to become a cycling city (depending on how the question is formulated), since 50% or more agree with the answer given on the question or statement. For instance, if the median is agree on question 24 (see step 2 for the question), it is concluded that a small, compact city is needed in order to be considered a cycling city by respondents. Accordingly, the questions with answer categories ranging from 'not at all' to 'very often' in the survey, the interpretations of the medians 'often' and 'very often' are identical.

In SPSS, the mode and the median were computed. In Excel, charts and tables were made, based on the SPSS output. These charts and tables are added to the results section of the thesis (chapter 4) in order to provide a quick and good overview of the survey outcomes.

- **Binary logistic regressions**

Binary logistic regressions were performed in SPSS in order to explain the effects of the age, transport usage and place of residence of respondents on whether or not the selected cities are perceived as cycling cities. The following steps were taken in order to perform the binary logistic regressions and, subsequently, to analyze the data:

[11] The mode is the answer most often given by respondents on a question (Norušis, 2011).
[12] The median separates the higher half of the answers given by respondents from the lower half. Since data on a nominal scale do not have a ranking, it is meaningless to calculate the median for this type of data (Norušis, 2011).

- Step 1: Formulating the hypotheses

First of all, based on proposition 2 (see section 2.4), the case selection (which is Amsterdam, Groningen and Geneva, as explained in section 3.1) and the representativeness of the population sample (section 3.4.3), hypotheses were formulated which were tested through performing the binary logistic regressions. These hypotheses are formulated as followed:

1. There is a negative relationship between the age of respondents and whether or not Amsterdam, Groningen and Geneva are perceived as cycling cities.
2. A city – in this case, Amsterdam, Groningen or Geneva - is more often perceived as a cycling city by respondents living in a city with a lower percentage of people travelling by bicycle relative to respondents living in the city concerned. The opposite is also expected; a city (Amsterdam, Groningen or Geneva) is less often perceived as a cycling city by respondents living in a city with a higher percentage of people traveling by bicycle compared to respondents living in the city concerned.
3. There is a positive relationship between the travel time spent on a bicycle by respondents living in Amsterdam, Groningen and Geneva and perceiving their place of residence (Amsterdam, Groningen or Geneva) as a cycling city.

- Step 2: Selecting the respondents for testing the hypotheses

All respondents in the final dataset (n=291) were selected in order to test the first and second hypothesis. Hypothesis 3 was tested through only selecting the respondents living in the same place of residence as the city mentioned in the dependent variable (see the formulation of the hypotheses for a better understanding).

- Step 3: Determining the dependent, independent and control variables

For testing the hypotheses, the dependent, independent and control variables were determined. It was checked whether all categories of the variables determined consisted of 10 cases or more. The independent and control variables were transformed if one answer category was filled out less than 10 times by survey respondents in order to reduce problems with regard to an increasing bias and variability, unreliable confidence interval coverage and problems with the model convergence (Vittinghoff & McCulloch, 2007). After transforming the independent an control variables, each category consisted of 10 cases or more. Moreover, independent and control variables were checked for multicollinearity before putting them in the model. None of the variables included in the models appeared to be significantly related to each other, as the highest Pearson Correlation coefficient between the variables is 0.62 (see Attachment 1). After checking the number of cases per category and the correlation between the variables, it was determined to use the following variables for testing the first and second hypotheses (n=291):

Dependent variables

For each selected city, binary logistic regressions were performed. The binary dependent variables were defined as followed:

- Groningen is a cycling city according to survey respondents, measured in no/yes
- Amsterdam is a cycling city according to survey respondents, measured in no/yes
- Geneva is a cycling city according to survey respondents, measured in no/yes

In Table 3, it is displayed under which variable name, label and coding these dependent variables are found in the final dataset:

Table 3 - Variables from the dataset which are used as dependent variables for testing all hypotheses

Variable Name	Variable Label	Measurement Scale
v15	Is Amsterdam a bike city?	Binary, 0=no; 1=yes
v16	Is Groningen a bike city?	Binary, 0=no; 1=yes
v17	Is Geneva a bike city?	Binary, 0=no; 1=yes

Independent variables

In order to test the effects of the age and place of residence of respondents on the perception of a cycling city (see hypotheses 1 and 2), the variables age and place of residence were added in the models as independent variables. The independent variables measured on a categorical scale were recoded into dummy variables. The first category of each variable was chosen as reference category. This implies that the effects of the categorical variables are reported in terms of comparison with the reference category.

In Table 4, it is shown under which variable name, label and coding these independent variables can be found in the final dataset:

Table 4 - Variables from the dataset which are used as independent variables for testing hypotheses 1 and 2

Variable Name	Variable Label	Measurement Scale
v1	Age	Categorical, 0=15-29 years old *(reference)*; 1=30-44 years old; 2=45-59 years old; 3=60-74 years old
v3	Place of residence	Categorical, 0=Amsterdam; 1=Groningen; 2=Geneva *(reference: city mentioned in the dependent variable)*

Control variables

Previous studies reveal the effects of sex, the interaction between sex and age, income and nationality on bike usage (section 2). Although not expected, these personal characteristics might have an influence on whether the selected cities are perceived as cycling cities. Therefore, these variables were selected as control variables in this study. Since the income of respondents is not known for all survey respondents, the highest level of education achieved was used as a proxy of income. (Kolenikov & Angeles, 2009). However, educational attainment is still an imperfect measure of income, as not everyone with a high level of education achieved earns automatically more money than people with a low level of education achieved. The variable 'hours cycled on average per week' by respondents might have an influence on the perception of a cycling city as well and is therefore included as a control variable. However, it is expected that there is only a positive relationship between the travel time spent on a bicycle by respondents and perceiving their place of residence as a cycling city, instead of perceiving all cities as cycling cities.

In Table 5, it is shown under which variable name, label and coding these control variables are included in the final dataset.

Table 5 - Variables from the dataset which are used as control variables for testing hypotheses 1 and 2

Variable Name	Variable Label	Measurement Scale
v12	Hours cycled on average per week	Categorical, 0=<1 hour *(reference)*; 1=1-3 hours; 2=4-6 hours; 3=>6 hours
v2	Sex	Binary, 0=male; 1=female
v2 * v1	Sex * Age	Categorical, 0=male * 15-29 years old *(reference)*; 1=female * 30-44 year old; 2= female * 45-59 years old; 3=female * 60-74 years old
v7t	Highest level of education achieved transformed	Categorical, 0=Lower than the University of Applied Sciences / HES (Haute écoles spécialisées) *(reference)*; 1=University of Applied Sciences / HES (Haute écoles spécialisées); 2=University
v4t	Nationality transformed	0=Dutch nationality (and other nationality) *(reference)*; 1=Swiss nationality (and other nationality); 2=other nationality/nationalities than Dutch or Swiss nationality

For testing the third hypothesis, the same dependent variables have been used as the dependent variables used for testing the first and second hypotheses. However, the independent and control variables are different for testing the third hypothesis as compared to the variables used for

testing the first and second hypotheses, since only one independent variable and no control variables were added into the models. This was done on purpose, as the minimum number of cases which needs to be included in each category could often not be reached (even after recoding) when respondents living in Amsterdam (n=53), respondents living in Groningen (n=168) or respondents living in Geneva (n=70) were only selected in the dataset. Moreover, high standard errors were often found when the variables included in the models are the ones mentioned in Table 4 and 5.

The independent variable added in the models in order to test the third hypothesis is: hours cycled on average per week. Table 6 provides an overview of the independent variable used from the dataset. For examining the influence of the hours cycled per week by respondents living in Groningen on whether Groningen is perceived as a cycling city or not, the categories <1 hour and 1-3 hours cycled on average per week were taken together to have more than 10 cases included in each category (the transformed variable used from the dataset has the variable name v12t).

Table 6 - Variable from the dataset which is used as independent variable for testing hypothesis 3

Variable Name	Variable Label	Measurement Scale
v12	Hours cycled on average per week	Categorical, 0=<1 hour *(reference)*; 1=1-3 hours; 2=4-6 hours; 3=>6 hours

- Step 4: Dealing with standard errors

In the fourth step of the data analysis, the binary logistic regressions were performed with the dependent, independent and control variables as determined in order to examine whether high standard errors are found in these variables (method used in SPSS: ENTER). After performing the regressions with all respondents included in the final dataset for testing hypotheses 1 and 2, a high standard error was found in the control variable sex * age when it was tested whether Geneva is perceived as a cycling city or not due to a lack of variance in this variable. As this control variable is not crucial in order to test hypothesis 2, the variable is removed from models which have ‘is Geneva perceived as a cycling city?’ as a dependent variable. High standard errors were also found after performing the binary logistic regressions in order to test hypothesis 3. These high standard errors are the consequence of a lack of variance in the one (and only) independent variable selected. The variable ‘hours cycled on average per week’ showed high standard errors when the respondents living in Amsterdam were only selected in the dataset and when ‘is Amsterdam a cycling city?’ was used as a dependent variable. Subsequently, this variable was deleted from the model in which ‘is Amsterdam a cycling city?’ was used as a dependent variable.

- Step 5: Interpretation of the outcomes

After all binary logistic regressions were performed, the output was interpreted. This was done through determining the relationships between the dependent variable selected and the independent variables. There was searched for (a) possible explanation(s) for the unexpected relationships found by making use of the survey data and focus group data (see the hypotheses for the expected relationships). After the relationships between the first dependent variable and all variables of interest, the second dependent variable and all variables of interest and the third dependent variable and the independent variable was determined, the similarities and differences between the outcomes were compared with each other. Subsequently, the hypotheses formulated were (not) rejected.

Furthermore, to measure to what extent the perception of respondents on whether a city is a cycling city or not is influenced by the age, place of residence and transport modality used by respondents, the Nagelkerke R square (which measures how well the model fits the data) and the Chi-square (Step) and the Chi-square (Model) (which measures whether adding (a) variable(s) to the model makes a significant improvement to the model fit compared to the model of the previous step or compared to the model with the intercept only) were analyzed. These outcomes are shown in the analysis section (chapter 5).

- **Inductive coding**

Inductive coding was used in order to get a first insight in other possible conditions (required or barriers) than expected to be perceived as a cycling city (the expected conditions are derived from the literature review). The following steps were taken in order to analyze the inductive codes:

- Step 1: Assigning codes and themes to answers

First, inductive codes[13] were assigned to the data collected on the open-ended questions and half-open ended questions in Excel. For each new theme brought forward by a respondent, a new code was assigned to the data. More codes can be assigned to an answer given by a respondent, as a number of themes are sometimes mentioned in one answer. To give an example, one answer provided on question 21 is shown below, as well as the codes and themes (each code is linked to a theme) assigned to this answer:

[13] Inductive codes are not predetermined beforehand. These codes are drawn from the raw information; the information obtained was read several times and phenomena that emerged from the data were labeled (Pandit, 1996).

Question 21
I would like to see the following road infrastructure in the ideal bike city: _____

Answer given on this question by a respondent:
"specific bicycle traffic lights. possibility to turn right when cars have to wait for red light, if situation allows. No sharing bicycle lanes with taxi's and busses as is currently the case in Geneva, this is very dangerous. No obligation to wear a helmet. NO LAW LIKE HAS BEEN RECENTLY INTRODUCED IN SWITZERLAND THAT CARS NEED TO HAVE LIGHT ON ALL DAY - THIS HAS CAUSED MANY MORE CYCLING DEATHS AND INJURIES (see the statistics!!!). separate cycling paths... covered parking for bikes. Bike repair shops everywhere."

Codes and themes assigned to this answer which relate to the road infrastructure:

i	-	*traffic lights for cyclists*
q	-	*separate bike lanes*
x	-	*covered parking space for bicycles*
al	-	*bicycle repair shops*

Codes and themes assigned to this answer which are not related to the road infrastructure:

as	-	*no obligation to wear a helmet*
at	-	*cars need to have a light on all day*

- Step 2: Measuring the impact of the themes

The second step was to count the number of responses that apply to each of these codes in Excel in order to understand how important the themes linked to these codes are. When a code was used more than 10 times, the theme linked to this code is mentioned in the results section of this thesis (chapter 4), although this does not imply that this is a required condition or a barrier to be perceived as a cycling city.

An oversight of all codes, themes and the number of times that each code is mentioned in the survey data, is available upon request.

- Step 3: Data usage for the focus group discussions and for further research

The final step was to examine the relevance of some of the identified themes in more detail during the focus group discussions. The goal of using these themes during the focus group discussions was to examine whether these themes are conditions to be perceived as a cycling city by focus group participants. Furthermore, the themes which were mentioned in the answers on the open-ended questions can be used for a new study in order to identify which of these themes are conditions to be perceived as a cycling city.

3.5 Focus group discussions: data collection and analysis

In this paragraph, it is explained how participants were recruited for the focus group discussions, how focus group discussions were conducted and in what way the focus group data were analyzed.

3.5.1 Participant recruitment

For the focus group discussions, the research-based recruitment method was used to recruit participants. A selection of participants who reported in the survey that they were willing to participate in one of the focus group discussions were approached by e-mail. The goal was to recruit for a maximum diversity in the age, place of residence and transport modalities most often used by people to uncover a broad range of perspectives on the statements made and questions asked in the focus group discussions (Rooney et al., 2011). In practice, it was possible to recruit for a maximum diversity in the age and place of residence of the participants while using the research-based recruitment method. However, it was impossible to recruit for a maximum diversity in the transport modality most often used by people while using this research method, since all respondents who wanted to participate in the focus group discussions use the bicycle most often.

In Table 7, it is shown that 20 people participated in the focus group discussions in total; 8 people participated in the focus group discussion held in Groningen, 6 people participated in the focus group discussion conducted in Amsterdam and 6 people participated in the focus group discussion in Geneva. The age of focus group participants ranged between the age category 15-29 years old and 60-74 years old. Half of the focus group respondents are male. They all lived in Groningen, Amsterdam or Geneva at the moment the focus group discussions were conducted (on 9 February 2016 in Groningen, on 10 February 2016 in Amsterdam and on 18 February 2016 in Geneva).

Focus Group Participants in Groningen	Focus Group Participants in Amsterdam	Focus Group Participants in Geneva
Chantal	Gijs	Jean
Ruben	Wendy	Emma
Henk	Anna	Emily
Marjan	Anniek	Luciana
Jeroen	Karen	Oliver
Guus	Jannes	Loes
Marijn		
Wessel		

Table 7 – Names of focus group participants (pseudonyms used), by focus group discussion

More detailed information about the characteristics of the research participants is provided in Attachment 2. Pseudonyms were used instead of the real names of focus group participants.

These pseudonyms are commonly used first names in the countries the focus group participants come from.

3.5.2 Conducting the focus group discussions

- **Focus group discussion guides**

For each focus group discussion, a PowerPoint presentation was designed (see Appendix 6, 7 and 8). The items covered in these PowerPoint presentations are: introducing yourself, the time schedule, 3 statements, 3 questions and 1 assignment/question. The statements and questions incorporated in the PowerPoint presentations were sometimes supported by survey results. The content of these PowerPoint presentations is the same, except from the last question included in the PowerPoint presentations. In the PowerPoint presentations made for the focus group discussions held in Groningen and Amsterdam, an assignment was included in the PowerPoint presentations. Due to a lack of time for finishing the questions which should be asked in the focus group discussions in Groningen and Amsterdam, it was decided to change this assignment into a question in the PowerPoint presentation made for the focus group discussion in Geneva.

- **Content of the focus group discussions**

The focus group discussions started with an introduction and continued with an opening question and transition questions, the explanation of the program, the introduction and explanation of the key statements and key questions and ended with a conclusion.

In the introduction of the focus group discussions, the purpose of the study and focus group discussion and ethical issues were mentioned among others (i.e. outlining confidential data use and storage and seeking consent for recording the discussion). Moreover, the roles of the moderator and participants were explained. The role of the note-taker was only explained to participants during the focus group discussion conducted in Groningen, as a note-taker was only present at this focus group discussion.

As an opening question, participants were asked to introduce themselves. This question was used to make participants feel at ease and to get to know participants better (Hennink et al., 2011). The transition questions covered questions about participants' opinion towards cycling and the transport modality most often used by them.

After having asked very general questions about the key topic, statements were introduced. The first statement – which is derived from the answers given on question 18 in the survey - is about the number of cycling city dwellers relative to the number of city dwellers using the car. The answers given on this question were presented to focus group participants in the PowerPoint presentation in order to show to them what respondents answered on this question and to open up

the discussion. As no answer category in question 18 was filled out by the majority of the survey respondents and the answers provided on this question vary a lot, it was very difficult to determine the amount of cycling city dwellers required in order to consider a city as a cycling city by survey respondents. The input given by focus group participants may be used in order to better understand the amount of cycling city dwellers needed in a city in order to consider a city as a cycling city (as perceived by focus group participants). Statements 2 and 3 are derived from the survey results which were given more often than once on the aspects missing in the survey that determine whether a city is a cycling city. These key statements concern the following topics: (1) whether 'everything' in the city should be reached within biking distance in order to become a cycling city or not; and (2) whether you should go faster from A to B by bicycle than by public transport or by car in a city in order to consider a city as a cycling city. The answers provided on these statements by focus group participants may give an insight in whether these aspects are relevant in order to become or to be considered as a cycling city.

Subsequently, 3 questions and 1 assignment/question were given/asked to participants. The first question focusses on the spatial measures which can be taken in a city with many elderly people (>60 years old) in order to become a cycling city. Before the cases with missing data were removed from the dataset, half of the survey respondents mentioned that it is possible for a city with many elderly people (>60 years) to become a cycling city (this is also shown in the PowerPoint presentation). However, it was unclear under which spatial circumstances this is possible and how the words 'many elderly people' were interpreted. This lack of clarity may be reduced with the answers provided by focus group participants. Question 2 and 3 are about the bottom-up and top-down measures which should be taken in a city in order to become a cycling city. In the PowerPoint presentations, suggestions for the measures which should be taken in order to become a cycling city were included. These suggestions are derived from the findings on the aspects missing in the survey. The last key question/assignment incorporated in the focus group discussion guide was derived from the survey question about the road infrastructure which should be present in the ideal cycling city (question 21). During the focus group discussions held in Groningen and Amsterdam, focus group participants should have been asked to draw a mental map of the road infrastructure which need to be present in the city in which the focus group discussion was conducted in order to consider this city as a cycling city. However, due to a limited amount of time for conducting the focus group discussions (1.5 hours at maximum), this last question was skipped in both focus group discussions. Based on these focus group experiences, it was decided to change this assignment into a question in the focus group discussion guide made for the focus group discussion in Geneva. Focus group participants who participated in the focus group discussion in Geneva were asked to describe the road infrastructure which should be present in Geneva in order to consider Geneva as a cycling city. As this question was only asked during the focus group discussion conducted in Geneva, a comparison between the data collected in multiple focus groups on this question cannot be made.

In the conclusion of the focus group discussions, participants were thanked for their participation and asked whether they had remaining questions or remarks.

- **Data storage**

All focus group discussions were audiotaped and 2 focus group discussions (conducted in Amsterdam and Groningen) were also videotaped. The tape-recorders were used in order to listen attentively to the discussion instead of writing the conversation down and, subsequently, missing parts of the conversation. The videotapes served as a backup of the audiotapes and were used to check who was saying what exactly. After these focus group discussions were held, these tapes were stored on my laptop.

3.5.3 Analysis of the focus group discussions

The focus group data were analyzed in a couple of steps. These steps are described below.

- Step 1: Transcribing the focus group data

The focus group conversations were transcribed verbatim while making use of the audiotapes and videotapes. In the transcripts, background noises were written down between brackets and texts were marked in red when parts of the conversation could not be understood.

- Step 2: Coding the focus group data

For the data analysis of the transcripts, the software program ATLAS.ti was used. Deductive and inductive codes were assigned to the qualitative data. Deductive codes were derived from the theoretical framework. These deductive codes are the factors influencing bike usage. The deductive codes created (based on the theoretical framework) are presented in Table 8.

Table 8 - Codes which are derived from the literature review and used for coding the focus group data

Categories	Spatial Conditions	Socio-cultural Conditions	Economic Conditions	Demographic Conditions	Safety Conditions
Codes	Road infrastructure	Political preferences	Income	Sex	Social safety
	Traffic regulation	Nationality	Transportation costs	Sex * age	
	Urban design	Religion		Age	
	Weather	Image of the bicycle		Household size	
	Terrain	Social norms		Number of inhabitants	

Inductive codes were drawn from the raw information; transcripts were read several times and phenomena that emerged from the data – which are relevant for answering the research question - were labeled (Pandit, 1996). A code covers a specific statement made by a focus group participant (although this statement might shortly be interrupted by another focus group participant).

At the end of each code, the following addition was made: '(Gr)', '(Ge)' or '(A)'. These additions stand for Groningen, Geneva and Amsterdam respectively, which are the places where the focus group discussions were conducted. These additions are useful for doing a cross-case analysis afterwards; similarities and differences between the data collected in Groningen, Geneva and Amsterdam can be identified in this way (McGuiggan & Lee, 2008).

An example of the codes assigned to a fragment of the transcript of the focus group discussion in Geneva, is given below:

> Transcript fragment:
> *"Yeah through cycling promotion, through allowing people to take bikes on public transport if they live in the suburbs, through having places where they can put their bikes at work through possibly even bringing in policies whereby bikes somehow are giving priority over cars on streets and on roads making cars and fuels so expensive that people will not use cars. So within a second you will get rid of certain car centric mentality if you like" (Oliver)*

Codes assigned to this response:

- *Bicycle parking measures (Ge)*
- *Bike-and-ride measures (Ge)*
- *Costs of transport modalities measures (Ge)*
- *Image of using the bicycle measures (Ge)*
- *Traffic regulations measures (Ge)*

- Step 3: Categorizing the focus group data

In the third step of the data analysis, the created codes were linked to each other and grouped into categories. The deductive categories used, are: spatial conditions, socio-cultural conditions, economic conditions, demographic conditions and safety conditions. In Table 8, an overview of these deductive categories and the codes that belong to each category is presented.
Based on the inductive codes, the following categories were created in addition: general description of a cycling city, spatial-time measures, socio-cultural measures, economic measures and socio-safety measures. Moreover, the category spatial conditions was replaced by the category spatial-time conditions.

- Step 4: Comparing the data for each code and category

In the fourth stage of the data analysis, it was checked whether the information that emerged from one focus group discussion also emerged from other focus group discussions for each code and category created. In this way, it can be assessed whether data saturation was reached and whether there are similarities and differences between the data collected in Groningen, Amsterdam and Geneva (McGuiggan & Lee, 2008; Onwuegbuzie et al., 2009). In the section about the focus group results (see paragraph 4.2) and in the analysis section (chapter 5), it is mentioned whether the topics, which are linked to the codes, are mentioned in one or more focus group discussions and to what extent these findings can be generalized.

- Step 5: Counting the frequencies that codes were used

Finally, the codes used were counted in ATLAS.ti. In Excel, charts were made of the frequencies that each code was used by focus group discussion. These charts are displayed in paragraph 4.2.

3.6 Ethical considerations during the research process

Quantitative and qualitative research should be conducted in an ethical way. Ethics in quantitative and qualitative research differ to some extent due to the different nature of quantitative and qualitative research (Hennink et al., 2011). In quantitative and qualitative research, most researchers have agreed upon the following ethical considerations to protect

human subjects of behavioral research: seeking informed consent, anonymity, confidentiality, justice, beneficence and a minimization of harm (Hennink et al., 2011; Babbie, 2013). In this subparagraph, it is described why and how these ethical principles were followed in this study.

- **Informed consent**

It is important to obtain sufficient information about the reasons for conducting the focus group discussions and surveys and the way in which the data will be used before people take part in this research. Moreover, people should participate in this study on a voluntary basis (Hennink et al., 2011). For the focus group discussions, this permission is sought in question 35 of the survey. In this question, respondents were asked whether they would like to participate in one of the focus group discussions after having informed them about the objective of the focus group discussions and the way in which the identity of participants will be protected (see Attachment 4 and 5). The next step was to seek permission from participants who stated that they wanted to participate in this research by email. In this email, practical information concerning the date, time and location of the focus group discussion was provided as well. The email sent to the potential participants is attached to this thesis (see Attachment 3).

Respondents should also fill out the survey voluntarily (Babbie, 2013). In this study, respondents were not forced to fill out the questionnaire and there were no negative consequences for people who did not start or completed the survey. It may thus be assumed that respondents filled out the survey voluntarily.

- **Minimization of harm**

Hennink et al. (2011) describe that, in qualitative research, participants should not mentally, physically, socially, or economically be harmed by other research participants or by the researcher. Mental harm of participants, e.g. feeling ashamed of statements made, were minimized through ensuring participants that the focus group data will be anonymized and kept confidential. Physical harm was not expected and did not occur during the focus group discussions. Social harm could occur in a group setting and therefore, it was said at the beginning of each focus group discussion or/and during the discussions that all opinions were valued and that all participants should have the opportunity to talk. Participants who interrupted other participants more often, were asked to remain silent until this participant shared his/her view. Participants who did not give much input during the focus group discussion, were invited to talk through making eye contact with them and smiling to them regularly. A few times, it was also asked to them whether they wanted to share their perspective on a topic as well, since they could have been overwhelmed by the input given by others. Social harm from the side of the researcher was avoided by giving no counter arguments on the points of view of the participants. Instead, in the role of the moderator, the researcher only lead these discussion. Economic harm was minimized by taking no more than 1.5 hours of participants' time.

When surveys are conducted, respondents can also be harmed, since sensitive questions included in the survey may negatively influence the mental well-being of respondents (Babbie, 2013). To reduce the potential mental harm, the sensitive question concerning the income of respondents was included in the survey as an optional question. Economic harm was minimized through making a survey not too long (the survey could be completed within 10 to 15 minutes).

- **Anonymity**

Another ethical issue in qualitative and quantitative research is ensuring anonymity to the human subjects of behavioral research (Babbie, 2013). Anonymity needs to be guaranteed in order to protect the privacy of research participants and to do them no harm (Hennink et al., 2011). To comply with this ethical issue, pseudonyms instead of the real names of focus group participants were used in the transcripts. Other personal information provided during the focus group discussions which might uncover the identity of the participants – such as, the locations that participants visit frequently and occupations of participants – were replaced by the announcement "(personal information is removed)" in the transcripts and could, as a consequence, not be traced anymore. Participants were informed about the way in which there should be dealt with the principle of anonymity in the conclusion of the survey.

Survey respondents also remained anonymous, as was ensured in the introduction of the survey. Their data were made anonymous through deleting the IP addresses of respondents from the dataset and removing the email addresses from the dataset after having used these email addresses to approach those respondents who reported that they wanted to receive the analysis of the survey outcomes.

- **Confidentiality**

The quantitative and qualitative data collected should be kept confidential in order to minimize the potential harm (e.g. mental or social harm) to survey respondents and focus group participants (Hennink et al., 2011). To achieve this objective, focus group participants were told at the beginning of the focus group discussion that the focus group data – consisting of the audiotapes, videotapes and transcripts - will securely be stored and kept for the researcher. In practice, these data were also shared with the supervisor and the second reviewer of this thesis in order to assess this thesis.

In the introduction of the survey, it was written down that the obtained survey data will be kept confidential. In practice, the survey output was stored on my own computer and only shared with the supervisor of this thesis and with the second reviewer of this thesis in order to assess this thesis.

- **Justice**

To do research participants and respondents justice, the primary data collected was not sensationalized and both positive and negative findings, as well as unexpected findings on issues were reported (Babbie, 2013; Hennink et al., 2011). Yet, the research findings may not correspond to the objective reality. According to Denzin and Lincoln (2011, p.13) "all research is interpretative, guided by a set of beliefs and feelings about the world and how it should be understood and studied". The researcher interprets the questions and findings and therefore, research findings should not be taken for granted.

- **Beneficence**

This research is not societal relevant when study findings are not disseminated. Therefore, this thesis will be disseminated by email to all focus group participants and to the survey respondents who mentioned that they wanted to receive the thesis by email. Disseminating the findings also serves the focus group participants who mentioned that they participated in the focus group discussion in order to obtain information about the conditions needed in order to be considered as a cycling city and the focus group participants who stated that they want to transfer their knowledge about cycling (in) cities to other people and parties.

The research findings also need to be presented in such a way that focus group participants and respondents – as well as other people – understand the research findings and, subsequently, benefit from the study results (Hennink et al., 2011). The information provided in the methodology section can be used for a better understanding of how the primary data is collected and analyzed. Besides, respondents and participants can approach the researcher for further information with regard to the data analysis in case the data analysis might be unclear, for instance.

4. Results

In this chapter, the survey results and the focus group results are presented. Paragraph 4.1 – which is called 'survey results' – consists of a description of the survey results on the following topics: the characteristics of respondents, a general description of a cycling city and the conditions (required or barriers) to be considered as a cycling city. In paragraph 4.2 – that is, the focus group results – the codes assigned to the transcripts which are related to the general description of a cycling city, the conditions (required or barriers) to be considered as a cycling city and the measures in order to become a cycling city are described.

4.1 Survey results

4.1.1 Characteristics of respondents

Data on demographic, spatial, socio-economic and travel behavior characteristics of respondents were collected in the survey. In paragraph 4.1.1, the demographic, spatial, socio-economic and travel behavior characteristics of respondents which are included in the data set (n=291) are described.

- **Demographic characteristics**

The survey results show that there are slightly more men than women included in the sample (58% of the respondents is a male). The age distribution of the sample varies quite a lot, as displayed in Table 9. These data reveals that there are more respondents of a young age included in the sample than respondents of an old age. The biggest difference is found between the age category 15-29 years old and the age category 60-74 years old; there are 4.6 times more respondents aged between 15-29 years old as compared to respondents aged 60-74 years old included in the sample. In Table 10, the nationalities of the respondents included in the dataset are displayed. Almost three quarters of the respondents have a Dutch (and other) nationality and 15.8% have a nationality other than Dutch (and other) or Swiss (and other) nationality. The percentage of respondents having a Swiss (and other) nationality is low compared to the percentage of respondents having a Dutch (and other) nationality.

Table 9 - Age distribution of respondents

Age in Years	Percentage of Respondents n=291
15-29	39.9
30-44	32.0
45-59	19.6
60-74	8.6

Table 10 - Nationalities of respondents

Nationality	Percentage of Respondents n=291
Dutch (and other)	74.9
Swiss (and other)	9.3
Other	15.8

- **Spatial characteristics**

Table 11 shows the spatial distribution of the respondents (n=291), by place of residence. The data reveals that the majority of the respondents live in Groningen (60%). Almost one quarter of the respondents live in Geneva and nearly one-fifth of the respondents live in Amsterdam (18%).

Table 11 - Spatial distribution of respondents, by place of residence

Place of Residence	Percentage of Respondents n=291
Groningen	57.7
Amsterdam	18.2
Geneva	24.1

- **Socio-economic characteristics**

One of the optional questions included in the survey was about the net monthly income of respondents (Purchasing Power Parity[14] (PPP) adjusted incomes are applied). Thirty-five respondents did not fill out this question. As shown in Table 12, the net monthly income (PPP) of the majority of the respondents who answered the question is below 3000 Euro/5048 Swiss Franc (n=256). Only a very small percentage of the respondents (11%) receive a net monthly income of more than or equal to 5000 Euro/8416 Swiss Franc.

Table 12 - Income distribution among respondents

Net Montly Income (PPP)	Percentage of Respondents n=256
<1000 Euro/ <1683 Swiss Franc	26.6
1000-2999 Euro/ 1683-5048 Swiss Franc	48.8
3000-4999 Euro/ 5049-8415 Swiss Franc	13.3
≥5000 Euro/ ≥8416 Swiss Franc	11.3

In Table 13, data is presented about the highest level of education achieved by respondents. The majority of the respondents have followed a master's degree program at the University (50.2%). The smallest share of respondents have followed a PhD program (5.5%).

[14] Purchasing Power Parity (PPP) is the rate at which the currency of one country would have to be converted into that of another country to buy the same amount of goods and services in each country (OECD, 2014).

Table 13 – Educational attainment of respondents, by level of education

Highest Level of Education Achieved	Percentage of Respondents n=291
Lower than the University of Applied Sciences	10.0
University of Applied Sciences	16.8
Bachelor's degree program at the University	17.5
Master's degree program at the University	50.2
PhD	5.5

- **Travel behaviour characteristics**

Data have been collected about the mode of transportation most often used, the years cycled by respondents and the hours cycled per week on average by respondents. The mode of transportation most often used by 67.7% of the respondents is the city bike (not electric motor-driven) (Table 14). Other modes of transportation than the bicycle, e.g. the car or public transport, are used by less than 10% of the respondents.

Table 14 – Mode share among respondents

Mode of Transportation Most Often Used	Percentage of Respondents n=291
The city bike (not electic motor-driven)	67.7
Other type of bike	7.9
The car	7.9
Public transport	8.9
Walking	5.2
Other mode of transportation	2.4

In Table 15, it is shown that 9 out of 10 respondents have cycled more than or equal to 10 years of their lifetime. Only a small percentage of the respondents have cycled less than 1 year of their lifetime. Table 16 shows that the hours cycled per week on average is for 88.3% of the respondents more than or equal to 1 hour per week. Most respondents filled out that they cycle 1-3 hours per week on average (32.3%).

Table 15 - Years cycled by respondents

Years Cyclced	Percentage of Respondents n=291
<1 year (cycled ≥ once)	1.7
1-4 years	2.7
5-9 years	2.7
≥10 years	89.7
I have never cycled	3.1

Table 16 - Hours cycled per week by respondents

Hours Cycled per Week on Average	Percentage of Respondents n=291
< 1 hour	11.7
1-3 hours	32.3
4-6 hours	31.6
> 6 hours	24.4

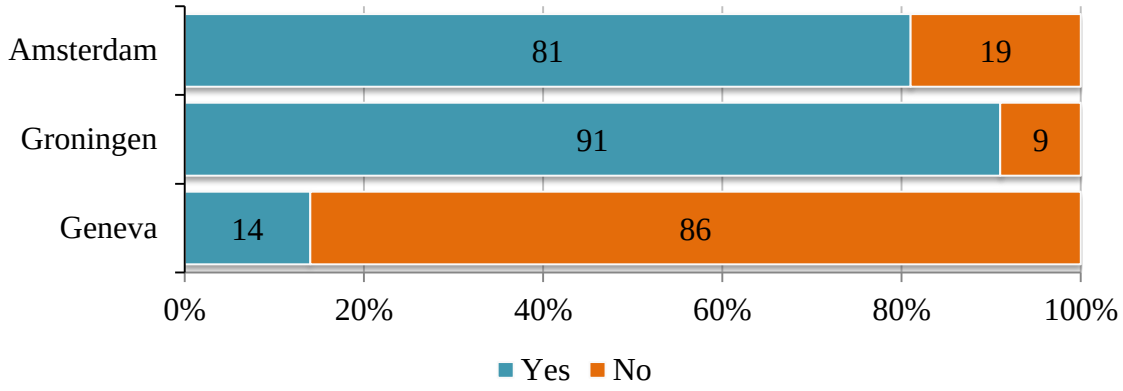
4.1.2 General description of a cycling city

Through conducting the survey, it was tested which of the selected cities for research are perceived as cycling cities and whether the amount of cycling city dwellers (in comparison to city dwellers using other modes of transport) matters in order to be as considered a cycling city by respondents. The answers provided by respondents (n=291) on these topics are shown in this paragraph.

- **Selected cities: cycling cities or not?**

The survey results with regard to whether the cities Amsterdam, Groningen and Geneva are perceived as cycling cities by respondents are displayed in Figure 7. From this figure, it can be derived that a clear majority of the respondents perceives Amsterdam an Groningen as a cycling city (81% and 91% of the respondents respectively). Geneva, however, is not perceived as a cycling city by a vast majority of the respondents; 14% of the respondents perceives Geneva as a cycling city.

Fig. 7 - Answers given by respondents on the question 'Is [selected city] a [cycling][15] city according to you?'



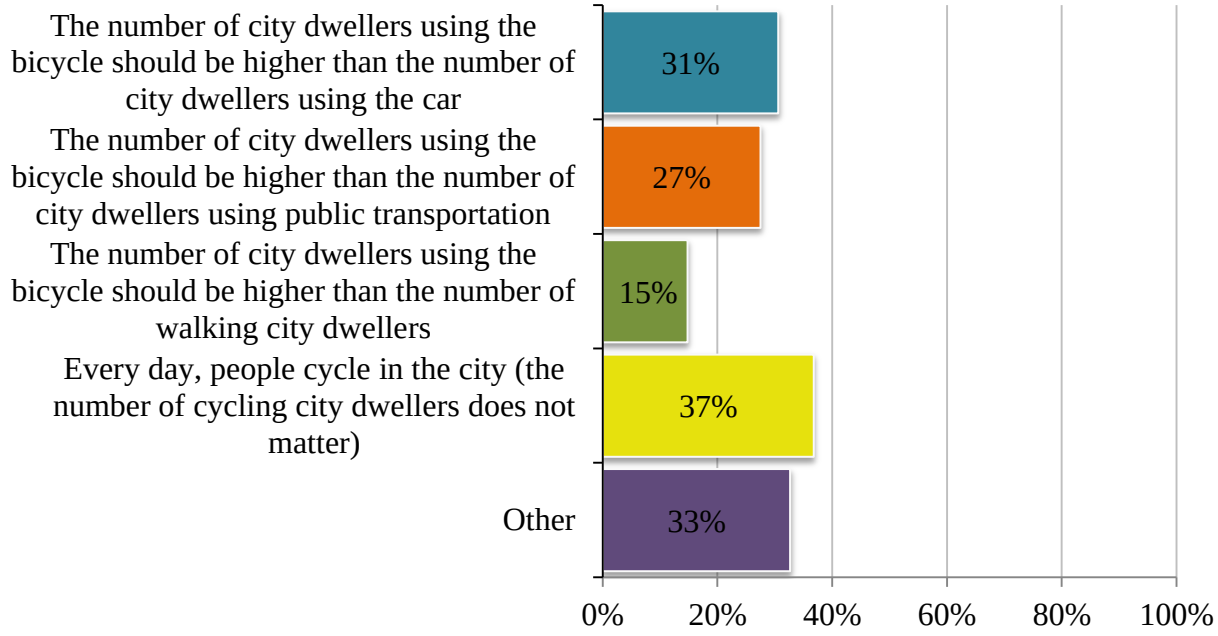
- **Bicycle usage among city dwellers**

In the survey, it was asked what the share of the bicycle in comparison to other transport modalities should be in order to call a city a cycling city. As shown in Figure 8, thirty-seven percent of the respondents answered that people have to cycle in the city every day and that the number of cycling city dwellers does not matter for calling a city a cycling city (this answer was filled out by most respondents). The smallest share of the respondents (15%) reported that the number of city dwellers using the bicycle should be higher than the number of walking city dwellers in order to call a city a cycling city. The category 'other' was filled out by nearly one third of the respondents. In this category, more than ten respondents gave the following answers:

[15] The word 'cycling' is placed between square brackets, as it was the word 'bike' instead of 'cycling' was used in the survey.

there should be many cyclists (e.g. “the bicycle is an essential part of the streetscape”); the percentage of cyclists should, at least, be 20-26% (although it is not clear whether this percentage always refers to the percentage of city dwellers using the bicycle); and that cycling facilities are important to take into account for calling a city a cycling city.

