Justice of Green Mobility

A case study on mobility justice in the Eindhoven Brainport region

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Bachelor thesis Geography, Planning and Environment (GPE)
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Summary

The city of Eindhoven has a long history in which it had to overcome a multitude of challenges. More recently, this includes issues of mobility and the transition towards sustainable modes of transportation. Though multiple solutions have already been proposed or even implemented (Gemeenteraad Eindhoven, 2023), more research still needs to be conducted on the effects of these policies (Lucas, 2012) and how they affect different populations (Sheller, 2018a). As such, this research seeks to find an answer to the following question: "*How does policy on sustainable mobility contribute to a just mobility system within the Eindhoven Brainport region?".* Additionally, several sub-questions have been developed;

- What policy on mobility has been created in the Eindhoven Brainport region?
- How does participatory planning contribute to the creation of mobility policy?
- How does policy on mobility ensure equal access to mobility among its citizens?

Based on existing literature, it was found that the theory of mobility justice is most applicable to this research. This theory was elected due to the wide range of scales to which in can be applied (Sheller, 2018a) as well as its relation to present-day issues (Harada, 2023). In short, this theory entails "*Thinking about how power and inequality inform the governance and control of movement, shaping the patterns of unequal mobility and immobility in the circulation of people, resources, and information"* (Sheller, 2018a, p. 30-31). Similarly, based on existing literature, several other key concepts were identified. First of all, there is the concept of institutions. This is defined as "the humanly devised constraints that structure political, economic, and social interaction. They consist of both informal constraints, and formal rules" (North, 1991). However, these institutions often fail to take into account the perspectives of marginalized groups (Robbins et al., 2022). Therefore, more bottom-up approaches are required in the creation of policy. As a result, this research also incorporates the concept of participatory planning as a possible solution to the aforementioned problem. For the purpose of this research, participatory planning is defined as the incorporation of the needs of city inhabitants in order to create more just outcomes (Whitney & Ledsham, 2023). However, existing literature finds that there are both positive and negative effects of participatory planning as a way of policy creation. The final concept that is incorporated in this research is that of mobility. This is defined as the ability to move around freely as well as possible restrictions on the ability to do so (Hannam et al., 2006). However, as this provides a very broad definition of the concept, mobility was further divided into the aspects of availability, accessibility and human behavior.

This research makes use of a qualitative approach and a research strategy that consists of a mix between a case study and grounded theory. Data was collected through a combination of desk research and semi-structured interviews in order to ensure the possibility of data triangulation. The desk research was conducted by examining policy documents, news paper articles and scientific journals on mobility. The interviews were semi-structured and included 7 respondents over the course of 6 interviews. All respondents were male and either policymaker or expert in the field of mobility. The data analysis was conducted by transcribing the interviews followed by coding using ATLAS.TI 25. Based on these codes, finding could then be made in order to provide an answer to the central research questions.

The results of this research are summarized in the following points:

- Availability of transportation modes varies between an area's center and periphery, both within municipalities as well as the entire Eindhoven Brainport region, with peripheries receiving a lower level of service.
- Availability of transportation modes is often lower in residential areas compared to industrial areas.
- Differences in availability are mostly caused by a lack of financial resources or political will.
- Current paradigms result in the perception that public transport should be profitable.

- Levels of accessibility depend on financial aspects (e.g. income and cost of transportation), physical aspects (e.g. being in a wheelchair) and lack of knowledge or skills (e.g. using the internet or language barriers)
- Respondents perceived differences in the cost of different transport modalities. Though based on existing literature, no significant differences were identified (Warnaar et al., 2024) except between active and passive forms of mobility.
- Budget cuts on public transportation are likely to result in higher degrees of transport poverty (OV-NL, 2025).
- Elderly and disabled populations face higher barriers to access of mobility compared to others, resulting in higher levels of car dependency for these populations (Anthony jnr., 2024).
- Lack of accessibility to information is most common among youth and elderly (Anthony jnr., 2024; Masoumi et al., 2020) and is most common in modalities of public transportation and shared mobility.

- Car use is the most common mode of transportation in the Eindhoven Brainport area (Gemeenteraad Eindhoven, 2023).
- Behavioral change is required to meet the needs for a sustainable transition regarding mobility (Arts & Prohn, n.d.)
- The main contributors to the choice of modality consist of environmental values, social environment (e.g. exemplary behavior or status) and financial considerations
- Norms and values also affect policymakers and therefore are considered to have an indirect influence on the creation of policy.

- Processes of participation often attract the same participants or populations (Ponok et al., 2021).
- Diverse perspectives during the creation of policy result in more inclusive and higher quality policies (Vlaanderen & Klinker, 2024).
- Imbalances of power are likely to result in unfair policies. In order to overcome this, independent funds are established to include the interest of all stakeholders.
- Participatory planning is often used for higher degrees of public support while equality is considered to be a precondition.
- Policymakers report high use of participatory planning while experts report little usage.

Based on the findings listed above, it can be concluded that the relation between mobility policies and mobility justice in the Eindhoven Brainport region is complex; policies regarding sustainable mobility may result in both positive and negative effects on equality. Therefore, a mobility system is required that provides a diverse set of sustainable modalities in order to provide sustainable mobility that is accessible to everyone. To further remove any inequalities regarding mobility, it is required to change current paradigms, norms and values. This is in regard to both individuals and governments and involves the need to transform matters of equality from a precondition to a central aspect of sustainable mobility. However, before this goal is finally achieved a multitude of obstacles and restrictions, including matters of political will and financial struggles, still need to be overcome.

Preface

Before you lies the Bachelor thesis 'Justice of Green Mobility: A case study on mobility justice in the Eindhoven Brainport region'. This thesis was written over the course of 6 months during which I conducted research on the topic of mobility and its effects on equality. During this period, I have learned a lot about these topics as well as how to conduct scientific research. However, this has not been possible without the help of several people to whom I would like to express my gratitude.

First of all, I would like to thank my supervisor, Dr. Cristina Aoki Inoue, for her guidance over the course of this research as well as providing me with helpful feedback and insights during the writing process. Secondly, I would like to express my gratitude to all of the respondents for the time and effort they took to participate in this research. Without the information they have provided me with, this research would not have been possible. Finally, I would like to thank my fellow students, friends and family for the help and advice they have provided me with during this research. Their support has helped me keep motivated to work on this research.

Tijn van Grunsven
Best, June 19th, 2025

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1. Introduction

The city of Eindhoven has been around for quite some time, since 1232 to be exact (Gemeente Eindhoven, n.d-a). Despite its long existence, it remained a small village until the 19th century. During this time, several big companies settled in the city including Philips (lightbulbs) and van Abbe (cigars). With their arrival, they laid the foundations for the city we know today. It is thanks to companies such as Philips and van Abbe that the economy and population of the city were able to grow (Gemeente Eindhoven, n.d.-a). Despite an economic crisis in the nineties that resulted in the downsizing and bankruptcy of some of its biggest employers, the city was able to make a remarkable comeback to now become one of the most important regions in the world for innovation and technology (Gemeente Eindhoven, n.d.-a) and the fifth largest city of the Netherlands (CBS, n.d.). However, all of these developments did not come without a cost. Big employers such as the High Tech Campus, the technical university and in recent years most notably ASML attract thousands of employees, all in need of a home and a way to get to work. This has resulted in the increase of housing prices (Wijdeven, 2024) and problems regarding mobility such as congestion (van Dijk, 2022).

Several solutions have already been proposed within the region to solve these problems. For example, the municipality Eindhoven has worked out these solutions ‘masterplan mobiliteit 2050’ to improve accessibility as well as improved inclusivity in the mobility networks (Gemeenteraad Eindhoven, 2023). This masterplan includes plans for a 15-minute city, extensions and improvements of bike and walking infrastructure, construction of mobility hubs and zero emission zones (Gemeenteraad Eindhoven, 2023). Similarly, other municipalities in the region have developed their own policies in order to stimulate a transition towards sustainable mobility (e.g. Gemeente Veldhoven & Royal HaskoningDHV, 2023; Louwers, 2015). At the same time, there are also some large scale projects planned to improve mobility in the region, such as an underground bus station in Eindhoven (ProRail, 2024) and possibilities for the construction of a light rail in the future (de Koning, 2024). As can be deducted from the aforementioned examples, improvement of mobility infrastructure and services in the region is urgently required. For this purpose, the Beethoven deal has been closed; a deal signed by the national government, municipality of Eindhoven, the province and several big employers in the region that has resulted in a budget of €2,51 billion to improve education, knowledge and spatial infrastructure (Rijksoverheid, 2024).