Fig. 8 - Answers provided by respondents on the question ‘In your opinion, what should be the share of the bicycle in comparison to other transport modalities in order to call a city a [cycling] city?’ (multiple answers possible)



4.1.3 Conditions to be perceived as a cycling city

In paragraph 4.1.3, the survey results on the questions concerning the conditions (required or barriers) to be perceived as a cycling city are described and displayed with figures. These are spatial conditions, socio-cultural conditions, economic conditions, demographic conditions and socio-safety conditions. The results are based on the answers given by respondents (n=291).

4.1.3.1 Spatial conditions

- **Road infrastructure**
    - **Road infrastructure (required or barriers) to be considered as a cycling city**

<u>Separate bike lanes</u>
When the answers given on the question ‘In your opinion, how often must the following road infrastructure, at least, be present in a cycling city?’ are compared with each other, the results reveal that most survey respondents (46%) filled out that separate bike lanes should, at least,

often be present in a cycling city (see Figure 9). It was the least often reported that separate bike lanes should, at least, not be present at all in a cycling city (Figure 9).

Roundabouts that give priority to bicycles

In Figure 9, it is shown how often roundabouts that give priority to bicycles should, at least, be present in a cycling city according to respondents. Roundabouts that give priority to bicycles should, at least, often be present in a cycling city according 48% of the respondents (the answer 'often' was filled out by most of the respondents). The smallest share of respondents (5%) reported that these roundabouts should, at least, not be present at all in a cycling city.

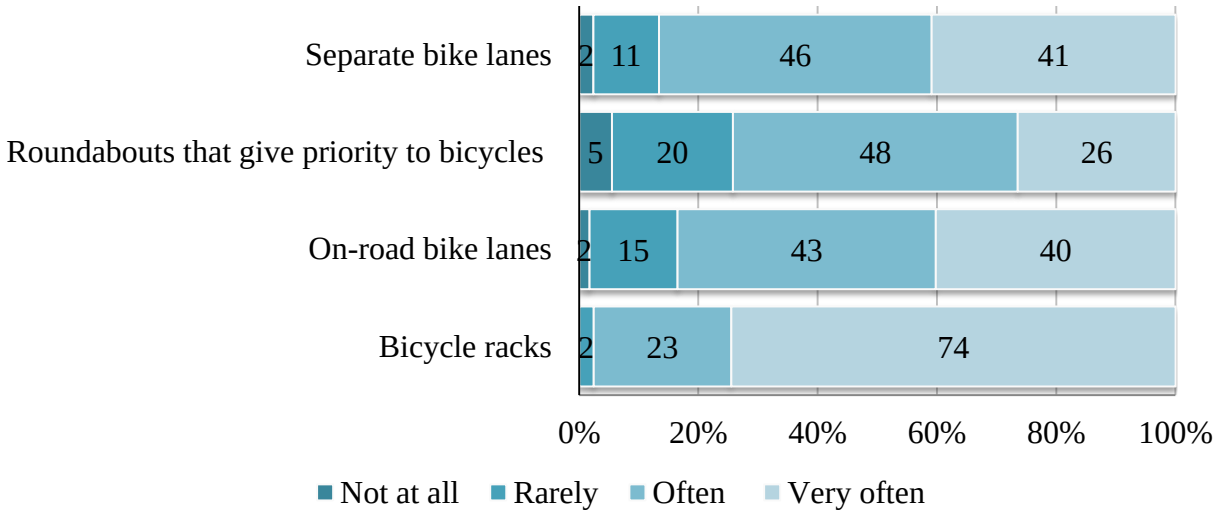
On-road bike lanes

It was examined how often on-road bike lanes should, at least, be present in a cycling according to respondents. As displayed in Figure 9, 43% of the respondents filled out that on-road bike lanes should, at least, often be present in a cycling city. This answer was given most often by respondents. The answer which was given the least often was that on-road bike lanes should, at least, not be present at all in a cycling city.

Bicycle racks

In Figure 9, the results on how often bicycle racks should, at least, be present in a cycling city are presented. According to a great majority of the respondents (74%), bicycle racks should, at least, very often be present in a cycling city. None of the respondents filled out that bicycle racks should, at least, not be present at all in a cycling city (the answer 'not at all' was filled out the least often by respondents).

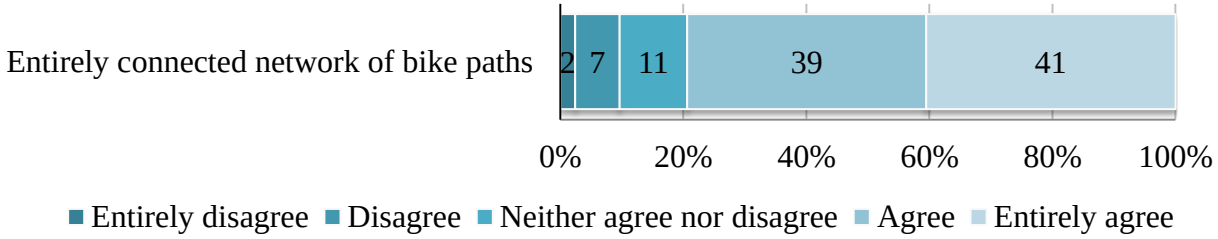
Fig. 9 - Answers given by respondents on the question 'In your opinion, how often must the following road infrastructure, at least, be present in a [cycling] city?'



Entirely connected network of bike paths

In Figure 10, the views on whether or not an entirely connected network of bike paths is needed in a city in order consider a city as a cycling city are displayed. A percentage of 41% of the respondents entirely agree that an entirely connected network of bike paths is required in order to be considered as a cycling city (the answer 'entirely agree' was filled out most often). Respondents answered the least often that they entirely disagree with the statement that an entirely connected network of bike paths is required in order to be considered a cycling city (Figure 10).

Fig. 10 - Answers provided by respondents on the statement 'A city needs to comply with the following spatial characteristic[s] in order to be considered as a [cycling] city'



50 km/h roads which are shared by cars, public transport and cyclists

In Figure 11, the survey results are shown with regard to how often 50 km/h roads which are shared by cars, public transport and cyclists may, at maximum, be present in a cycling city according to respondents. These results reveal that the majority of the respondents (53%) filled out that 50 km/h roads which are shared by cars, public transport and cyclists may, at maximum, rarely be present in a cycling city. The smallest share of respondents (3%) reported that 50 km/h roads which are shared by cars, public transport and cyclists may, at most, very often be present in a cycling city.

Bikeways shared with pedestrians

Information was obtained about how often bikeways shared with pedestrians may, at most, be present in a cycling city. As displayed in Figure 11, most respondents filled out that bikeways shared with pedestrians may, at most, rarely be present in a cycling city. Of all respondents, the smallest number of respondents (2%) reported that bikeways shared with pedestrians may, at most, very often be present in a cycling city.

Roads used by cyclists, busses and taxis

Through conducting the survey, information was collected about how often roads used by cyclists, busses and taxis may, at most, be present in a cycling city. The majority of the respondents (54%) reported that roads used by cyclists, busses and taxis should, at most, rarely be present in a cycling city. A percentage of 5% of the respondents are of the opinion that roads used by cyclists, busses and taxis may, at most, very often be present in a cycling city (the answer 'very often' was filled out the least often by respondents, as shown in Figure 11).

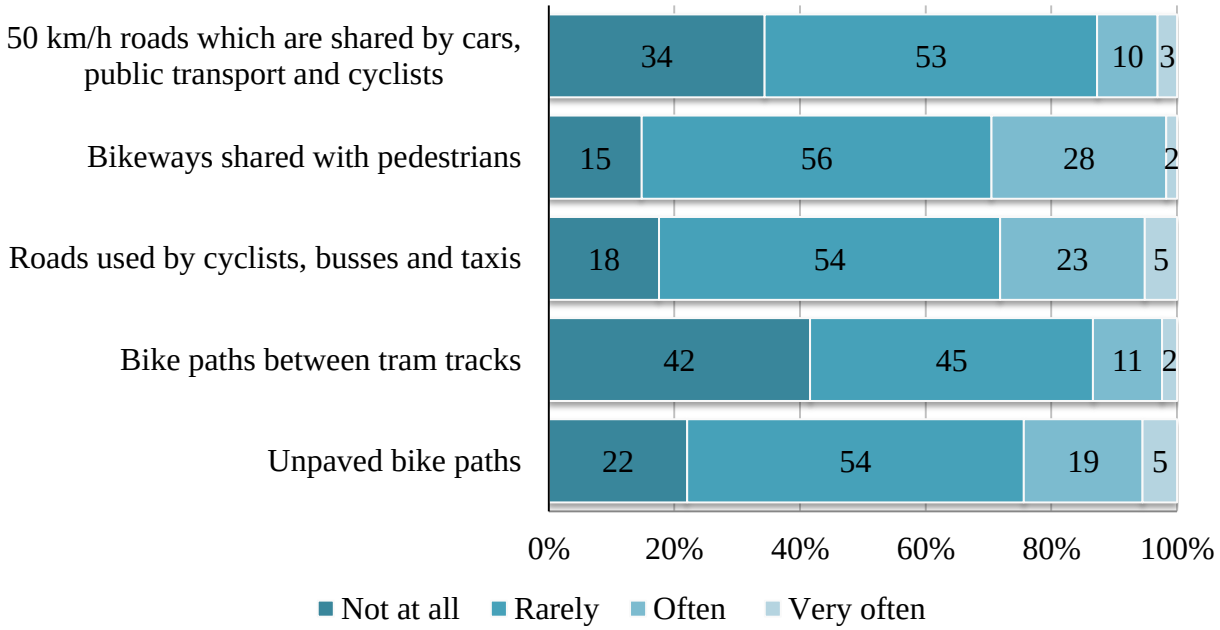
Bike paths between tram tracks

Survey respondents were asked how often bike paths between tram tracks may, at most, be present in a cycling city. In Figure 11, it is shown that most of the respondents filled out that bike paths between tram tracks may, at most, rarely be present in a cycling city (45%). The smallest share of the respondents (2%) reported that bike paths between tracks should, at most, very often be present in a cycling city.

Unpaved bike paths

In the survey, it was asked how often unpaved bike paths may, at most, be present in a cycling city. The results presented in Figure 11 show that unpaved bike paths may, at most, rarely be present in a city according to the majority of the respondents (54%). The least respondents (5%) filled out that unpaved bike paths may, at most, very often be present in a cycling city.

Fig. 11 - Answers given on the question 'In your opinion, how often may the following road infrastructure, at most, be present in a [cycling] city?'



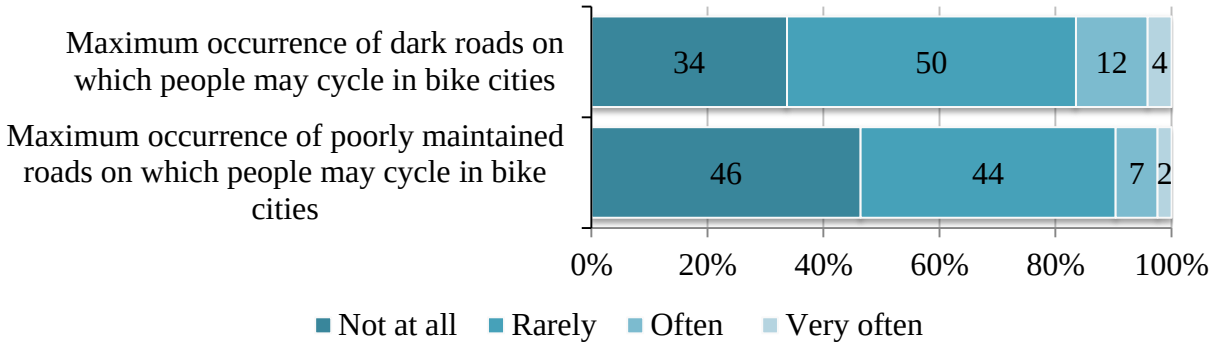
Dark roads

In the survey, it was asked how often dark roads on which people may cycle may, at maximum, occur in cycling cities according to respondents. Fifty percent of the respondents reported that dark roads on which people may cycle may, at most, rarely occur in cycling cities (this answer was given the most by respondents). The smallest share of the respondents reported that dark roads on which people may cycle may, at most, very often occur in cycling cities (see Figure 12).

Road maintenance

The survey also contains a question about how often poorly maintained roads on which people may cycle may, at most, occur in cycling cities. As shown in Figure 12, most respondents (46%) answered that poorly maintained roads may, at most, not occur at all in cycling cities. Two percent of the respondents filled out that poorly maintained roads on which people may cycle may, at maximum, very often occur in cycling cities (this answer was provided by the least respondents).

Fig. 12 - Answers provided by respondents on the question 'How often may the following [traffic-]safety situations, at most, occur in [cycling] cities?'

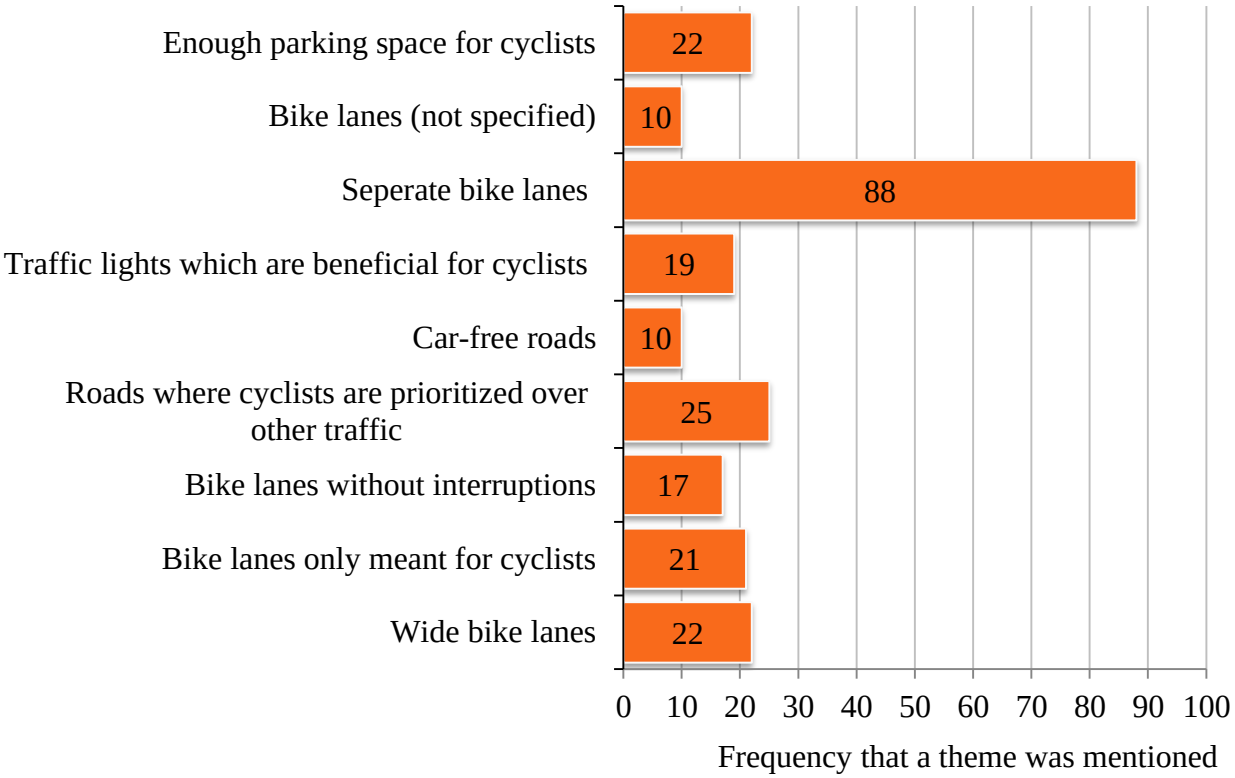


- **Road infrastructure in the ideal cycling city**

Road infrastructure which should be present in the ideal cycling city

Complementary to the results on the road infrastructure which is required in order to be considered as a cycling city by respondents, information was collected about the road infrastructure which should be present and should not be present at all in the ideal cycling city. In Figure 13, the road infrastructure which should be present in the ideal cycling city according to respondents is displayed. Ten or more survey respondents mentioned that they would like to see the following road infrastructure in the ideal cycling city: enough parking space for cyclists; bike lanes in general; separate bike lanes; traffic lights which are more beneficial for cyclists than for other traffic (i.e. the green wave for cyclists); car-free roads in the city; places in a city where the bicycle gets priority over other traffic, among others at junctions, roundabouts or 'everywhere'; bike lanes without interruptions, such as traffic lights, complex junctions and speed bumps; bike lanes excluding all motorized traffic (scooters, mopeds, taxi's, busses); and wide bike lanes. In particular, separate bike lanes should often be present in the optimal cycling city according to 88 respondents (this answer was filled out most often).

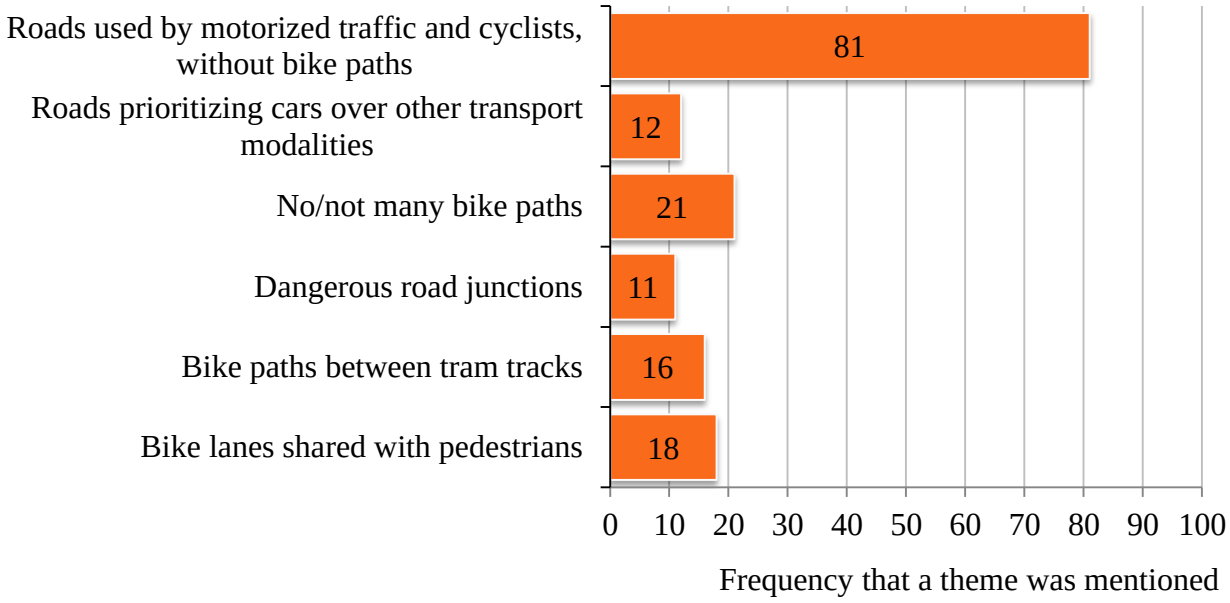
Fig. 13 - Road infrastructure which should be present in the ideal [cycling] city according to 10 or more respondents, by frequency that a theme was mentioned



Road infrastructure which should not be present at all in the ideal cycling city

In the ideal cycling city, the following road infrastructure should not be present at all according to ten or more survey respondents (see Figure 14): roads used by motorized traffic and cyclists, without bike paths; roads on which cars have priority over other transport modalities, e.g. at roundabouts and at road junctions; no or not many bike paths; dangerous road junctions (e.g. road junctions without cycling facilities); bike paths between tram tracks; and bike lanes shared with pedestrians. The answer which was filled out most often on the survey question 'Which road infrastructure should not be present at all in a city in the ideal cycling city?' was the following: roads used by motorized traffic and cyclists (this theme was mentioned by 81 respondents).

Fig. 14 - Road infrastructure which should not be present at all in the ideal [cycling] city according to 10 or more respondents, by frequency that a theme was mentioned

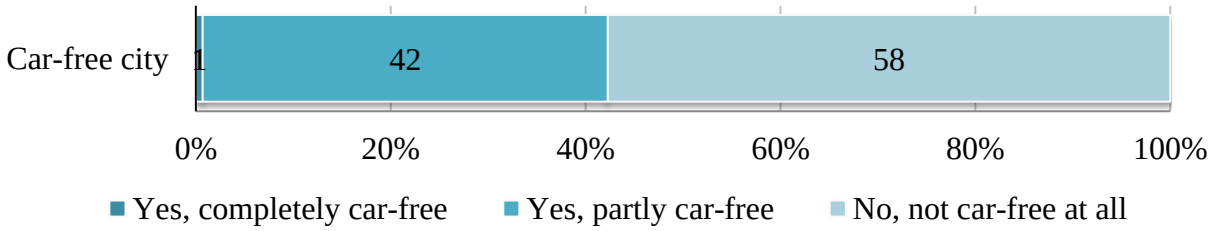


- **Traffic regulations**

Car-free city

In Figure 15, it is displayed whether a city needs to be car-free in order to be considered as a cycling city according to respondents. Fifty-eight percent of the respondents filled out that a city does not have to be car-free at all in order to be considered a cycling city. A very small percentage of the respondents (1%) reported that a city has to be completely car-free in order to be considered a cycling city.

Fig. 15 - Does a city have to be car-free in order to be considered a [cycling] city according to respondents?



- **Urban design**

A small, compact city

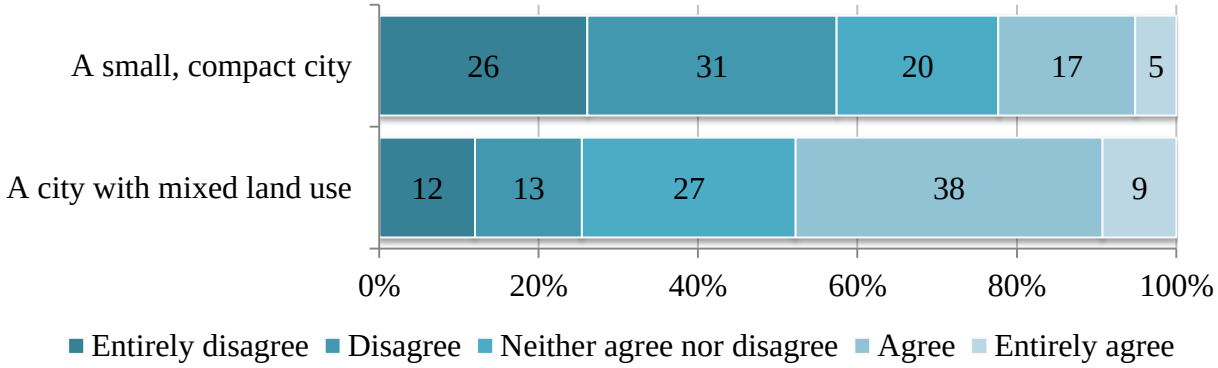
As shown in Figure 16, it was tested whether a city needs to be small/compact in order to be considered a cycling city. Most respondents filled out that they disagree with the statement that a

small, compact city is a required condition in order to consider a city as a cycling city (31% of the respondents). A percentage of 5% of the respondents reported that they entirely agree that a small, compact city is needed in order to be considered a cycling city (the answer 'entirely agree' is filled out the least often).

A city with mixed land use

In Figure 16, the views of respondents are shown with regard to whether mixed land use in a city is required or not in order be considered as a cycling city. Thirty-eight percent of the respondents agree that a city with mixed land use is required in order to be considered as a cycling city (the answer 'agree' is filled out most often by respondents). The smallest share of respondents (9%) reported that they entirely agree that a city with mixed land use is required in order to be considered as a cycling city.

Fig. 16 - Answers given on whether the following urban design is needed in a city in order to be considered as a [cycling] city according to respondents

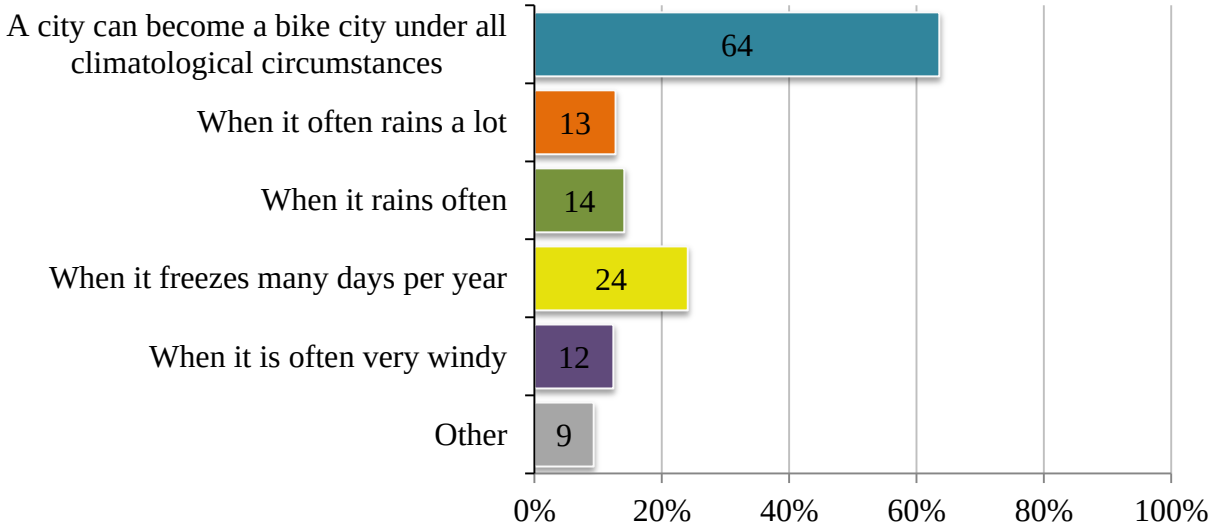


- **Climatological circumstances**

Climate in a city

In Figure 17, the answers provided on the question 'Under which climatological circumstances is it impossible for a city to become a bike city?' by respondents are shown. According to 64% of the respondents, a city can become a cycling city under all climatological circumstances. The answer category least often filled out is 'other'. In this answer category, more than 10 respondents filled out that a city cannot become a cycling city when it is too warm (e.g. more than 30 degrees Celsius).

Fig. 17 - Answers given by respondents on the question 'Under which climatological circumstances is it impossible for a city to become a [cycling] city?' (multiple answers possible)

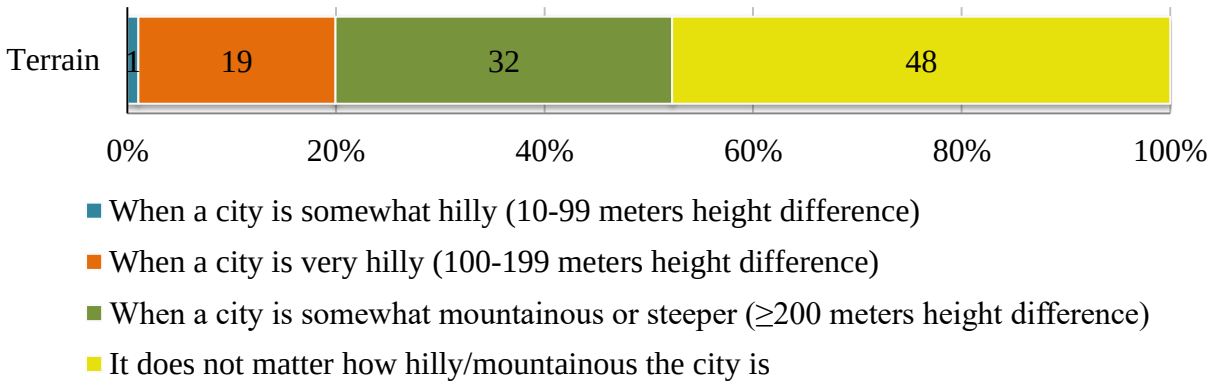


- **Terrain**

Difference in altitude in a city

It was examined whether the difference in altitude in a city is a barrier towards becoming a cycling city according to respondents. In Figure 18, it is displayed that nearly half of the respondents (48%) reported that the difference in altitude in a city does not make it impossible for a city to become a cycling city (the answer category 'it does not matter how hilly/mountainous the city is' was filled out most often). The smallest share of the respondents (1%) filled out that a city which is somewhat hilly (10-99 height difference) cannot become a cycling city.

Fig. 18 - Difference in altitude in a city which makes it impossible for a city to become a [cycling] city according to respondents



4.1.3.2 Socio-cultural conditions

Figure 19 displays the perspectives of respondents on whether various socio-cultural aspects are needed in order to be considered as a cycling city or not by them.

- **Religion**

Religious city dwellers

Through conducting the survey, it was tested whether not a city which is not religious is perceived as a criterion in order to be considered a cycling city by them. In Figure 19, it is shown that 67% of the respondents entirely disagree with the statement that a city needs to be not religious in order to be considered as a cycling city. The least respondents (1%) reported that they 'entirely agree' with this statement.

- **Nationality**

Western society

In Figure 19, the survey answers are displayed concerning whether or not mostly Western people need to live in a city in order to be considered as a cycling city by respondents. The majority of the respondents (56%) entirely disagree with the statement that mostly Western people should live in a city in order to be considered a cycling city. Three percent of the city dwellers entirely agree that mostly Western people should live in the city to be considered a cycling city (this answer is filled out by the smallest share of respondents).

- **Political preferences**

Voters for political parties

It was examined whether a city needs to have a mostly left-wing City Council in order to be considered as a cycling city. As shown in Figure 19, 52% of the respondents entirely disagree with the statement that a city needs to have a mostly left-wing City Council in order to be considered a cycling city. The least respondents (1%) filled out that they entirely agree with this statement.

- **Image**

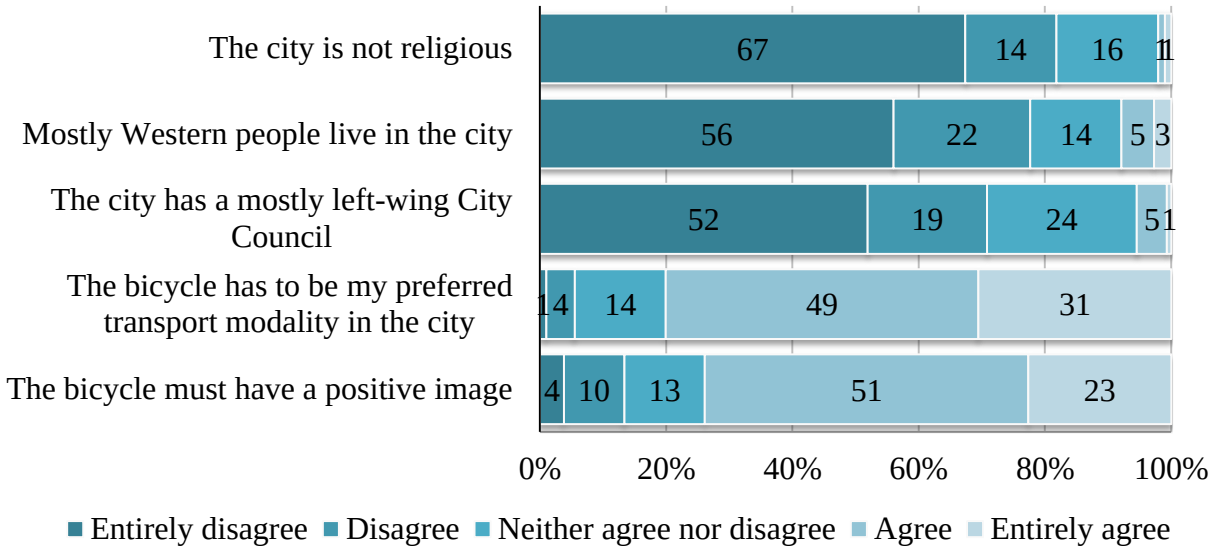
Preference of using the bicycle

It was tested whether the bicycle needs to be the preferred transport modality of respondents in the city. As shown in Figure 19, nearly half of the respondents (49%) agree with the statement that "the bicycle has to be my preferred transport modality in the city" in order to be considered as a cycling city (the answer 'agree' was filled out the most). The smallest share of the respondents (1%) filled out that they entirely disagree with this statement.

Positive image of the bicycle

In the survey, the statement was included that the bicycle must have a positive image (e.g. the bike is perceived as athletic and environmentally friendly in general) in order to be considered a cycling city. In Figure 19, it is displayed that a small majority of the respondents (51%) agree that the bicycle must have a positive image to be considered a cycling city. The least respondents (4%) filled out that they entirely disagree with the statement that the bicycle must have a positive image in order to be considered as a cycling city.

Fig. 19 - Answers provided by respondents on the statement 'A city needs to comply with the following socio-cultural conditions in order to be considered as a [cycling] city'



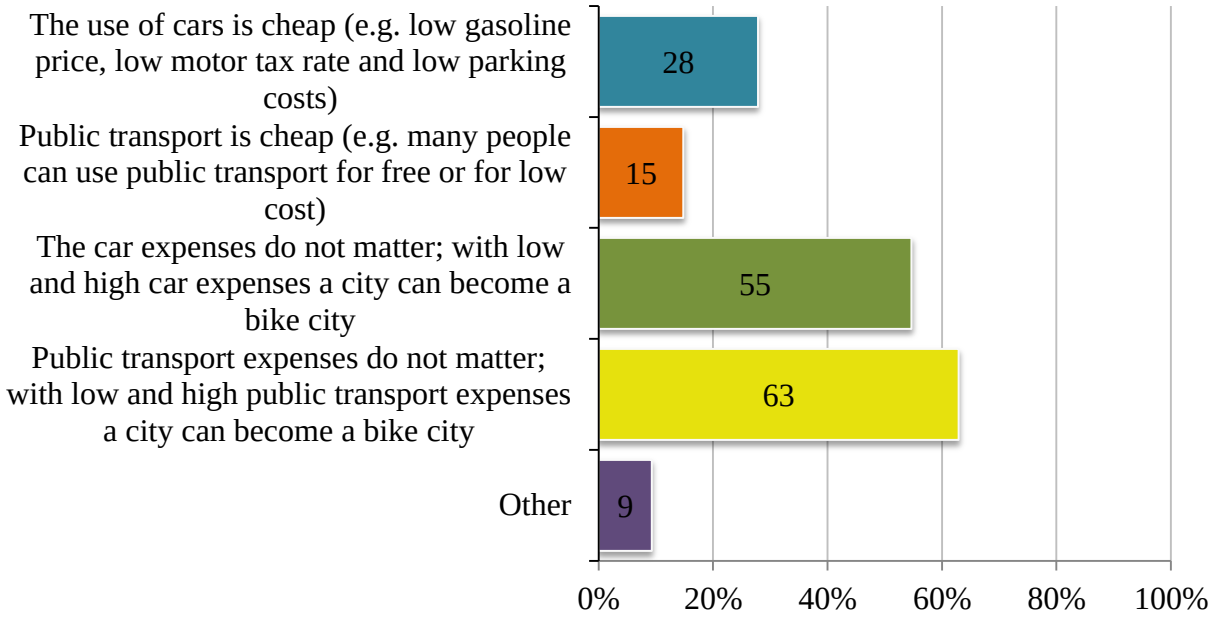
4.1.3.3 Economic conditions

- **Transportation costs**

Costs of motorized transport modes

In Figure 20, the survey results are displayed concerning whether low costs for the car and/or public transport are perceived as (a) barrier(s) in order to become a cycling city or not. The results show that 63% of the respondents reported that a city can become a cycling city with low and high public transport expenses. The majority of the respondents also filled out that a city can become a cycling city with low and high car expenses (55%). The smallest share of the respondents filled out their own answer in the answer category 'other'. In this category, more than 10 respondents mentioned that the costs for the car and/or public transport do not prevent a city from becoming a cycling city.

Fig. 20 - With the following costs for the car and/or public transport a city cannot become a [cycling] city according to respondents (multiple answers possible)

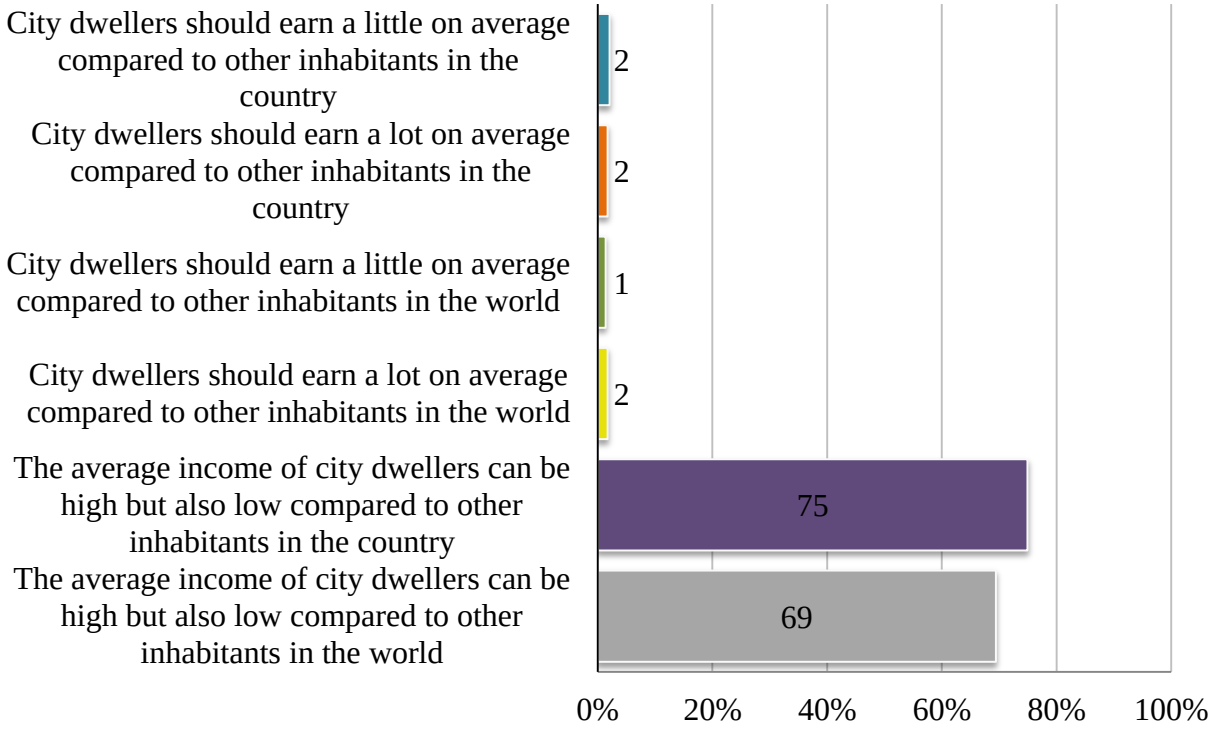


- **Income**

Income of city dwellers

In the survey, it was asked what the average income of city dwellers must be in order to become a [cycling] city. In Figure 21, it is shown that the vast majority of respondents (75%) filled out that the average income of city dwellers can be high but also low compared to other inhabitants in the country in order to become a cycling city. Sixty-nine percent of the respondents reported that the average income of city dwellers can be high but also low compared to other inhabitants in the world. A few respondents (1%) reported that city dwellers should earn a little on average compared to other inhabitants of the world in order to become a cycling city (this answer was reported the least often by respondents).