But as issues of mobility affect certain populations more than they affect others (Sheller, 2018b), the question that arises is whether the same can be said for its solutions? To understand matters such as these, this research seeks to enhance understanding of the effects of sustainable mobility policies in the Eindhoven Brainport region on the mobility of its inhabitants and the inequality thereof. In order to understand matters of inequality within mobility, Sheller (2018a) developed the notion of mobility justice. This theoretical lens focuses on power and inequality of movement, mobility and immobility (Sheller, 2018a). Therefore, mobility justice can be seen as an intersectional approach that addresses several injustices within society (Harada, 2023). By incorporating the theory of mobility justice into current mobility systems, higher degrees of equity and inclusion, sustainability and quality of life may be achieved (Sheller, 2020). Based on its strong

relation to environmental effects, the transition towards sustainable mobility and its incorporation of equality, it was elected to use the theory of mobility justice as the theoretical lens of this research.

1.1 Research question

The aim of this research is to investigate how sustainable mobility policies affect the way in which different population groups move around focusing on questions of power, participation and inequality of movement. In doing so, this research will focus on the city of Eindhoven and its surrounding region (the Eindhoven Brainport region). This leads to the following research question: "*How does policy on sustainable mobility contribute to a just mobility system within the Eindhoven Brainport region?"*

Additionally, bottom-up solutions have been emphasized to be particularly useful towards the problems posed by mobility justice (Sheller, 2018b). As such, this research will focus on the aspects of participatory planning for the creation of mobility policy. This has been done in order to narrow down the scope of this research. As a result, this research will make use of the following sub-questions:

- What policy on mobility has been created in the Eindhoven Brainport region?
- How does participatory planning contribute to the creation of mobility policy?
- How does policy on mobility ensure equal access to mobility among its citizens?

1.2 Social relevance

The social relevance of this research lies in the fact that it investigates the possibility of unequal effects within mobility policy. In a time of growing inequality (Oxfam Novib, 2024) limiting policies that further increase these inequalities is of importance. For this purpose, conducting research that investigates the effects of current and future policy is required. This is especially of importance as a study by Lucas (2012) found that transport is often related to matters of social exclusion. As this in turn leads to reduced economic opportunities, accessibility of essential services and overall quality of life among marginalized populations (Hook et al., 2025), addressing these inequities is of great importance for the overall benefit of society. Similarly, other studies have pointed out the further inequities related to matters of mobility (Hook et al., 2025). These include the uneven distribution and accessibility of, and ability to use mobility infrastructure and services as well as the disproportionate exposure to the harms of mobility such as pollution and social or physical effects (e.g. Kindler et al, 2011; Ma et al., 2018; Liu & Kwan, 2020). Therefore, these studies further support the need for research on the effects of mobility policies.

Next to this, this research explores the possibility of finding new perspectives on the problem at hand, which might lead to new solutions or recommendations regarding the creation and implementation of sustainable mobility policies. Furthermore, this research will contribute to raising awareness on the matter of mobility justice, possibly resulting in enhanced understanding of the theory among both civil society and policy makers. This in turn might lead to better future policies in terms of sustainable mobility and reduce the problems posed by mobility justice.

In addition to the aforementioned contributions, the social relevance of this research can also be found in the concept of mobility itself. As can be seen in the readings of Sheller (2018a) the concept of mobility influences in many ways the problems we face today. This not only includes matters of congestion or refugee movements, but mobility can also be tied to matters such a climate change and segregation (Sheller, 2018a). In the case of climate change the most notable example might be that of pollution caused by mobility. However, climate change and mobility are also both intertwined in the injustices of the uneven distribution of resources and energy infrastructure (Sheller, 2018a). Additionally, there is also the relation between mobility and segregation. As stated in a study by Liao et al. (2025), levels of transport accessibility are found to influence spatial segregation and risk of social exclusion. Based on this information it is clear that mobility plays a vital role within society. Therefore, this further highlights the importance of researching how the creation and implementation of sustainable mobility policies affect overall levels of mobility, the distribution thereof as well as possible recommendations for further improvement of mobility.

1.3 Scientific relevance

As numerous studies have already been conducted on the topic of mobility, the scientific relevance of this research may be found in its contribution to expand on existing knowledge and fill some of the remaining knowledge gaps. The first knowledge gap this research seeks to contribute to is pointed out in a study by Silonsaari (2025), who notes that existing literature has yet to focus on how accessibility of mobility can be provided to marginalized groups. As this research investigates the effects of sustainable mobility policies, it contributes to this knowledge gap by providing an estimate of their effectiveness to reduce the inequalities of accessibility that are currently being faced among different populations.

Secondly, the scientific relevance of this research is related to the definition of mobility itself. As stated in a study by Hannam et al. (2006), mobility entails the ability to move around freely as well as possible restrictions on the ability to do so. However, as noted by Sheller (2018a) this results in a broad definition and applicability of the term. As such, Lucas (2012) finds that there is no ‘one size fits all’ approach to fix the problems that are present within the field of mobility. Therefore, the study by Lucas (2012) towards the need to find additional examples of measures that do or do not work, as well as the different geographical and social contexts this applies to. By researching the effectiveness of sustainable mobility policies, this research therefore contributes to the existing literature on what are or are not effective measures to ensure more just mobility systems.

As mentioned above, it is also of importance to find examples of the effectiveness of measures among different geographical and social contexts (Lucas, 2012). Therefore, this research further contributes to existing literature by researching the concept of mobility justice in a new context. This is done by investigating its workings in the Eindhoven Brainport region. This region provides a unique setting for this research due to its historical dependence on big companies for economic growth. These include Philips and more recently ASML. As a result, these and several other employers have obtained a key role in the process of policy creation (Gemeenteraad Eindhoven, 2023). This in turn may lead to changes within the power dynamics that are responsible for the creation of policy. As mobility justice seeks to investigate these power dynamics (Sheller, 2018a) it makes the Eindhoven Brainport region a suitable case to research the application of mobility justice.

Furthermore, a study by Karner et al. (2023) finds that little research has yet been conducted on the underlying structures and conventions that create these injustices within mobility. Similarly, Sheller (2018a) points out that existing literature has not sufficiently shown how embodied differences such as gender, age and class result in inequalities within mobility. In an attempt to contribute to this knowledge gap, this research will closely examine the policy created in the Eindhoven Brainport region in order to address these problems and create an enhanced understanding of the effects the policies bear with them.

Additionally, a study by Harada (2023) points out that existing literature has insufficiently covered the current issues of society and the environment through a lens of mobility justice. Therefore, requiring further research on these topics. One such issue is that of the transition towards sustainable mobility, as it is relevant from both societal and environmental perspectives. This can be seen in both direct environmental effects such as pollution but also its relation to other societal issues such as equality (Sheller, 2018a). As a result, by researching the effects of sustainable mobility policies, this research expands the knowledge on the application of mobility justice in present-day issues.

The final aspects of this research's scientific relevance lie in its incorporation of participatory planning as a possible solution. Though earlier research on the use of bottom-up approaches for the creation of policy have already been conducted (e.g. Klaever et al., 2024; Whitney & Ledsham, 2023), this research contributes to the existing literature by researching the application of these bottom-up approaches through the perspectives of policymakers. The most notable bottom-up approach that is discussed in this research is that of participatory planning. Similarly to bottom-up approaches as a whole, several studies have already been conducted on the effects of the use of participatory planning more specifically (e.g. Agramont et al., 2022; Evers et al., 2019; Whitney & Ledsham, 2023). However, this research sets itself apart by connecting participatory planning to the theory of mobility justice. Furthermore, this research addresses the aforementioned knowledge gap addressed by Silonsaari (2025) by investigating the effectiveness of participatory planning as a way to empower voices of marginalized groups.

1.4 Reading guide

The following chapter elaborates the key concepts and theories of this research. Based on these concepts a conceptual model was created, the relations of which will also be discussed in this chapter. In Chapter 3, this is then followed by an explanation of the methodology. This includes the approach that was used for this research as well as the methods of data collection and finally how the obtained data was analyzed. These results will then be presented in Chapter 4. Based on the findings presented in Chapter 4, a concluding answer will then be provided to the central research questions in Chapter 5. Finally, in Chapter 6 the limitations of this research will be discussed as well as suggestions for possible future research. Additionally, any choices that were made that altered the course of this research will also be discussed in this chapter.

2. Theoretical framework

Based on an initial review of the literature several concepts and theories were identified that corresponded with the subject of this research¡ This chapter will discuss several of these concepts and theories in order to provide further contextualization of the research topic¡ These concepts are then presented in the conceptual model which will in turn provide the foundation for the further stages of this research¡

2.1 Mobility justice

An earlier study on cycling mobility in Amsterdam by Silonsaari (2025) has pointed out that transportation research is often focused on finding all-encompassing solutions to problems such as congestion or matters of public transport. For such matters the theory of transport economics is often used (Hörcher & Tirachini, 2021). This theory seeks to enhance transport efficiency through the means of economic theory (Button, 2010). As per example, we can think of the current popularity of the 15-minute city as one of these all-encompassing solutions. However, solutions such as the 15-minute city fail to take into account both social and physical infrastructure and often focus only on the latter (Silonsaari, 2025). As such, these 'solutions' tend to neglect the underlying issue of social injustice. Following the argumentation of Sheller (2018b), Silonsaari notes that:
"We should not expect wide ranging mobility transitions if we cannot simultaneously tackle the intersectional, socio-spatially produced, multi-scalar and historically contingent social injustices" (Silonsaari, 2025).

Thus, a need for focus on social infrastructures is also required. This can be achieved through the concept of mobility justice (Sheller, 2018a), which is as she defines it:
"Thinking about how power and inequality inform the governance and control of movement, shaping the patterns of unequal mobility and immobility in the circulation of people, resources, and information" (Sheller, 2018a, p. 30-31).

Mobility justice is a very broad concept and can be applied in almost every aspect of society; the scales on which it can be applied range from that of the body to that of the planet (Sheller, 2018a). First of all, the bodily scale includes individual differences that limit a person in their mobility (Sheller, 2018a). On a slightly larger scale, there are the scale of the street and that of the extended urban scale (Sheller, 2018a). These involve the use of the built environment to enforce segregation and exclusion through the construction of mobility infrastructure and services. Additionally, this includes the creation of unfair distributions of the benefits and harms resulting from mobility such as pollution (Sheller, 2020). Next to these there is the national scale, which involves border control, matters of migration and refugee policies (Sheller, 2018a). Finally, there is the planetary scale. Here, Sheller ties mobility justice to aspects of environmental justice through the movement of resources and energy as well as the unequal distribution of pollution and effects of climate change (Sheller, 2020).

Additionally, mobility justice is an approach that seeks to address the injustices of our present-day world (Harada, 2023). Therefore, it promotes research on how mobility, as well as immobility, is affected by power and inequality (Sheller, 2020). As the aim of this research is to investigate how power relations affect inequality of mobility in the Brainport region, it makes mobility justice a suitable theoretical lens for the purpose of this research. Similar notions can be found in the theory of transport justice as described by Martens (2017). This theory argues that accessibility to mobility should be guaranteed at a sufficient level for everybody (Vanoutrive & Cooper, 2019). The theory of transport justice therefore shows great resemblance to mobility justice. However, it differs on the means to achieve more just transportation networks. Whereas Martens' theory relies on the principles of a free market to achieve equal distribution of accessible mobility (Vanoutrive & Cooper, 2019), Sheller argues for reforms of current power relations that reproduce unequal mobilities (Sheller, 2018a). Furthermore, mobility justice sets itself apart from other theories as transport justice through its broad conceptualization of mobility as well as the scales on which it can be applied (Verlinghieri & Schwanen, 2020).

Taking into account the critique of Davidson (2020), stating that mobility justice is inherently related to the sustainability of mobility, further complements the conceptualization of mobility justice as described by Sheller. As this research is focused on the effects of sustainable mobility, the incorporation of Davidson's critique further improves the suitability of mobility justice as a theoretical lens for this research which is why it has ultimately been elected above other theories on mobility.

2.2 Institutions

Sheller (2018a) in addition to several other academics (e.g. Hardin and Ostrom) takes an institutionalist approach to the cause of injustices within mobility. This approach argues that failure of institutions has made possible the existence of these injustices as well as some of the other great predicaments of modern times (Robbins et al., 2022). So, what exactly is an institution then? A commonly used definition of an institution is the one provided by Douglass North. He defines institutions as "the humanly devised constraints that structure political, economic, and social interaction. They consist of both informal constraints, and formal rules" (North, 1991).

However, these institutions often fail to take into account the needs of different populations. This often results in the neglection of experiences of marginalized groups which is often based on matters of gender, nationality, race or class (Robbins et al., 2022). As such, it leaves these populations without a voice in the creation of new policies. In order to overcome this problem Sheller (2018b) uses notions of feminist theory in her conceptualization of mobility justice. In doing so, she argues that the field of mobility as a whole is one structured through a colonial, extractive and patriarchal history (Sheller, 2018a). This is exemplified by the notion that "some bodies can more easily move through space than others, due to restrictions on mobility relating to gender, race, class, ethnicity, sexuality and physical abilities" (Sheller, 2018a, p. 24). This is further supported by several other studies finding that populations such as poor (Krabbenborg & Durand, 2024), elderly or disabled people (Anthony Jnr., 2024) often face more restrictions regarding mobility, limiting them from partaking in society. As, according to some, feminist

theory has its foundations in cases such as the Chicago Hull House and the Love Canal scandal (Robbins et al., 2022), it places great emphasis on bottom-up solutions. This is also illustrated in the readings of Harding, who through the notion of standpoint theory argues that production of knowledge needs to be done by “studying up” (Harding, 2009). Building onto this, a study by Vlaanderen and Klinker (2024) found that by implementing such bottom-up approaches in the creation of policy, a more diverse set of perspectives may be included. In turn, this is likely to result in a higher quality of policies (Vlaanderen & Klinker, 2024) as well as public support (Ministerie van Infrastructuur en Waterstaat, n.d.).

This argument is further supported by the negative effects of top-down governance. As shown in the study by Dirix et al. (2013), top-down governance often lacks the political will to act or resolve problems. Additionally, they argue that two of the main top-down policies, grandfathering and offsetting, neglect both participatory and intergenerational justice (Dirix et al., 2013). However, top-down governance has also shown to have some positive sides (Paul & Milman, 2017). As a result, top-down governance often remains the most chosen route for policy creation (Liu, 2016). This in turn leads to institutions holding on to their dominant position without much change happening. Therefore, this research aims to investigate how the position of these institutions affects the creation of policy and in what ways this might be changed.

2.3 Participatory planning

A common way in which bottom-up solutions are incorporated into policy is through the notion of participatory planning (Klaever et al., 2024). As argued by Agramont et al. (2022) this form of policy creation completely differs from other forms of planning. Therefore, it is of interest to this research to investigate whether this is indeed a suitable solution to incorporate the voices of marginalized groups in the creation of policy. In order to do this, first a definition of the concept of participatory planning is required. This research will make use of the definition provided by Whitney and Ledsham (2023). They describe participatory planning as the incorporation of the needs of city inhabitants in order to create more just outcomes (Whitney & Ledsham, 2023).