Fig. 21 - Answers given by respondents on the question 'What must be the average income of city dwellers in order to become a [cycling] city?' (multiple answers possible)



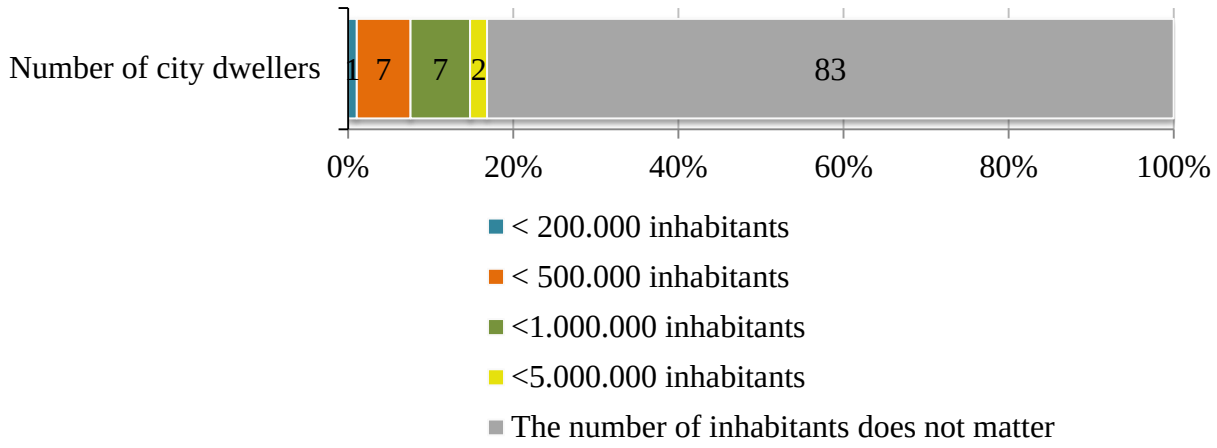
4.1.3.4 Demographic conditions

- **Population size**

Number of city dwellers

Through conducting the survey, it is tested, among others, whether the number of inhabitants in a city is a barrier toward becoming a [cycling] city according to respondents. As shown in Figure 22, 83% of the respondents answered that a city can become a cycling city with a high and low number of city dwellers (the number of inhabitants in a city does not matter). The smallest share of the respondents answered that a city with less than 200.000 inhabitants can only become a cycling city.

Fig. 22 - A city with the following number of inhabitants can only become a [cycling] city according to respondents

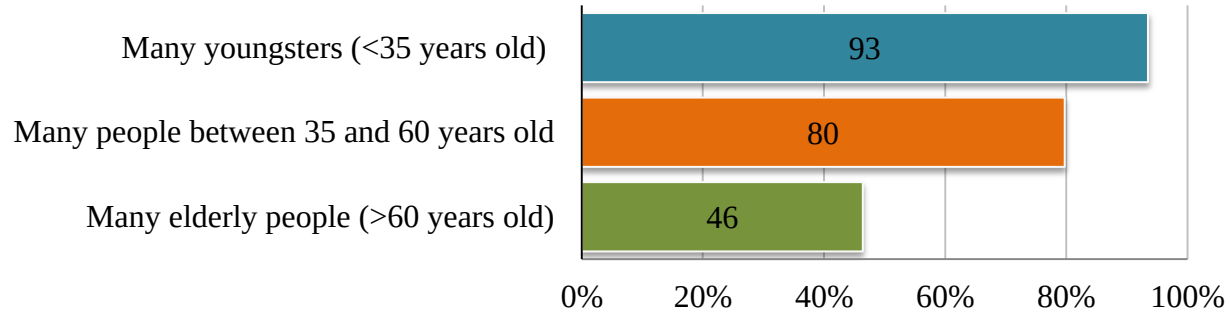


- **Age**

Age structure of city dwellers

In Figure 23, the survey results on the statement 'A city with the following age structure can become a [cycling] city' are displayed. According to almost all respondents (93%), a city with many youngsters (<35 years old) can become a cycling city. A city with many people between 35 and 60 years old can also become a cycling city according to a vast majority of the survey respondents (80%). Slightly less than half of the respondents (46%) reported that a city with many elderly people (>60 years old) can become a cycling city.

Fig. 23 - Answers given by respondents on the statement 'A city with the following age structure can become a [cycling] city' (multiple answers possible)



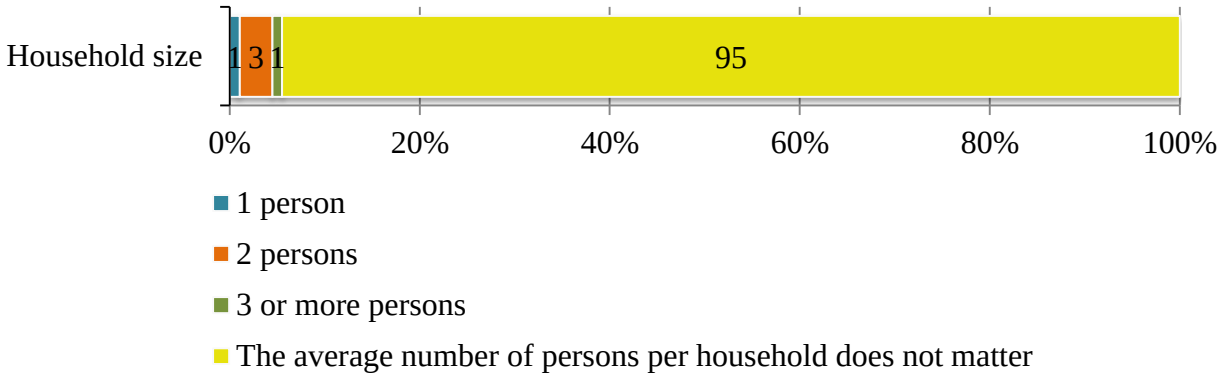
- **Household size**

Average number of persons per household in a city

It was examined whether the average household size in a city matters in order to become a cycling city or not in the survey. According to a vast majority of the respondents (95%), the average number of persons per household in a city does not have an influence on whether a city

can become a cycling city or not. The smallest share of the respondents provided the answer that a city with 1 person per household on average can become a cycling city (this answer was filled out by 1% of the respondents). Moreover, 1% of the respondents filled out that a city with 3 or more persons can become a cycling city (see Figure 24).

Fig. 24 - A city with the following average number of persons per household can become a cycling city according to respondents



4.1.3.5 Socio-safety conditions

- **Bicycle theft**

Occurrence of bicycle theft

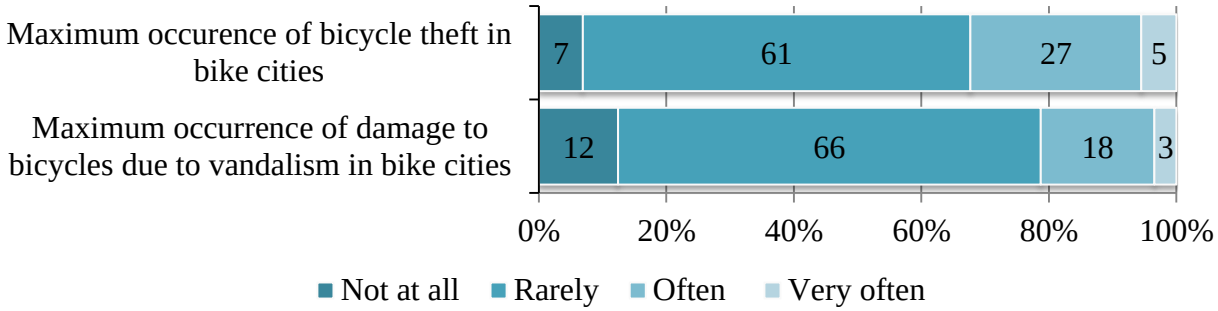
It was tested how often bicycle theft may, at most, occur in cycling cities. According to the majority of the respondents (66%), bicycle theft may, at most, rarely occur in cycling cities. The least respondents (5%) filled out that bicycle theft may, at most, very often occur in cycling cities (see Figure 25).

- **Vandalism**

Occurrence of damage to bicycles

In Figure 25, the maximum occurrence of damage to bicycles due to vandalism in cycling cities according to respondents is displayed. According to 66% of the respondents, damage to bicycles due to vandalism may, at most, occur rarely in cycling cities. The smallest number of respondents (3%) filled out that damage to bicycles due to vandalism may, at most, very often occur in cycling cities.

Fig. 25 - Answers provided by respondents on the question 'How often may the following [socio-]safety situations, at most, occur in [cycling] cities?'



4.2 Focus group results

The focus group results are described through making use of codes. These codes were assigned to the transcripts of the focus group discussions in Amsterdam, Groningen and Geneva. Each code is related to the general description of a cycling[16] city, to the conditions to be considered a cycling city or to the measures in order to become a cycling city. In paragraph 4.2.1, the codes related to the general description of a cycling city are described, as well as the frequencies of assignment of these codes to the transcript. In paragraph 4.2.2, the codes related to the conditions to be considered a cycling city are mentioned. Moreover, it is described how often these codes are assigned to the transcript. In paragraph 4.2.3, the codes related to the measures in order to become a cycling city and the frequencies of assignment of these codes to the transcript are described.

4.2.1 General description of a cycling city

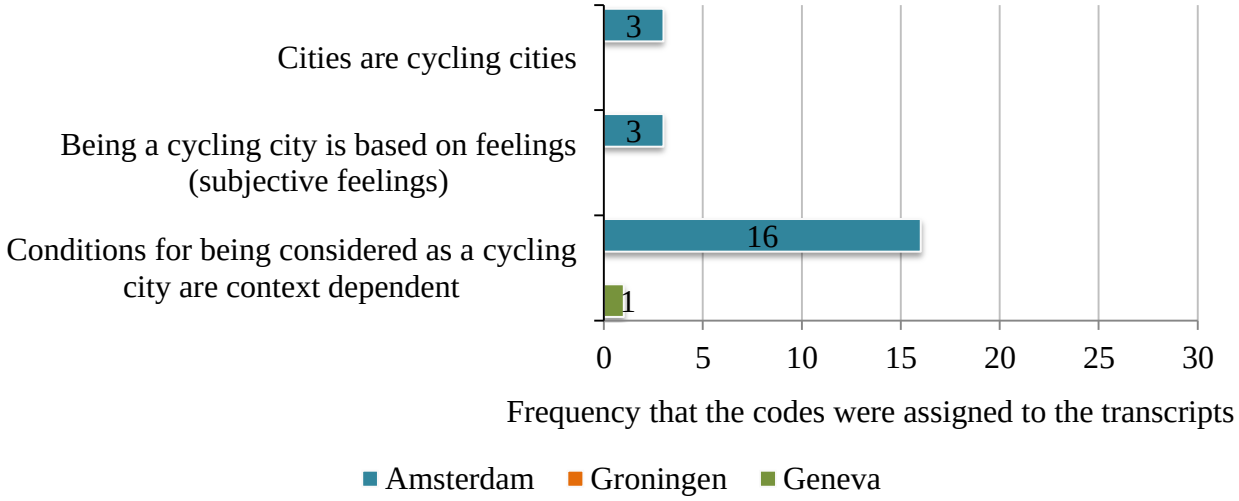
- **Is a city a cycling city or not?**

In two focus groups, it was discussed which cities are cycling cities and which critical notes can be made on the conditions (required or barriers) in order to consider a city as a cycling city. During the focus group discussions in Amsterdam and Geneva, a few respondents mentioned a couple of cities which are cycling cities according to them. As shown in Figure 26, the code 'cities are cycling cities' was 3 times assigned to the transcript of the focus group discussion in Amsterdam and 1 time assigned to the transcript of the focus group discussion in Geneva. The focus group participants in Amsterdam also discussed whether considering a city as a cycling city is based on objective criteria or on feelings (subjective perceptions); the code linked to this discussion is 'being a cycling city is based on feelings (subjective perceptions)' and this code was 3 times assigned to the transcript of the focus group discussion in Amsterdam. In the focus groups Amsterdam and in Geneva, it was discussed whether the conditions in order to consider

[16] Throughout paragraph 4.2, the word bike city is changed into the word cycling city (in the focus group discussions, the word bike city instead of cycling city was used)

city A as a cycling city differ from the conditions in order to consider city B as a cycling city due to spatial circumstances and the culture in a city among others (i.e. whether the conditions to be perceived as a cycling city are context dependent). The code 'conditions for being considered as a cycling city are context dependent' was 16 times assigned to the transcript of the focus group discussion in Amsterdam and 1 time to the transcript of the focus group discussion in Geneva.

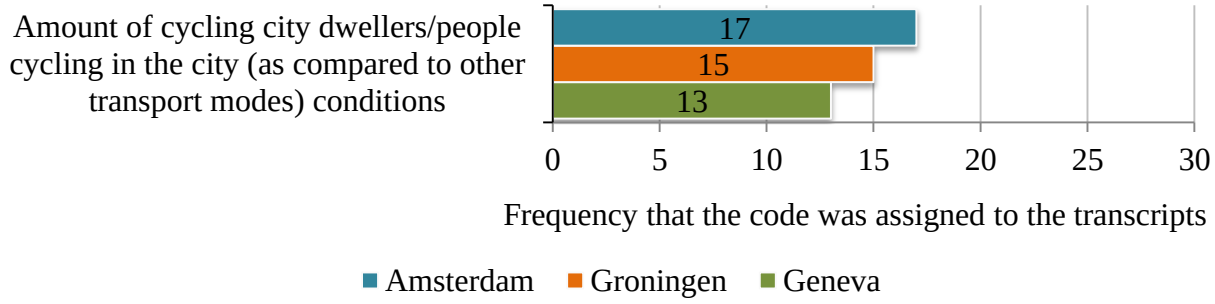
Fig. 26 – Frequency that the codes related to whether a city is perceived as a cycling city were assigned to the transcripts, by focus group discussion



- **Amount of cycling city dwellers/people cycling in the city**

Participants of the focus groups in Amsterdam, Groningen and Geneva discussed the issue "the amount of cycling city dwellers/people cycling in the city which is needed in order to be considered as a cycling city" according to them. As shown in Figure 27, the code 'amount of cycling city dwellers/people cycling in the city (as compared to other transport modes) conditions' was 17 times assigned to the transcript of the focus group discussion in Amsterdam and 15 times to the transcript of the focus group discussion in Groningen. This code was slightly less often assigned to the transcript of the focus group discussion in Geneva; 13 times in total. The code refers to the visibility of cyclists in the city, to the percentage of people cycling in the city (as compared to the percentage of people using other modes of transportation) and to the percentage of cycling city dwellers among others.

Fig. 27 - Frequency that the code 'amount of cycling city dwellers/people cycling in the city (as compared to other transport modes)' was assigned to the transcripts, by focus group discussion



4.2.2 Conditions to be perceived as a cycling city

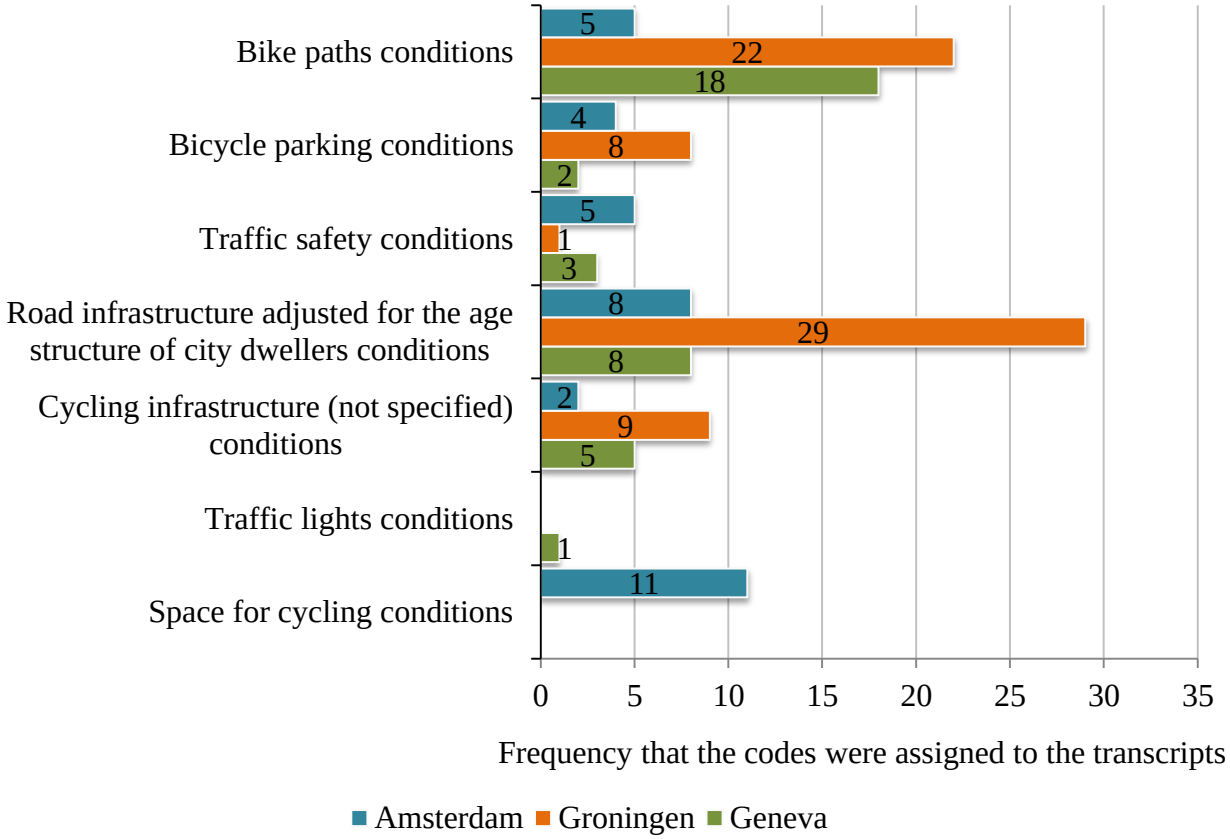
In the focus groups in Amsterdam, Groningen and Geneva, various spatial conditions, socio-cultural conditions, economic conditions and demographic conditions (required or barriers) in order to be considered as a cycling city were discussed. Socio-safety conditions were not addressed in the focus group discussions. In this subparagraph, the structure of the theoretical framework has been used to discuss all topics mentioned in the focus group discussions. Additional topics mentioned in the focus group discussions - which were not taken into account in the theoretical framework - have been added to this paragraph.

4.2.2.1 Spatial-time conditions

- **Road infrastructure**

In the focus group discussions, the conditions (required or barriers) with regard to the road infrastructure to be perceived as a cycling city were widely discussed. Codes which fall under the road infrastructure conditions (required or barriers) to be perceived as a cycling city were 133 times assigned to the transcripts in total (Figure 28). As shown in Figure 28, the code 'bike paths conditions' (e.g. bike lanes and an entirely connected network of bike paths) and the code 'road infrastructure adjusted for the age structure of city dwellers conditions' (for instance, shared spaces for city dwellers who are relatively young) were among the codes with regard to the road infrastructure most often assigned to the transcripts. The code 'space for cycling conditions' refers to the space that cyclists need (of the total traffic space) in the city in order to be considered a cycling city. This code was most often assigned to the transcript of the focus group discussion in Amsterdam relative to the other codes related to the road infrastructure. In the transcript of the focus group discussion in Groningen, the code 'road infrastructure adjusted for the age structure of city dwellers conditions' was most often assigned to the transcript. In the transcript of the focus group discussion in Geneva, the code 'bike paths conditions' was most often assigned to the transcript compared to the other road infrastructure codes which were assigned to the transcripts.

Fig. 28 - Frequency that the codes were assigned to the transcripts which fall under the conditions (required or barriers) related to the road infrastructure in order to be considered as a cycling city, by focus group discussion



- **Bicycle related services**

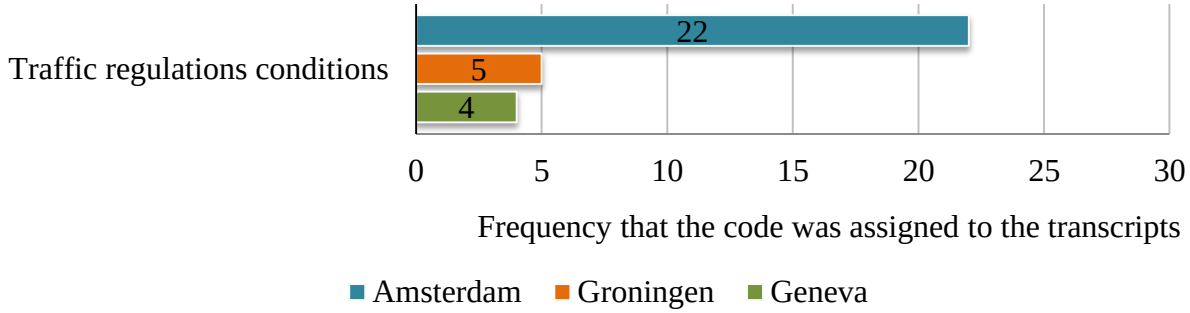
During the focus group in Amsterdam, there was a discussion about whether bicycle repair shops are required in order to be considered as a cycling city. The code 'bicycle repair shops conditions' was 2 times assigned to the transcript of the focus group discussion in Amsterdam. This code was not assigned to the transcripts of the focus group discussions in Groningen and Geneva. Other bicycle related services which are perhaps perceived as required in order to be considered as a cycling city were not mentioned in the focus group discussions.

- **Traffic regulations**

The conditions (required or barriers) with regard to the traffic regulations in order to be considered a cycling city – e.g. regulations about who can ride/drive on bike paths - were discussed in all focus groups. In Figure 29, it is displayed that the code 'traffic regulations conditions' was 22 times assigned to the transcript of the focus group discussion conducted in

Amsterdam. In the transcripts of the focus group discussions held in Groningen and Geneva, this code was assigned to the texts 5 times and 4 times respectively.

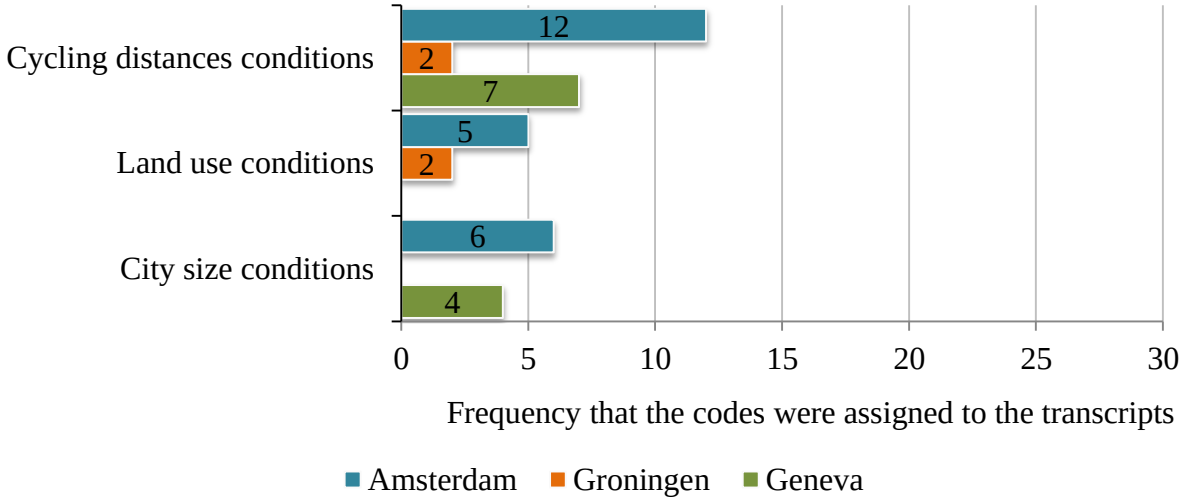
Fig. 29 - Frequency that the code 'traffic regulations conditions' was assigned to the transcripts, by focus group discussion



- **Urban design**

In the focus group discussions, data were collected about the conditions (required or barriers) related to urban design in order to be considered or to become a cycling city; that is, about cycling distance, land use and city size. In Figure 30, the codes assigned to the transcripts which are related to the urban design conditions in order to be considered or to become a cycling city are displayed. The code 'cycling distances conditions' refers to the type of facilities which should be reached within biking distance in order to become a cycling city. This code is most often assigned to the transcript of the focus group discussion in Amsterdam compared to the times this code has been assigned to the other transcripts. The codes 'land use conditions' (e.g. nature and buildings in the city) and 'city size conditions' (for instance, small and big cities) were less often assigned to the transcripts than the code 'cycling distances conditions'; in total, the code 'land use conditions' was 7 times assigned to the transcripts, 'city size conditions' was 10 times assigned to the transcripts, while 'cycling distances conditions' was 21 times assigned to the transcripts. During the focus group discussion in Geneva, land use was not mentioned as a condition to be considered as a cycling city. During the focus group discussion conducted in Groningen, the conditions (required or barriers) with regard to the city size in order to be considered a cycling city were not mentioned.

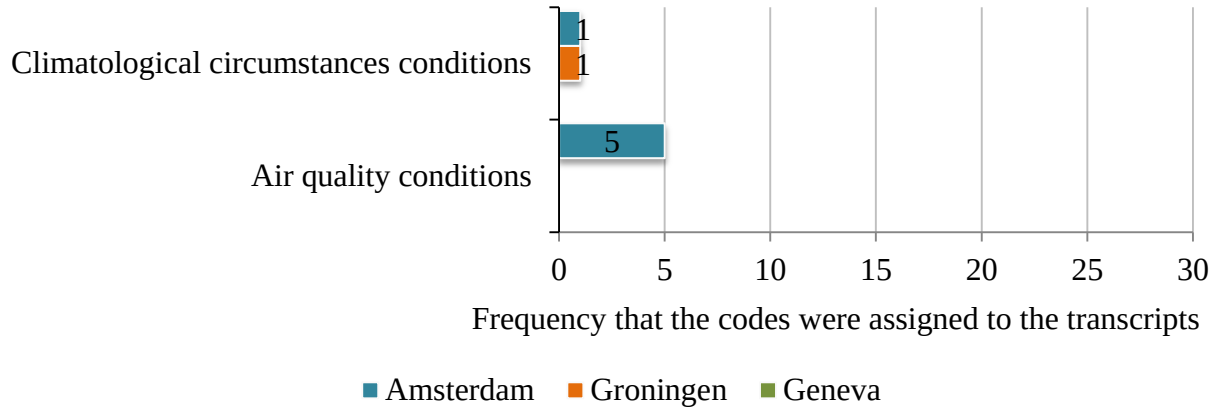
Fig. 30 - Frequency that the codes were assigned to the transcripts which fall under the conditions (required or barriers) related to urban design in order to be considered as a cycling city, by focus group discussion



- **Climatological circumstances and air quality**

During the focus group discussions in Amsterdam and Groningen, the conditions related to the climatological circumstances (required or barriers) in order to be considered as a cycling city were mentioned a few times. As displayed in Figure 31, the code ‘climatological circumstances conditions’ (e.g. rainfall) was 2 times assigned to the transcripts. The conditions (required or barriers) related to the air quality in order to be considered as a cycling city were only discussed in the focus group discussion in Amsterdam. The code ‘air quality conditions’ (for instance, clean air) was 5 times assigned to the transcript of this focus group discussion.

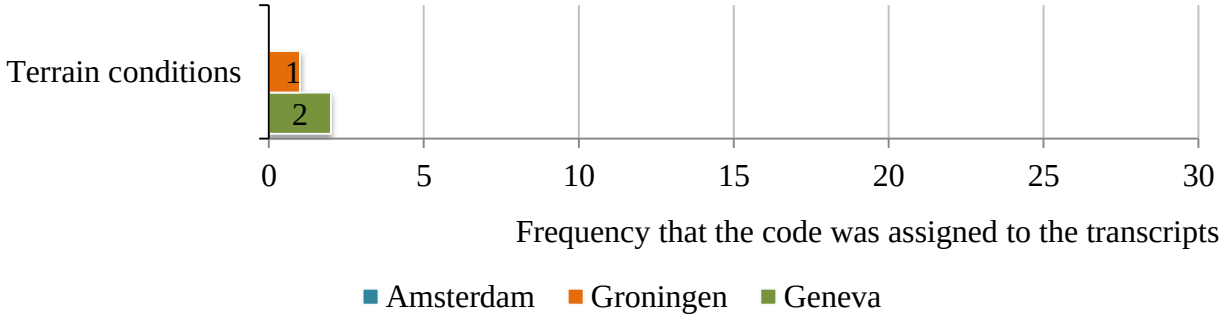
Fig. 31 – Frequency that the codes ‘climatological circumstances conditions’ and ‘air quality conditions’ were assigned to the transcripts, by focus group discussion



- **Terrain**

During the focus group discussions, there was to a very limited extent discussion about the terrain conditions (required or barriers) in order to be considered as a cycling city. As shown in Figure 32, the code 'terrain conditions' (for instance, a flat terrain) was 3 times assigned to the transcripts (1 time to the transcript of the focus group discussion in Groningen and two times to the transcript of the focus group discussion in Geneva).

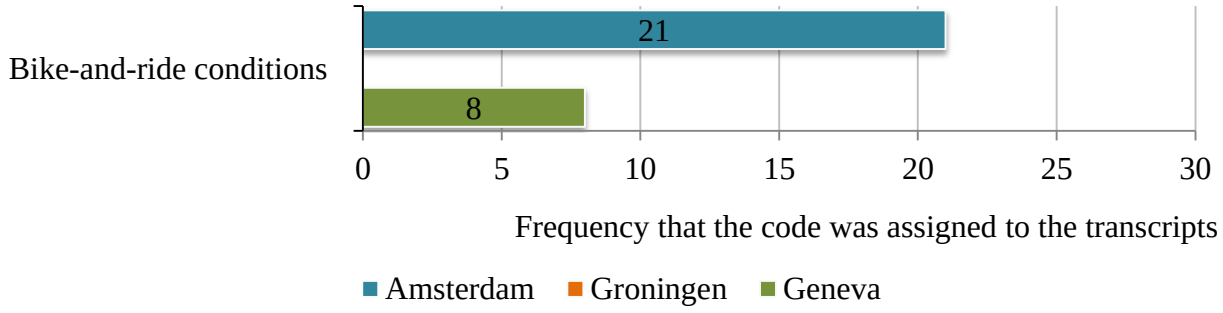
Fig. 32 - Frequency that the code 'terrain conditions' was assigned to the transcripts, by focus group discussion



- **Bike-transit integration**

In relation to the city size, it was discussed in the focus groups in Amsterdam and Geneva whether bike-transit integration (e.g. binging the bicycle in the train) is needed in order to be considered as a cycling city. As shown in Figure 33, the code 'bike-and-ride conditions' was 29 times assigned to the transcripts in total; 21 times to the transcript of the focus group in Amsterdam and 8 times to the transcript of the focus group discussion in Geneva.

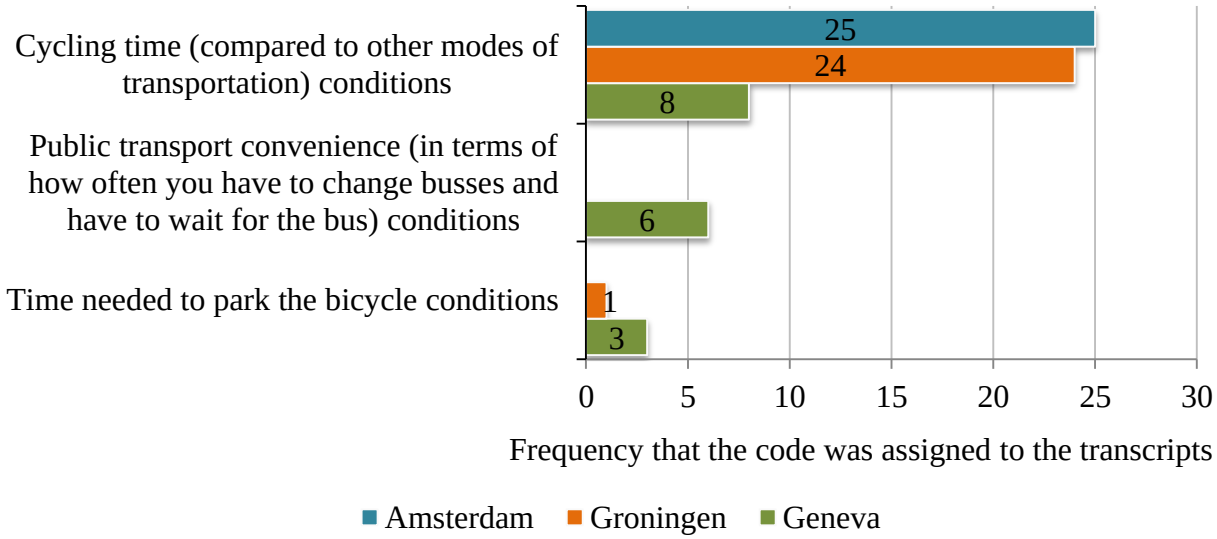
Fig. 33 - Frequency that the code 'bike-and-ride conditions' was assigned to the transcripts, by focus group discussion



- **Travel time by bicycle (as compared to other modes of transport)**

In the focus groups, the following conditions in order to be considered a cycling city were discussed: cycling time (compared to other modes of transportation), public transport convenience (in terms of how often you have to change busses and have to wait for the bus) and how long it takes to park the bicycle in the city. The topic cycling time needed to travel by bicycle from place A to B in a city (as compared to other modes of transport) has been discussed in all focus groups as a condition to be considered a cycling city. As shown in Figure 34, the code 'cycling time (compared to other modes of transportation) conditions' was assigned to the transcripts of the focus group discussions in Amsterdam, Groningen and Geneva 25 times, 24 times and 8 times respectively. The code 'public transport convenience (in terms of how often you have to wait for the bus and have to change busses) conditions' was only assigned to the transcript of the focus group discussion in Geneva (this code was 6 times assigned to the transcript). The code 'time needed to park the bicycle conditions' was one time assigned to the transcript of the focus group discussion in Groningen and 6 times to the transcript of the focus group discussion in Geneva.

Fig. 34 – Frequency that the code terrain condition was assigned to the transcripts, by focus group discussion



4.2.2.2 Socio-cultural conditions

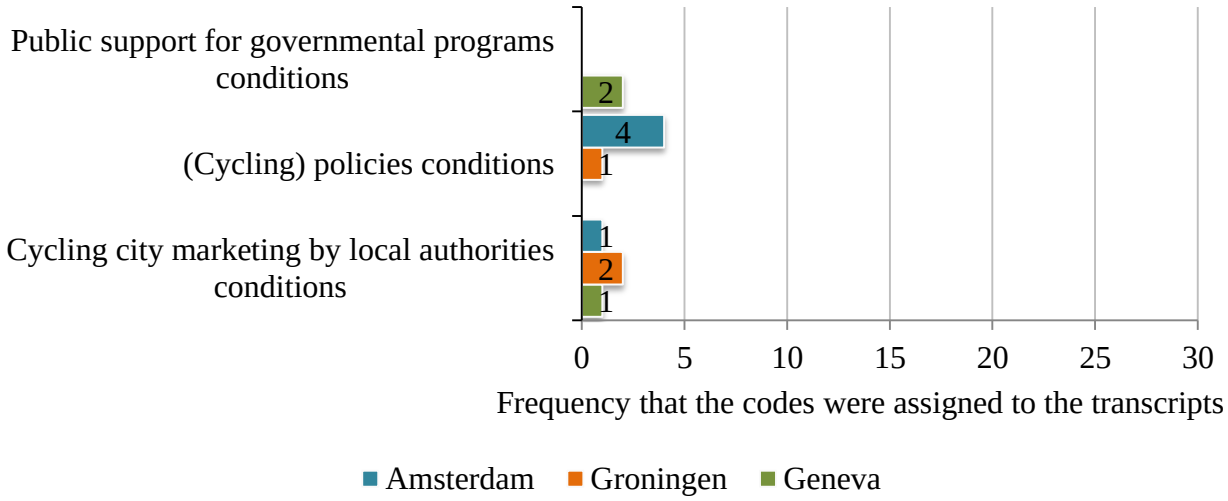
- **Religion**

The effect of religion on being considered a cycling city was only mentioned in the focus group discussion in Groningen. The code 'religion conditions' - which refers to Muslims - was one time assigned to the transcript of the focus group discussion in Groningen.