An examination of the literature on participatory planning finds that both positive and negative effects of this form of policy creation can be found. Positive effects include an increase of diversity among stakeholders, as well as a decrease of hierarchy within policy creation (Agramont et al., 2022). Furthermore, a study by Evers et al. (2019) found that participatory planning led to a number of benefits. These include better communication, knowledge sharing, social learning, decreasing power differences, integration of different sectors and supporting agreements (Evers et al., 2019). This would indeed imply that application of participatory planning would result in a decrease of injustices.

Contrasting this, Whitney and Ledsham (2023) state that urban planners still struggle to create proper participatory planning processes. As a result, they often fail to empower voices from marginalized groups or individuals (Whitney & Ledsham, 2023). This is supported by Klaever et al. who state that participatory planning processes favor “a loud and privileged minority” (Klaever et al., 2024). Another study by Ponok et al. (2021) finds similar results. Yet, they attribute this to a different cause; differences within communities’

level of competence. In their study, Ponok et al. state that as a community has higher levels of power, knowledge or skills, they become more likely to participate in participatory planning (Ponok et al., 2021). Additionally, they found that those who participated in participatory planning had often already participated in similar projects before (Ponok et al., 2021). This then creates a never-ending cycle where those who participate gain more knowledge on these initiatives and thus become more likely to participate again. As a result, this makes for an overrepresentation of these participants, therefore reducing the levels of equality in the creation of policies.

2.4 Mobility

As the ultimate goal of these policies is to increase mobility among citizens, it is important to define this concept. According to the Oxford dictionary mobility entails “the ability to move or walk around freely” (Oxford dictionary, n.d.). However, as pointed out in the article by Hannam et al. (2006) mobility takes on many different forms. As such, they argue that mobility is not only about the ability to move around but also includes restrictions to do so (Hannam et al., 2006). This can be seen in several ways, take for example airports; commercial flight has over time become a mode of mass mobility, at the same time it requires vast amounts of immobile space to accommodate this mobility (Hamman et al., 2006). Therefore, this research uses the definition of mobility as mentioned in Chapter 1: the ability to move around freely as well as possible restrictions on the ability to do so.

Based on this definition there are several aspects of mobility that may be discerned. The first of these aspects is the matter of availability. As no existing literature could be found to provide a definition of this term, this research defines availability as the number of mobility infrastructures and services in a certain area and the distribution thereof. As found in a study by Ren et al. (2023) the availability of (sustainable) modes of transportation may differ per region or city, therefore greatly impacting the number of transportation options an individual might choose from. Therefore, discrepancies in the level of available mobility infrastructure and services are likely to result in different choices regarding the use thereof (Ren et al., 2023). This is of the utmost importance for this research as another study by De Haas (2021) found that the choice of transportation mode has severe implications for the overall health and quality of life for an individual. As a result, the number of available mobility infrastructure and services can be seen as an indirect driver of inequality within society.

Secondly, there is the aspect of accessibility. As opposed to availability, there are numerous studies on this aspect of mobility. However, within these studies, there is a broad variety of definitions of the term accessibility. For example, a study by Bastiaanssen and Breedijk (2024) focused on matters of distance whereas Anthony Jnr. (2024) focusses on physical accessibility and accessibility to information. Additionally, further studies research matters of perceived accessibility (Lättman et al., 2018) or financial accessibility (Krabbenborg & Durand, 2024). In order to include all the aforementioned forms of accessibility, it was elected to define accessibility as “the ease of interacting with potential opportunities” (Soukhov et al., 2025, Abstract). Using this definition of accessibility there is

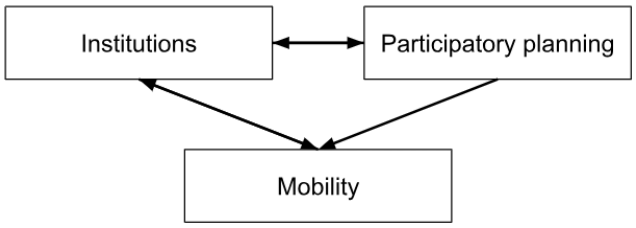
a clear relation between accessibility and equality. As the level of accessibility is evidenced to affect the possibility for people to partake in society (Bastiaanssen & Breedijk, 2024; Krabbenborg & Durand, 2024; Anthony Jnr., 2024) as well as affecting their quality of life (Anthony Jnr., 2024), it is of great interest to this research how levels of accessibility are influenced by the transition towards sustainable mobility.

The final aspect of mobility that was discerned is that of human behavior. As found by Arts and Prohn (n.d.) the mere providing of sustainable infrastructure and services is not enough to achieve a transition in the field of mobility. For such a purpose, additional attention should be paid towards human behavior (Arts and Prohn, n.d.). Further research by Chuang et al. (2020) supports this by highlighting the influence of different worldviews on the use of sustainable transportation modes. As such, similarly to the aspect of availability, human behavior can be seen as an indirect driver of inequality and should therefore be taken into account over the course of this research.

2.5 Conceptual model

Based on the examination of existing literature the concepts mentioned above have been elected to be used during this research. In order to create a clear overview of the central concepts of this research, the aforementioned concepts have been compiled into a conceptual model (Figure 1). This is done in order to improve the understanding of these concepts and their influence on one another.

Figure 1
conceptual model



As can be seen in Figure 1, the concept ‘institutions’ has a reciprocal effect on both mobility and participatory planning. This is the case as institutions consist of the restrictions on human interactions (North, 1991), therefore including the restrictions of both mobility and participatory planning. On the other hand, participatory planning influences institutions as it is used to formulate new policies, which in their own way can be seen as a restriction of human interactions. Mobility though, influences institutions in another way. Seeing that mobility influences the degree to which one can partake in society (Bastiaanssen & Breedijk, 2024) results in the fact that mobility can be seen as an institution itself. The final relation shown in the conceptual model is that of participatory planning on mobility. As more (diverse) policymakers result in better and more inclusive policies (Ministerie van Infrastructuur en Waterstaat, n.d.), this is likely to affect the equality of mobility among different populations. However, as little evidence was found to support an effect of mobility on participatory planning, this relation is not reciprocal.

3. Methodology

This chapter will provide an elaboration on the methodological choices that were made to conduct this research¡ This includes the chosen research approach as well as methods of data collection? analysis of the data that was obtained and interpretation thereof¡.

3.1 Research approach

For the purpose of this research, it was elected to make use of a qualitative approach. As this research is set in a new context (the Eindhoven Brainport region), key variables have not yet been identified in pre-existing literature. For such purposes, a study by Creswell (2003) found that qualitative research methods are most suitable. As a result, an in-depth analysis of the research data will be required for which qualitative research methods are most suitable (Creswell, 2003). Furthermore, as noted by Vennix (2019) qualitative research lays focus on the meanings that people attribute to certain phenomena. As this research seeks to understand the effects of sustainable mobility policies through the perspectives of policymakers, this further supports the choice for qualitative research methods for this research.

The research strategy that was primarily used over the course of this research has been that of a case study. Despite the fact that mobility justice is a concept that can be applied on a larger scale, this research places it in a local context as it only focuses on the Eindhoven Brainport region, therefore making a case study a favorable research strategy. Additionally, this research is conducted in an exploratory manner, for which case studies are also well suited (Stake, 2009). According to Yin (1989) a case study is also most appropriate in case the phenomenon can't be separated from its natural context. As mobility justice is a broad concept that depends on different levels of policy and not just that of the Eindhoven Brainport region, this is also the case for this research.

It should however also be noted that this research makes use of several elements of grounded theory. This includes the continuous comparing of categories of information, as well as sampling of different groups with the purpose of triangulation. Though it is not the purpose of this research to formulate a general theory, the aforementioned characteristics are considered to be central to grounded theory (Creswell, 2003). Therefore, the research strategy that is used for this research can be seen as a mix between a case study and grounded theory.

3.2 Data collection

The first instances of data collection were conducted through desk research. During this phase existing literature on the relation of mobility policy and mobility justice in a wider context was closely examined. This includes both articles from scientific journals as well as reports from government agencies. This was done in order to gain a better understanding of key concepts and similarities within earlier research. Any concepts that were considered to be applicable to this research were then incorporated into the interview questions (See Appendix 8.1 for the entire interview guide). In addition to scientific literature, this research also examined policy documents and media outlets such as news articles. This way, a better understanding is created regarding recent policy as well as possible problems this has caused. Additionally, the information obtained during this phase of the research was then also used for triangulation later on.

After an initial examination of the existing literature and policy documents was completed, several interviews were conducted. People that were approached for these interviews were selected based on expertise in mobility policy in the Brainport region therefore consisting mostly of local policy makers such as aldermans or civil servants. However, several policy makers on provincial level were also contacted in order to obtain additional information on public transportation. Additionally, several professors in the field of mobility were contacted in order to improve triangulation of the data obtained through the interviews.

In the end, 6 interviews were conducted in which 7 respondents were interviewed. The sample groups consisted of 2 professors in the field of mobility (Respondents 2 and 3), 2 alderman (Respondents 1 and 6), 1 local policy advisor (Respondent 7) and 1 provincial policy maker (Respondent 5). It can thus be noted that a diverse set of experiences was included in the sample group therefore resulting in a broader range of data. It should however also be noted that all respondents were male, therefore excluding female experiences despite evidence that male and female experiences regarding mobility differ (Carboni et al., 2021). As a result, this has reduced the generalizability of this research's findings (Lakes, 2013).

For each of these interviews informed consent was obtained through oral confirmation by every respondent. The interviews were semi-structured and conducted either face-to-face or using Microsoft Teams. This method was chosen as semi-structured interviews leave the interviewer with more flexibility regarding the questions to ask. As a result, questions can be tailored to each interviewee, who can in turn provide the researcher with more accurate responses resulting in a better understanding of the data (Shuy, 2001). More importantly, according to Holmberg and Madsen (2014) this makes the respondent feel respected for their time and input, therefore resulting in an enhanced quality of the results. During these interviews a professional setting was maintained in order to make more efficient use of time (Holmberg & Madsen, 2014). Therefore, this saved time which could be used during other phases of the research. In case new questions arose during these interviews, these would then be researched through further examination of existing

literature or by conducting additional interviews. This process of iteration would then be continued until theoretical saturation was achieved.

3.3 Research analysis

In order to gain a proper understanding of the concept of mobility justice in the context of the Eindhoven Brainport region, the data collected was subjected to a thorough analysis. This was done in the following order: First of all, the interviews were transcribed, followed by the coding of the data and finally the analysis. The transcription of the interviews was conducted manually in order to improve the memorization of the data. This was done so that time could be saved in further stages of the analysis as the researcher will be more familiar with the data.

After completion of the transcripts, both interviews as well as policy documents were coded. For this purpose, the computer program ATLAS.TI 25 was used. The coding was done in order to combine concepts and topics from the earlier desk research with those obtained during the interviews. Using ATLAS.TI 25, these concepts and themes were then transformed into new codes or themes in order to facilitate easier analysis of the research data. The initial coding was primarily conducted through highlighting segments of the documents that were relevant to this research. When this was completed, codes were then attached to these quotes. Finally, these codes were then compared with one another and if possible combined in order to reduce overlap between codes. The aforementioned process was then repeated for all documents after which a final codebook was formulated (Appendix 8.2). Additionally, a network of codes was created highlighting the relations between the codes listed in the codebook. This was done in order to provide a clear and structured overview of this research's results, based on which the findings could then be presented. Any information that was provided by the respondents was then anonymized to ensure confidentiality of their identities. Finally, the findings made over the course of this research are used to ultimately provide an answer to the central research question.

4. Results

Based on the interviews that were conducted and their analysis this research has made several findings. These findings will be presented in the following chapter in addition to findings made during additional research of existing literature. This will be done based on the concepts featured in the conceptual model "mobility" institutions and participatory planning".

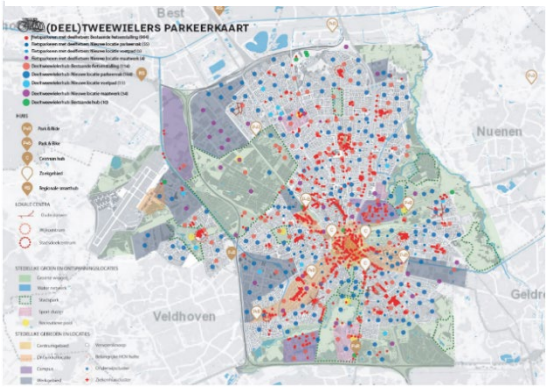
4.1 Mobility

As stated in Chapter 2.4 there are several factors that contribute to the level of mobility of an individual: Availability, accessibility and human behavior. Based on the interviews, their analysis and additional literature review these same aspects of mobility could be discerned. Each of these factors contribute in their own way to both the enabling and restricting of an individual in their ability to participate in society. First of all, as availability entails the number and distribution of mobility infrastructure and services it determines the distance an individual has to travel in order to make use of a mobility network. Secondly, accessibility determines the possibility for said individual to make use of a certain mode of transportation. The final factor to contribute to the level of mobility one possesses is that of human behavior. However, it was found that this mostly relates to norms and values present within society. Therefore, this aspect of mobility will be discussed in the chapter on institutions (Chapter 4.2).

4.1.1 Availability

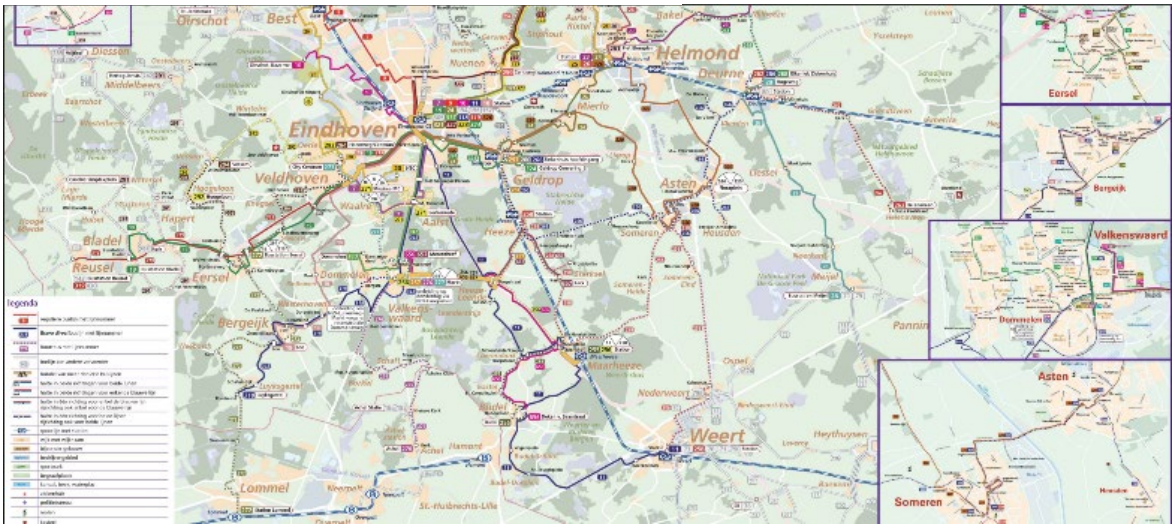
Based on the assumption that someone has a moderate income and lives in a somewhat urbanized area, respondent 2 argues that every such person has a choice on how to get around. However, as can be derived from this statement, for some people, groups or regions availability of different mobility options are limited. Additionally respondent 4 argues that the modality an individual choses for their mobility depends on their environment. Therefore, the conditions to be sufficiently mobile differ between those living in the city and those living in the suburbs or a small municipality as the latter enjoy a lower level of provided services. As can be seen in Figure 3, showing the public transport network of the Brainport region, and Figure 2 showing the parking areas for (shared) cycles and scooters, there is indeed a difference to be noted within the availability of mobility services. These images clearly show the different amount of public transport lines and facilities for shared mobility between the center of the city and region as compared to its periphery. As a result, people in the peripheries of the Brainport region that use public transport or shared mobility often have to put in more time or energy in order to reach their destination compared to those living in its center.