- **Politics**

During the focus group discussion in Geneva, a few participants gave their view on whether public support for any governmental programs in general is needed in order to consider a city as a cycling city. As shown in Figure 35, the code 'public support for governmental programs conditions' was 2 times assigned to the transcript of the focus group discussion conducted in Geneva. This code was not assigned to the other transcripts. During the focus group discussions in Amsterdam and Groningen, the kind of (cycling) policies required in order to be considered as a cycling city were briefly mentioned; the code '(cycling) policies conditions' was 4 times assigned to the transcript of the focus group discussion in Amsterdam and 1 time to the transcript of the focus group discussion in Groningen. Besides, the topic cycling city marketing by local authorities (i.e. promoting a city as a cycling city) in relation to considering a city as a cycling city was to a very limited extent discussed all focus group discussions. The code 'cycling city marketing by local authorities conditions' was one or two times assigned to each of the transcripts of the focus group discussions in Amsterdam, Groningen and Geneva.

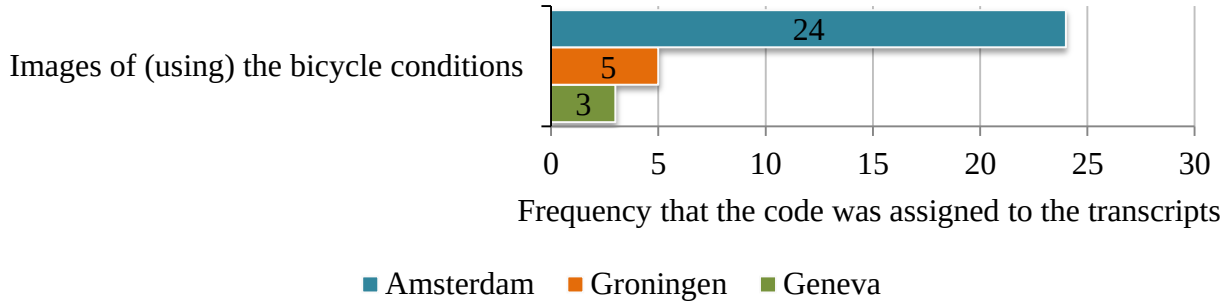
Fig. 35 – Frequency that codes which fall under politics were assigned to the transcripts, by focus group discussion



- **Image**

The images of (using) of the bicycle (e.g. cycling is healthy, cycling is for people who are poor, cycling is nice) as conditions (required or barriers) to be considered as a cycling city were mentioned in all focus group discussions. In Figure 36, it is displayed that the code 'images of (using) the bicycle conditions' was most often assigned to the transcript of the focus group conducted in Amsterdam (24 times in total). This code was 5 times assigned to the transcript of the focus group discussion in Groningen and 3 times assigned to the transcript of the focus group discussion in Geneva.

Fig. 36 - Frequency that code 'images of (using) the bicycle conditions' was assigned to the transcripts, by focus group discussion



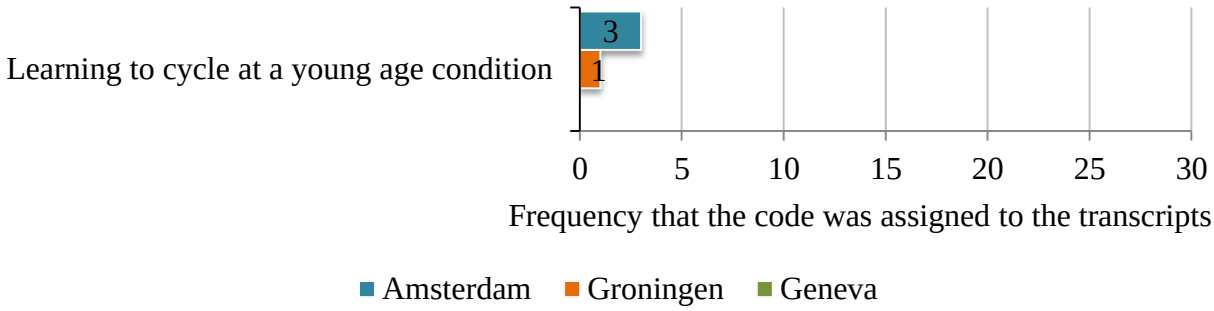
- **Social norms**

The conditions (required or barriers) with regard to social norms in order to be considered as a cycling city – i.e. cycling is considered as a normal transport mode - were discussed in the focus group in Groningen. The code 'social norms conditions' was only one time assigned to the transcript of the focus group discussion in Groningen.

- **Cycling experience**

In the focus group discussion in Amsterdam and Groningen, participants talked about the relevance of learning to cycle at a young age as a cultural item in order to be considered as a cycling city. However, this topic was mainly discussed in relation to the age of city dwellers. As shown in Figure 37, the code 'learning to cycle at a young age condition' was assigned to the transcript of the focus group discussion in Amsterdam 3 times and 1 time to the transcript of the focus group discussion in Groningen.

Fig. 37 - Frequency that code 'learning to cycle at a young age condition' was assigned to the transcripts, by focus group discussion

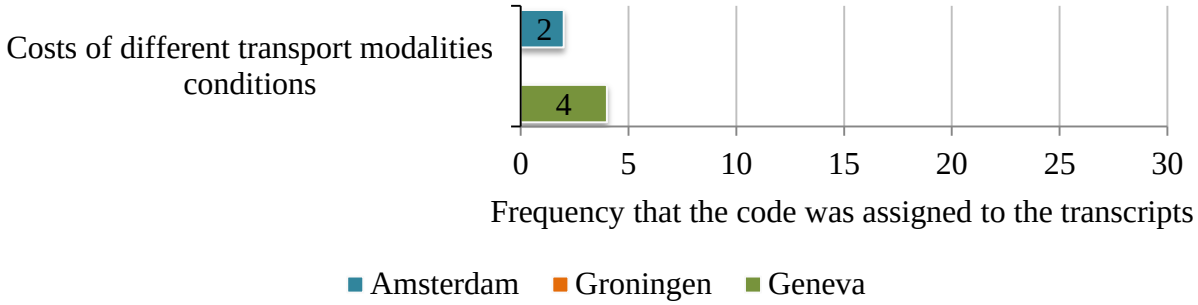


4.2.2.3 Economic conditions

- **Transportation costs**

In the focus group discussions in Amsterdam and Geneva, the costs of the bike, car and/or public transport as conditions (required or barriers) in order to consider a city as a cycling city were mentioned to a limited extent. In Figure 38, it is displayed that the code 'costs of different transport modalities conditions' was 2 times assigned to the transcript of the focus group discussion in Amsterdam and 4 times assigned to the transcript of the focus group discussion in Geneva.

Fig. 38 - Frequency that code 'costs of different transport modalities conditions' was assigned to the transcripts, by focus group discussion



4.2.2.4 Demographic conditions

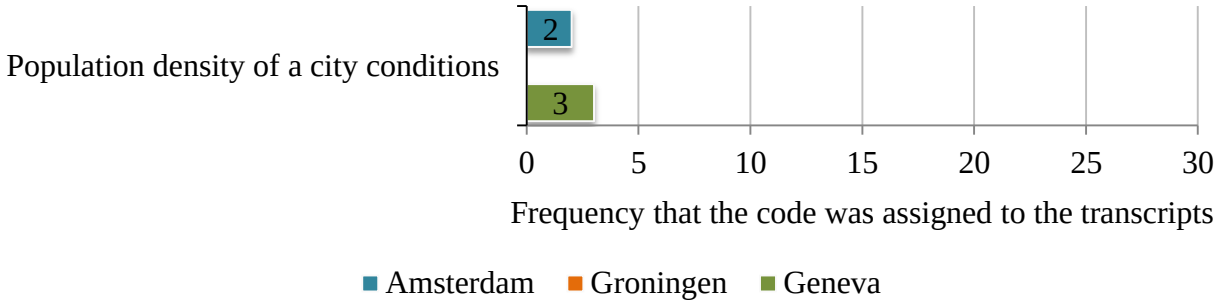
- **Age**

In the focus group discussion in Amsterdam, the influence of the age of city dwellers (whether a large share is a student or retired) on being considered a cycling city was mentioned. The code 'age structure of city dwellers conditions' was 11 times assigned to the transcript of this focus group discussion. Yet, this topic was not discussed in the focus groups in Groningen and Geneva.

- **Population density**

In Amsterdam and in Geneva, participants of the focus group discussions talked about the population density of a city which is required according to them in order to be considered as a cycling city. As shown in Figure 39, the code 'population density of a city conditions' (e.g. a city with a high population density) was two times assigned to the transcript of the focus group discussion in Amsterdam and 3 times assigned to the transcript of the focus group discussion in Geneva.

Fig. 39 - Frequency that the code 'population density of a city conditions' was assigned to the transcripts, by focus group discussion



4.2.3 Measures proposed in order to become a cycling city

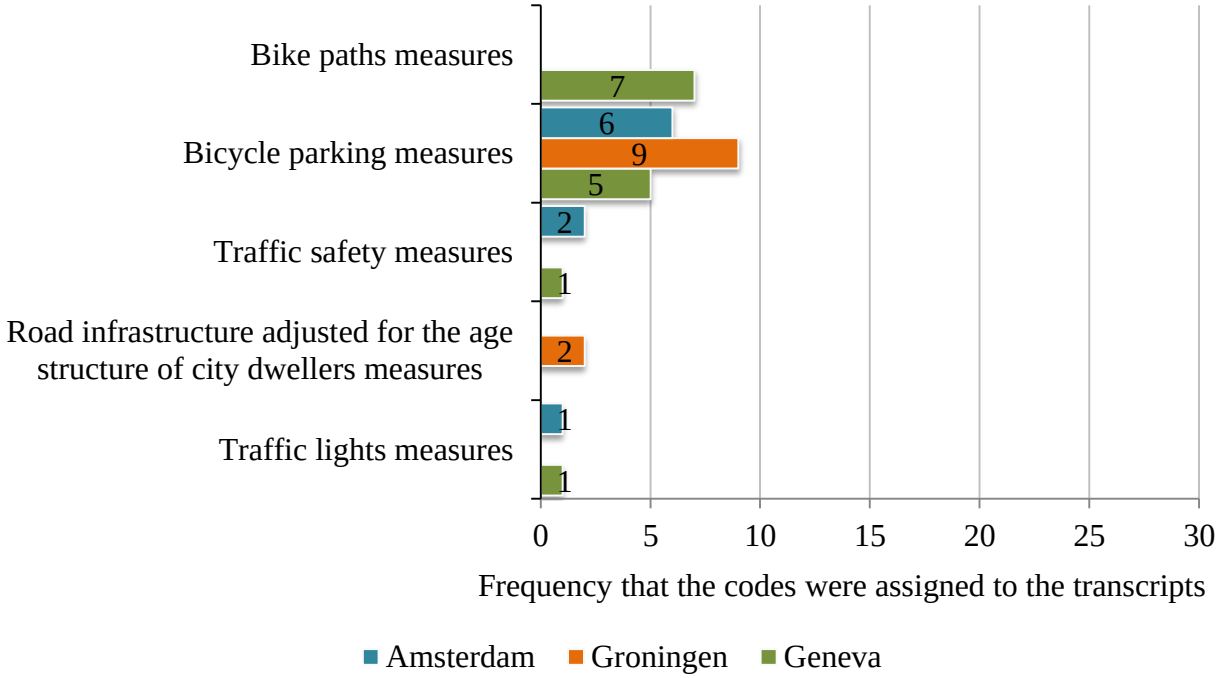
During the focus group discussions in Amsterdam, Groningen and Geneva, measures were proposed to be taken in order to become a cycling city. These are spatial measures, socio-cultural measures, economic measures and socio-safety measures. Demographic measures were not mentioned in the focus group discussions by participants. In this subparagraph, the structure of the theoretical framework has been applied to describe the codes which fall under these measures.

4.2.3.1 Spatial measures

- **Road infrastructure**

In the focus group discussions in Amsterdam, Groningen and Geneva, several measures with regard to the road infrastructure which should be taken or which are suggested to be taken in order to become a cycling city were mentioned. As displayed in Figure 40, various codes which refer to these measures were assigned to the transcripts of the focus group discussions. The code 'bicycle parking measures' (e.g. bicycle parking spaces with only markings) was most often assigned to the transcripts (20 times in total). This code was most often assigned to the transcripts of the focus group discussions in Amsterdam and Groningen, whereas the code 'bike paths measures' (such as wide and continuous bike lanes) was most often assigned to the transcript of the focus group discussion in Geneva of all codes related to the road infrastructure measures which should be taken or are recommended to be taken in order to become a cycling city.

Fig. 40 - Frequency that the codes were assigned to the transcripts which fall under the road infrastructure measures which could or should be taken in order to become a cycling city, by focus group discussion



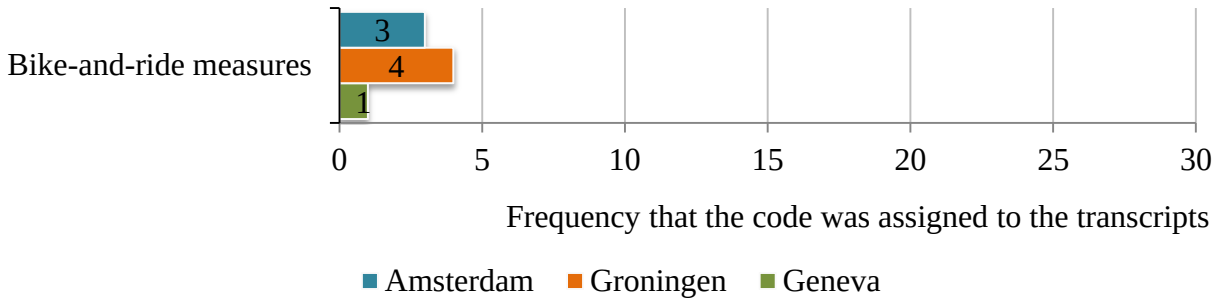
- **Traffic regulations**

Focus group participants did not mention measures with regard to traffic regulations which should be taken in a city in order to become a cycling city, except from one participant in Geneva. The code ‘traffic regulations measures' (e.g. giving bikes priority over cars) was therefore 1 time assigned to the transcript of the focus group discussion in Geneva.

- **Bike-transit integration**

In the focus groups in Amsterdam, Groningen and Geneva, the accommodation of bikes on trains, busses and subways as measures which should be taken in order to become a cycling city were discussed. The code ‘bike-and-ride measures’ was 3 times assigned to the focus group discussion in Amsterdam, 4 times assigned to the focus group discussion in Groningen and 1 time assigned to the focus group discussion in Geneva (Figure 41).

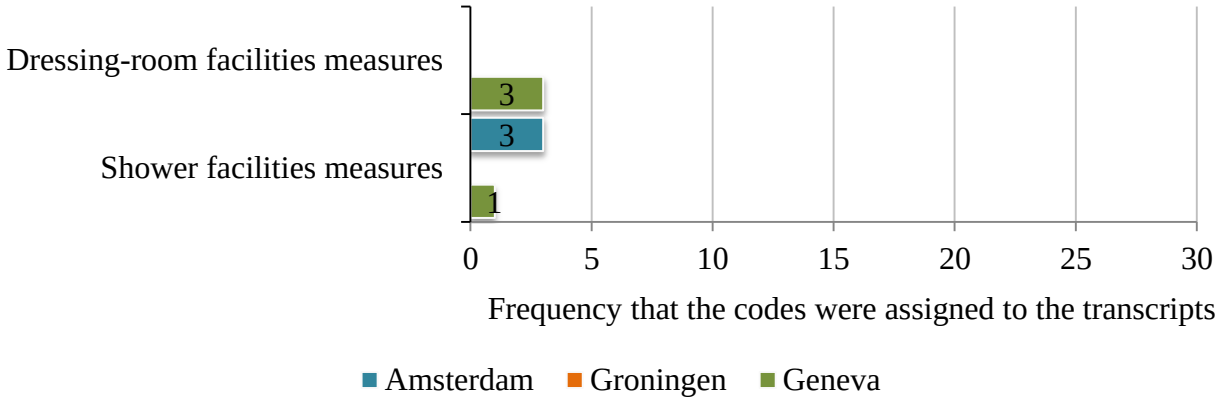
Fig. 41 - Frequency that the code 'bike-and-ride measures' was assigned to the transcripts, by focus group discussion



- **Dressing room and shower facilities**

During the focus groups in Amsterdam, it was discussed whether it is desirable to place dressing room facilities and shower facilities at work or at school in order to become a cycling city. This topic was discussed in relation to changing the image of the bicycle. As displayed in Figure 42, the 'dressing-room facilities measures' code was 1 time assigned to the transcript of the focus group discussion in Amsterdam. The code 'shower facilities measures' was 3 times assigned to the focus group discussion in Amsterdam.

Fig. 42 – Frequency that the codes 'dressing-room facilities measures' and 'shower facilities measures' were assigned to the transcripts, by focus group discussion



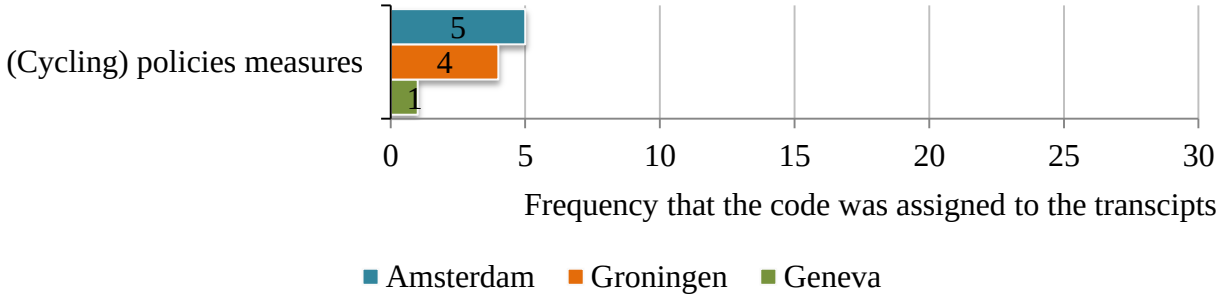
4.2.3.2 Socio-cultural measures

- **Politics**

In all focus group discussions, participants talked about the (cycling) policies which should to be taken in a city in order to become a cycling city (e.g. whether local authorities should apply a bicycle impact assessment to all infrastructure projects). As shown in Figure 43, the topic '(cycling) policies measures' was 5 times assigned to the transcript of the focus group discussion

in Amsterdam, 4 times to the transcript of the focus group discussion in Groningen and one time assigned to the transcript of the focus group discussion in Geneva.

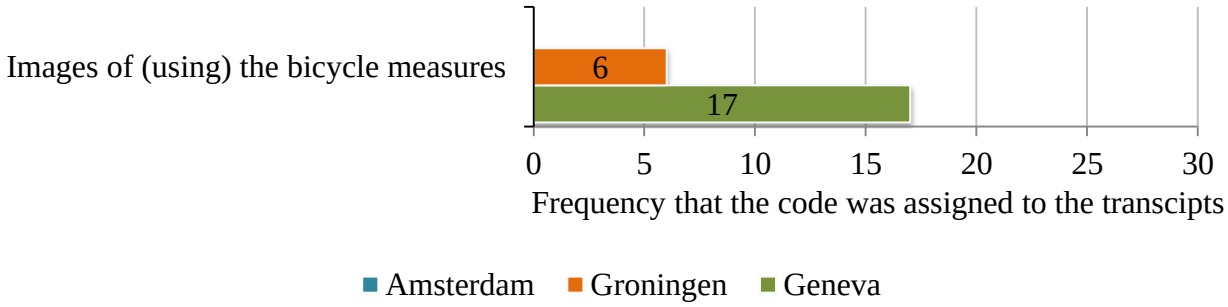
Fig. 43 - Frequency that the code '(cycling) policies measures' was assigned to the transcripts, by focus group discussion



- **Image**

In the focus groups in Groningen and Geneva, measures related to changing the image of (using) the bicycle which should be taken in a city in order to become a cycling city, were discussed. A couple of measures discussed: broadcasting high-society people who are cycling to work and organizing cycling events. The code 'images of (using) the bicycle measures' was 6 times assigned to the transcript of the focus group discussion in Groningen and 17 times assigned to the transcript of the focus group discussion in Geneva (see Figure 44).

Fig. 44 - Frequency that the code 'images of (using) the bicycle measures' was assigned to the transcripts, by focus group discussion



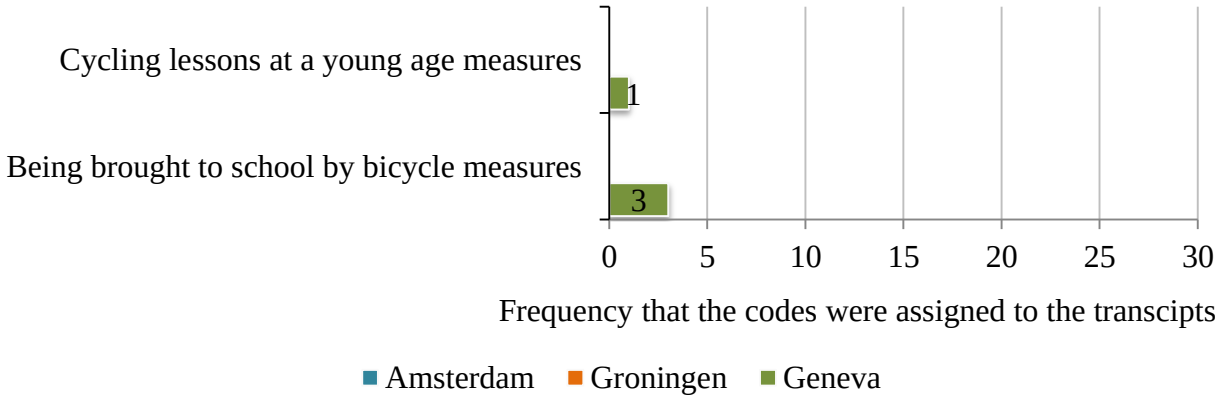
- **Social norms**

In the focus group discussion in Groningen, one participant talked about the measures with regard to changing the social norms towards cycling (i.e. talking positively about cycling to colleagues) which should be taken in a city to become a cycling city. The code 'social norms measures' was one time assigned to the transcript of this focus group discussion.

- **Cycling experience**

Focus group participants in Geneva discussed measures with regard to increasing the cycling experience which should be taken in a city to become a cycling city. The code ‘cycling lessons at a young age measures’ was 3 times assigned to the transcript of the focus group discussion in Geneva and the code ‘being brought to school by bicycle measures’ was 1 time assigned to the same transcript (see Figure 45).

Fig. 45 – Frequency that the codes ‘cycling lessons at a young age measures’ and ‘being brought to school by bicycle measures’ were assigned to the transcripts, by focus group discussion

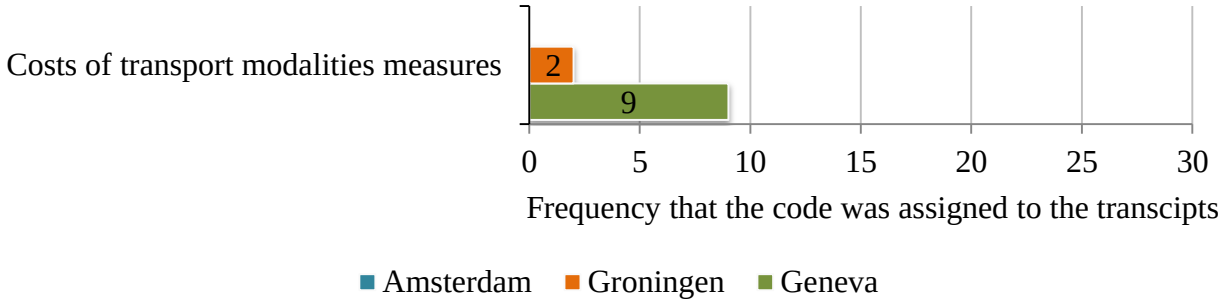


4.2.3.3 Economic measures

- **Transportation costs**

Participants of the focus groups in Groningen and Geneva discussed economic measures which must be carried out in order to become a cycling city. The price of buying and using a car and the price of buying a bicycle were topics focus group participants talked about. The code ‘costs of transport modalities measures’ was 2 times assigned to the transcript of the focus group discussion in Groningen and 9 times assigned to the transcript of the focus group discussion in Geneva (see Figure 46).

Fig. 46 – Frequency that the code 'costs of transport modalities measures' was assigned to the transcripts, by focus group discussion



4.2.3.4 Socio-safety measures

- **Bicycle theft**

In the focus group discussion in Groningen, a socio-safety measure which should be taken in order to become a cycling city was mentioned one time; that is, guarded bike parking. In total, one document segment in the transcript of the focus group discussion in Groningen was coded as 'bicycle theft measures'.

5. Analysis

In the analysis section of this thesis, the survey results and focus group results are combined and analyzed. In paragraph 5.1 the results with regard to the general description of a cycling city are analyzed. In the next paragraph (paragraph 5.2), the spatial, socio-cultural, economic, demographic and socio-safety conditions in order to be considered as a cycling city by respondents and/or focus group participants are described. The relationships between the age, place of residence and travel behavior of respondents and calling Groningen, Amsterdam and Geneva a cycling city or not are described in paragraph 5.3. In paragraph 5.4, it is mentioned which cities have a limited potential to become a cycling city. In the final paragraph (paragraph 5.5), it is described which measures are required or suggested to be taken in order to become a cycling city.

5.1 General description of a cycling city

This paragraph consists of 3 parts: first, the cities which are called cycling cities by respondents and/or focus group respondents are mentioned; second, the amount of people cycling in the city in order to be considered as a cycling city by respondents and/or focus group participants is reported; and third, the quality of cycling in a city in order to be perceived as a cycling city by respondents and/or focus group participants is briefly mentioned.

- **Is a city a cycling city or not?**

The survey results show that Amsterdam and Groningen are perceived as cycling cities by respondents, whereas Geneva is not perceived as a cycling city by respondents. Focus group participants in Amsterdam also called the cities Nijmegen, Utrecht and Copenhagen cycling cities and Rotterdam was not perceived as a cycling city by one focus group participant. A participant in the focus group in Geneva did not perceive Montréal as a cycling city.

In accordance with the expectations, cities with a high amount of people using the bicycle (as compared to people using another mode of transportation) (i.e. Groningen, Amsterdam, Nijmegen, Utrecht, Copenhagen) are more often perceived as cycling cities than cities with a low amount of people using the bicycle (as compared to the people who use another mode of transport) by respondents (such as Geneva, Rotterdam and Montréal).

- **Amount of cycling city dwellers/people cycling in the city**

The survey data revealed that respondents have very diverse opinions on the required amount of city dwellers using the bicycle in comparison to the number of city dwellers using other transport modalities in order to call a city a cycling city. These opinions range from ‘the number of city dwellers using the bicycle should be higher than the number of city dwellers using the car or public transportation’ (which was filled out by 31% of the respondents) to ‘every day, people cycle in the city’ in order to call a city a cycling city (this answer was reported by 33% of the

respondents). The focus group data provided more insight in the relationship between the amount of people cycling in the city and the perception of a cycling city. According to focus group participants, the visibility of many cyclists on the streets is perceived as an important condition in order to be considered as a cycling city.

> *"Only if you see a lot of people cycling on the streets than you would call a city a real bicycle city. I mean it doesn't have to be [a] higher [amount of cyclists than the amount of people using another mode of transportation] as long as there are many cyclists." (Loes)*

As expected, the amount of cyclists (on the streets) in the city appears to be an important indicator in order to be considered as a cycling city according to focus group participants. Yet, there was no consensus among focus group participants on whether many cyclists should be seen pretty much everywhere in the city or only in the city center. As Anna mentioned, this depends on the context.

- **Quality of cycling in the city**

The focus group data reveals that the amount of people cycling in the city is not the only indicator in order to be considered as a cycling city, as the quality of cycling in the city also matters.

> *"Do you have a cycling city when all people cycle on terrible roads between the cars?! [..] No." (Chantal)*

> *"Is there infrastructure, or how safe and healthy can you cycle [in a city]? Because in Chinese cities people cycle en masse and I would not call these real cycling cities because loads of people die there" (Anna)*

In all focus group discussions, the presence of safe infrastructure for cycling in a city appeared to be an important condition for considering a city as a cycling city. Furthermore, focus group participants living in Amsterdam and Geneva stressed the convenience of cycling in a city as an important condition in order to be considered as a cycling city by them.

> *"In the cities I have visited and where I have cycled or not it is rather the feeling whether I can cycle conveniently that makes the difference and this can be in various ways. But a cycling city needs to have this, I think. It must be convenient. [..] It is more than safety. It is also about; is the environment nice where I want to cycle?" (Karen)*

It was not expected that the quality of cycling in a city should also be taken into account as an important indicator in order to be perceived as a cycling city by focus group participants (and perhaps, by survey respondents as well).

5.2 Conditions to be perceived as a cycling city

In paragraph 5.2, the conditions (required or barriers) are described to be considered as a cycling city by survey respondents (and/or by focus group participants). According to focus group participants in Amsterdam, the perceive the conditions for being considered as a cycling city are context dependent. One participant of the focus group in Amsterdam explained that a cycling city in the Netherlands is not the same as a cycling city in America due to differences in culture and interests. Other participants in Amsterdam said that the conditions for being perceived as a cycling city should not be generalized due to spatial differences between the cities (in the altitude of the city and compactness of the city among others). These views suggest that the conditions in order to be considered as a cycling city, which are described in this paragraph, might not apply (to the same extent) to all cities. Perhaps, additional conditions are required for perceiving some cities as cycling cities as well (e.g. depending on the spatial and cultural characteristics of a city). More data is, however, needed in order to understand the differences between cities in the conditions (required or barriers) for being perceived as a cycling city by respondents and other people (i.e. to understand the context dependency of these conditions).

5.2.1 Spatial-time conditions

- **Road infrastructure**

    - **Road infrastructure (required or barriers) to be considered as a cycling city**

Separate bike lanes

As expected, the survey findings show that separate bike lanes should, at least, often or more than often be present in a cycling city according to respondents; 46% reported that separate bike lanes should, at least, often be present in a cycling city and 40% filled out that separate bike lanes should, at least, very often be present in a cycling city (median: often).

Roundabouts that give priority to bicycles

The survey findings reveal that roundabouts that give priority to bicycles should, at least, often or more than often be present in a cycling city according to respondents; almost half of the respondents (48%) filled out that roundabouts that give priority to bicycles should, at least, often be present in a cycling city and 26% of the respondents reported that these roundabouts should, at least, very often be present in a cycling city (median: often). These findings are in accordance with the expectations.

On-road bike lanes

As expected, the survey results show that on-road bike lanes should, at least, often or more than often be present in a cycling city according to respondents. A percentage of 43% of all respondents filled out that on-road bike lanes should, at least, often be present in a cycling city. According to 40% of the survey respondents, on-road bike lanes should, at least, very often be present in a cycling city (median: often).

In all focus group discussions, it was briefly mentioned that on-road bike lanes should be wide in order to be considered as a cycling city according to some participants. However, the interpretation of wide bike lanes differs. One focus group participant in Geneva mentioned that wider bike lanes than the ones which are currently present in Geneva are needed in a city in order to consider a city as a cycling city. In the focus group discussion in Amsterdam, a participant mentioned that on-road bike lanes should be wide enough so that cyclists do not have to ride directly next to cars or next to other cyclists. In the focus group discussion in Groningen, one participant explained that bicycle paths should be wide enough so that cyclists have the opportunity to pass each other on the bicycle. Another participant proposed to have very wide on-road bike lanes when roads are very often used by cyclists as compared to people using other modes of transport.

> *"If you keep the Korreweg [road in Groningen, Netherlands] in mind than you have a very wide pavement, you have 2.5 meters wide bike paths or something less, parking spaces, 9 meters roadways etcetera. When you look at the usage, most people use the smallest section. They have to use the bike path. When we turn this around, if we want to make the bike paths faster and if you go by car well than you have a small part of, how wide is a car, well 2.5 meters that must be enough [which should be used by cars]. [..] And then, you have a spatial design which is based on a cycling city." (Marijn)*

It is unclear to what extent the views of these participants with regard to the width of bike paths are shared by respondents (including focus group participants).

In the focus group in Geneva, it was also discussed whether motorcyclists are allowed to make use of these on-road bike lanes in a cycling city. Focus group participants in Geneva shared the opinion that fast motorcycles (like 80 km/h) should not make use of on-road bike lanes. Luciana explained that these motorcycles are quite dangerous for cyclists. It is not sure whether other respondents share this view.

Bicycle racks

Corresponding to the expectations, the survey findings show that bicycle racks should, at least, very often be present in a cycling city according to respondents; nearly ¾ of all respondents filled out that bicycle racks should, at least, very often be present in a cycling city.

Focus group participants provided a better insight in the reasons why bicycle racks should, at least, very often be present in a cycling city. According to focus group participants taking part in the focus group discussion in Geneva and Groningen, bicycle racks are needed in order to make cycling more convenient.

> *"You can be very fast from point A to point B but if you don't have, let's say, bicycle parking at point B than you have to spend 15 minutes trying to find one." (Jean)*

Focus group participants in Groningen also mentioned that these racks are needed in order to avoid bicycle parking everywhere in the city, as it hinders pedestrians among others since pavements are blocked by bicycles.

> *"People who go to the Albert Heijn [at the Gedempte Zuiderdiep, Groningen] park their bicycle [next to a bicycle rack which is already full of bicycles, and] even somewhere next to the streetlight which is in front of the zebra crossing [..], thus that the zebra crossing gets blocked." (Chantal)*

One focus group participant in Groningen mentioned that it is not required to have enough bicycle parking spaces for everyone in the city in order to be perceived as a cycling city. It is unknown whether this opinion is shared by respondents.

A survey respondent commented on the survey question about the bicycle racks. This person mentioned that also other bicycle parking options should have been taken into account in the survey, such as parking in bicycle parking spots with only markings. It is yet unclear whether other parking options are also required to be considered as a cycling city according to respondents.

Entirely connected network of bike paths

As expected, the survey findings reveal that bike paths should entirely be connected in a city in order to be considered as a cycling city by respondents; 39% of the respondents agree that an entirely connected network of bike paths is needed in a city in order to be considered as a cycling city and 41% of them entirely agree with this statement (median: agree).

During the focus group discussion in Geneva, some participants stated that continuous bike parths are needed for safety reasons. When bike paths are not connected to each other, they may not be used according to a focus group participant in Geneva.

> *"I also know a case where [..] they changed this one little suburban road in the middle of nowhere, changed it to all the car side street parking lots and putting really wide bike lanes that don't go to anywhere. And it's just purely for being like look at us urban planning look at what we've done we've put in all these bike lanes but they don't go anywhere so they are not being used. Everyone just sees them and it's a nuisance cause they've taken away their parking."(Emily)*

Coherent bicycle network

The focus group data revealed that a bicycle network does not only have to be entirely connected, but needs to be coherent in order to be considered a cycling city according to focus group participants in Geneva (this topic was not mentioned in the theoretical framework and, subsequently, there were no epectations with regard to whether a coherent bicycle network is needed in order to be considered as a cycling city). According to Jean, a coherent bicycle network makes it easier to go from one network to the other by bicycle.

"Having infrastructures on main arteries, that's coherent and continuous and easy to remember [is important]. You don't have to think o now that I'm on the bicycle I need to use like a different route, a different network. I can just use main arteries and once I get outside there's like that smaller network I can also use." (Jean)

It is unclear whether respondents agree with the view of focus group participants in Geneva towards coherent bicycle networks.

50 km/h roads which are shared by cars, public transport and cyclists

In accordance with the expectations, the survey results reveal that 50 km/h roads which are shared by cars, public transport and cyclists may, at most, rarely be present in a cycling city; 54% of the respondents reported that 50 km/h roads which are shared by cars, public transport and cyclists may, at most, rarely be present in a cycling city.

Bikeways shared with pedestrians

Corresponding to the expectations, the survey findings show that bikeways shared with pedestrians may, at most, rarely be present in a cycling city according to respondents (the majority of the respondents (56%) reported that bikeways shared with pedestrians may, at most, rarely be present in a cycling city).

Roads used by cyclists, busses and taxis

As expected, roads used by cyclists, busses and taxis may, at most, rarely be present in a cycling city according to respondents (more than half of the survey respondents (54%) filled out that these roads may, at most, rarely be present in a cycling city).

Bike paths between tram tracks

According to respondents, bike paths between tram tracks may, at most, rarely or less than rarely be present a cycling city; forty-two percent of the respondents reported that bike paths between tram tracks may, at most, not be present at all in a cycling city and 45% filled out that bike paths between tram tracks may, at most, rarely be present in a cycling city (median: rarely). This survey result was expected.

Unpaved bike paths

The survey outcomes show that unpaved bike paths may, at most, rarely be present in cycling cities according to respondents; a slight majority of the respondents (54%) reported that unpaved bike paths may, at most, rarely be present in a cycling city. This outcome is in line with the expectations.

Dark roads

As expected, survey results show that dark roads on which people may cycle may, at most, rarely occur in a cycling city according to respondents (50% of the respondents filled out that dark roads on which people may cycle may, at most, rarely occur in a cycling city).

Road maintainence

Corresponding to the expectations, the survey outcomes show that poorly maintained roads may, at most, rarely or less than rarely occur in a cycling city according to respondents. Nearly half of the respondents (46%) filled out that these roads may, at maximum, not occur at all in a cycling city. Forty-four percent of the respondents reported that poorly maintained roads may, at most, rarely occur in a cycling city (median: rarely).

- **Road infrastructure adjusted for the age structure of the city dwellers**

The topic 'road infrastructure adjusted for the age structure of city dwellers' has not been addressed in the theoretical framework. As a consequence, there were no expectations about the relationship between the road infrastructure adjusted for the age structure of city dwellers and perceiving a city as a cycling city. This topic has, however, been discussed in the focus groups. The data collected during the focus group discussions in Groningen and Geneva revealed that less facilities are required in a city with many youngsters compared to a city with many elderly people in order to become a cycling city according to participants.

> *"I think younger people would require a little less space and stuff. [Younger people] would perhaps be more comfortable [with] cycling [on] smaller lanes whereas elderly would be too scared." (Loes)*

> *"If you have a city with I don't know people aged 20 to 30 mainly, than this [city] can more easily become a cycling city with less facilities [compared to a city with many elderly] because these people dare to cycle faster without these facilities" (Chantal)*

It is not known whether these perspectives are shared by respondents.

According to focus group participants in Amsterdam, Groningen and Geneva, a city with many elderly people can become a cycling city when cycling facilities are adjusted to their abilities (reaction time, balance), such as through building wide cycling lanes and traffic lights for bicycles in the city. Focus group participant Ruben mentioned that other cycling facilities are required in a city with many youngsters compared to a city with many elderly in order to become a cycling city, such as fast cycling routes. It is not known whether the view of Ruben is shared by respondents. A few participants in Groningen have a positive view on the presence of fast and slow bike paths close to each other in a cycling city. In this way, cycling in the city is convenient for all ages according to them. It is not clear whether both types of bike paths need to be present close to each other in a city in order to be considered as a cycling city by survey respondents.