Figure 2
(Shared) Two-wheeler parkingmap



Note. Adapted from *Wij gaan vooruit: Masterplan mobiliteit 2050,* by Gemeenteraad Eindhoven, 2024, p. 56.

Figure 3
Buslines South-East Brabant



Note. Adapted from *Lijnennetkaart 2025 Zuidoost-Brabant*, by Hermes, 2025, p. 1.

Additionally, respondent 2 noted a difference in the availability of facilities for mobility between industrial and residential areas. Even though this was not mentioned by any other respondents, this statement can be supported in some cases when again taking a look at Figures 2 and 3. Here it can be seen that big employers such as hospitals, Strijp-T and the campuses of ASML and DAF each have multiple lines of public transport either on their grounds or in close proximity. An exception to this is the High Tech campus which despite having over 12.000 employees (High Tech Campus Eindhoven, n.d.) only has 1 bus line (Figure 3). This lack of public transit is however made up for by a relatively high concentration of shared mobility services in the area (Figure 2). Similar proportions can be seen when looking at the public transport for residential areas. However, a difference can be noted when looking at the kinds of public transport. Where industrial areas and campuses are almost exclusively serviced by line buses, residential areas are often serviced by the so-called ‘buurtbus’ (Figure 3). Despite having similar schedules, these buses have a greatly reduced capacity as compared to regular line buses (Provincie Noord-Brabant, n.d.). As such, residential areas enjoy a similar amount of bus lines per potential user but a relatively low capacity.

What can be seen as the underlying problem for this unequal distribution of availability is mostly economically motivated. However, politics also create severe limitations on the availability of sustainable mobility. As explained by respondents 1 and 5 the current nitrogen crisis in the Netherlands has enormous implications for the construction of new infrastructure to improve mobility. Additionally, 6 out of 7 respondents noted how the political landscape on both national and local levels affect the development of policies regarding sustainable mobility. Though not directly mentioned by respondent 3 he did mention that a lack of financial resources resulted in the fact that “there’s a tradeoff, a decision to be made of [*Sic*] a certain area can be provided with such a service or … at what frequency or at what level of accessibility” (Respondent 1, personal communication, April 15th 2025). As this tradeoff is once again a political matter, it further emphasizes the importance of politics on the availability of sustainable mobility infrastructure and services.

As mentioned earlier, availability of sustainable mobility infrastructure and services is also a financial matter. As is with political matters, financial resources were mentioned by all but respondent 1 to be a direct driver of inequality of available sustainable mobility infrastructure and services. With the exception of respondent 2 this was mostly related to the fact that areas of greater population density had greater financial resources to provide sustainable mobility infrastructure and services. Another factor contributing to this is exploiters of shared mobility facing comparatively higher operational costs in rural areas (Jorritsma et al., 2021). As explained by respondents 6 and 7, this has left shared mobility services in rural areas such as the municipality of Asten mostly dependent on volunteers to fulfil this need. As a result, fewer alternative modes of mobility are to be found in areas of low population density as is also visible in Figures 2 and 3. In turn, this has resulted in the fact that the population in the region's periphery is comparatively more dependent on their cars for their mobility, as is also visible in the average number of cars per household (Table 1).

Table 1
Average car ownership per household

Municipality	Average car ownership per household	Population density
Asten	1.2	246
Bergeijk	1.3	190
Best	1.1	921
Bladel	1.3	279
Cranendonck	1.3	272
Deurne	1.2	284
Eersel	1.3	245
Eindhoven	0.8	2800
Geldrop-Mierlo	1.1	1313
Gemert-Bakel	1.2	258
Heeze-Leende	1.3	162
Helmond	1.0	1803
Laarbeek	1.3	420
Nuenen, Gerwen en Nederwetten	1.2	720
Oirschot	1.3	189
Reusel-De Mierden	1.3	174
Someren	1.3	252
Son en Breugel	1.3	692
Valkenswaard	1.1	578
Veldhoven	1.1	1478
Waalre	1.2	804

Note. Adapted from *Autobezit per huishouden, 1 januari 2023*, by CBS, 2024; *Inwoners per gemeente,* by CBS, n.d..

On the other hand, respondent 2 emphasized how the unequal distribution of financial resources leads to the perception that public transport, as opposed to private cars, should be profitable. Thus leading to the creation of policy that focusses on popular destinations such as areas of high population density and industrial areas. This was also noticeable in the interviews with policymakers where it was pointed out that some modalities or services were simply not profitable enough to be implemented. Along with budget cuts by the national government (OV-NL, 2025), this has led to the reduction of the availability of public transportation networks resulting in lower accessibility of jobs and facilities (Bastiaanssen & Breedijk, 2024). This problem is however largely mitigated through the closure of the Beethoven deal as over €1 billion of the €2,51 billion that was allocated to the region may be used for the improvement of mobility infrastructure (Rijksoverheid, 2024). Therefore resulting in both increased availability as well as accessibility of (sustainable) mobility infrastructures and services within the region.

4.1.2 Accessibility

In addition to the availability of infrastructure for mobility, this infrastructure and the accompanying modalities must also be accessible for people to use in order to ensure equality within mobility. Yet, the transition towards sustainable mobility has proven to have both positive and negative effects on the accessibility of mobility infrastructure and services. As discussed above, the accessibility to jobs and facilities through public transit finds itself in a worsening position (Bastiaanssen & Breedijk, 2024). However, as pointed out by Bastiaanssen and Breedijk themselves, their study mostly focused on accessibility from a perspective of distance. Yet, accessibility also includes matters such as cost and comfort (Hoogendoorn-Lanser et al., 2011). Additionally, levels of accessibility or perceptions thereof may vary depending on gender, income and ethnicity (Bittencourt & Giannotti, 2023) as well as age and health (Anthony jnr., 2024).

Perhaps one of the more obvious aspects of accessibility is its financial aspect. With all respondents noting the importance of financial accessibility of mobility, it is clear that an individual's financial resources play a key role both in access to mobility as a whole, as well as the transition towards sustainable forms of mobility. Yet, despite this crucial role in the transition towards sustainable mobility, budget cuts on public transit by the national government will likely result in either the abolishment of public transit services or the rise of prices (OV-NL, 2025). The latter resulting in increasing transport poverty, thus increasing inequality in access to mobility infrastructure and services (Primc et al., 2025). Additionally, a report by the European Parliament (Kiss, 2022) finds that policies penalizing fossil fuels can further increase transport poverty through increased prices of mobility for consumers. This way, policies stimulating the transition towards sustainable mobility might result in increased inequality within society (Kiss, 2022).

An interesting result regarding financial accessibility was the difference in costs associated with different modalities of mobility that were discerned by some respondents. Even though a study by Warnaar et al. (2024) finds that there are little differences between the cost of travelling by car or public transport several respondents did state that there is a notable difference between those 2 modalities. On the one hand, respondent 4 stated that car use was significantly more expensive compared to public transportation while respondents 6 and 7 stated the contrary. A possible explanation for this difference in

perception could again be related to regional differences as Eindhoven (Respondent 4) has implemented parking tariffs in certain areas (Gemeenteraad Eindhoven, 2023) as opposed to the municipality Asten (Respondents 6 and 7) (Gemeente Asten, n.d.). A similar point can be made for the comparison between private mobility and shared mobility with costs largely depending on the frequency and duration of journeys (Jorritsma et al., 2021). However, a more notable difference may be discerned between fossil fueled cars and electric vehicles. As noted by several respondents, electric vehicles are significantly more expensive to purchase. Therefore making them less accessible for people with a lower income. Despite this, starting 2025, the city of Eindhoven has implemented a zero-emission zone (Gemeente Eindhoven, n.d.-b). Furthermore, the city of Helmond has completed a 3-year pilot program that also made use of a zero-emission zone (Gemeente Helmond, n.d.). Even though the implementation of zero-emission zones results in significant contributions towards sustainable mobility and the reduction of greenhouse gas emissions (De Bok et al., 2020), by banning fossil fueled vans, trucks and buses, a significant part of businesses lose access to these areas. As tax exemptions on electric vehicles are now also being lifted (ANWB, n.d.), access to these areas requires an even larger investment and further increasing disparities within society. Additionally, the study by De Bok et al. (2020) has also shown that implementation of a zero-emission zone leads to a higher degree of vehicle use outside of the designated area, thus reducing the effectiveness of this measure.