- **Road infrastructure (required or barriers) in the ideal cycling city**

In paragraph 4.1 of the thesis, the road infrastructure which should be present in the ideal cycling city and the road infrastructure which should not be present at all in the ideal cycling city according to ten or more survey respondents were described. As mentioned in the methodology chapter, the suggestions on the road infrastructure (required or barriers) in the ideal cycling city

might be used in order to become an optimal cycling city. Moreover, the road infrastructure which should be present in the ideal cycling city according to 10 or more repondents might also be required in order to be considered as a cycling city by respondents. The road infrastructure which should not be present at all in the ideal cycling city might be perceived as barriers towards considering a city as a cycling city by respondents, although evidence is missing (due to a lack of data).

- **Bicycle related services**

Bicycle repair shops

In the survey, no questions were asked with regard to whether bicycle related services are required or not in order to be considered as a cycling city, as this topic was not mentioned in the literature review. As a consequence, no expectations were made about the influence of bicycle repair shops on being considered as a cycling city by respondents. Some focus group participants in Amsterdam, however, stated that bicycle repair shops are needed in a city in order to be considered a cycling city. They linked the presence of bicycle repair shops in a city to the bicycle culture in a city, which is a relevant aspect in order to be considered as a cycling city by them. Whether this view is shared by other survey respondents (including focus group participants), is not known yet.

- **Traffic regulations**

Car-free city

Against expectations, the survey findings reveal that a city does not have to be car-free at all in order to be considered as a cycling city by respondents (58% of the survey respondents mentioned that a city does not have to be car-free at all in order to be considered as a cycling city). Yet, there is still a high share of the respondents (42%) who consider a city as a cycling city when a city is partly car-free.

Based on the focus group findings which are shown below, the different perspectives on car-free cities might be explained by the opportunities and restrictions that survey respondents perceive towards (partly) car-free cities and by the frame of reference that respondents use.

> Question: *"Isn't it the future to ban cars? Isn't that the future? For health reasons, for other reasons? [..] you could make some streets really none accessible to cars" (Emma)*
>
> Answer: *"Hm but it also depends on how the city is build out itself like for example if you look at a lot of American cities, go to Los Angeles, you have highways and things like that and you've got suburbs so far out, they are never going to use bikes" (Oliver)*

Traffic regulations for cyclists

In the academic literature, no relationship was found between prioritizing cyclists over people using other modes of transport and bicycle use and, subsequently, this topic was not addressed in

the literature review and in the survey (and, subsequently, no expectations were made about the influences of prioritizing cyclists over people using other modes of transport and perceiving a city as a cycling city). According to participants taking part in the focus group discussion in Groningen, prioritizing cyclists over people using other transport modalities in traffic is required in order to be considered as a cycling city.

> *"For the Eikenlaan (street in Groningen, Netherlands) that crosses the [street to the] Zernike a proposal is made to prioritize cyclists [over people using other modes of transport]. You have such an unregulated intersection and the car traffic needs to wait [for cyclists] but there is also a bus line that drives there. It is a consideration you have to make and the bus passengers arrive too late during peak hours. And yet, we do it and this also reveals how the city deals with the position of cyclists. [..] According to me, [being a cycling city] is determined by the position a cyclist takes [in traffic]."(Marijn)*

It is not clear whether cyclists need to have priority over people using other modes of transport in order to be perceived as a cycling city by the majority of the survey respondents. Moreover, due to a lack of data, it is not sure where cyclists should have priority over people using other modes of transport in traffic in a city in order to be perceived as a cycling city by respondents.

- **Urban design**

<u>A small, compact city</u>

Against expectations, the survey results show that a small, compact city is not required in order to be considered as a cycling city by respondents; 26% of the respondents reported that they entirely disagree and 31% filled out that they disagree with the statement that a small, compact city is required in order to be considered as a cycling city (median: disagree). This result indicates that the size of the city does not matter in order to be considered a cycling city and one explanation for this result is given by participants taking part in the focus group discussions in Amsterdam and Geneva. They mentioned that a large city can also be considered as a cycling city when public transportation facilitates cycling in the city.

> *"In larger cities with a large surface you need to have a bike-and-ride system. That you say; a part by bicycle, you hop with the bike on the metro or something and you get off and you continue cycling. That should be part of the cycling city." (Anniek)*

Perhaps, a bike-and-ride system is required in a large city in order to be perceived as a cycling city by respondents. There is not enough data collected in order to confirm this relationship though.

<u>A city with mixed land-use</u>

Based on the survey outcomes, it is concluded that a city with mixed land-use - such as mixed living, working and green spaces - is required in order to be considered as a cycling city by

respondents; 77% of the respondents filled out that they entirely disagree, disagree or neither agree nor disagree with the statement that a city with mixed land-use is a requirement in order to be considered as a cycling city (median: neither agree nor disagree). This outcome was not expected.

Participants of the focus group in Groningen mentioned that cycling through nature is perceived as more convenient than cycling next to roadways. However, there is not enough data collected to conclude that (a typical kind of) nature next to bike paths is required in a city in order to be perceived as a cycling city by respondents.

- **Climatological circumstances and air quality**

Climate in a city

The survey results show that the climatological circumstances in a city do not make it impossible to become a cycling city according to respondents; 64% of the respondents reported that a city can become a cycling city under all climatological circumstances. This result also indicates – against expectations - that a city can be considered as a cycling city under all circumstances. A reason for filling out that the climatological circumstances in a city do not make it impossible in order to become a cycling city was given by a few respondents. They mentioned that there might be seasonal limitations to the practice of cycling in cities, but this does not prevent people from biking in the city for the rest of the year.

Air quality

The air quality required in a city in order to be considered as a cycling city was a discussion topic in the focus group in Amsterdam. This topic was not mentioned in the theoretical framework and in the survey and, subsequently, no expectations were made with regard to the air quality. According to focus group participants in Amsterdam, the air quality in a city should be good at places where people may cycle in order to be considered as a cycling city, as people do not want to cycle in places with air pollution.

> *"If there is for instance a bike path next to a big road than you don't want to cycle [there] because you instantly notice that you only breath in that [exhaust gases]"(Karen)*

It is not known whether this opinion is shared by other survey respondents.

- **Terrain**

Difference in altitude in a city

The survey outcomes show that the hilliness of a city is perceived as a barrier toward becoming a cycling city by respondents, although the opinion of survey respondents differs on how hilly/mountainous a city has to be in order to make it impossible for a city to become a cycling city. According to a slight majority of the survey respondents (52%), cities which are somewhat mountainous or steeper (≥200 meters difference in altitude) cannot become a cycling city.

However, according to almost half of the respondents (48%), the hilliness of a city does not prevent a city from becoming a cycling city.

One reason for filling out that that the difference in altitude in a city does not matter for becoming a cycling city is given by a survey respondent.

> *"The difference in altitude is not important, but the slope" (Survey respondent)*

It is unclear whether this opinion is shared by other respondents who reported the same answer.

In the focus group discussions conducted in Geneva, the hilliness of a city in relation to being able to cycle in the city was mentioned a few times. A couple of focus group participants in Geneva stated that cycling can be difficult when a city is hilly.

> *"I grew up in Lausanne (Switzerland) which is a very hilly city. [It] is quite difficult to cycle everywhere." (Luciana)*

Since a city cannot become a cycling city when a city is somewhat mountainous or steeper according to respondents, the terrain circumstances in a city also matter for being perceived as a cycling city by respondents (which is also an expected outcome). That is, a city which is somewhat mountainous or steeper cannot be considered as a cycling city by respondents.

- **Travel time**

Travel time by bicycle (as compared to other modes of transport)

The travel time by bicycle (as compared to other modes of transport) in a city in order to be considered as a cycling city has not been addressed in the theoretical framework and in the survey, but has been discussed in the focus groups. Since this topic was not addressed in the literature review, no expectations were made about the travel time by bicycle (as compared to other modes of transport) required in order to be perceived as a cycling city. The focus group data of Amsterdam, Groningen and Geneva reveal that it is not required to get faster from A to B in the city by bicycle than by public transport or by car in order to be considered a cycling city according to participants.

> *"Cycling [in a cycling city] can just be a nice choice since I don't have to be faster at B [by bicycle as compared to by car or by public transport]" (Karen)*

However, cyclists should be able to go quickly – without many detours, interruptions or bicycle parking problems - from A to B by bicycle in a cycling city according to participants.

> *"[It is important] that the shortest route [in a cycling city] is by bicycle instead of making detours because there is a main road or something." (Jeroen)*

Based on these results, it is concluded that the absolute cycling time and not the relative cycling time appears to matter in order perceived as a cycling city by focus group participants and perhaps, by respondents as well.

5.2.2 Socio-cultural conditions

- **Religion**

Religious city dwellers

Respondents state that it is not required to have an unreligious city in order to be considered as a cycling city; 67% of them entirely disagree with the statement that a city should not be religious in order to be considered as a cycling city. No expectations were made with regard to whether a city is religious or not in order to be considered as a cycling city by people (in the literature review, a few religions were mentioned but it was perceived as too sensitive to ask questions about specific religions to respondents and the cultures which go together with these religions might be quite unknown for some respondents as well). If statements concerning the religion of city dwellers were formulated in a different way in the survey - for example, through including the major world religions in the survey - the outcome might have been that religion matters in order to be considered as a cycling city. A focus group participant in Groningen noted that Muslims do not often use the bicycle while going to the Mosque. However, other factors - instead of religion - might explain why people do not often go by bicycle to the Mosque, such as the culture of these people in the country of origin.

> *"I live close to the mosque and on Friday afternoon almost no one goes there by bicycle, everyone goes by car. That is a matter of culture." (Henk)*

Data is, however, lacking in order to identify and understand the relationship between a city with mostly Muslim city dwellers and being perceived as a city as a cycling city by respondents.

- **Nationality**

Western society

Against expectations, the survey findings show that it is not required that mostly Western people live in a city in order to be considered as a cycling city; 56% of the respondents filled out that they entirely disagree with the statement of having mostly Western people living in the city in order to be considered a cycling city. 'Western people' is, however, a very ambiguous term as it lends itself to many interpretations (Donksis, 2011). The 'Western world' also consists of different ethnicities. Other results can possibly be found when various ethnicities were compared in the survey.

- **Politics**

Political preferences

Against expectations, the survey outcomes show that a city does not need to have a left-wing City Council in order to be considered as a cycling city by respondents (52% of the respondents entirely disagree with the statement that a city needs to have a left-wing City Council in order to be considered as a cycling city). Perhaps, different results were found if it was asked whether most of the city dwellers need to be left-wing voters instead of right-wing voters in order to be considered as a cycling city, or whether it matters to have a mostly progressive, instead of a mostly conservative City Council or voters in the city in order to consider this city as a cycling city.

(Cycling) policies

Although not mentioned in the literature review and in the survey as a question, the topic cycling policies was a couple of times filled out as an aspect missing in the survey which determines whether a city is a cycling city or not by survey respondents. These respondents reported that local authorities have to develop cycling policies to accommodate and encourage cycling in a city in order to be considered as a cycling city. These findings were not expected.

In line with the views of these survey respondents, focus group participant Wendy stated that a city can only be a cycling city when the municipal council takes the cycling interests into account. In the focus group discussion in Groningen, it was stated that policies need to be made to encourage cycling and to make transport alternatives of the bicycle less attractive in a cycling city.

These results suggest that (cycling) policies are needed in a city in order to be perceived as a cycling city by respondents. It is yet unclear which policies should be developed for the most effective result.

Furthermore, focus group participants in Geneva stated that a degree of public support for governmental programmes – and thus, for carrying out cycling policies as well – is needed in order to become a cycling city.

> *"I think you need some degree of public and governmental support for your government programmes or something like that, so that cycling is not just seen as a nuisance basically, [but cycling is] actually endorsed by society." (Oliver)*

It might be that other focus group participants and respondents also perceive a degree of public support for governmental programmes (and for cycling policies) as needed in order to become a cycling city, and also in order to be considered as a cycling city. Due to a lack of data, it cannot be examined whether a certain degree of public support for governmental programmes and cycling policies is perceived as required in order to be perceived as a cycling city by respondents.

‘Cycling city’ marketing by local authorities

In the survey, cycling city marketing by local authorities in relation to being considered as a cycling city was not tested, since this topic was not mentioned in the theoretical framework (and subsequently, no expectations were made with regard to cycling city marketing). However, the topic cycling city marketing was discussed in the focus groups in Groningen and Geneva. A few focus group participants saw cycling city marketing as needed in order to be perceived as an excellent cycling city by the outer world.

> *“Nijmegen, Groningen, Copenhagen have started a PR campaign [to promote themselves] as a cycling city 10 years ago. Actually, there are more bicycles [and] more bike paths here [in Amsterdam], but Copenhagen did the best promotion by far. Well, that is always cycling city number 1 in the world.” (Anna)*

However, focus group participants in Geneva do not perceive all cities which are called cycling cities by its local authorities as cycling cities.

> *“I think we have to be careful with that, [be]cause it’s easy to say we are a bike city. Look at Montreal which is also doing a lot of good things but which is not a bike city. They claim to be the biggest bicycle city in North-America but there’s lots of works to do. One thing that they are trying to do, and I think it works, is just to add kilometers of cycling lanes. You might say for the first time o that’s great but if you build 500 meters of cycle lanes here that is not connected to anything. [..] you add 500 meters, but nothing else.” (Jean)*

These outcomes suggest that cycling city marketing by local authorities is needed in order to be perceived as a cycling city by the outer world. However, a city also needs to prove that they are a cycling city in order to be perceived as a cycling city (e.g. through taking road infrastructure measures). Yet, more data needs to be collected in order to understand the role of cycling city marketing in relation to being perceived as a cycling city by respondents.

- **Image**

Positive image of the bicycle

As expected, the survey findings reveal that the bicycle must have a positive image (e.g. the bike is perceived as athletic and environmentally friendly in general) in the city in order to be considered as a cycling city by respondents; 51% percent of the respondents agree that the bicycle needs to have a positive image in the city in order be considered as a cycling city.

Several focus group participants stressed the importance of a positive image of the bicycle in order to be considered as a cycling city, as a negative image of the bicycle has a negative

influence on the usage of the bicycle in the city according to them. The following example clarifies why bicycles should not be demonized.

> *"In Sydney they had the bike lanes and they ended up taking them out and putting car spaces back because nobody was using them. Probably [reasons for doing] this was also about culture because we are so car centric in many ways and also it was just too dangerous to cycle for a lot of people. And [cyclists] were sort of demonized in a way and looked down on. I remembered one time [in a game show] there was actually a question, what are the 10 most annoying things about cyclists?" (Oliver)*

Focus group participants in Amsterdam also stated that the positive image of the bicycle needs be shown in the city through the presence of cycling clubs, cycling museums and bicycle repair shops in the city.

> *"For me a cycling city is much more about culture. [..] If you have a lively bike culture than a cycling museum originates from a kind of proud by itself and the number of bicycle repair shops also says a lot of course." (Gijs)*

Whether the perspectives on having a cycling culture which is shown in the environment is required in order to be perceived as a cycling city by the majority of the survey respondents, is yet unclear.

Preference of using the bicycle

Based on the survey results and in line with the expectations, the bicycle needs to be the preferred mode of transport of respondents in the city in order to consider a city as a cycling city according to respondents; nearly half of all survey respondents (49%) agree and 31% entirely agree with the statement that the bicycle needs to be the preferred mode of transport in the city in order to be considered as a cycling city (median: agree). Yet, it remains unclear whether the bicycle should be the preferred mode of transportation among city dwellers living in a certain city in order to perceive their city as a cycling city.

- **Social norms**

Norms towards cycling

The topic norms towards cycling was addressed in the theoretical framework, but was not mentioned in the survey. One focus group participant in Groningen discussed the social norms which are required in a city in order to become a cycling city according to him. Corresponding to the expectations, he stated that cycling needs to be the norm in a city in order to become a cycling city.

> *"I think, when do you become a cycling city? You can build facilities, but it is in particular about the culture of using the bicycle together, which you should create." (Henk)*

Perhaps, this cycling norm is required in order to be considered as a cycling city by respondents. However, not enough data is collected in order to understand which social norms are needed in order to be perceived as a cycling city by respondents.

5.2.3 Economic conditions

- **Transportation costs**

Costs of different transport modalities

The survey results reveal that both low and high public transport and car expenses are not perceived as barriers toward becoming a cycling city by respondents; the public transport expenses and car expenses do not hinder a city to such an extent that the city cannot become a cycling city anymore according to 63% and 55% of the survey respondents, respectively. These results suggest that the public transport and car expenses are also not seen as a barrier toward being considered as a cycling city by respondents (which is a different result from what was expected). Perhaps, the following view of a survey respondent – which is shared with a couple of other survey respondents - might explain why the majority of the respondents filled out that car costs and public transport costs do not prevent a city from becoming a cycling city.

> *"I do think the expenses might be an incentive during [a] change from non-bike to bike city, but once it is there, these incentives should not (always) be necessary." (Respondent)*

In the focus group discussions in Amsterdam and Geneva, it was stated that cheap prices for (using) the bicycle stimulates cycling in the city according to a few participants. However, it is unclear whether cheap prices for (using) the bicycle is a criterion in order to perceive a city as a cycling city according to respondents.

- **Income**

Income of city dwellers

The survey results show that the average income of city dwellers can be high but also low compared to other inhabitants in the country and in the world in order to become a cycling city according to respondents (the majority of the respondents reported that the average income of city dwellers can be high but also low compared to other inhabitants in the country and in the world). These results indicate – against expectations - that the average income of city dwellers does not matter in order to be perceived as a city by respondents.

5.2.4 Demographic conditions

- **Population size and density**

Number of city dwellers and the population density of the city

The survey results show that, no matter how many inhabitants live in a city, a city can always become a cycling city according to respondents; a great majority of these respondents (83%) filled out that they do not perceive the number of inhabitants in a city as a barrier towards becoming a cycling city. These results suggest that the number of inhabitants is not a barrier to be perceived as a cycling city by respondents (which is against expectations). The explanation for this finding might be the same as the explanation given for the city size (see paragraph 5.2.1). However, the city size does not have to increase when the city population size increases, since the city size also depends on the population density of the city. Cities with a high population density might face more challenges to becoming a cycling city according to one focus group participant.

> *"Look back here in Geneva. Streets are quite narrow, probably the narrowest in Switzerland and probably one of the narrowest in Europe. [..] If you have a very dense, a very small city it might be very difficult to have cars, cyclists, pedestrians on one road." (Jean)*

The influence of the city population density on being considered as a cycling city by respondents remains unclear.

- **Age**

Age structure of city dwellers

As expected, the survey results show that a city with many youngsters (aged 35 years and younger) and a city with many people between 35 and 60 years old can become a cycling city according to respondents; according to 93% of the respondents, a city with many youngsters (<35 years old) can become a cycling city and according to 80% of the respondents, a city with many people between 35 and 60 years old can become a cycling city. A city with many elderly people (>60 years old) cannot become a cycling city according to respondents (46% of the respondents filled out that a city with many elderly people (>60 years old) can become a cycling city). Thus, the age of city dwellers matters in order to become a cycling city according to respondents.

Some focus group participants commented on the age groups chosen in the survey.

> *"In the Netherlands everybody can cycle basically. [..] In that sense the age categories you have chosen are not the most logical ones. I should rather chose for below 15 in which people need to be accompanied or you know in which others still worry whether everything will be okay" (Gijs)*

"Elderly are physically 10 years younger than 20 years ago. That is, the ones aged 60 are physically 50 now" (Anna)

When other age categories were chosen in the survey question, outcomes might have been different, as well as when the word 'many'- which leaves room for interpretation - is replaced by numbers, e.g. a percentage of young city dwellers.

Furthermore, it should be mentioned that the answers on the survey do not correspond to the focus group data, as a city with many elderly people can become a cycling city according to focus group participants. However, other cycling infrastructure is required in a city with many elderly people (>60 years old) in order to be considered as a cycling city by focus group participants (see paragraph 5.2.1). Besides, it is - according to focus group participants in Groningen and Amsterdam – recommended (and perhaps needed as well) to learn how to ride a bicycle at a young age in order to cycle at an old age as well. In this way, cycling becomes a habit for people of different ages and there is no barrier to learn how to ride the bicycle at an older age anymore (the cycling barrier is perceived as higher at an older age as compared to at a younger age).

"When people originally come from a culture where you have not learned how to ride the bicycle as a child than it becomes more difficult to learn to ride the bicycle at an older age I think." (Guus)

- **Household size**

<u>Average number of persons per household in a city</u>
Although not expected, the survey findings reveal that the average number of persons per household in a city does not matter in order to become a cycling city or not; the vast majority of the respondents (95%) reported that the average number of persons per household in a city does not matter in order to become a cycling city. These survey results indicate – against expectations - that the average number of persons per household in a city does not matter in order to be considered as a cycling city according to respondents.

Focus group participants have not provided a possible explanation for this outcome. One study, conducted in the Netherlands, showed that there is no relationship between the household size and the willingness to use the bicycle (Goeverden et al., 2013). As households with a high number of persons are willing to use the bicycle as often as households with a low average number of persons in the Dutch context, this might explain why the average number of persons per household required in a city in order to become a cycling city does not matter.

5.2.5 Socio-safety conditions

- **Bicycle theft**

Occurrence of bicycle theft
Corresponding to the expectations, the survey findings reveal that bicycle theft may, at maximum, rarely occur in a cycling city according to respondents (sixty-one percent of the respondents reported that bicycle theft that may, at most, rarely occur in cycling cities).

- **Vandalism**

Occurrence of damage to bicycles
In line with the expectations, the survey results show that damage to bicycles due to vandalism, may, at most, rarely occur in a cycling city according to respondents; 66% of the respondents reported that damage to bicycles due to vandalism may, at most, rarely occur in a cycling city.

5.3 Individual characteristics and perceiving a city as a cycling city or not

It is examined whether the age, place of residence and/or travel behavior of respondents explain the difference in perceiving a selected city for research as a cycling city or not through performing binary logistic regressions and analyzing these results. In Table 17 until 21, the outcomes of these binary logistic regressions are shown for the cities Amsterdam, Groningen and Geneva separately.

In this paragraph, the following order is used. First of all, the associations between the age, place of residence and travel behavior of respondents and perceiving Amsterdam as a cycling city or not are shown and possible explanations for these results are given (paragraph 5.3.1). Second, the relationships between the age, place of residence and travel behavior of respondents and perceiving Groningen as a cycling city are described (paragraph 5.3.2). Possible explanations for these outcomes are provided in this paragraph as well. Third, the relationships between the age, place of residence and travel behavior of respondents and perceiving Geneva as a cycling city are examined (paragraph 5.3.3). Last, the findings on each of these selected cities for research are compared in paragraph 5.3.4 and, based on these findings, the hypotheses mentioned in the methodology section are confirmed or rejected. Possible reasons for these findings are provided as well.

5.3.1 Amsterdam: cycling city or not?

The final model in Table 17 with all variables of interest and control variables included, displays the relationships between the personal characteristics of respondents living in Amsterdam, Groningen and Geneva and whether Amsterdam is called a cycling city by survey respondents.

- **Age**

The data shows that, at an alpha level of less than 10% (p=0.080), respondents aged 45-59 years old significantly less often call Amsterdam a cycling city than respondents aged 15-29 years old. An outcome in this direction was expected. However, against expectations, no negative association is found between respondents aged 60-74 years old relative to respondents aged 15-29 years old and whether Amsterdam is perceived as a cycling city or not by them. There is also no negative association between respondents aged 30-44 years old compared to respondents aged 15-29 years old and whether Amsterdam is perceived as a cycling city. Explanations for not finding the expected negative associations between the age of respondents and perceiving Amsterdam as a cycling city, might be: (1) the roads in Amsterdam are to the same extent perceived as safe by young and old respondents; (2) people with (severe) physical and sensory problems are insufficiently included in this research. The age limitation of this study is 74 years old and physical and sensory problems are more often perceived by (very) old people than by younger people (Guralnik & Simonsick, 1993; Picavet & Hoeymans, 2002); (3) respondents who have never been in Amsterdam cannot make a proper judgement on whether Amsterdam is a cycling city – while only knowing the mode share and the number of inhabitants in Amsterdam. As a consequence, the results shown in Table 17 are biased; and (4) the criteria for calling a city a cycling city according to younger people are very similar as compared to the criteria for calling a city a cycling city according to older people, because younger people may perceive a city only as a cycling city when many elderly people can cycle in the city. A statement made by a focus group participant supports this possible explanation behind the outcomes found for the variable age.

> *"I should say that a city is by definition a cycling city if many elderly can cycle there. [..] you are done when a city is suitable for someone younger than 8 years old and for 80 years old people." (Chantal)*

However, this view is not in line with the opinion of most focus group participants, who state that less facilities are required in a city with many youngsters compared to a city with many elderly people in order to become a cycling city (see paragraph 5.2.1). Therefore, the fourth possible explanation is not well supported.

- **Place of residence**

Corresponding to the expectations, respondents living in Groningen significantly less often call Amsterdam a cycling city as compared to respondents living in Amsterdam on a $p < 0.01$ level. Moreover, respondents living in Geneva significantly less often call Amsterdam a cycling city than respondents living in Amsterdam on an alpha level of less than 10% (p=0.087). A relationship in the opposite direction was expected though. A possible explanation for this outcome is that Genevan respondents use the percentages of the traffic movements in the selected cities which are travelled by bicycle - as displayed in a table in section 4 of the surveys - to judge

which cities are cycling cities. According to this table, the percentage of people traveling by bicycle in Amsterdam is 9% lower than the percentage of people traveling by bicycle in Groningen. Subsequently, respondents from Geneva might not perceive Amsterdam as a cycling city, since the percentage of cyclists in Amsterdam could have been higher. Respondents from Amsterdam might take other criteria into account to judge whether Amsterdam is a cycling city, e.g. the cycling infrastructure, the number of cyclists they observe on the streets in Amsterdam and the Amsterdam cycling city marketing. Based on these criteria, respondents from Amsterdam might have a more positive view on cycling in Amsterdam than respondents from Geneva and might, therefore, perceive Amsterdam more often as a cycling city than respondents from Geneva.

- **Travel behavior**

As mentioned in chapter 3, the relationship between the hours cycled on average per week and calling Amsterdam a cycling city has not been tested due to high standard errors which were found in all categories for this variable. As a consequence of not performing this analysis, hypothesis 3 cannot be checked for calling Amsterdam a cycling city or not.

- **Model fit**

The Nagelkerke R^2 value in Table 17 shows that 22.7% of the variation in the outcome variable is explained by the final model. The model with only the variables age and place of residence included explains 15.8% of the variation in the outcome variable. The final model significantly improves the model fit compared to the model with only the intercept included, since the Chi-square of the model with 18 degrees of freedom is significant at a $p<0.01$ level. Including age and the place of residence to the model makes a significant improvement to the model ($p<0.01$), whereas adding the control variables to the model does not improve the model significantly.

Table 17 – Binary logistic regression results of whether Amsterdam is called a cycling city or not according to respondents *(Ref. Amsterdam is not called a cycling city)*

Variable	Model 1		Model 2		Model 3	
	B	*Exp(B)*	*B*	*Exp(B)*	*B*	*Exp(B)*
Intercept	1.833 ***	6.250	3.597 ***	36.479	3.031 ***	20.718
Age						
Ref.: 15-29 years old						
30-44 years old	-.016	.985	-.270	.763	-.326	.722
45-59 years old	-1.217 ***	.296	-1.009 **	.365	-1.002 *	.367
60-74 years old	-.888 *	.411	-.748	.473	-1.104	.332
Place of residence						
Ref.: Amsterdam						
Groningen			-2.186 ***	.112	-.192 ***	.825
Geneva			-1.176	.308	-1.153 *	.316
Hours cycled on average per week						
Ref.: <1 hour						
1-3 hours					.236	1.267
4-6 hours					.387	1.472
>6 hours					-.343	.709
Sex						
Female					-.099	.905
Sex * age						
*Ref.: 15-29 years old * male*						
30-44 years old * female					-.151	.860
45-59 years old * female					-.009	.991
60-74 years old * female					.697	2.009
Highest level of education achieved						
Ref.: lower than University of Applied Sciences						
Univeristy of Applied Sciences					1.466 **	4.331
University					.271	1.311
Nationality						
Ref. Dutch (and other) nationality						
Swiss (and other) nationality					2.122	8.351
Other nationality than Dutch or					.822	2.274
Degrees of freedom	3		5		16	
Chi-square (Step)	13.185***		17.086***		14.216	
Chi-square (Model)	13.185***		30.270***		44.487***	
Nagelkerke R square	0.071		0.158		0.227	

* p < 0.10. ** p < 0.05. *** p < 0.01.

5.3.2 Groningen: cycling city or not?

- **Age**

Table 18 displays the effects of the variables of interest and control variables on whether or not Groningen is perceived as a cycling city by respondents living in Amsterdam, Groningen and Geneva. There appears to be no relationship between the age of respondents and calling Groningen a cycling city. Possible reasons for not finding the expected negative associations between the age of respondents and calling Groningen a cycling city might be the same reasons as the previously mentioned possible explanations for not finding the expected negative correlations between the age of respondents and calling Amsterdam a cycling city, although the word 'Amsterdam' should be read as 'Groningen' in this explanation.

- **Place of residence**

Against expectations, no association is found between the place of residence of respondents and perceiving Groningen a cycling city (see Table 18). Respondents living in Groningen might not call Groningen significantly less often a cycling city compared to respondents living in Amsterdam and respondents living in Groningen, since almost all respondents living in Groningen (92%) perceive Groningen already as a cycling city. A variation in the outcome variable between Groningen and Amsterdam and between Groningen and Geneva is therefore difficult to be found.

- **Travel behavior**

In Table 19, the influence of the hours cycled on average per week by respondents living in Groningen city on perceiving Groningen as a cycling city is shown. In chapter 3, it was mentioned that the categories <1 hour and 1-3 hours cycled on average per week were taken together to have more than 10 cases included in each category. Against expectations, the outcomes do not show a relationship between the hours cycled on average per week by respondents living in Groningen city and perceiving Groningen a cycling city. A possible explanation for not finding this relationship might be that respondents living in Groningen have a very similar view on the number of people cycling in Groningen, since they observe cyclists in Groningen even when they do not cycle many hours per week.

- **Model fit**

The final model in Table 18 does not explain a lot of variation in the outcome variable; only 10.7% is explained by the model. Moreover, the final model - with 16 degrees of freedom - does not significantly improve the model fit compared to the model with the intercept only. When the variable age and place of residence are only added to the intercept only model, 2.6% of the variation in the outcome variable is explained by the model. Both variables do not significantly improve the model fit. As only a small variation exists in the outcomes of the dependent variable

(26 respondents do not call Groningen a cycling city vs. 265 respondents call Groningen a cycling city), it is more difficult to explain this variance compared to finding a lot of variation in the outcomes of the dependent variable. It is thus not surprising that the variable ‘age’ and ‘place of residence’ are not related to calling Groningen a cycling city.

The variable ‘hours cycled on average per week’ in Table 19 explains 2.2% of the variance in the outcome variable. The variable does not significantly improve the model fit as compared to the model with the constant included.

Table 18 – Binary logistic regression results of whether Groningen is called a cycling city or not according to respondents *(Ref. Groningen is not called a cycling city)*

Variable	Model 4		Model 5		Model 6	
	B	*Exp(B)*	*B*	*Exp(B)*	*B*	*Exp(B)*
Intercept	2.745 ***	15.571	2.859 ***	17.437	1.590	4.901
Age						
Ref.: 15-29 years old						
30-44 years old	-.512	.599	-.340	.712	-.233	.792
45-59 years old	-.779	.459	-.898	.408	-1.074	.342
60-74 years old	-.753	.471	-.829	.437	-1.212	.298
Place of residence						
Ref.: Groningen						
Amsterdam			.020	1.020	-.192	.825
Geneva			-.540	.583	-1.153	.316
Hours cycled on average per week						
Ref.: <1 hour						
1-3 hours					.986	2.681
4-6 hours					.925	2.523
>6 hours					.021	1.022
Sex						
Female					-.202	.817
Sex * age						
*Ref.: 15-29 years old * male*						
30-44 years old * female					-.111	.895
45-59 years old * female					.977	2.657
60-74 years old * female					.835	2.305
Highest level of education achieved						
Ref.: lower than University of Applied Sciences						
Univeristy of Applied Sciences					1.476	4.377
University					.490	1.633
Nationality						
Ref. Dutch (and other) nationality						
Swiss (and other) nationality					.526	1.692
Other nationality than Dutch or Swiss nationality					1.339	3.816
Degrees of freedom	3		5		16	
Chi-square (Step)	2.375		1.102		10.936	
Chi-square (Model)	2.375		3.48		14.412	
Nagelkerke R square	0.018		0.026		0.107	

* p < 0.10. ** p < 0.05. *** p < 0.01.

Table 19 – Binary logistic regression results of whether Groningen is called a cycling city or not according to respondents living in Groningen *(Ref. Groningen is not called a cycling city)*

Variable	Model 7		
	B		*Exp(B)*
Intercept	2.468	***	11.800
Hours cycled on average per week Ref.: < 4 hours			
4-6 hours	.194		1.215
> 6 hours	-.660		.517
Degrees of freedom	2		
Chi-square (Model)	2.927		
Nagelkerke R square	0.022		
*p < 0.10. **p < 0.05. ***p < 0.01.			

5.3.3 Geneva: cycling city or not?

- **Age**

In Table 20, personal characteristics which might explain whether Geneva is called a cycling city by respondents living in Amsterdam, Groningen and Geneva are displayed. Against expectations, the age of respondents does not have an influence on calling Geneva a cycling city. Possible reasons for this outcome are mentioned in section 3.3, although the word 'Amsterdam' should be read as 'Geneva' in the explanation.

- **Place of residence**

Besides, the results show that respondents living in Amsterdam significantly more often perceive Geneva as a cycling city relative to respondents living in Geneva (p=0.063), which is against expectations. Respondents living in Amsterdam are 5.718 times more likely to call Geneva a cycling city compared to respondents living in Geneva. This finding might be explained by the different perceptions of cycling in Geneva according to people living in Geneva and people outside Geneva. According to a survey respondent and a focus group participant living in Geneva, biking in Geneva can be (quite) dangerous:

> *"[There should be] no sharing bicycle lanes with taxi's and busses as is currently the case in Geneva, this is very dangerous." (Respondent)*

> *"I had a big [bike accident] 5 years ago with a trauma and I hear a lot of friends who have had a bike accident. It's also a reason for sometimes stopping biking." (Emma)*

Respondents living in Amsterdam might perceive a cycling percentage of 11% in Geneva as quite a high percentage (for a foreign country) and they might not take into account whether it is dangerous to cycle in Geneva, as this information is not provided to them. Furthermore, the results reveal that respondents living in Groningen do not significantly differ in their perception of calling Geneva a cycling city compared to respondents living in Groningen. This outcome is not in accordance with the expectations. The explanation previously given in this paragraph might explain why this expected relationship has not been found.

- **Travel behavior**

When the relationship between the hours cycled on average per week by respondents living in Geneva city and perceiving Geneva as a cycling city is examined, no association is found (see Table 21). A possible explanation for this unexpected outcome is that respondents living in Geneva have, irrespective of their travel behavior, quite a similar view on the number of people cycling in Geneva since they have observed the number of cyclists in Geneva when they were traveling by car, public transportation, scooter, bicycle or in another way.

- **Model fit**

The variables included in the final model presented in Table 20 explains 12.5% of the variation in the outcome variable. The final model significantly improves the model fit at a $p<0.10$ level compared to the model with the intercept included only. The model with the variables age and place of residence included only (model 9) explain no more than 3.8% of the variance and including these variables in the model does not make a significant improvement to the model fit.

Table 21 shows that the variable hours cycled on average per week by respondents living in Geneva city explains 0.7% of the variance in the outcome variable. The variable does not make a significant contribution to the model fit compared to the model with the constant included only.

Table 20 – Binary logistic regression results of whether Geneva is called a cycling city or not according to respondents *(Ref. Geneva is not called a cycling city)*

Variable	Model 8		Model 9		Model 10	
	B	*Exp(B)*	*B*	*Exp(B)*	*B*	*Exp(B)*
Intercept	-1.762 ***	.172	-1.200 ***	.301	-1.502	.223
Age						
Ref.: 15-29 years old						
30-44 years old	-.247	.781	-.174	.841	-.463	.629
45-59 years old	.331	1.393	.377	1.458	.178	1.195
60-74 years old	-.680	.506	-.654	.520	-.800	.449
Place of residence						
Ref.: Geneva						
Amsterdam			-.727 *	.483	1.744 *	5.718
Groningen			-.879	.415	.706	2.027
Hours cycled on average per week						
Ref.: <1 hour						
1-3 hours					-.277	.758
4-6 hours					.048	1.049
>6 hours					.085	1.089
Sex						
Female					-.933 **	.393
Highest level of education achieved						
Ref.: lower than University of Applied Sciences						
Univeristy of Applied Sciences					-.848	.428
University					-.842	.431
Nationality						
Ref. Dutch (and other) nationality						
Swiss (and other) nationality					1.665 *	5.285
Other nationality than Dutch or Swiss nationality					-.186	.830
Degrees of freedom	3		5		13	
Chi-square (Step)	2.495		3.762		14.651*	
Chi-square (Model)	2.495		6.257		20.908*	
Nagelkerke R square	0.015		0.038		0.125	

* p < 0.10. ** p < 0.05. *** p < 0.01.

Table 21 - Binary logistic regression results of whether Geneva is called a cycling city or not according to respondents living in Geneva *(Ref. Geneva is not called a cycling city)*

Variable	Model 11	
	B	*Exp(B)*
Intercept	-2.015	.133
Hours cycled on average per week Ref.: < 1 hour		
1-3 hours	-.006	.994
4-6 hours	.297	1.346
> 6 hours	.422	1.525
Degrees of freedom	3	
Chi-square (Model)	1.160	
Nagelkerke R square	0.007	
*p < 0.10. **p < 0.05. ***p < 0.01.		

5.3.4 Testing the hypotheses

- **Age**

When the relationships between the age of respondents and perceiving Amsterdam, Groningen and Geneva as cycling cities are compared (see Table 17, 18 and 20), no significant pattern is found between the age of respondents for the age groups included in the models and whether Amsterdam, Groningen and Geneva are called cycling cities. Based on these outcomes, the first hypothesis, *"there is a negative relationship between the age of respondents and whether or not Amsterdam, Groningen and Geneva are perceived as cycling cities"*, is rejected. However, the age of city dwellers living in Amsterdam, Groningen and Geneva might still have an influence on whether or not these cities are perceived as a cycling cities. For instance, significant outcomes in the expected direction might be found if other age categories were also included in the dataset (e.g. 75 years and older) or if a more representative group of people filled out the survey. The outcomes in Table 17 and 18 also show that Amsterdam and Groningen are less often perceived as a cycling city as the age of respondents increases, although these outcomes are not significant except from one result. In Geneva (Table 20), the same pattern is shown as the age of respondents increases, although this is not the case for the age category 45-49 year old compared to the age category 15-29 years old. Thus, there is a chance that the age of respondents matters if older age categories are added to the dataset, although data have to be collected first.

- **Place of residence**

The results in Table 17, 18 and 20 show that the place of residence of respondents living in Amsterdam, Groningen and Geneva matters for perceiving Amsterdam and Geneva as a cycling

city, although this was not the case for perceiving Groningen as a cycling city. Based on the findings, the hypothesis *"A city – in this case, Amsterdam, Groningen or Geneva - is more often perceived as a cycling city by respondents living in a city with a lower percentage of people travelling by bicycle relative to respondents living in the city concerned. The opposite is also expected; a city (Amsterdam, Groningen or Geneva) is less often perceived as a cycling city by respondents living in a city with a higher percentage of people traveling by bicycle compared to respondents living in the city concerned"* is rejected. It is striking that respondents living in Amsterdam significantly more often perceive Amsterdam as a cycling city than respondents from Groningen and Geneva and that respondents from Groningen more often perceive Groningen as a cycling city (although no significant differences are found) than respondents from Amsterdam and Geneva. Respondents from Geneva (significantly) less often perceive Geneva as a cycling city compared to respondents from Amsterdam and Groningen. Perhaps, these outcomes are caused by the way respondents assess their own city on whether or not this city is a cycling city versus the way this city is assessed by outsiders (i.e. respondents who live somewhere else); respondents living in the city which is assessed on whether or not this city is a cycling city, base their judgement probably more often on observations (e.g. the perceived cycling safety or cycling convenience in the city) than people who live somewhere else, whereas respondents who live somewhere else probably more often base their judgement on the percentage of people travelling by bicycle in the city (as mentioned in the questionnaire).

- **Travel behaviour**

The results shown in Table 19 and 21 provide a better insight in whether the last hypothesis should be confirmed or rejected. The outcomes in both tables do not show a positive relationship between the travel time spent on a bicycle by respondents and perceiving his or her home city (Groningen or Geneva) as a cycling city. As a consequence, the last hypothesis -*"there is a positive relationship between the travel time spent on a bicycle by respondents living in Amsterdam, Groningen and Geneva and perceiving their place of residence (Amsterdam, Groningen or Geneva) as a cycling city"* - is rejected. A reason for this outcome might be that respondents have – irrespective of how much they cycle - almost the same view on the number of persons cycling in their own city, since respondents who cycle not that much still observe cyclists in the city while using another mode of transportation or by watching them while sitting somewhere in the city.

- **Model fit**

The models presented in this paragraph 5.3 do not explain much of the variation in the outcome variable; the variable age – without the variable place of residence and the control variables included in the model – explains 1.5% to 7.1% of the variation in the outcome variable (see models 1, 4 and 8 in Table 17, 18 and 20). From the models in which the control variables have not been added to the models, it can be derived that the variable place of residence explains between the 0.8% and 8.7% of the variation in the outcome variable (see models 2, 5 and 9 in

Table 17, 18 and 20). The variable 'hours cycled on average per week' (as a variable of interest) explains no more than 0.7% to 2.2% of the variation in the outcome variable (see models 7 and 11 in Table 19 and 21). In the models in which the variables of interest and the control variables have been included (models 3, 6 and 10 in Table 17, 18 and 20), 10.7% to 22.7% of the variation in the outcome variable is explained by these variables.

The variable age does significantly improve the model fit compared to the model with the intercept included only in 1 one out of 3 models (see models 1, 4 and 8 in Table 17, 18 and 20). The variable place of residence also shows an improvement of the model fit in 1 out of 3 models (see models 2, 5 in Table 17 and 18) and compared to the models with the intercept and the variable age included (models 1, 4 and 9 in Table 17 and 18). The variable hours cycled on average per week (as a variable of interest) does not show a significant improvement of the model fit compared to the model with the concept included only in both models presented in this paragraph (models 7 and 11 in Table 19 and 21).

5.4 Cities with a limited potential to become a cycling city

The survey results reveal that there are a few barriers towards being perceived as a cycling city by respondents. These are, among others, barriers related to the road infrastructure. The following road infrastructure should rarely (or less than rarely) be present in a cycling city according to respondents: unpaved bike paths, bike paths between tram tracks; roads used by cyclists, together with busses and taxis; bikeways shared with pedestrians; and 50 km/h roads which are shared by cars, public transport and cyclists. Moreover, dark roads on which people may cycle and poorly maintained roads are perceived as barriers by respondents (these roads may, at most, rarely (or less than rarely) occur in a cycling city. Other barriers toward being perceived as a cycling city by respondents are related to the socio-safety situation in the city; respondents filled out that bicycle theft and damage to bicycles due to vandalism may, at most, rarely occur in a cycling city. There are two other aspects which make it impossible to become a cycling city (and thus, in order to be considered as a cycling city as well) according to respondents: that is, the terrain in the city (a city which is somewhat mountainous or steeper (≥200 meters difference in altitude) cannot become a cycling city) and the age structure in the city (a city with many elderly city dwellers (>60 years old) cannot become a cycling city).

From the theoretical framework, it can be derived that it is realistic to take measures to change the road infrastructure and the socio-safety situation in the city. However, it is not realistic to take measures to change the terrain of the city and the age structure of city dwellers. This information indicates that a city with many elderly city dwellers (>60 years old) and a city with a high difference in altitude (≥200 meters difference in altitude) may not become a cycling city, even though measures are taken in order to become one. For both of these factors it should be noted that there is a lot of disagreement among respondents about whether or not a city can become a cycling city under these conditions. Besides, it is unclear how 'many elderly city dwellers' should

be interpreted exactly. Subsequently, it is difficult to define under which particular conditions a city has a limited potential to become a cycling city.

5.5 Measures in order to become a cycling city

In this sub-paragraph, measures are described to achieve the conditions to be perceived as a cycling city by respondents. These measures are derived from the conditions in order to be perceived as a cycling city by respondents (including focus group participants), the measures proposed by focus group participants in order to become a cycling city and the results of the binary logistic regressions. These measures (may) also contribute to a higher amount of cyclists in the city – as can be derived from the literature review – and to a higher quality of cycling in the city, which are both important indicators to be considered as a cycling city by respondents (including focus group participants). The measures which should (possibly) be taken in order to achieve the required conditions to be perceived as a cycling city by respondents, might (slightly) differ in each city though, as the conditions to be perceived as a cycling city might be context dependent (although data is lacking in order to understand in what way these measures might differ). Please note that these measures are based on the views of respondents towards cycling cities. Other measures may be required in order to become a cycling city when another subset of the study population was studied for this research.

5.5.1 Measures to achieve the spatial-time conditions

- **Road infrastructure**

Separate bike lanes

As mentioned earlier, the survey findings confirm the expected outcome that separate bike lanes need to be present in a city in order to be perceived as a cycling city by respondents (these bike lanes should, at least, often or more than often be present in a cycling city according to respondents). Based on this required condition to be perceived as a cycling city, it is concluded that separate bike lanes should be built in a city as often as possible in order to become a cycling city.

Roundabouts that give priority to bicycles

As reported in paragraph 5.2.1, the survey outcomes show that roundabouts that give priority to bicycles have to be present in a city in order to be perceived as a cycling city by respondents; these roundabouts should, at least, often or more than often be present in a city according to respondents (this outcome corresponds to the expectations). From this finding, it can be derived that as many roundabouts that give priority to bicycles as possible have to be built in a city in order to become a cycling city.

On-road bike lanes

As mentioned previously, the survey findings verify the expected outcome that on-road bike lanes should be present in a city in order to be considered as a cycling city by respondents (the

survey findings show that these bike lanes should, at least, often or more than often be present in a city). Based on this finding, it is concluded that as many on-road bike lanes as possible should to be built in a city in order to become a cycling city. From the survey and focus group data, it is derived that – in order to become a cycling city - it is preferred to build wide on-road bike lanes (e.g. wide enough to pass each other on the bicycle on the bike lane) and to have traffic regulations for these bike lanes so that on-road bike lanes are not shared by people using other modes of transport.

Bicycle racks

It was expected that bicycle parking areas are needed in a city in order to be perceived as a cycling city. The survey and focus group findings make clear that it is indeed important to have a particular kind of bicycle parking area – that is, bike racks - in a city in order to be perceived as a cycling city by respondents (bicycle racks should, at least, very often be present in a cycling city according to respondents). These findings reveal that bicycle racks should be installed in a city very frequently in order to become a cycling city according to respondents. However, the focus group data indicate that a city can still be perceived as a cycling city when there are not enough bicycle parking areas for all bicycles in the city. Therefore, not as many bicycle racks as the number of bikes in the city might have to be installed in the city in order to become a cycling city.

Entirely connected network of bike paths

Based on survey and focus group data, it was reported in paragraph 5.2.1 that an entirely connected network of bike paths is needed in a city in order to be perceived as a cycling city by respondents (this outcome was expected). In order become a cycling city, an entirely connected network of bike paths should therefore be developed. Different types of bike paths which are perceived as required in order to be considered as a cycling city by respondents can be built in this network, such as separate bike paths and on-road bike lanes.

Coherent bicycle network

In paragraph 5.2.1, it was mentioned that a coherent bicycle network might be needed in order to consider a city as a cycling city according to focus group participants. A network of bike paths in the city which is well connected to bicycle networks outside the city might therefore need to be developed in order to stimulate the usage of the bicycle in the larger urban area and in order to become a cycling city.

50 km/h roads which are shared by cars, public transport and cyclists

Previously, it was concluded that the presence of 50 km/h roads which are shared by cars, public transport and cyclists in a city are a barrier towards perceiving this city as a cycling city; these roads may, at most, rarely be present in a cycling city according to respondents (this result corresponds to the expectations). In order to become a cycling city, it is therefore relevant not to build roads which are shared by cars, public transport and cyclists with a speed limit of 50 km/h

in the city. In cities with 50 km/h roads which are shared by cars, public transport and cyclists, on-road bike lanes can be painted on these roads as a measure to become a cycling city.

Bikeways shared with pedestrians

As mentioned earlier, the survey findings show that bikeways shared with pedestrians should only be present in a city to a limited extent in order to be perceived as a cycling city by respondents (these roads may, at most, rarely be present in a cycling city according to respondents and this result was expected). The survey results clarify that bikeways shared with pedestrians should not be constructed in a city in order to become a cycling city. In cities where bikeways shared with pedestrians are present, traffic regulations can be enforced to make sure that these bikeways are separated for cyclists and pedestrians as much as possible.

Roads used by cyclists, busses and taxis

In paragraph 5.2.1, it was reported that the survey results reveal that roads used by cyclists, together with busses and taxis should rather not be present in a cycling city according to respondents (the results show that these roads may, at most, rarely be present in a cycling city). This result was expected. Based on these survey results, it is concluded that roads used by cyclists, together with busses and taxis should not be constructed in a city in order to become a cycling city. In case there are roads which are used by cyclists, together with busses and taxis in a city, traffic regulations can be enforced to prohibit a simultaneous presence of cyclists, busses and taxis on one road. Alternatively, on-road bike lanes can be painted on roads which are currently used by different modes of transport.

Bike paths between tram tracks

Previously, it was mentioned that bike paths between tram tracks are seen as a barrier in order to be perceived as a cycling city by respondents (bike paths between tram tracks may, at most, rarely or less than rarely be present in a cycling city according to respondents). This is an outcome in the expected direction. Bike paths between tram tracks should therefore not be built in a city in order to become a cycling city. Bike paths between tram tracks which are already present in a city have to be replaced by bike paths outside tram tracks as much as possible in order to become a cycling city.

Unpaved bike paths

As mentioned earlier, the survey results regarding unpaved bike paths show that these bike paths may only be present in a city to a limited extent in order to be perceived as a cycling city by respondents, which is an outcome in the expected direction (the survey results reveal that these unpaved bike paths may, at most, rarely be present in a cycling city). In order become a cycling city, it is therefore important not to build unpaved bike paths and to replace unpaved bike paths which are already present in the city for paved bike paths which are required in a city in order to be perceived as a cycling city by respondents (e.g. separate bike lanes).

Dark roads

In paragraph 5.2.1, it was mentioned that dark roads – without street lights - on which people may cycle may, at most, rarely occur in a cycling city according to respondents. This survey result is in line with the expectations. From these survey and focus group findings, it can be derived that street lights need to be installed next to roads on which people may cycle in order to become a cycling city.

Road maintenance

As reported earlier, poorly maintained roads on which people may cycle are seen as a barrier towards considering a city as a cycling city by respondents, which corresponds to the expectations (these roads may, at most, rarely occur in a cycling city according to respondents). Therefore, it is concluded that roads on which people may cycle in a city should be maintained on a regular basis (e.g. through re-graveling a road).

- **Road infrastructure adjusted for the age structure of city dwellers**

As mentioned previously, no expectations were made regarding the road infrastructure adjusted for the age structure of city dwellers which is required in order to become a cycling city, as this topic was not mentioned in the theoretical framework and, subsequently, not in the survey. Yet, it appeared to be an important topic in the focus group discussions. The focus group data reveal that in order to become a cycling city, less bike facilities (with regard to the road infrastructure) are needed in a city with many young people as compared to a city with many elderly people according to focus group participants (and perhaps, according to respondents as well). These bike facilities should be adjusted to the abilities of its city dwellers according to focus group participants. Based on the data collected, bike paths with shared spaces may be sufficient in a city with many youngsters, while wide bike lanes with traffic lights may have to be built in a city with many elderly people in order to become a cycling city. Focus group participants in Groningen recommended to build wide bike paths (for elderly people) and fast bike paths (for youngsters) close to each other in a city in order to make cycling in the city convenient for all ages.

- **Bicycle related services**

Bicycle repair shops

As mentioned previously, no expectations were made with regard to bicycle repair shops as no relationship was found between bicycle repair shops and bicycle use in the academic literature. As a consequence, no survey question was asked about the role of bicycle repair shops in being considered as a cycling city. Nevertheless, the focus group data reveal that bicycle repair shops may be needed in order to be perceived as a cycling city. In order to become a cycling city, it is probably not needed to take measures in order to increase the number of bicycle shops in the city according to focus group participants in Amsterdam, as these shops originate anyway from a lively cycling culture according to them.

- **Traffic regulations**

Car-free city

It was expected that cities need to be car-free to some extent in order to be perceived as a cycling city. However, as mentioned in paragraph 5.2.1, the survey findings show that cities do not have to be car-free at all in order to be perceived as a cycling city by respondents. The focus group data, on the other hand, give a more detailed view on whether cities have to be (partly) car-free in order to be perceived as a cycling city. These data reveal that spread-out cities might not have to be car-free in order to be perceived as a cycling city by focus group participants and respondents. However, in compact cities, it might be difficult to have cars and bicycles on one road and therefore, it might be required to make compact cities partly car-free in order to be perceived as a cycling city by focus group participants and respondents. Based on these data, it is recommended to make compact cities partly car-free in order to become a cycling city, whereas it is not needed to make spread-out cities partly car-free (or: to create car-free areas).

Traffic regulations for cyclists

Previously, it was reported that no expectations were made regarding the traffic regulations for cyclists needed in order to be perceived as a cycling city (e.g. when cyclists need to have priority over other modes of transport), except from expectations regarding the roundabouts that give priority to bicycles. As a consequence, only one question in the survey was asked about this topic. The overall position of cyclists in traffic in the city was, however, discussed in the focus group in Groningen. From these findings, it was derived that it might be important to give cyclists sometimes priority over people using other modes of transport in a city in order to be perceived as a cycling city by focus group participants (and perhaps, by respondents as well). Yet, it is not exactly clear what kind of measures might have to be taken with regard to prioritizing cyclists over people using other modes of transport in order to become a cycling city, as it is not known to what extent and where exactly cyclists need to have priority over people using other transport modalities.

- **Urban design**

A small, compact city

In paragraph 5.2.1, it was – against expectations - mentioned that a small, compact city is not needed in order to be perceived as a cycling city by respondents. However, the focus group data reveal that a large city can perhaps only be perceived as a cycling city when an additional criterion is met; that is, having bike-and-ride systems in the city. In order to become a cycling city, it is therefore recommended to provide bike-and-ride systems in small cities and it is perhaps required to provide these bike-and-ride systems in large cities. A few focus group participants in Amsterdam proposed to have compartments for bicycles in trains to contribute to the objective of becoming a cycling city.

"In Germany, they have separate train compartments. [..] We can also have that. I mean we are more a cycling country than Germany I think. So why do they have them while we don't have them?" (Jannes)

It is not sure whether the opinion of focus group participants in Amsterdam concerning bike-and-ride systems is shared by respondents.

A city with mixed land-use

As mentioned before, it was expected that a city with mixed land-use is required in order to be perceived as a cycling city. This expectation was disproved by the survey findings. Nevertheless, the focus group findings indicate that it might be more convenient for people to cycle next to green spaces as compared to cycling next to roadways in a city according to focus group participants and perhaps, according to respondents as well. Based on these findings, it is suggested to create green spaces next to bike paths in a city in order to contribute to becoming a cycling city.

- **Climatological circumstances and air quality**

Climate in a city

Previously, it was reported that the climate in the city is not seen as a barrier towards becoming a cycling city by survey respondents and that the expectations concerning the climate in a city in order to become a cycling city cannot be verified or falsified yet. While it is not realistic to take climatological measures to change the climate in the city, it is also not required in order to become a cycling city based on the data collected.

Air quality

As mentioned earlier, data regarding the air quality needed in a city in order to be perceived as a cycling city were not collected in the survey, since no academic literature was found on the relationship between the air quality and bicycle use. As a consequence, no expectations were made with regard to the air quality. The focus group data, however, reveal that good air quality next to bike paths might be needed in order to be perceived as a cycling city by focus group participants (and maybe, by respondents as well). In order to become a cycling city, it is therefore suggested to have bicycle paths in areas with the least air pollution possible (e.g. next to green spaces instead of next to roadways and highways). Measures can also be taken to reduce air pollution, such as reducing the number of cars by making parts of the urban space none accessible to cars or trucks or by increasing the price of (using) motorized transportation in the city (see paragraph 2.1.1 and 2.1.3).

- **Terrain**

Difference in altitude in the city
In paragraph 5.2.1, it was mentioned that cities which are somewhat mountainous or steeper (≥200 meters difference in altitude) are perceived as having no chance to become a cycling city according to respondents. Based on these outcomes and the literature findings described in paragraph 2.3, it is concluded that cities with a mountainous or steeper terrain probably have no potential to become a cycling city, even though measures are taken in these cities. Perhaps, measures can be taken in these cities to compensate for a somewhat mountainous or steeper terrain in order to become a cycling city eventually, since these cities can become a cycling city according to almost half of the respondents.

- **Travel time**

Travel time by bicycle (as compared to other modes of transport)
Previously, it was mentioned that no survey data was gathered about the travel time by bicycle which is required in a city in order to be perceived as a cycling city by respondents, as this topic was not mentioned in the literature review. From the focus group data, it was derived that cyclists have to be able to go fast from one place in a city to another place in the city by bicycle in order to be perceived as a cycling city by focus group participants (and perhaps, by respondents as well). This implies that cyclists should have the opportunity to make use of direct cycling routes without many interruptions (e.g. using bike tunnels instead of traffic lights at intersections). Based on these findings, it is concluded that direct cycling routes without many interruptions may have to be developed in a city in order to become a cycling city according to focus group participants.

5.5.2 Measures to achieve the socio-cultural conditions

- **Religion**

Religious city dwellers
Previously, it was mentioned that a city does not have to be unreligious in order to be considered as a cycling city according to survey respondents. No expectations were made about the relationship between being an unreligious city and considering a city as a cycling city in the theoretical framework. In the focus group discussions, there was one time spoken about the bicycle use of Muslims, in a way that Muslims rarely use the bicycle to go the Mosque in Groningen. Based on these findings, it is concluded that measures with regard to religion probably do not have to be taken in order to become a cycling city (although such measures are also not realistic to be taken).

- **Nationality**

Western society

As mentioned in paragraph 5.2.2, the survey findings showed – against expectations – that is not perceived as required that mostly Western people live in the city in order to be considered as a cycling city by respondents. In the focus group discussions, there was not referred to the nationality of people in relation to being perceived as a cycling city or not. From this conclusion, it is derived that no measures have to be taken to change the nationality of city dwellers in order to become a cycling city according to respondents (although such measures are also not realistic to be taken).

- **Politics**

Political preferences

Previously, it was reported that it is not needed to have a left-wing City Council in order to be perceived as a cycling city by respondents (this survey result is not in line with the expectations). To become a cycling city, no measures have to be taken to change the composition of the City Council based on these outcomes.

(Cycling) policies

As mentioned in paragraph 5.2.2, (cycling) policies were not addressed in the literature review and, subsequently, no expectations were made with regard to the (cycling) policies. As a consequence, no survey question was asked about the (cycling) policies needed in order to be considered as a cycling city. However, according to some survey respondents and focus group participants, (cycling) policies are relevant in order to be considered as a cycling city. Yet, it is not exactly clear what kind of policies are required to be perceived as a cycling city by respondents, although the data suggest that policies in which the cycling interests are addressed or in which the bicycle is prioritized over other modes of transport might contribute or might even be needed in order to be perceived as a cycling city by respondents. In order to become a cycling city, it is therefore recommended to develop policies in which the cycling interests are addressed and in which the bicycle is prioritized over other modes of transport.

Besides, it was stated by a few focus group participants in Geneva that some degree of public support for governmental programs – e.g. for (carrying out) cycling policies – is needed in order to become a cycling city (although it is not known whether this view is shared by other respondents). More interaction between the government and the civil society may contribute to more public support for governmental programs. The government can use the input given by the civil society for the development of its cycling policies. A focus group participant in Amsterdam stated that the interaction between the civil society and government is necessary in order to understand which cycling measures are perceived as needed by the civil society.

"A government should be aware of the citizens' interest groups who have ideas about how [bicycle facilities] can [be] improve[d] [in the city], and then I am talking particularly about cities and countries with less of a cycling culture than over here. [..] You have to take a look what is happening over there instead of just thinking like well if you really want that than you have to come to us and you have to shout out loud and then maybe, in 20 years, something happens. But there should be a more active kind of interaction."(Karen)

Furthermore, some focus group participants in Amsterdam proposed a policy which is recommended to be implemented in a city in order to become a cycling city. According to them, the local authority should make a bicycle impact assessment a requirement for new road infrastructure projects in the city.

"In Groningen there is a very good [initiative] but probably you have heard it already. In Groningen, I believe, the municipal council passed a bill that every new project in the public space or infrastructure needs to be assessed on the impact for the bicycle. [..] That is just great!"(Wendy)

<u>'Cycling city' marketing by local authorities</u>
As mentioned before, the topic cycling city marketing by local authorities was not addressed in the theoretical framework and, as a consequence, there were no expectations with regard to whether cycling city marketing is expected to be needed in order to be perceived as a cycling city. Cycling city marketing – i.e. calling a city a cycling city – was, however, addressed in focus group discussions in Groningen and Geneva. These focus group results indicate that cycling city marketing may be needed in order to be perceived as a cycling city by respondents, although a city may also need to prove that they are a cycling city in other ways in order to be perceived as a cycling city by respondents. In order to become a cycling city, it might therefore be needed that local authorities make use of cycling city marketing. In this manner, local authorities also show to the outer world that they want to create a cycling culture in the city according to a focus group participant in Groningen.

"I think it is nice that you try to search for a definition for a [cycling] city, but I think it is also a marketing term that refers to the culture you want to create." (Marijn)

- **Image**

<u>Positive image of the bicycle</u>
Previously, it was mentioned that the bicycle needs to have a positive image in order to be perceived as a cycling city by respondents. This is a finding in the expected direction. The focus group findings indicate that this positive image should also be seen in the environment in order to be perceived as a cycling city according to focus group participants (i.e. through the presence of

cycling clubs, cycling museums and bicycle repair shops). From these findings, it is concluded that measures should be taken in a city in order to turn the image of the bicycle into a positive one (in case the image of the bicycle is negative among city dwellers) in order to become a cycling city. A couple of measures were proposed by focus group participants in Groningen and Geneva in order to change the image of bicycle into a positive one. First of all, (social) media can be used according to focus group participants in Groningen in order to show to people that the bicycle is a common mode of transportation for people who are poor and rich.

> "*You have to ask the Mayor or Minister to go by bicycle to the Parliament since that will be broadcasted" (Henk)*

Second, cycling events may change the image of the bicycle according to focus group participants in Groningen and Geneva. Cycling events can be useful to make people aware of the cycling opportunities in the city according to focus group participants in Geneva.

> *"Cycling organizations organized cycling events within cities when people come out and people see that the city is actually accessible." (Emily)*

Third, communication from mouth-to-mouth can be used to make people aware of the health benefits of cycling according to focus group participants in Groningen.

> *I think that, in the future, the health aspect becomes very important. I mean, we suffer from dementia very often and this is associated with too little exercise. In the hospital, those people who are working in this field stress that you have to move, you have to move much more! [..] If you live a quarter or 20 minutes from your work than you should go by bicycle because that is healthy. If you do that for 40 years you have less chance to get dementia. The health aspect is something we should stress much more for that [cycling] city." (Henk)*

Fourth, placing dressing-rooms and showers at school and at work might change the image of the bicycle into a positive one according to a couple of focus group participants in Amsterdam.

These measures might be taken to change the image of the bicycle. However, it is not known how effective these strategies are.

Furthermore, the focus group data indicate that top-down measures do not have to be carried out to encourage the start-up of cycling clubs, bicycle repair shops and cycling museums, since these clubs and facilities originate anyway from a lively cycling culture.

<u>Preference of using the bicycle</u>

As mentioned before, the survey findings reveal – in accordance with the expectations – that the bicycle should be the preferred mode of transport of respondents in order to perceive a city as a cycling city according to respondents. Yet, it is unclear whether the bicycle should be the

preferred mode of transport of most of the people living in a city in order to be perceived as a cycling city by them. The measures which should be taken in order to make the bicycle the preferred mode of transportation of people might be similar to the proposed measures which may contribute to a more positive image of the bicycle (see the previous paragraphs).

- **Social norms**

Norms towards cycling

Previously, it was reported that no data was gathered on the social norms needed in a city in order to be considered as a cycling city by respondents, although the relationship between social norms and bicycle use was addressed in the literature review. In the focus group discussions, one focus group participant in Groningen stated that the culture of using the bicycle together should be the norm in the city in order to become a cycling city. It is unclear whether this opinion is shared by other focus group participants. To become a cycling city, measures might have to be taken to in order to change the cycling norm into a 'using the bicycle together' norm in the city. One measure which might contribute to becoming a cycling city (trough changing the cycling norm) is given by a focus group participant in Groningen. He stated – in line with the findings of Dill and Voros (2007) and Sherwin et al. (2014) which are described in the literature review - that people's mindsets towards cycling change when people start to exchange their cycling experiences.

> *"I experience that if you are satisfied and eager about something than you are telling that. I still have an effect on people and they start to think about it. I have a colleague and he lives further away, he lives in Vries (the Netherlands) and yes he considers to buy an electric bicycle to travel by bicycle all the way from Vries. Thus, previously he has never thought about it but now that he has an example he perceives it as an option." (Jeroen)*

When positive experiences about cycling in the city are exchanged among city dwellers, the cycling norm might thus gradually change into one in which it is normal to use the bicycle in the city as a mode of transportation.

Another measure which might change the social norm into a 'using the bicycle together' norm is to make cycling lessons at primary school a school criterion according to a few focus group participants in Geneva. As a result, cycling might become normal and safe for people from a young age onwards. Below, a fragment of the transcript of the focus group discussion in Geneva is shown which explains the relevance of having cycling lessons at a young age.

"If you've learned when you were young to ride a bike safely. I mean when we were at primary school we had cycling lessons." (Loes)
"Really? That must be school criteria! " (Oliver)
"And then you had to look to the right and left before you cross the road and put out your hand. [..]" (Loes)
"Yeah that changes the mentality, because of very young age for the next generation." (Emily)

5.5.3 Measures to achieve the economic conditions

- **Transportation costs**

Costs of different transport modalities
As reported in paragraph 5.2.3, the survey findings make clear that both low and high public transport and car expenses do not prevent a city from becoming a cycling city according to the majority of the survey respondents. These survey results are against expectations. Based on these findings, it is concluded that no measures have to be taken to change the costs of (using) public transport or the car in order to become a cycling city. Nevertheless, a couple of economic measures were proposed by focus group participants which can be taken in order to encourage cycling in a city; e.g. subsidizing children's bikes and making car-use so expensive that people will use less cars in the city. These measures might be taken as an incentive in order to become a cycling city.

- **Income**

Income of city dwellers
As mentioned in paragraph 5.2.3, the survey results show – against expectations - that the average income of city dwellers can be high but also low compared to other inhabitants in the country and in the world in order to become a cycling city according to respondents. From these findings, it can be derived that no measures have to be taken in a city with regard to the income of city dwellers in order to become a cycling city.

5.5.4 Measures to achieve the demographic conditions

- **Population size and density**

Number of city dwellers and the population density of the city
As mentioned previously, the survey results reveal that cities with small and large populations can become cycling cities according to respondents. This result was not expected. In the focus group discussion in Geneva, an additional topic was discussed which is linked to the population size of a city – that is, the population density of a city. These results indicate that it might be more difficult for a city with a high population density to become a cycling city as compared to a city with a low population density, since it might be problematic in cities with a high population

density to have a combination of all traffic modes on one road. Based on these outcomes, it is concluded that representatives and other stakeholders of a city with a high population density might have to make (some) narrow streets car-free or have to give motorized transport a limited space for driving on narrow streets (e.g. through having an one-lane road for motorized transport in narrow streets) in order to become a cycling city.

- **Age**

Age structure of city dwellers

In paragraph 5.2.4, it was described that a city with many youngsters (<35 years old) and a city with many people between 35 and 60 years old can become a cycling city, whereas a city with many elderly people (>60 years old) cannot become a cycling city according to respondents. These conclusions are drawn from the survey data and are in accordance with the expectations. Cities with many elderly people (>60 years old) can, however, become a cycling city according to focus group participants and remarks were also made about the age categories chosen in the survey by them. Furthermore, focus group participants proposed road infrastructure measures and measures to learn how to cycle at a young age (which also contributes to cycling at an old age according to participants) in order to become a cycling city in a city with many youngsters (aged 35 and younger) and in a city with many elderly people (>60 years old). These measures are described in the paragraph 5.5.1 (see: 'road infrastructure adjusted for the age structure of city dwellers') and in paragraph 5.5.2 (see: 'social norms'). Based on the survey and focus group findings, it is concluded that cities with many youngsters and cities with many people between 35 and 60 years old can become cycling cities, although it is recommended to take road infrastructure measures and measures to learn how to cycle at a young age in these cities. For cities with many elderly people (>60 years old), it is probably not effective enough to take specific road infrastructure measures and measures to learn how to cycle at a young age in order to become a cycling city eventually.

- **Household size**

Average number of persons per household in a city

Previously, it was reported that the average number of persons per household in a city does not matter in order to become a cycling city according to respondents. This finding was not expected. Based on this survey outcome, no measures with regard to the household size have to be taken in order to become a cycling city (measures to change the household size are also not realistic to be taken).

5.5.5 Measures to achieve the socio-safety conditions

- **Bicycle theft**

Occurrence of bicycle theft

Previously, it was reported that the survey findings show that bicycle theft may, at most, rarely occur in a cycling city according to respondents (paragraph 5.2.5). This outcome was expected. One measure was proposed by a focus group participant in Groningen in order to reduce bicycle theft; that is, to create guarded bicycle parking facilities. This measure may contribute to becoming a cycling city.

- **Vandalism**

Occurrence of damage to bicycles

As mentioned earlier, the survey results show that damage to bicycles due to vandalism, may, at most, rarely occur in a cycling city according to respondents. This finding corresponds to the expectations. To become a cycling city, it is recommended to take measures to minimize damage to bicycles. Creating guarded bicycle parking facilities might reduce the occurrence of damage to bicycles. It is therefore suggested to create as much guarded bicycle parking facilities in the city as required in order to become a cycling city.

5.5.6 Measures in order to become a cycling city, based on individual characteristics

In paragraph 5.3, it was tested whether the age, place of residence and travel behaviour of respondents have an influence on calling a city a cycling city or not. The outcomes reveal that the age of respondents and hours cycled on average per week by respondents do not have a significant effect on calling Amsterdam, Groningen and Geneva a cycling city or not. However, the relationships between the place of residence of respondents and whether the cities Amsterdam, Groningen and Geneva are called cycling cities, show significant outcomes; the results reveal that respondents living in Amsterdam significantly more often call Amsterdam a cycling city than respondents living in Groningen and Geneva. These outcomes, and the results with regard to cycling city marketing as a condition to be perceived as a cycling city, indicate that the promotion of Amsterdam as a cycling city might be improved in order to change the status of Amsterdam is not a cycling city towards Amsterdam is a cycling city among people living in another place of residence than Amsterdam. Yet, it is not known to what extent this measure is effective, as it is not exactly clear why Amsterdam is more often perceived as a cycling city by respondents living in Amsterdam compared to respondents living in Groningen and in Geneva. Moreover, the results on the binary logistic regression reveal respondents living in Amsterdam significantly more often perceive Geneva as a cycling city than respondents living in Geneva. Measures which improve to the perception of Geneva as a cycling city among respondents living in Geneva, cannot be derived from the data.

6. Conclusion

In this chapter, a summary of this thesis is provided in paragraph 6.1. In this summary, answers are given on the research questions. Paragraph 6.2 reflects on the propositions which are derived from the literature review. In the next subparagraph, the strengths and limitations of this study are described. In paragraph 6.4, the recommendations for future research are presented. Finally, policy recommendations in order to become a cycling city are addressed (paragraph 6.5).

6.1 Summary

Many representatives of cities want to take measures in order to become a cycling city. For cities that want to become a cycling city, it is yet unclear which measures need to be taken in order to achieve this goal since the conditions to be perceived as a cycling city or not have never been determined. Moreover, it is unknown whether the perception on calling a city a cycling city differs due to demographic, spatial and travel behavior characteristics of city dwellers. The main research question in this study is derived from the lack of knowledge on this topic and is formulated as followed: *"Which measures are perceived as required to be taken in become a cycling city and to what extent is the perception of whether a city is a cycling city or not influenced by demographic, spatial and travel behavior characteristics of those living in cities?"* The sub-questions - which are formulated in order to answer the main question eventually - are the following: (1) *"What are the conditions (required or barriers) to be perceived as a cycling city according to those living in cities?"*; (2) *"What are the influences of demographic, spatial and travel behavior characteristics of city dwellers on calling a city a cycling city?"*; and (3) *"Which measures are perceived as required to be taken in order to become a cycling city, based on the previous research findings and the measures proposed by those living in cities?"*

In order to answer the main question, a theoretical framework was constructed first (Chapter 2). In this theoretical framework, an overview of the spatial, socio-cultural, economic, demographic and socio-safety conditions that determine the bike usage in the city is provided (as literature findings indicate that bicycle use might be an important indicator in order to perceive a city as a cycling city). Moreover, literature is used which reveals that the age, place of residence and travel behavior of people have a possible effect on perceiving a city as a cycling city or not. Furthermore, legal documents and academic papers were obtained which suggest that some cities might have a limited potential in order to become a cycling city in case the conditions for being perceived as a cycling city coincide with the conditions that determine the bicycle use.

In the next stage of this study, the study population and sample were determined, as well as the methods for conducting this study (Chapter 3). The study population was defined as people living in Groningen, Amsterdam and Geneva of both sexes aged between 15-74 years old. Based on the research questions and the theoretical framework, the research methods for this study were chosen. In total, 2 internet surveys (n=291) and 3 focus group discussions were conducted. The

survey data were analyzed through applying descriptive statistics, binary logistic regressions and inductive coding. A combination of deductive and inductive coding was used to analyze the focus group data.

In Chapter 4 of this thesis, the results of the survey and focus group discussions are displayed and described without providing a further interpretation of the data. The analysis of the results – for the general description of a cycling city, the conditions (required and barriers) to be perceived as a cycling city; the effects of the age, place of residence and travel behavior of people on calling a city a cycling city or not; and the measures required in order to be perceived as a cycling city - are described in Chapter 5.

The findings on sub-question 1 show that the following spatial-time conditions are required in order to be perceived as a cycling city by respondents: separate bike lanes, roundabouts that give priority to bicycles, on-road bike lanes, an entirely connected network of bike paths and bicycle racks. The socio-cultural conditions which are required in order to be perceived as a cycling city, are a positive image of the bicycle and perceiving the bicycle as the preferred transport modality in the city. The barriers with regard to space and time to be perceived as a cycling city by respondents are the following: unpaved bike paths; bike paths between tram tracks; roads used by cyclists, busses and taxis; bikeways shared with pedestrians; dark roads and poorly maintained roads. A difference in altitude in the city of 200 meters or more is perceived as a barrier in order to become a cycling city by respondents (and thus, for being considered as a cycling city by respondents as well). A barrier regarding the demography of a city in order to become a cycling city according to respondents is the age structure of city dwellers; cities with many elderly people (>60 years old) cannot become a cycling city according to survey respondents (and therefore, a city with many elderly people (>60 years old) is also a barrier toward being perceived as a cycling city by respondents), although the focus group data show a different view. Barriers with regard to the social safety in order to be perceived as a cycling city are damage to bicycles due to vandalism and bicycle theft according to respondents. The survey and focus group findings indicate that there may be other conditions (required or barriers) in order to be perceived as a cycling city by respondents as well (see Chapter 5). It should, however, be noted that these findings are not representative for all people living in cities (as mentioned in sub-question 1); another group of city dwellers sampled may have different thoughts about the conditions (required or barriers) in order to be considered as a cycling city and therefore, these findings only indicate what might be conditions (required or barriers) in order to be perceived as a cycling city by city dwellers.