The final difference to be noted in financial accessibility is that between active and passive forms of mobility. Here, active mobility being a form of mobility that involves the movement of people themselves, the best-known examples being cycling and walking (Goudappel, n.d.). As such, for the purpose of this research, passive mobility is defined as the opposite, thus including mobility by public transport or via car. As the costs of walking are negligible and cycling also encompasses far lower costs in ownership or environmental pollution (Milieu Centraal, n.d.), the prioritization of active mobility lowers the barrier of financial accessibility. Indeed, every policymaker (respondents 1, 4, 5, 6 and 7) that was interviewed noted the importance of active mobility as well as its incorporation in policy.

In addition to financial accessibility there is also the matter of physical accessibility. This entails the physical capabilities of a person that either enables or disables them from using certain modalities of transportation. During the interviews the most notable differences were found among people of different ages and people with physical disabilities. These findings are further supported by research done by Anthony jnr. (2024) and Petterson et al. (2024) respectively. As discussed by respondents 1, 2, 4 ,6 and 7 this most often affects these populations in forms of active mobility as they are more likely to suffer injuries or are not able to make use of these modalities at all due to their physical impairments. However, restrictions on mobility due to a lack of physical access are not limited to only active forms of mobility. As Anthony jnr. (2024) finds that elderly people as well as people with disabilities also experience higher barriers to access of other modalities such as public transportation. This has resulted in Dutch elderly becoming more automobile, thus reducing the effectiveness of sustainable mobility policies if the experiences of those with physical impairments are not taken into account sufficiently (Böcker et al., 2016).

A possible solution to the problem of physical accessibility might be found in virtual mobility (Kenyon et al., 2002). As mentioned by respondents 2 and 3, this form of mobility overcomes the problems of physical accessibility as one does not have to leave their residence in order to take part in society. Even though this form of mobility cannot fully cover the possibilities provided by physical mobility, it has the potential to reduce social exclusion (Kenyon et al., 2002). However, a transition towards more virtual mobility also has its downsides and may increase inequality in other aspects of society. As shown by Dolcini et al. (2021), disparities regarding internet access can be found based on levels of income and ethnicity. An additional disparity in internet access was found based on age (Mackett, 2018). This study found that elderly populations more often do not use or have access to the internet or apps that provide them with information (Mackett, 2018).

Finally, there is also the aspect of accessibility to information. This is defined as either a lack of knowledge or level of skills in order to make use of a certain form of mobility. As can be deduced from the interviews, this aspect of accessibility is again common among elderly populations. Similarly, this was also one of the findings in the study of Anthony jnr. (2024). However, as noted by respondent 4, accessibility to information also limits youth in their mobility. An example of this is children not being able to travel independently to school as their parents are unaware of their abilities in traffic situations (Masoumi et al., 2020) or worried about traffic danger in general (Dessing et al., 2014). This leads them to restrict their children's mobility through the notion of safety (Masoumi et al., 2020). As mentioned by the interviewed policy makers, safety is already one of the main priorities regarding mobility policies. However, as stated by respondent 4, it is of importance to keep improving traffic safety in order to ensure equal accessibility for youth and elderly to public spaces.

Elderly, on the other hand, experience different forms of inaccessibility to information. The aforementioned study by Anthony jnr. (2024) found that elderly populations more often struggle with reading or understanding signs when travelling with public transportation. Similarly, respondents 6 and 7 also thought that elderly people struggled relatively more with understanding and using shared mobility services. Additionally, respondent 4 pointed out a disparity within use of shared mobility based on digital skills. As lack thereof is also more common among elderly populations (Borbely & Némethi-Takács, 2023) it can be argued that are less likely to use shared mobility due to a low degree of accessibility to information. Therefore, it is of importance to include the needs of all populations in order to keep both information regarding mobility and mobility itself accessible to all.

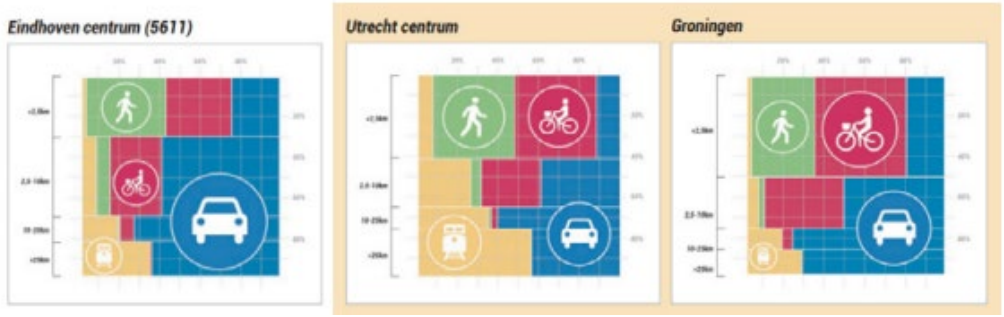
4.2 Institutions

As mentioned in the previous chapter, the final factor to contribute to the mobility of an individual is human behavior. This can be in regard to either the values of an individual or the norms society imposes on them. In the end, availability and accessibility of sustainable mobility modes may be provided, as long as there is no one to make use of them, they are still of no use. An example of this is the percentage of trips taken by car. As stated by respondent 4, in the city of Eindhoven over half of the trips shorter than 5 kilometers are made by car (also shown in Figure 4). This is despite the fact that the city center of

Eindhoven enjoys perhaps the greatest availability of sustainable transportation modes in the Brainport region (Figures 2 and 3). A similar point was made by respondent 5 who stated that car mobility still enjoys great facilitation in the Brainport region. Therefore, as stated by respondent 2 and 4, technical innovations such as the electrification of cars and public transport alone will not suffice in reaching the mobility goals of the region, as this also includes the reduction of congestion (Arts & Prohn, n.d.). Rather, in order to achieve this transition, more attention should be paid to alter human behavior (Arts & Prohn, n.d.).

Figure 4

Choice of modality according to distance



Note. Adapted from *Wij gaan vooruit: Masterplan mobiliteit 2050,* by Gemeenteraad Eindhoven, 2023, p. 45.

In doing so, this research has found varying results regarding the relation between norms and values and the modality a person makes use of. With all respondents agreeing on the importance of personal values regarding the choice of travel mode, it can be concluded that personal values play a key role in the transition towards sustainable mobility. This is also supported by several studies including those by Lind et al. (2015) and Arroyo et al. (2020). Based on the interviews 3 main factors were found to contribute to the norms and values that affected the choice of modality. These were found to be either financial, social or environmental motivations.

All but respondent 5 noted the influence of environmental values. However, respondents 3 and 6 noted that this effect is lower as compared to financial and social values. On the other hand, respondents 1, 2, and 4 stated the contrary. An additional study of the literature however found the latter to be true with environmental concerns being listed as one of the main contributors to influence use of sustainable mobility (Nordlund & Westin, 2013; Pojani et al., 2018). This can be either through the purchase of an electric vehicle (respondents 1 and 6) or through the overall reduction of car use (respondents 2 and 4).

Secondly the social environment of an individual also influences their norms and values. Therefore, as noted by respondents 5, 6 and 7, this highlights the importance of exemplary behavior by employers and policymakers. This follows the logic that these people hold important positions within society therefore their actions and behavior also influence the norms and values of the people they employ or govern. Additionally, a study by Arroyo et al. (2018) also found that the overall social environment of an individual also influences their choices and behavior. This is also supported by respondent 2 who noted that groups of people often share the same interest and opinions regarding mobility. Furthermore, respondent 4 noted the importance of status regarding the choice of mobility of an individual. Therefore, if people associate status with certain modes of mobility, they are more likely to elect that mode above other forms of transportation (Buunk & Bastiaanssen, 2016).