The results on sub-question 2 provide an insight in the influences of demographic, spatial and travel behavior characteristics of respondents on calling Amsterdam, Groningen and Geneva a cycling city. These findings show significant relationships between the place of residence of respondents (living in Amsterdam, Groningen and Geneva) and perceiving Amsterdam and Geneva as a cycling city. Respondents who live in Amsterdam significantly more often perceive

Amsterdam as a cycling city as compared to respondents living in Groningen and Geneva. Respondents who live in Geneva significantly less often perceive Geneva as a cycling city than respondents living in Amsterdam and Groningen. In the models, the variable 'place of residence' of respondents explains 0.8% to 8.7% of the variation in the outcome variable. When the findings on the relationships between the age of respondents and calling Amsterdam, Groningen and Geneva cycling cities or not are compared, no significant pattern is found between the age of respondents (for the age groups included in the models) and perceiving Amsterdam, Groningen and Geneva as cycling cities or not. The results on the model fit show that the variable 'age' of respondents explains 1.5% to 7.1% of the variation in the outcome variable in the models. Furthermore, the results on the binary logistic regressions reveal that no association is found between the travel behavior of respondents living in Groningen, Amsterdam or Geneva and perceiving his or her home city as a cycling city. In the models, the variable 'hours cycled on average per week' – explains 0.7% to 2.2% of the variance in the outcome variable. These findings do, however, only say something about the perspectives of respondents on calling a city a cycling city instead of on the views of all city dwellers in the world towards perceiving a city as a cycling city (as mentioned in sub-question 2).

As mentioned in sub-question 3, the measures which are perceived as required to be taken in order to become a cycling city are derived from the previous research findings and the measures proposed by focus group participants. The following spatial measures are perceived as required to be taken in order to become a cycling city: building separate bike lanes, roundabouts that give priority to bicycles, on-road bike lanes and an entirely connected network of bike paths (e.g. with separate bike lanes and on-road bike lanes) in the city. Moreover, street lights on roads on which people may cycle and bicycle racks should be placed in the city and roads on which people may cycle need to be well maintained. The road infrastructure which should not be built in a city or should be replaced (if present) in the city for road infrastructure which is perceived as required in order to be perceived as a cycling city, are: unpaved bike paths, bike paths between tram tracks, roads used by cyclists, busses and taxis; bikeways shared with pedestrians; and 50 km/h roads which are shared by cars, public transport and cyclists. The socio-cultural measures which are perceived as required to be taken in order to become a cycling city by respondents are the following: changing the image of the bicycle into a positive image and changing the mindset of people into one in which the bicycle is seen as the preferred transport modality in the city. This might be achieved through making use of (social) media, mouth to mouth communication and organizing cycling events. Measures regarding the socio-safety – i.e. measures to have the least damage to bicycles and bicycle theft possible in the city - should be taken in order to become a cycling city. Perhaps, guarded bicycle parking facilities in the city might reduce the damage to bicycles and bicycle theft in cities. As reported in the last paragraph, the measures which are perceived as required to be taken in order to become a cycling city only refer to what is perceived as required to be taken according to respondents (and not, what is perceived as required to be taken according to all city dwellers in the world – which is written down in sub-question 3).

All measures which are perceived as required to be taken in order to become a cycling city by respondents, might not have enough effect in cities with many elderly people (>60 years) and in cities which are somewhat mountainous or steeper (≥200 meters difference in altitude), as these cities have a limited potential to become a cycling city according to respondents and based on the literature findings. Furthermore, it should be noted that other measures might also be needed in order to become a cycling city according to respondents. A few of these additional measures are suggested by survey respondents (including focus group participants) and mentioned in Chapter 5. Finally, is should be mentioned that the conclusions drawn from this research are not representative for the study population; instead, these conclusions describe the views of the respondents taking part in this study. Nevertheless, useful insights are drawn from these results and the input given by survey respondents can be used for future research.

6.2 Reflection on the propositions

In the theoretical framework, 3 propositions were formulated and these propositions were tested with the results on the surveys and focus group discussions. In paragraph 6.2, a brief reflection on these propositions is given.

The first proposition was formulated as followed: *"That bicycle use is an important indicator in order to be perceived as a cycling city. Factors stimulating or significantly positively influencing bicycle usage are conditions which are perceived as required in order to be considered as a cycling city, whereas factors which are significantly negatively influencing bicycle use or discouraging bicycle use are barriers towards being perceived as a cycling city and should not often be present in a city in order to be perceived as a cycling city."* The survey and focus group results show that bicycle use in a city is indeed an important indicator in order to be considered as a cycling city by respondents. However, a city where many cyclists are visible on the streets is not a cycling city when the quality of cycling is perceived as low – e.g. in terms of cycling safety and the quality of the bicycle network. Therefore, the quality of cycling should also be included as an important indicator in order to be considered as a cycling city by respondents. Besides, the data shows that the factors stimulating or significantly positively influencing bicycle usage are not always conditions which are perceived as required in order to be considered as a cycling city by respondents; this is only the case for all factors related to the road infrastructure and the image of the bicycle which are mentioned in the literature review. Against expectations, the factors related to urban design, traffic regulations, political preferences and nationality which stimulate or significantly positively influence bicycle use are not required in order to be considered as a cycling city according to respondents. Probably, these factors are perceived as less important in order to be perceived as a cycling city by respondents. Furthermore, in accordance to the expectations, the data also revealed that the factors related to the road infrastructure and to the socio-safety situation in the city (i.e. vandalism and bicycle theft) which are mentioned in the literature review as factors which are significantly negatively influencing bicycle use or

discouraging bicycle use, are barriers toward being perceived as a cycling city according to respondents. Some other factors which are significantly negatively influencing bicycle use or discouraging bicycle use, prevent a city from becoming a cycling city according to respondents; that is, the difference in altitude in a city and the age of city dwellers. These are probably also barriers toward being perceived as a cycling city. Against expectations, some factors which are significantly negatively influencing bicycle use or discouraging bicycle use do not prevent a city from becoming a cycling city - and probably, these factors also do not prevent a city from being perceived as a cycling city. These factors are related to the climate in a city, the financial costs of different transport modalities, the income of city dwellers, the number of city dwellers and the average number of persons per household in a city.

The second proposition is the following: *"That demographic, spatial and travel behavior characteristics have an effect on perceiving cities as cycling cities."* This proposition is divided into 3 subpropositions. The first subproposition is: *"that there is a negative relationship between the age of people and whether or not a city is perceived as a cycling city."* The results on the binary logistic regression analysis showed that there is no relationship between the age of respondents and calling Amsterdam, Groningen and Geneva a cycling city and therefore, this proposition is rejected. However, selecting another group of people for this research may provide other results on the first subproposition. The second subproposition – that is, *"that a city is more often perceived as a cycling city by persons living in cities with a lower percentage of people travelling by bicycle relative to persons living in the city concerned. The opposite is also true; a city is less often perceived as a cycling city by persons living in cities with a higher percentage of people travelling by bicycle relative to persons living in the city concerned."* – is also rejected based on the data collected, as other relationships between the place of residence of respondents and perceiving Amsterdam, Groningen and Geneva as a cycling city have been found (different from what was expected). Yet, also for this proposition – it can be noted that other outcomes might be found when another group of people was sampled for this study. The third subproposition, i.e. *"that there is a positive relationship between the travel time spent on a bicycle by persons living in a city and perceiving their place of residence as a cycling city."*, is also rejected, as no association has been found between the travel time spent on a bicycle on average per week by respondents and perceiving his or her home city as a cycling city. Another relationship might be found when other respondents took part in this study though.

The last proposition which is tested is: *"that some cities have a limited potential to become a cycling city. Some conditions which are required to be perceived as a cycling city can only be influenced to a minor extent and when these conditions are not present in a city, a city has a minor potential to become a cycling city."* The survey data and literature findings show that 2 conditions make it impossible to become a cycling city, which cannot be changed through taking realistic measures; that is, a city with a high difference in altitude (≥200 meters difference in altitude) and a city with many elderly city dwellers (>60 years old). Subsequently, it is concluded that cities with a high difference in altitude (≥200 meters difference in altitude) and cities with

many elderly city dwellers (>60 years old) probably have a limited potential in order to become a cycling city according to respondents. Yet, the interpretation of 'many elderly people' is still unclear, especially considering the outcomes of the focus group discussions.

6.3 Reflection on the strengths and limitations of this study

This study has a number of strengths. The first strength is related to the field and subject of this research. As no academic paper has been written about cycling cities, all information regarding this topic had to be obtained from scratch. The results acquainted in this study can be used for further scientific debates on cycling cities. The relevance of this research is also high, as many stakeholders (e.g. governments, urban planners, (city) marketers and civil society organizations) can use the obtained knowledge in order to take effective measures in order to become one. That the obtained knowledge will probably be read and used, can be derived from the respondents who mentioned that they want receive the analysis of this study and from the reasons provided by focus group participants for participating in this study among others. A second strength of this study is the usage of mixed-methods (quantitative and qualitative). Through conducting surveys and focus group discussions, the results on the surveys could partly be explained. Moreover, the focus group data provided a first insight in other conditions than expected for perceiving a city as a cycling city (which were not addressed in the theoretical framework). Furthermore, the focus group discussions provided more insight into measures which might be required in order to become a cycling city. This information can be used for further research. A third strength of this study is the number of unexpected findings on this topic; the unexpected findings show that the topic researched is more complex than initially thought and that further research is needed to better understand the conditions (required or barriers) to be perceived as a cycling city, the characteristics which have an effect on perceiving a city as a cycling city or not and the measures which should be taken in order to become a cycling city.

This study also has its limitations. The first limitation is found in the sample used for this research. As mentioned in the methodology section, the sample is not representative for the study population and therefore, no conclusions can be drawn on the population level. A second limitation is related to the measures proposed by focus group participants in order to become a cycling city. In this study, the measures proposed in order to become a cycling city are not assessed on its effectivity in practice (e.g. through using papers that reflect on the positive and negative outcomes of similar measures taken in cities). A third limitation of this study is the assumption that the conditions (required or barriers) to be perceived as a cycling city are the same for each city. However, the focus group data indicate that the perception on the conditions in order to consider a city as a cycling city are context dependent. This implies that the conditions for perceiving city A as a cycling might be different from the conditions in order to perceive city B as a cycling city. The obtained knowledge on the conditions (required or barriers) to be perceived as a cycling city might therefore refer to a general image of a cycling city and might need to be specified for each city as well. A fourth (and last) limitation of this study is that the

survey results are only to a very limited extent compared by place of residence of respondents, while the title of the thesis suggests that this comparison will be made on all aspects included in the survey.

6.4 Recommendations for future research

The reflection on the research methodology used and the survey and focus group findings show that there is need for further research on the (context dependency of the) conditions in order to be perceived as a cycling city and on the (context dependency of the) measures needed in order to become a cycling city (see paragraph 5.2 and 5.5), as well as on the relationship between the characteristics of respondents and calling a city a cycling city or not (see paragraph 5.3).

In the Methodology section (Chapter 3), it was mentioned that the recruitment method used for this research is reliance on available subjects. However, the representativeness of the sample cannot be controlled with this sampling method. For this reason, it is recommended to use another recruitment method for future research, such as random sampling (Babbie, 2013). The research methods used - that is, internet surveys and focus group discussions – can also be extended through conducting in-depth interviews. In-depth interviews provide a deeper understanding in the conditions to be perceived as a cycling city and in the measures required in order to become a cycling city as compared to the focus group discussions (Hennink et al., 2011).

From the survey and focus group results and analysis in Chapter 4 and 5, a couple of points are derived which are recommended to be tested. First of all, the survey and focus group data show that some aspects might be conditions for perceiving a city as a cycling city. For future research, it is therefore recommended to assess these aspects on whether these are conditions to be perceived as a cycling city. Second, the focus group data indicate that the conditions to be perceived as a cycling city are context dependent. In order to test the context dependency of the conditions to be perceived as a cycling city, various cities can be assessed which differ on a limited number of aspects (such as the terrain and city size). Third, the data revealed that there might be a negative relationship between the age of city dwellers living in Groningen, Amsterdam and Geneva and perceiving a city as a cycling city or not when respondents aged 75 years and older were included in the dataset. Therefore, it is advised to include people who are 75 years and older in the dataset (e.g. through making use of paper-based surveys in addition to online surveys for elderly people). In addition, smaller age groups can be included in the surveys in order to get a more detailed insight in the influence of the age of respondents on calling a city a cycling city or not. Fourth, some measures were proposed by a few survey respondents and focus group participants which should be taken in order to become a cycling city according to them. However, it is not known whether these measures are perceived as required according to all respondents. Therefore, it is advised to assess these measures in a new study in order to get an insight in the relevance of measures according to the study population. Finally, the effectivity of the measures which are perceived as required in order to become a cycling city is unclear. To

assess the effectivity of these measures, policy papers and research papers which reflect on the effects of taking one of these measures might be used for future research.

6.5 Policy recommendations

In the introduction of this thesis, it was mentioned that many cities want to become a cycling city or are already called cycling cities by various stakeholders. However, it was not known under which conditions a city is perceived as a cycling city and which measures should be taken in order to become one. Based on the measures required as well as on the measures suggested in order to become a cycling city, (which are derived from the survey and focus group results), the following 7 policy recommendations for becoming a cycling city are made.

First of all, it is recommended to develop an entirely connected and coherent network of bicycle paths in the city, consisting of wide on-road bike lanes and separate bike lanes which are well maintained and lightened. Preferably, these bike paths should not have many detours and interruptions. Moreover, it is advised to build fast bike paths (with shared spaces) and wide bike lanes with more traffic lights close to each other in the city. In this way, the road infrastructure in the city is (partly) adjusted for city dwellers of all ages.

The second recommendation is to create as many bicycle parking facilities (e.g. bicycle racks) in the city as reasonably possible in order to make cycling more convenient and to avoid bicycle parking everywhere in the city, which hinders pedestrians among others. To reduce damage to bicycles and the occurrence of bicycle theft, it is advised to have guarded bicycle parking facilities in the city as well.

Third, it is recommended to make (some of the) narrow streets car-free and/or to give motorized vehicles a limited space on these streets. Subsequently, cyclists have enough space for riding the bicycle in these narrow streets.

Fourth, it is advised to develop bike-and-ride systems in cities. One of the options is to have a compartment for bicycles in trains. These bike-and-ride systems are especially needed in large cities, as the travel distances are often too large in these cities to get somewhere by bicycle only. Bike-and-ride systems stimulate the usage of the bicycle for very large travel distances as well.

Fifth, it is recommended to take measures in order to change the image of the bicycle into a positive one in the city. The following measures were proposed by focus group participants: (1) to stimulate and contribute to the promotion of using the bicycle trough stressing the health benefits by word of mouth; (2) to use the media in order to show to city dwellers that high-society people use the bicycle; and (3) to organize cycling events. Although not proposed by respondents, stressing the health benefits of cycling may also be done through making use of (social) media.

A sixth recommendation is to make cycling lessons a school criterion at primary school. Through offering cycling lessons, cycling becomes a more common and safer mode of transportation for young children and this measure also contributes to changing the cycling norm and attitude into one in which it is normal to use the bicycle.

Finally, it is advised to develop cycling policies in which the cycling interests are addressed. For a better understanding of the cycling policies needed according to city dwellers, governments are recommended to have conversations with cycling advocacy organizations on a regular basis.

It is recommended to use these findings to make cycling policies work.

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Attachment 1 – Pearson correlation coefficients

The Pearson Correlation coefficients were computed in SPSS for the variables which were used in the models for testing the hypotheses formulated in the Methodology section. The highest Pearson Correlation coefficient between the variables used for testing the hypotheses is 0.62, as shown in Table 22. This implies that the variables in the models are not significantly related to each other. It can therefore be concluded that no variable has to be removed from the models as the problem of multicollinearity does not exist.

Table 22 - Pearson Correlation coefficients between the independent and control variables included in the binary logistic regression models (n=291)

	Age	Sex	Place of Residence	Hours Cycled on Average per Week	Nationality	Highest Level of Education achieved
Age	1.00	-0.04	-0.04	0.18	-0.19	-0.22
Sex	-0.04	1.00	-0.12	-0.04	-0.07	-0.02
Place of residence	-0.04	-0.12	1.00	-0.22	0.62	0.20
Hours cycled on average per week	0.18	-0.04	-0.22	1.00	-0.32	-0.11
Nationality	-0.19	-0.07	0.62	-0.32	1.00	0.28
Highest level of education achieved	-0.22	-0.02	0.20	-0.11	0.28	1.00

Attachment 2 – Characteristics of focus group participants

Demographic and spatial characteristics of participants (pseudonyms are used) who participated in the focus group discussion held in Groningen, Amsterdam or Geneva, are shown in Table 23 Furthermore, three columns were added to this table to describe the main daily activity of each of the participants. When participants mentioned that they were a student or intern at the moment the focus group discussion was conducted, a cross was placed behind their names in the column 'intern/student'. Participants who are working (for money) in the public or private sector, are displayed with a cross behind their names in the column 'working in the public/private sector'. The column 'Citizen' is used for people who are not a student or intern and do not work in the public or private sector.

Table 23 - Characteristics of focus group participants

Name (pseudonym)	Sex	Age of Participant	Place of Residence	Intern/ Student	Working in the public/private sector	Citizen*
Chantal	Female	45-59 years old	Groningen		x	
Ruben	Male	30-44 years old	Groningen		x	
Henk	Male	60-74 years old	Groningen		x	
Marjan	Female	15-29 years old	Groningen	x		
Jeroen	Male	45-59 years old	Groningen		x	
Guus	Male	45-59 years old	Groningen		x	
Marijn	Male	30-44 years old	Groningen		x	
Wessel	Male	15-29 years old	Groningen	x		
Gijs	Male	30-44 years old	Amsterdam		x	
Wendy	Female	45-59 years old	Amsterdam		x	
Anna	Female	45-59 years old	Amsterdam		x	
Anniek	Female	60-74 years old	Amsterdam			x
Karen	Female	15-29 years old	Amsterdam		x	
Jannes	Male	15-29 years old	Amsterdam		x	
Jean	Male	15-29 years old	Geneva		x	
Emma	Female	30-44 years old	Geneva		x	
Emily	Female	15-29 years old	Geneva	x		
Luciana	Female	15-29 years old	Geneva			x
Oliver	Male	15-29 years old	Geneva	x		
Loes	Female	15-29 years old	Geneva	x		

** The column 'Citizen' applies to participants who are not a student nor an intern and do not work in the public or private sector*

Attachment 3 - Emails sent to the selected focus group participants to ask for their consent to participate in the focus group discussion

Email sent to the selected focus group participants who mentioned that they wanted to participate in the focus group discussion being held in Geneva:

Dear Sir/Madam,

Thank you for filling in the survey 'What is a bike city?'

Following your answers on the survey, I would like to invite you to participate in the focus group being held on Thursday 18th of February in Geneva. During this group discussion, I would like to go more into depth with you on the conditions necessary in order to become a bike city by making use of statements and questions. These questions and statements are derived from the results on the survey.

The focus group takes place in the Boardroom for 8 persons at Accueil et Businesspoint CFF (Place Cornavin 7, Geneva). The doors will open at 5:15 pm and the group discussion starts at 5:30 pm (this is a change compared to the time mentioned in the survey). The focus group takes 1 to 1,5 hours of your time. Please reply via e-mail before the 16th of February if you are able to attend the focus group. Your opinion is very much appreciated for my research. Coffee and tea will be served!

With kind regards,

Anne Abbing
Telephone number[redacted]

Email sent to the selected Focus Group Participants who mentioned that they wanted to participate in the Focus Group Discussion being conducted in Amsterdam:

Beste heer/mevrouw,

Hierbij wil ik u allereerst bedanken voor uw bijdrage aan de enquête 'Wat is een fietsstad?'.

Verder zou ik - naar aanleiding van uw antwoorden op de enquête - u graag willen uitnodigen voor de focusgroep in Amsterdam. In de focusgroep zal er met behulp van stellingen dieper

worden ingegaan op de condities die benodigd zijn om uit te groeien tot fietsstad. De voor te leggen stellingen komen voort uit de resultaten van de enquête.

De focusgroep zal op 10 februari plaatsvinden in EBC Amsterdam B.V. (Keizersgracht 62-64, Amsterdam) in de studio voor 8 personen. De deuren zijn geopend vanaf 15.45 uur en om 16.00 uur zal de groepsdiscussie van start gaan (dit is een verandering ten opzichte van de tijd die in de enquête staat vermeld). De focusgroep zal tussen de 1 en anderhalf uur in beslag nemen. Graag hoor ik voor zondag 7 februari via de mail van u of u bij de focusgroep aanwezig kan zijn. Uw deelname kan heel waardevol zijn voor het onderzoek. Koffie en thee staan voor u klaar!

Met vriendelijke groet,

Anne Abbing
Telefoonnummer[redacted]

Email sent to the selected Focus Group Participants who mentioned that they wanted to participate in the Focus Group Discussion being held in Groningen:

Beste heer/mevrouw,

Hierbij wil ik u allereerst bedanken voor uw bijdrage aan de enquête 'Wat is een fietsstad?'.

Verder zou ik - naar aanleiding van uw antwoorden op de enquête - u graag willen uitnodigen voor de focusgroep in Groningen. In de focusgroep zal er met behulp van stellingen dieper worden ingegaan op de condities die benodigd zijn om uit te groeien tot fietsstad. De voor te leggen stellingen komen voort uit de resultaten van de enquête.

De focusgroep zal op 9 februari plaatsvinden in Launch Cafe (Herestraat 107, Groningen) in de vergaderzaal voor 10 personen. De deuren zijn geopend vanaf 16.15 uur en om 16.30 uur zal de groepsdiscussie van start gaan (dit is een verandering ten opzichte van de tijd die in de enquête staat vermeld). De focusgroep zal tussen de 1 en anderhalf uur in beslag nemen. Graag hoor ik voor woensdag 3 februari via de mail van u of u bij de focusgroep aanwezig kan zijn. Uw deelname kan heel waardevol zijn voor het onderzoek. Koffie en thee staan voor u klaar!

Met vriendelijke groet,

Anne Abbing
Telefoonnummer[redacted]

Attachment 4 – Survey (language: English)

What is a bike city?

1. Introduction

'Bike city' is a term often used by people in some countries in Europe and in the United States. However, the conditions to be considered a bike city and the measures needed in order to become one remain unclear.

This survey concentrates on the cities Groningen (Netherlands), Amsterdam (Netherlands) and Geneva (Switzerland). The objective is to obtain information regarding the conditions needed to be considered a bike city. These conditions are based on your criteria. This knowledge can be used to make cycling in cities more appealing for you and for other road-users. This survey results will be presented in my thesis for the Master's programme in Environmental and Infrastructure Planning in Groningen, Netherlands. The obtained data will be anonymized and kept confidential.

The survey will take 10 to 15 minutes to complete. All responses remain confidential. After completing the survey, you may participate in a raffle for a €25,00 bol.com gift card and for a €15,00 national cinema card (for Swiss participants, this will be a CHF 25.00 Inter Discount gift card and a CHF 20.00 Pathé gift card). If you are interested in receiving the results of the analysis, I can send them to you by email (I expect to have the data analysed by mid-2016).

Thank you very much in advance for your cooperation!

With kind regards,

Anne Abbing

What is a bike city?

2. Personal information

*** 1. What is your age?**

- ◯ < 15 years old
- ◯ 15-29 years old
- ◯ 30-44 years old
- ◯ 45-59 years old
- ◯ 60-74 years old
- ◯ ≥ 75 years old

*** 2. What is your sex?**

- ◯ Male
- ◯ Female

*** 3. What is your place of residence?**

- ◯ Amsterdam
- ◯ Groningen
- ◯ Geneva
- ◯ Other:

*** 4. What is/are your nationality/nationalities?**

- ☐ Dutch nationality
- ☐ Swiss nationality
- ☐ French nationality
- ☐ I (also) have the following nationality/nationalities

*** 5. Which places of residence (cities and villages) do you visit frequently?**

- [ ] Amsterdam
- [ ] Groningen
- [ ] Geneva
- [ ] (Also) other places of residence:

6. What is your net income? (this question is optional; Purchasing Power Parity adjusted incomes are applied)

- ◯ < 1000 Euro / < 1683 Swiss Franc
- ◯ 1000-2999 Euro / 1683-5048 Swiss Franc
- ◯ 3000-4999 Euro / 5049-8415 Swiss Franc
- ◯ ≥ 5000 Euro / ≥ 8416 Swiss Franc

*** 7. What is your highest level of education achieved?**

- ◯ No education, primary school
- ◯ VMBO / MAVO / LBO / orientation school (Cycle d'orientation) / lower secondary education
- ◯ HAVO / VWO / MMS / HBS / High School (Collège) / Trade School (École de commerce) / General Culture School (École de culture générale)
- ◯ University of Applied Sciences / HES (Haute écoles spécialisées)
- ◯ Bachelor's degree program at the University / University Undergraduate program
- ◯ Master's degree program at the University / University Graduate program
- ◯ PhD
- ◯ Other:

What is a bike city?

3. Your cycling usage and your opinion towards cycling

*** 8. Which mode of transportation do you use most often?**

- ◯ The city bike (not electric motor-driven)
- ◯ The electric bike
- ◯ The racing bike
- ◯ The car (as a driver)
- ◯ The car (as a passenger)
- ◯ Public transport
- ◯ Walking
- ◯ Other:

*** 9. How many years have/had you been cycling?**

- ◯ < 1 year
- ◯ 1-4 years
- ◯ 5-9 years
- ◯ ≥ 10 years
- ◯ I have never cycled

What is a bike city?

3. Your cycling usage and your opinion towards cycling

*** 10. How old were you when you cycled for the first time?**

- ◯ younger than 10 years
- ◯ 10-14 years
- ◯ 15-19 years
- ◯ ≥ 20 years

11. In which places of residence (cities and villages) do you cycle often? (this question is optional)

- ☐ Amsterdam
- ☐ Groningen
- ☐ Geneva
- ☐ (Also) in other places of residence:

*** 12. Approximately how many hours a week do you cycle?**

- ◯ < 1 hour
- ◯ 1-3 hours
- ◯ 4-6 hours
- ◯ > 6 hours

*** 13. For what kind of transportation do you use the bicycle? (multiple answers are possible)**

- ☐ To go to work
- ☐ To go to school and/or a course
- ☐ To go to the shop
- ☐ To go to friends and/or family
- ☐ For leisure activities (for instance, cycling in the nature)
- ☐ Other:

*** 14. What thoughts come to mind when you think of cycling (multiple answers are possible)?**

- [ ] Cycling is healthy
- [ ] Cycling is dangerous
- [ ] Cycling is for people who are too poor to own a
- [ ] car Cycling is normal
- [ ] Cycling is exhausting
- [ ] Only men should use a
- [ ] bicycle Other:

What is a bike city?

4. General description of a bike city

The cities Groningen (data from 2008, source: Mobility Survey Netherlands), Amsterdam (data from 2008, source: Mobility Survey Netherlands) and Geneva (data from 2011, source: Ville de Genève) have the following characteristics:

	Amsterdam	Groningen	Geneva
Inhabitants	747.093	182.484	220.860
% bike	22	31	11
% car	38	44	30
% public transport	20	10	18
% walk	20	15	41

* **15. Is Amsterdam a bike city according to you? (see also the table)**

- ◯ Yes
- ◯ No

* **16. Is Groningen a bike city according to you? (see also the table)**

- ◯ Yes
- ◯ No

* **17. Is Geneva a bike city according to you? (see also the table)**

- ◯ Yes
- ◯ No

18. In your opinion, what should be the share of the bicycle in comparison to other transport modalities in order to call a city a bike city? (multiple answers are possible)

- [ ] The number of city dwellers using the bicycle should be higher than the number of city dwellers using the car
- [ ] The number of city dwellers using the bicycle should be higher than the number of city dwellers using public transportation
- [ ] The number of city dwellers using the bicycle should be higher than the number of walking city
- [ ] dwellers Every day, people cycle in the city (the number of cycling city dwellers does not matter)
- [ ] Other:

What is a bike city?

5. Spatial conditions

*** 19. In your opinion, how often must the following road infrastructure, *at least,* be present in a bike city? (see the following numbered images for clarification)**

	Not at all	Rarely	Often	Very often
Separate bike lanes (excluding all motorized traffic) (nr. 1)	○	○	○	○
On-road bike lanes (nr. 2)	○	○	○	○
Roundabouts that give priority to bicycles (nr. 3)	○	○	○	○
Bicycle racks (nr. 4)	○	○	○	○

1 2 3 4

* **20. In your opinion, how often may the following road infrastructure, *at most,* be present in a bike city? (see the following numbered images for clarification)**

	Not at all	Rarely	Often	Very often
Unpaved bike paths (nr. 1)	○	○	○	○
Bike paths between tram tracks (nr. 2)	○	○	○	○
Roads used by cyclists, busses and taxis (nr. 3)	○	○	○	○
Bikeways shared with pedestrians (nr. 4)	○	○	○	○
50 km/h roads which are shared by cars, public transport and cyclists (there are no bike paths) (nr. 5)	○	○	○	○

1 2 3 4 5

21. I would like to see the following road infrastructure in the ideal bike city:

22. I do not want to see the following road infrastructure at all in the ideal bike city:

* **23. Does a city have to be car-free in order to be considered a bike city?**

- ○ Yes, a bike city has to be completely car-free
- ○ Yes, a bike city has to be partly car-free
- ○ No, a bike city does not have to be car-free at all

* **24. A city needs to comply with the following spatial characteristics in order to be considered a bike city (please (also) fill in 'entirely disagree' in case you think the statement is not related to the bike city at all and 'neither agree or disagree' in case you do not have an opinion about the statement)**

	Entirely disagree	Disagree	Neither agree nor disagree	Agree	Entirely agree
A small, compact city	○	○	○	○	○
A city where there is a variety of land use, such as mixed living, working and green spaces	○	○	○	○	○
An entirely connected network of bike paths	○	○	○	○	○

* **25. When is it impossible for a city to become a bike city? (see the images below for clarification)**

- ○ When a city is somewhat hilly (10-99 meters height difference)
- ○ When a city is very hilly (100-199 meters height difference)
- ○ When a city is somewhat mountainous or steeper (≥ 200 meters height difference)
- ○ It does not matter how hilly/mountainous the city is; a city that is somewhat mountainous or steeper, can become a bike city

somewhat hilly

very hilly

somewhat mountainous

*** 26. Under which climatological circumstances (temperature, precipitation, sunshine) is it impossible for a city to become a bike city? (multiple answers are possible)**

- [ ] When it is often very windy
- [ ] When it freezes many days per year (for example, during the whole
- [ ] winter) When it rains often (for example, every day)
- [ ] When it often rains a lot (for instance, there is pouring rain 1 to 2 hours per
- [ ] day) A city can become a bike city under all climatological circumstances
- [ ] Other:

What is a bike city?

6. Socio-cultural conditions

*** 27. A city needs to comply with the following conditions in order to be considered a bike city (please (also) fill in 'entirely disagree' in case you think the statement is not related to the bike city at all and 'neither agree or disagree' in case you do not have an opinion about the statement)**

	Entirely disagree	Disagree	Neither agree nor disagree	Agree	Entirely agree
The bicycle must have a positive image (e.g. the bike is perceived as athletic and environmentally friendly in general)	○	○	○	○	○
The bicycle has to be my preferred transport modality in the city	○	○	○	○	○
The city has a mostly left-wing City Council	○	○	○	○	○
Mostly Western people live in the city (e.g. from Europe and the United States)	○	○	○	○	○
The city is not religious (e.g. not many Christians, Muslims and Buddhists live there)	○	○	○	○	○

What is a bike city?

7. Financial conditions

*** 28. With the following costs for the car and/or public transport a city cannot become a bike city (multiple answers are possible):**

- [ ] The use of cars is cheap (e.g. low gasoline price, low motor tax rate and low parking costs) Public
- [ ] transport is cheap (e.g. many people can use public transport for free or for low cost) The car
- [ ] expenses do not matter; with low and high car expenses a city can become a bike city
- [ ] Public transport expenses do not matter; with low and high public transport expenses a city can become a bike
- [ ] city Other:

*** 29. What must be the average income of city dwellers in order to become a bike city? (multiple answers are possible)**

- [ ] City dwellers should earn a little on average compared to other inhabitants in the country City
- [ ] dwellers should earn a lot on average compared to other inhabitants in the country City
- [ ] dwellers should earn a little on average compared to other inhabitants in the world City
- [ ] dwellers should earn a lot on average compared to other inhabitants in the world
- [ ] The average income of city dwellers can be high but also low compared to other inhabitants in the country (the average income does not matter)
- [ ] The average income of city dwellers can be high but also low compared to other inhabitants in the world (the average income does not matter)

What is a bike city?

8. Demographic conditions

*** 30. A city with the below mentioned number of inhabitants can only become a bike city:**

- ◯ < 200.000 inhabitants (e.g. Assen/Lausanne)
- ◯ < 500.000 inhabitants (e.g. Groningen / Geneva (city) / Zurich (city))
- ◯ <1.000.000 inhabitants (e.g. Amsterdam / Copenhagen)
- ◯ <5.000.000 inhabitants (e.g. Paris / Vienna)
- ◯ The number of inhabitants does not matter
- ◯ Other, that is <..... inhabitants:

*** 31. A city with the following age structure can become a bike city (multiple answers are possible):**

- ☐ Many youngsters (<35 years old)
- ☐ Many people between 35 and 60 years old
- ☐ Many elderly people (>60 years old)

*** 32. A city with the following average number of persons per household can become a bike city:**

- ◯ 1 person
- ◯ 2 persons
- ◯ 3 or more persons
- ◯ The average number of persons per household does not matter

What is a bike city?

9. Safety conditions

*** 33. How often may the following safety situations *at most* occur in bike cities?**

	Not at all	Rarely	Often	Very often
Bicycle theft	○	○	○	○
Damage to bicycles due to vandalism	○	○	○	○
Poorly maintained roads on which people may cycle	○	○	○	○
Dark roads on which people may cycle	○	○	○	○

What is a bike city?

10. Conclusion

34. Are there still aspects missing in this survey that determine whether a city is a bike city? If so, which factors?

In February 2016 I am going to conduct focus groups in order to go more into depth on the conditions needed in order to become a bike city. These conversations (with a group of 6-8 persons) will take place in Groningen on 9 February at 19.00h (language: Dutch), in Amsterdam on 10 February at 19.00h (language: Dutch) and in Geneva on 18 February at 19.00h (language: English). Information concerning the location will follow by email. These conversations will be recorded and transcribed without mentioning the names of participants. Your opinion in the focus group is very much appreciated!

35. Would you like to participate in one of the focus groups?

- ◯ Yes, in the focus group in Groningen
- ◯ Yes, in the focus group in Amsterdam
- ◯ Yes, in the focus group in Geneva
- ◯ No

36. Would you like to receive the analysis of this survey?

- ◯ Yes
- ◯ No

37. Please state your e-mail address below if you would like to participate in a focus group, are interested in the analysis of the outcomes of the survey and/or if you want to be in the running for winning a prize:

Thank you for filling out this survey!

Attachment 5 – Survey (language: Dutch)

Wat is een fietsstad?

1. Introductie

Fietsstad is een woord dat vaak wordt gebruikt door mensen. Toch zijn er veel meningsverschillen over de condities om te worden gezien als fietsstad en de maatregelen die benodigd zijn om een fietsstad te worden.

Met behulp van deze enquête - gericht op de steden Groningen (Nederland), Amsterdam (Nederland) en Genève (Zwitserland) - probeer ik na te gaan welke voorwaarden volgens u benodigd zijn om een fietsstad te kunnen zijn. Deze kennis kan gebruikt worden om fietsen in de stad aantrekkelijker te maken voor u en voor andere verkeersdeelnemers. De resultaten op de enquête zullen in de scriptie van de master Environmental and Infrastructure Planning (Rijksuniversiteit Groningen) gepresenteerd worden. Er wordt uiteraard vertrouwelijk omgegaan met de door u verstrekte gegevens (uw gegevens blijven anoniem).

Omdat het invullen van deze enquête ongeveer 10 tot 15 minuten tijd kost, verloot ik onder de deelnemers aan deze enquête een bol.com cadeaukaart ter waarde van €25,00 en een nationale bioscoopbon ter waarde van €15,00. Mocht u interesse hebben in de analyse van de enquête resultaten dan wil ik deze graag naar u mailen (ik verwacht de gegevens halverwege 2016 te hebben geanalyseerd).

Alvast hartelijk dank voor uw medewerking!

Met vriendelijke groet,

Anne Abbing

Wat is een fietsstad?

2. Persoonlijke informatie

*** 1. Wat is uw leeftijd?**

- ◯ < 15 jaar
- ◯ 15-29 jaar
- ◯ 30-44 jaar
- ◯ 45-59 jaar
- ◯ 60-74 jaar
- ◯ ≥ 75 jaar

*** 2. Wat is uw geslacht?**

- ◯ Man
- ◯ Vrouw

*** 3. Wat is uw woonplaats?**

- ◯ Amsterdam
- ◯ Groningen
- ◯ Genève
- ◯ Anders, namelijk

*** 4. Welke nationaliteit(en) heeft u?**

- ☐ Nederlandse nationaliteit
- ☐ Zwitserse nationaliteit
- ☐ Franse nationaliteit
- ☐ Ik heb (ook) de volgende nationaliteit(en):

5. In welke woonplaatsen komt u vaak? (deze vraag is niet verplicht om in te vullen)

- [ ] Amsterdam
- [ ] Groningen
- [ ] Genève
- [ ] (Ook) in andere plaatsen, namelijk

6. Wat is uw netto maandinkomen? (deze vraag is niet verplicht om in te vullen)

- ◯ < 1000 euro
- ◯ 1000-2999 euro
- ◯ 3000-4999 euro
- ◯ ≥ 5000 euro

* **7. Wat is uw hoogst genoten opleiding?**

- ◯ Geen onderwijs of basisonderwijs
- ◯ VMBO/MAVO/LBO
- ◯ HAVO/VWO/MMS/HBS
- ◯ HBO
- ◯ WO Bachelor
- ◯ WO Master
- ◯ PhD
- ◯ Anders, namelijk

Wat is een fietsstad?

3. Uw fietsgebruik en uw mening over fietsen

*** 8. Hoe verplaatst u zich het vaakst?**

- ◯ Met de stadsfiets (niet elektrisch aangedreven)
- ◯ Met de elektrische fiets
- ◯ Met de racefiets
- ◯ Met de auto als bestuurder
- ◯ Met de auto als passagier
- ◯ Met het openbaar vervoer
- ◯ Lopend
- ◯ Anders, namelijk

*** 9. Hoeveel jaar fietst u/heeft u gefietst?**

- ◯ < 1 jaar
- ◯ 1-4 jaar
- ◯ 5-9 jaar
- ◯ ≥ 10 jaar
- ◯ Ik heb nog nooit gefietst

Wat is een fietsstad?

3. Uw fietsgebruik en uw mening over fietsen

*** 10. Hoe oud was u toen u met fietsen begon?**

- ◯ Jonger dan 10 jaar
- ◯ 10-14 jaar
- ◯ 15-19 jaar
- ◯ ≥ 20 jaar

11. In welke woonplaatsen fietst u vaak? (deze vraag is niet verplicht om in te vullen)

- ☐ Amsterdam
- ☐ Groningen
- ☐ Genève
- ☐ (Ook) in andere woonplaatsen, namelijk

*** 12. Hoeveel uur per week besteedt u gemiddeld aan fietsen?**

- ◯ < 1 uur
- ◯ 1 - 3 uur
- ◯ 4 - 6 uur
- ◯ > 6 uur

*** 13. Voor welke verplaatsingen gebruikt u de fiets? (meerdere antwoorden zijn mogelijk)**

- ☐ Naar uw werk
- ☐ Naar school en/of een cursus
- ☐ Naar de winkel
- ☐ Naar vrienden en/of familie
- ☐ Voor vrijetijdsbesteding (bijvoorbeeld fietsen in de natuur)
- ☐ Anders, namelijk

*** 14. Wat vindt u van fietsen? (meerdere antwoorden zijn mogelijk)**

- [ ] Fietsen is gezond
- [ ] Fietsen is gevaarlijk
- [ ] Fietsen is voor mensen die te arm zijn om een auto te kunnen
- [ ] betalen Fietsen is normaal
- [ ] Fietsen is vermoeiend
- [ ] Alleen mannen mogen
- [ ] fietsen Anders, namelijk

Wat is een fietsstad?

4. Algemene omschrijving van de fietsstad

De steden Groningen (gegevens uit 2008, bron: Mobiliteitsonderzoek Nederland), Amsterdam (gegevens uit 2008, bron: Mobiliteitsonderzoek Nederland) en Genève (gegevens uit 2011, bron: Ville de Genève) hebben de volgende karakteristieken:

	Amsterdam	Groningen	Genève
Inwoneraantal	747.093	182.484	220.860
% fietsers	22	31	11
% autogebruik	38	44	30
% openbaar vervoer	20	10	18
% wandelaars	20	15	41

* **15. Is Amsterdam volgens u een fietsstad? (zie ook de tabel)**

- ◯ Ja
- ◯ Nee

* **16. Is Groningen volgens u een fietsstad? (zie ook de tabel)**

- ◯ Ja
- ◯ Nee

* **17. Is Genève volgens u een fietsstad? (zie ook de tabel)**

- ◯ Ja
- ◯ Nee

* **18. Welk aandeel zou de fiets in vergelijking met andere vervoersmiddelen moeten hebben om een stad een fietsstad te kunnen noemen? (meerdere antwoorden zijn mogelijk)**

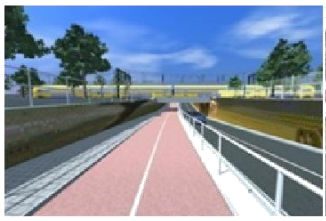
- [ ] Het aantal stedelingen dat de fiets gebruikt is groter dan het aantal stedelingen dat de auto gebruikt
- [ ] Het aantal stedelingen dat de fiets gebruikt is groter dan het aantal stedelingen dat het openbaar vervoer
- [ ] gebruikt Het aantal stedelingen dat de fiets gebruikt is groter dan het aantal stedelingen dat loopt
- [ ] Er fietsen dagelijks mensen in de stad (het aantal stedelingen dat fietst, maakt niet
- [ ] uit) Anders, namelijk

Wat is een fietsstad?

5. Ruimtelijke voorwaarden

*** 19. Hoe vaak moet de volgende verkeersinfrastructuur *minimaal* in een fietsstad aanwezig zijn? (zie de onderstaande genummerde afbeeldingen ter verduidelijking)**

	Helemaal niet	Nauwelijks	Vaak	Zeer vaak
Fietspaden gescheiden van de autoweg (nr. 1)	○	○	○	○
Autowegen met aanliggende fietspaden (nr. 2)	○	○	○	○
Rotondes waar fietsers voorrang hebben (nr. 3)	○	○	○	○
Fietsenrekken (nr. 4)	○	○	○	○



1

2

3

4

*** 20. Hoe vaak mag de volgende verkeersinfrastructuur *maximaal* in een fietsstad aanwezig zijn? (zie de onderstaande genummerde afbeeldingen ter verduidelijking)**

	Helemaal niet	Nauwelijks	Vaak	Zeer vaak
Fietspaden die onverhard zijn (nr. 1)	○	○	○	○
Fietspaden die zich tussen de tramrails bevinden (nr. 2)	○	○	○	○
Wegen die door fietsers, bussen en taxi's gebruikt worden (nr. 3)	○	○	○	○
Fietswegen die gedeeld worden met wandelaars (nr. 4)	○	○	○	○
50 km/u wegen die door auto's, het openbaar vervoer en fietsers gedeeld worden, maar waar geen fietspaden aanwezig zijn (nr. 5)	○	○	○	○


1


2


3


4


5

21. De volgende verkeersinfrastructuur wil ik graag zien in de ideale fietsstad, namelijk:

22. De volgende verkeersinfrastructuur wil ik helemaal niet te zien in de ideale fietsstad, namelijk:

*** 23. Moet een stad autovrij zijn om een fietsstad te kunnen zijn?**

- ○ Ja, een fietsstad moet geheel autovrij zijn
- ○ Ja, een fietsstad moet gedeeltelijk autovrij zijn
- ○ Nee, een fietsstad hoeft helemaal niet autovrij te zijn

* **24. Een stad moet de volgende ruimtelijke kenmerken hebben om een fietsstad te kunnen zijn (graag (ook) *'helemaal mee oneens'* invullen als de stelling volgens u niet gerelateerd is aan de fietsstad en *'niet oneens/niet eens'* invullen als u geen mening heeft over de stelling):**

	helemaal mee oneens	mee oneens	niet eens/niet oneens	mee eens	helemaal mee eens
Een kleine, compacte stad	○	○	○	○	○
Een stad waar verschillende vormen van landgebruik - zoals wonen, werken en groen - gemengd zijn	○	○	○	○	○
Een volledig verbonden netwerk van fietspaden	○	○	○	○	○

* **25. Wanneer kan een stad ***geen*** fietsstad worden? (zie ter verduidelijking de onderstaande afbeeldingen)**

- ○ Als de stad enigszins heuvelachtig is (10-99 meter hoogteverschil)
- ○ Als de stad sterk heuvelachtig is (100-199 meter hoogteverschil)
- ○ Als de stad enigszins bergachtig of steiler is (≥ 200 meter hoogteverschil)
- ○ Het maakt niet uit hoe steil/bergachtig de stad is; een stad die enigszins bergachtig of steiler is, kan een fietsstad worden

Enigszins heuvelachtig

Sterk heuvelachtig

Enigszins bergachtig

* **26. Onder welke klimatologische omstandigheden (temperatuur, neerslag, zonneschijn) kan een stad *geen* fietsstad worden? (meerdere antwoorden zijn mogelijk)**

- [ ] Klimaat waarbij het vaak hard waait
- [ ] Klimaat waarbij het veel dagen per jaar vriest (bijv. gedurende de hele winter)
- [ ] Klimaat waarbij het veel dagen per jaar regent (bijv. elke dag)
- [ ] Klimaat waarbij het vaak hard regent (bijv. 1 à 2 uur per dag regent het pijpestelen)
- [ ] Een stad kan onder alle klimatologische omstandigheden een fietsstad zijn
- [ ] Anders, namelijk

Wat is een fietsstad?

6. Sociaal-culturele voorwaarden

*** 27. Een stad moet aan de volgende voorwaarden voldoen om een fietsstad te kunnen zijn (graag (ook) *'helemaal mee oneens'* invullen als u vindt dat de stelling helemaal niet gerelateerd is aan de fietsstad en *'niet oneens/niet eens'* invullen als u geen mening heeft over de stelling):**

	helemaal mee oneens	mee oneens	niet eens/niet oneens	mee eens	helemaal mee eens
De fiets moet een positief imago hebben (bijv. de fiets wordt over het algemeen als sportief en milieubewust gezien)	○	○	○	○	○
Ik moet in de stad het liefst de fiets willen gebruiken	○	○	○	○	○
De stad heeft een grotendeels links stadsbestuur (bijv. PvdA en SP stadsbestuurders)	○	○	○	○	○
Er wonen vooral Westerlingen in de stad (bijv. uit Europa en de Verenigde Staten)	○	○	○	○	○
De stad is niet religieus (bijv. weinig christenen, moslims en boeddhisten wonen er)	○	○	○	○	○

Wat is een fietsstad?

7. Financiële voorwaarden

*** 28. Bij de volgende kosten voor de auto en/of het openbaar vervoer kan een stad *geen* fietsstad worden (meerdere antwoorden zijn mogelijk):**

- [ ] Het gebruik van auto's is goedkoop (bijv. lage benzineprijs, motorrijtuigenbelasting en parkeerkosten)
- [ ] Het openbaar vervoer is goedkoop (bijv. veel mensen kunnen gratis of voor weinig geld reizen met het openbaar vervoer)
- [ ] De kosten voor de auto maken niet uit; met lage en hoge kosten voor de auto kan een stad een fietsstad worden
- [ ] De kosten voor het openbaar vervoer maken niet uit; met lage en hoge kosten voor het openbaar vervoer kan een stad een fietsstad worden
- [ ] Anders, namelijk

*** 29. Wat moet het gemiddelde inkomen van stedelingen zijn om een fietsstad te kunnen worden? (meerdere antwoorden zijn mogelijk)**

- [ ] Stedelingen moeten gemiddeld weinig verdienen vergeleken met andere bewoners in het land
- [ ] Stedelingen moeten gemiddeld veel verdienen vergeleken met andere bewoners in het land
- [ ] Stedelingen moeten gemiddeld weinig verdienen vergeleken met andere bewoners in de wereld
- [ ] Stedelingen moeten gemiddeld veel verdienen vergeleken met andere bewoners in de wereld
- [ ] Het gemiddelde inkomen van stedelingen mag hoog maar ook laag zijn vergeleken met andere bewoners in het land (het gemiddelde inkomen maakt niet uit)
- [ ] Het gemiddelde inkomen van stedelingen mag hoog maar ook laag zijn vergeleken met andere bewoners in de wereld (het gemiddelde inkomen maakt niet uit)

Wat is een fietsstad?

8. Demografische voorwaarden

*** 30. Een stad met het hieronder genoemde aantal inwoners kan alleen een fietsstad worden:**

- ◯ < 200.000 inwoners (bv. Assen / Lausanne)
- ◯ < 500.000 inwoners (bv. Groningen / Genève stad / Zürich stad)
- ◯ <1.000.000 inwoners (bv. Amsterdam / Kopenhagen)
- ◯ <5.000.000 inwoners (bv. Parijs / Wenen)
- ◯ Het aantal inwoners maakt niet uit
- ◯ Anders, namelijk < _____ inwoners

*** 31. Een stad met de volgende leeftijdsopbouw kan een fietsstad worden (meerdere antwoorden zijn mogelijk):**

- ☐ Veel jongeren (<35 jaar)
- ☐ Veel mensen tussen de 35 en 60 jaar
- ☐ Veel ouderen (>60 jaar)

*** 32. Een stad met het volgende gemiddelde aantal personen per huishouden kan een fietsstad worden (meerdere antwoorden zijn mogelijk):**

- ◯ 1 persoon
- ◯ 2 personen
- ◯ 3 of meer personen
- ◯ Het gemiddelde aantal personen per huishouden maakt niet uit

Wat is een fietsstad?

9. Veiligheid

*** 33. Hoe vaak mogen de volgende veiligheidssituaties *maximaal* voorkomen in fietssteden?**

	Helemaal niet	Nauwelijks	Vaak	Zeer vaak
Diefstal van fietsen	○	○	○	○
Schade aan fietsen door vandalisme	○	○	○	○
Slecht onderhouden wegen waarop gefietst mag worden	○	○	○	○
Donkere wegen waarop gefietst mag worden	○	○	○	○

Wat is een fietsstad?

10. Tenslotte

34. Zijn er nog aspecten die missen in de enquête en die bepalen of een stad een fietsstad is? Zo ja, welke factoren?

In januari en februari 2016 ga ik focusgroepen houden om dieper op de voorwaarden om uit te groeien tot fietsstad in te gaan. Deze gesprekken (met een groep van 6-8 personen) zullen plaatsvinden in Groningen op 9 februari om 19.00 uur (voertaal: Nederlands), in Amsterdam op 10 februari om 19.00 uur (voertaal: Nederlands) en in Genève op 18 februari om 19.00 uur (voertaal: Engels). Informatie over de locatie volgt via de e-mail. Het is de bedoeling dat de gesprekken worden opgenomen en vervolgens worden getranscribeerd (overgeschreven) zonder hierbij namen van de participanten te vermelden. Uw mening wordt in de focus-groep zeer op prijs gesteld!

35. Zou u deel willen nemen aan een van de focusgroepen?

- ◯ Ja, aan de focusgroep in Groningen
- ◯ Ja, aan de focusgroep in Amsterdam
- ◯ Ja, aan de focusgroep in Genève
- ◯ Nee

36. Zou u de analyse van de resultaten van de enquête willen ontvangen?

- ◯ Ja
- ◯ Nee

37. Op welk e-mailadres kan ik u benaderen indien u deel wilt nemen aan de focus-groep, geïnteresseerd bent in de analyse van de uitkomsten van de enquête en/of kans wilt maken op een prijs?

Bedankt voor het invullen van deze enquête!

Attachment 6 – Focus group discussion guide in Groningen

Slide 1


“Welke condities zijn benodigd om uit te groeien tot fietsstad?”

Moderator: Anne Abbing
Notulist: Mariëtte Pepping

Focusgroep Groningen
Datum: 9 februari 2016

Slide 2

Voorstellen

- Naam
- Studie/werk/dagelijkse bezigheden
- Hoe kijk je tegen fietsen aan?
- Welk vervoersmiddel gebruik je het vaakst?

Slide 3

Planning

16.30 uur: uitleg focusgroep

16.35 uur: voorstelronde

16.40-17.00 uur: stelling 1 t/m 3 bespreken

17.00-17.20 uur: vraag 1 t/m 3 bespreken

17.20 uur: mental map tekenen

17.30 uur: mental map bespreken

17.40 uur: afsluiten

Slide 4

V18: Welk aandeel zou de fiets in vergelijking met andere vervoersmiddelen moeten hebben om een stad een fietsstad te kunnen noemen? (meerdere antwoorden zijn mogelijk)

Antwoordmogelijkheden	Aantal	Percentage
Het aantal stedelingen dat de fiets gebruikt is groter dan het aantal stedelingen dat de auto gebruikt	187	39,9%
Het aantal stedelingen dat de fiets gebruikt is groter dan het aantal stedelingen dat het openbaar vervoer gebruikt	127	27,1%
Het aantal stedelingen dat de fiets gebruikt is groter dan het aantal stedelingen dat loopt	73	15,6%
Er fietsen dagelijks mensen in de stad	167	35,6%
Anders, namelijk….	165	35,2%

Totaal aantal antwoorden: 469

Slide 5

V18: Welk aandeel zou de fiets in vergelijking met andere vervoersmiddelen moeten hebben om een stad een fietsstad te kunnen noemen? (meerdere antwoorden zijn mogelijk)

Antwoorden bij categorie 'anders, namelijk'

- Het aantal totaal irritante asocialen dat zich op een rijwiel verplaatst is groter dan de weldenkende soort die loopt
- Maximaal een kwart van het aantal verplaatsingen gaat per auto. De mix van fiets, lopen en OV verschilt per stad, stadsdeel en hun context"
- Fietsstad wordt mijn(s) inziens bepaald (door) welke positie de fietser inneemt en welke plek de fietser krijgt toebedeeld ten opzichte van andere vervoersvormen [..] zou zeggen Groningen is voor driekwart fietsstad
- Gaat niet om % maar het beeld 'Goh wat veel fietsers hier'
- Onbelangrijk, gaat om voorzieningen
- Minstens 1/5 moet de fiets gebruiken

Slide 6

Algemene condities: stelling 1

Een voorwaarde om een fietsstad te kunnen zijn, is dat het aantal stedelingen dat de fiets gebruikt groter is dan het aantal stedelingen dat de auto gebruikt

Slide 7

Ruimtelijke condities: stelling 2

Een stad kan alleen een fietsstad worden als alles in de stad op fietsafstand te bereiken is

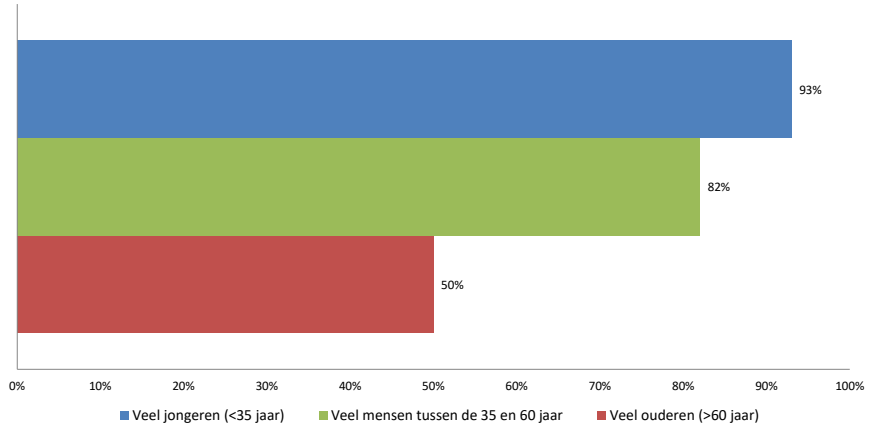
Slide 8

Ruimtelijke condities: stelling 3

In een fietsstad moet je sneller van A naar B komen met de fiets dan met het openbaar vervoer of met de auto, anders is een stad geen fietsstad zijn

Slide 9

V31: Een stad met de volgende leeftijdsopbouw kan een fietsstad worden (meerdere antwoorden zijn mogelijk)



Slide 10

Demografische en ruimtelijke condities: vraag 1

De helft van de respondenten vindt dat een stad waar veel ouderen wonen (>60 jaar) een fietsstad kan worden. Hoe moet een stad *ruimtelijk* zijn ingericht om een stad waar veel ouderen wonen, uit te laten groeien tot fietsstad?

Slide 11

V34. Zijn er nog aspecten die missen in de enquête en die bepalen of een stad een fietsstad is? Zo ja, welke factoren?

- *Fietsbeleid*
- *Bottom-up benaderingen*
- fietsenwinkel, fietsenmaker, veilige fietsenstalling, publieke fietspompen
- Leren fietsen vanaf jongs af aan
- Luchtkwaliteit

Slide 12

Fietsbeleid: vraag 2

Welk beleid dient de overheid (stadsbestuur/nationale overheid) uit te voeren om ervoor te zorgen dat een stad zich tot fietsstad ontwikkeld?

Antwoorden op vraag 34:

- Fietspromotie
- Investeringsbeleid (aanpassing fietspaden, verkeerslichten etc.
- De moeite die de overheid steekt in het creëren van een fietsvriendelijke infrastructuur
- Fietsstrategie met daarin creatieve oplossingen voor het fietsverkeer in de stad
- Stad noemt zich een fietsstad en gedraagt zich hiernaar

Slide 13

Bottom-up benaderingen: vraag 3

Welke bottom-up maatregelen zijn er benodigd om uit te groeien tot fietsstad (vanuit de gemeenschap, maatschappelijke organisaties, private bedrijven bv.)?

Antwoord op vraag 34:

- Saamhorigheid van fietsers (bijv. met NK tegenwindfietsen en de fietsers die in bijv. Sao Paolo zich georganiseerd hebben om samen te rouwen en een "ghostbike" te maken als er een fietser is overleden door toedoen van een buschauffeur of een automobilist)

Slide 14

Ghost bike

Slide 15

V.21 De volgende verkeersinfrastructuur wil ik graag zien in de ideale fietsstad, namelijk:

Antwoorden

- Aparte rijbanen voor gemotoriseerd verkeer, fietsen en wandelaars
- Infrastructuur voor autoverkeer en OV is ondergeschikt aan die voor fietsers
- Overdekte fietspaden [..] overstappen ov makkelijk vanaf fiets
- Veel voorrang voor fietsers bij kruisingen
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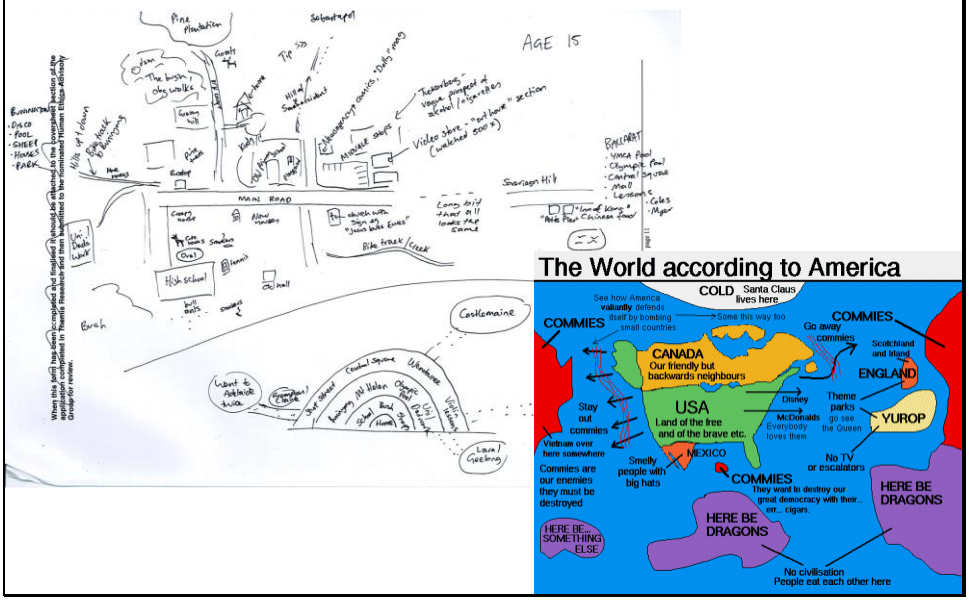
- Stoplichten die afgesteld zijn op de toevoer van fietsers
- Verwarmde fietspaden en werkelijk tijdsvoordeel door extra voorrang op overig verkeer
- Brede continue fietswegen die centra, wijken en buitengebied mooi, veilig en snel verbinden

Slide 16

Mental maps



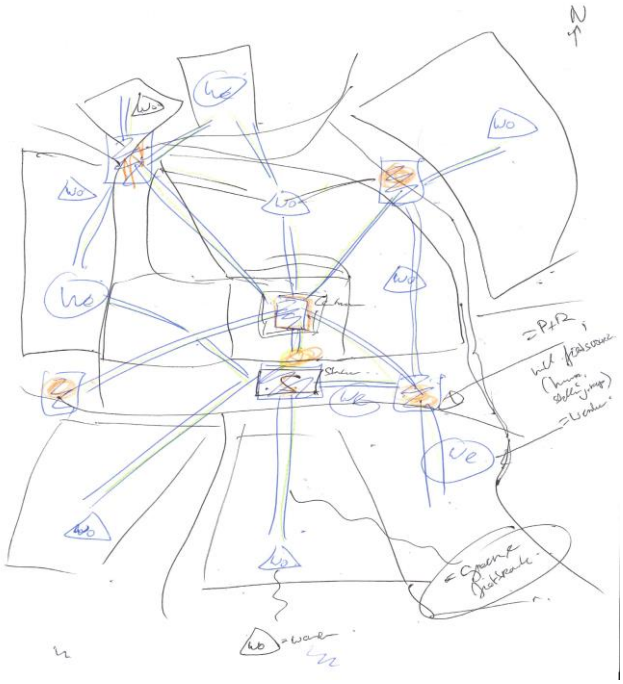
Slide 17

Mental maps

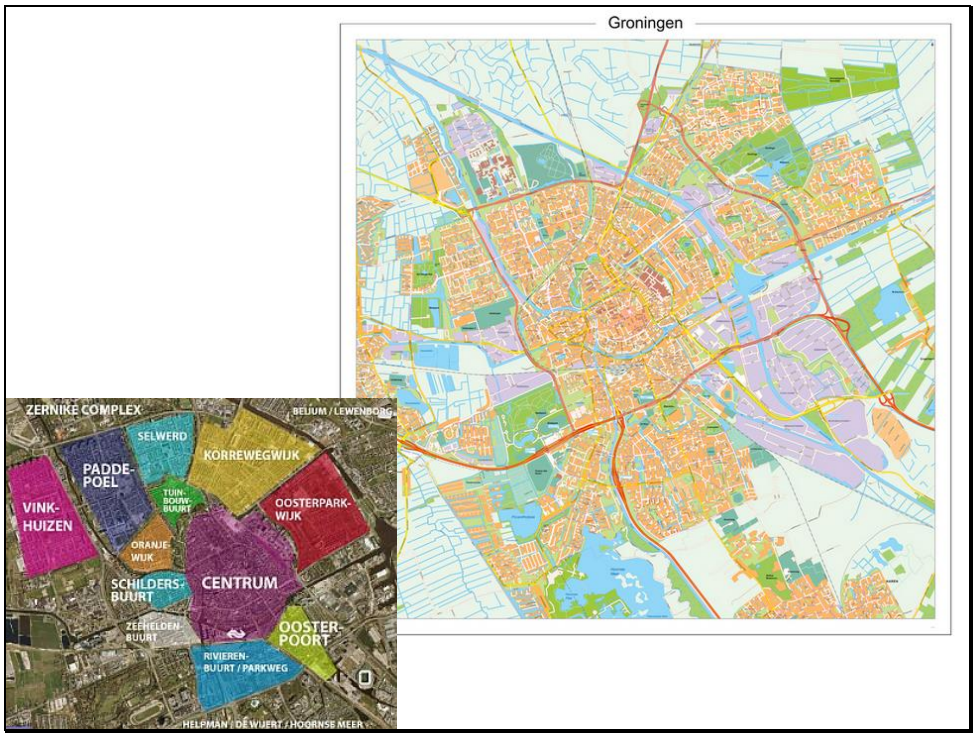
Maak een mental map van de verkeersinfrastructuur die *minimaal* in Groningen (stad) aanwezig moet zijn om deze stad een fietsstad te kunnen noemen

– teksten opschrijven, wegen tekenen etc.

Slide 18



Slide 19


Groningen
ZERNIKE COMPLEX
BELIUM / LEWENBORG
SELWERD
KORREWEGWIJK
PADDE-POEL
TUIN-BOUW-BUURT
OOSTERPARK-WIJK
VINK-HUIZEN
ORANJE WIJK
SCHILDERS-BUURT
CENTRUM
ZEEHELDEN-BUURT
OOSTER-POORT
RIVIEREN-BUURT / PARKWEG
HELPMAN / DE WIJERT / HOORNSE MEER

Attachment 7 – Focus group discussion guide in Amsterdam

Slide 1


“Welke condities zijn benodigd om uit te groeien tot fietsstad?”

Moderator: Anne Abbing

Focusgroep Amsterdam
Datum: 10 februari 2016

Slide 2

Voorstellen

- Naam
- Studie/werk/dagelijkse bezigheden
- Hoe kijk je tegen fietsen aan?
- Welk vervoersmiddel gebruik je het vaakst?

Slide 3

Planning

16.00 uur: uitleg focusgroep

16.05 uur: voorstelronde

16.10-16.30 uur: stelling 1 t/m 3 bespreken

16.30-16.50 uur: vraag 1 t/m 3 bespreken

16.50 uur: mental map tekenen

17.00 uur: mental map bespreken

17.10 uur: afsluiten

Slide 4

V18: Welk aandeel zou de fiets in vergelijking met andere vervoersmiddelen moeten hebben om een stad een fietsstad te kunnen noemen? (meerdere antwoorden zijn mogelijk)

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Slide 6

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Slide 7

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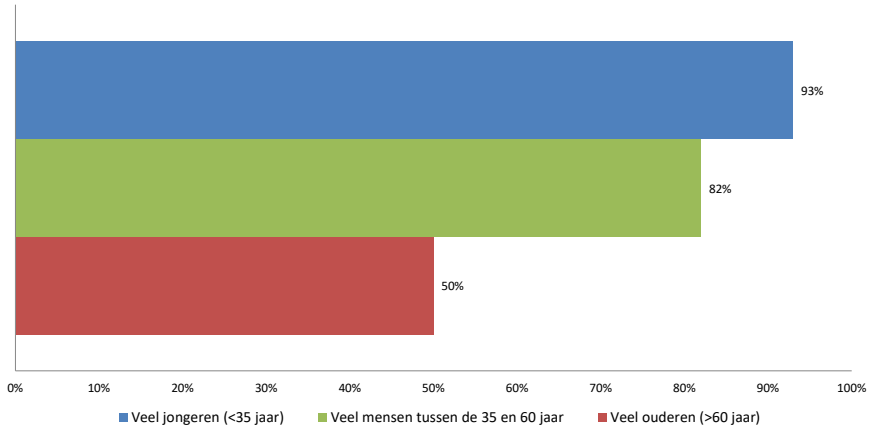

Slide 10

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Slide 14

Ghost bike

Slide 15

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Antwoorden

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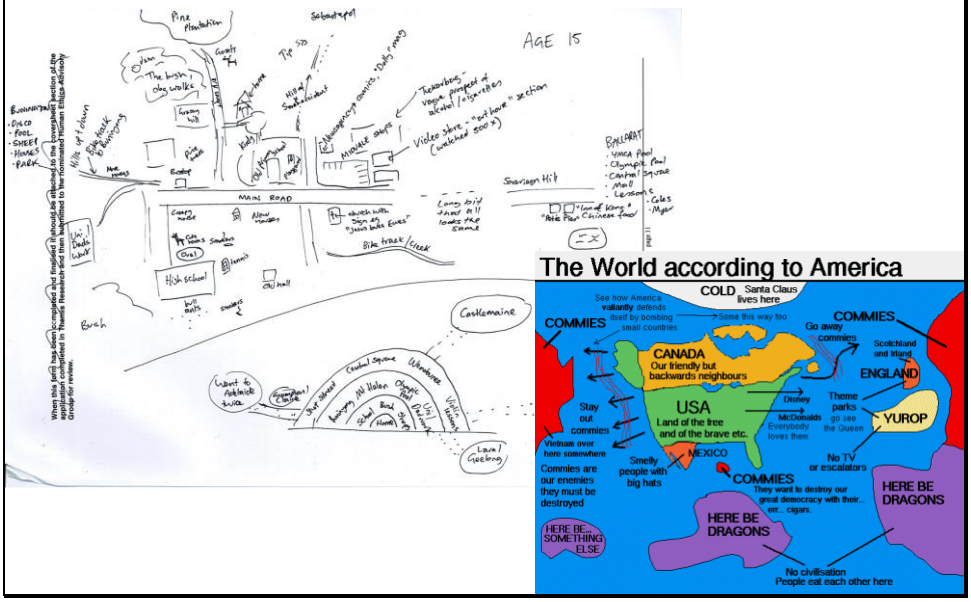

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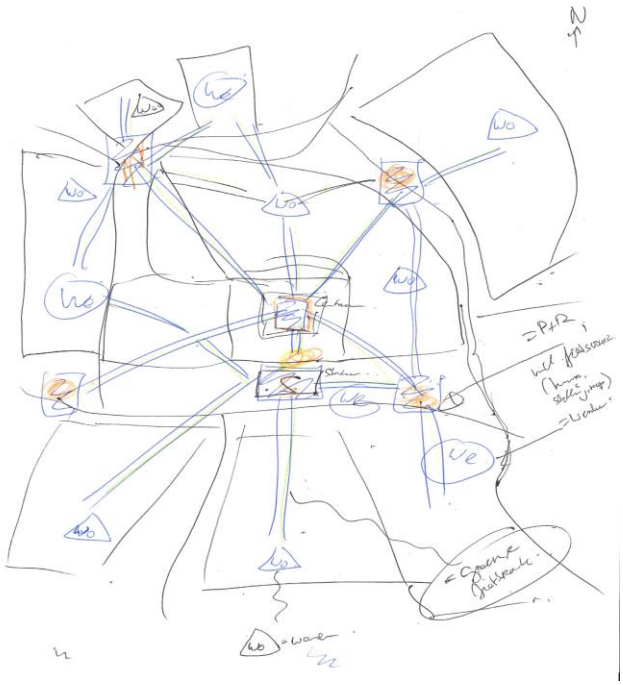


Slide 19

Slide 20

Attachment 8 – Focus group discussion guide in Geneva

Slide 1

“Which conditions are necessary in order to become a bike city?”

Moderator: Anne Abbing

Focus group Geneva
Date: 18 February 2016

Slide 2

Introducing yourself

- Name
- Country of origin
- Study/work/daily occupations
- What do you think of cycling?
- Which mode of transportation do you use most often?

Slide 3

Time schedule

17:30: explanation of the focus group

17:35: introducing yourself

17:40-18:10: discussing statements 1 to 3

18:10-18:40: discussing questions 1 to 4

18:40 uur: conclusion

Slide 4

Q18: In your opinion, what should be the share of the bicycle in comparison to other transport modalities in order to call a city a bike city? (multiple answers are possible)

Answer possibilities	Number of respondents	Percentage
The number of city dwellers using the bicycle should be higher than the number of city dwellers using the car	187	39,9%
The number of city dwellers using the bicycle should be higher than the number of city dwellers using public transportation	127	27,1%
The number of city dwellers using the bicycle should be higher than the number of walking city dwellers	73	15,6%
Every day, people cycle in the city (the number of cycling city dwellers does not matter)	167	35,6%
Other:	165	35,2%

Total number of answers: 469

Slide 5

Q18: In your opinion, what should be the share of the bicycle in comparison to other transport modalities in order to call a city a bike city? (multiple answers are possible)

Category 'other' answers:

- The number of totally annoying anti-social people that moves by bicycle is higher than the wise, walking people
- "At maximum, a quarter of all trips goes by car. The mixture of cycling, walking and public transportation differs per city, city district and its context"
- "I don't think it should be based on numbers. Lots of people can't or don't want to cycle, and that's ok; however, I believe that a bike city is the one that provides good quality facilities to make urban cycling accessible, safe and nice for people who decide to make it their principal mean of transportation"
- "It is not about a percentage, but about the image 'There are many cyclists here"
- "Not relevant, it's about services"
- "At least 1/5 has to use the bicycle"

Slide 6

General conditions: statement 1

"The number of city dwellers using the bicycle should be higher than the number of city dwellers using the car" is a condition in order to call a city a bike city

Slide 7

Spatial conditions: statement 2

A city can only become a bike city if everything in the city can be reached within biking distance

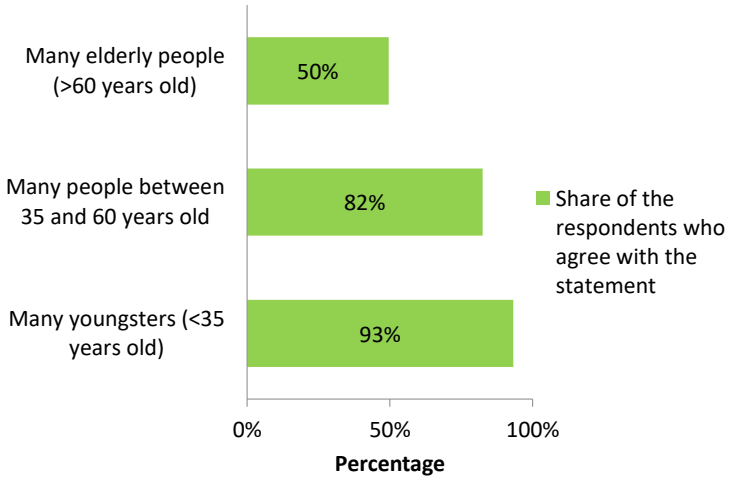
Slide 8

Spatial conditions: statement 3

In a bike city, you should go faster from A to B by bicycle than by public transport or by car, otherwise a city is not a bike city

Slide 9

Q31: A city with the following age structure can become a bike city (multiple answers are possible):



Slide 10

Demographic and spatial conditions: question 1

Half of the respondents thinks that a city with many elderly (> 60 years old) people can become a bike city. How should a city with many elderly people *spatially* look like in order to become a bike city?

Slide 11

Q34. Are there still aspects missing in this survey that determine whether a city is a bike city? If so, which factors?

- *Cycling policies*
- *Bottom-up approaches*
- Bicycle repair shops, safe bike parking lots, public bike pumps
- Learning to cycle at a young age

Slide 12

Cycling policies: question 2

Which cycling policies must be carried out by the government (city council/national government) in order to become a bike city?

Answers on question 34:

- Cycling promotion
- Investment policies (adjustment of bike paths, traffic lights etcetera)
- Cycling strategy with creative solutions for the bicycle traffic in the city
- The city calls itself a bike city and behaves like this

Slide 13

Bottom-up approaches: question 3

Which local initiatives are necessary in order to become a bike city (by the civil society, civil society organizations and private companies for example)?

Answer on question 34:

- Feeling of solidarity amongst cyclists (e.g. the Dutch championship 'cycling against the wind' and cyclists who have organized themselves in Sao Paolo to grieve together and to make a "ghostbike" for cyclists who died in a car or bus accident)

Slide 14

Ghost bike

Slide 15

Q21. I would like to see the following road infrastructure in the ideal bike city:

Answers:

- Separate lanes for motorized traffic, cyclists and pedestrians
- Infrastructure for car traffic and public transport is inferior to that of cyclists
- "green wave" for cyclists
- Broad, continuous bike roads that connect the city centre, neighbourhoods and the outskirts

Slide 16

Road infrastructure: question 4

Which road infrastructure must at least be present in Geneva (city) in order to call this city a bike city?