Finally, as noted by respondents 6 and 7, personal values often take into account the financial aspects of a decision. Respondent 6 further illustrates this by remarking how Dutch people in general often calculate the costs of their decisions. However, as noted by respondent 2, for some people with lower incomes this is not a matter of personal values as they are simply forced to make use of the cheapest modality in order to remain mobile and gain access to society. In addition to this, respondent 2 remarks that most people do however have the choice over their mode of transportation. Yet, people transitioning towards more sustainable modes of transportation often do this for financial gain.

Additionally, it should be noted that current travel behavior already affects inequality. A point often made regarding to climate change and carbon emissions is that effects are not equally distributed among different populations (Strelau & Köckler, 2016; Sheller, 2018a). A similar point can be made regarding mobility as those who chose to travel more sustainably still suffer from reduced quality of life (through congestion and air quality) due to the emissions of others (Kindler et al., 2011). Additionally, those living in close proximity to highways or the airport also suffer disproportionately from reduced air quality compared to others. These choices are of course made due to infrastructure facilitating less sustainable travel modes (through induced demand, see Van der Loop et al. (2016)). However, our own norms and values also contribute to this. As pointed out by respondent 6, individualism remains in a prominent place regarding the norms and values within Dutch society. As a result, initiatives such as car sharing may be less successful. However, respondent 6 also points towards values of kindness and consideration that contradict this, therefore contributing towards a more sustainable transit system.

However, norms and values do not solely affect users of transportation in their choices but also affect policymakers in the policy they create. As remarked by respondent 4, the focus regarding mobility has mostly lied on improving speed and accessibility while it should also include matters such as safety, quality and sustainability. However, based on the interviews conducted with policymakers it becomes clear that current policies are more and more changing to include these aspects as well (Respondents 1, 4, 5, 6 and 7). Therefore, based on how mobility is defined, different policies regarding mobility might emerge. This is also illustrated by the differences within the transportation network of the Netherlands as compared to countries like the USA (as also remarked by respondents 2 and 4). Additionally, policymakers are also subjected to the norms and values of society. The most notable example of this would be elections, however as noted by respondents 1, 2, 3, 4, 6 and 7 lawsuits, participation and other processes that let people share their norms and values may affect the creation of policy and the norms and values of the policymakers themselves.

4.3 Participatory planning

Increased diversity among policymakers contributes to a better quality of policy creation (Vlaanderen & Klinker, 2024). Yet over 70% of Dutch policymakers are known to be men (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2021). Additionally, respondent 5 remarks that provincial organizations often consist of employees that are highly educated. This lack of diversity in turn increases the risk of tunnel vision among policymakers. Therefore resulting in a lack of incorporation of the interests and experiences of other populations (respondent 5). With more people being able to share their voices, participatory planning should in principle be an instrument for policy creation that results in more equality. Yet, this is not always the case.

As mentioned before, participatory planning often attracts the same people or populations (Ponok et al., 2021). As such, respondent 2 describes the average participant of participatory planning as an older person that is well educated and has a background in urban planning or used to work for the municipality. Though, not describing participants as detailed, most of the other respondents noted how participants are indeed often of older age. Therefore resulting in the incorporation of only the perceptions of a select few individuals (Ponok et al., 2021). This imbalance of power is however also visible in other ways in the Brainport region. With companies such as Philips, ASML and NXP investing over €2 billion in the region per year (Brainport Development NV, 2021), these companies conduct a powerful lobby towards both local and national politics (Respondent 2). The aforementioned can be seen Beethoven deal as a result of this lobby (Respondent 2). Therefore, in order to prevent these companies from being favored above the region's inhabitants, several funds have been erected (Respondent 1). This way, money can still be invested in the regional infrastructure while still meeting the needs of the region's inhabitants. As a result, these power imbalances have limited effects on equality within the region. Though, through the Beethoven deal and similar projects equality might still increase on a more regional scale as neighboring regions receive less government funding.

During the analysis of the interviews 2 distinct forms of participation were identified. The first is which is more passive, which is mostly limited to the informing of participants. From the analysis of the interviews it can be concluded the problem described in the previous paragraph is most commonly encountered with passive participation. Contrary to this, a more active approach could also be identified. This includes the possibility for participants to share their opinions regarding the decisions to be taken. Additionally, active participation often entails taking the participation process to the participants instead of using 1 central location. This way, a more diverse composition of participants is obtained therefore not being limited to only the perceptions of the "usual suspects" (Respondent 6, personal communication, May 12th, 2025) and resulting in a more equal process of policy creation. This in turn results in additional policy or exemptions (Respondent 4) in order to better meet the interests of affected populations (Respondents 1, 2, 4, 5, 6 and 7).
It should be noted that this notion of increased diversity is often applied with the purpose of reducing legal struggles with inhabitants (respondent 1 and 6). This is achieved by making inhabitants more aware of the effects of policies and as a result creating more support (Respondent 1, 2, 4, 5, 6 and 7). Therefore, participatory planning should not only

be viewed as an instrument to increase equality, but also an instrument to alter the perceptions of inhabitants on certain policies. As such, increased equality can also be seen as a positive side effect of participatory planning instead of its main purpose.

An important difference to be noted regarding participatory planning is that between policymakers and the experts that were interviewed for this research. Whereas both experts stated that within the field of mobility little use is made of participatory planning, all policymakers stated the opposite. However, by analyzing the policy documents of the respective municipalities as well, it is evident that extensive use is made of participatory planning. However, as noted by respondent 3, it can be unclear to what degree the input from these processes is ultimately applied in the final policies. This could be a possible explanation for the differing perspectives among the respondents. Another possibility would be regional differences in the use of participatory planning. However, no existing literature was found to support this.

5. Conclusion

Based on the results mentioned in the previous chapter, this chapter will combine these results in order to formulate an answer to the central research question. For this purpose, the sub-questions will be answered first, after which the main conclusion of this research will be provided.

The first question to be answered is that of currently existing policies on mobility in the Eindhoven Brainport region. Over the course of this research, it was found that a multitude of policies have already been implemented. These include policies such as zero emission zones, paid parking and the stimulation of electric vehicles (Gemeenteraad Eindhoven, 2023). Through the aforementioned policies, the region is attempting to reduce its carbon emissions as well as improving the quality of life of its inhabitants. As such, the region is on a steady course to bring the transition towards sustainable mobility to a completion. It should however be noted that significant efforts still need to be made in order to achieve this goal. For example, new investments still include the improvement of infrastructure for car traffic (Rijksoverheid, 2024), thus limiting the reduction of carbon emissions. In addition to this, respondent 2 noted that the aforementioned policies often offer only technical solutions to reduce carbon emissions while neglecting the influence of norms and values on the choice of mobility. This is despite the fact that these factors have shown to play a key role in the transition towards sustainable mobility (Arts & Prohn, n.d.). As illustrated by respondent 4: the goal is not to exchange fossil fueled cars for electric vehicles but to get people from their cars onto bikes or to walk. In order to achieve this goal, it is required to alter current behavior and existing paradigms. Based on the results of this research it was found that human behavior is most notably influenced by environmental values, the social environment of an individual and the financial aspects of a decision. Therefore, it is of importance to include these aspects in the creation of future mobility policy.

Additionally, most policies focus on improving either safety or quality of transport modalities and regard equality as more of a precondition. As a result, mobility policies may have both positive and negative effects regarding equality. This makes it difficult to answer the second sub-question of this research which entails the effects of mobility policies on equal accessibility among inhabitants of the Eindhoven Brainport region. Similarly, the implemented policies themselves often differ within the region itself as well. These differences are most often a result of demographic factors, political will or the financial resources of each municipality. As bigger municipalities enjoy better positions regarding these factors, they are on average better able to supply a more diverse set of transport modalities (Jorritsma et al., 2023). Yet, in general, a divide can be noticed between the center and peripheries of the region. Therefore, as noted in chapter 4.1.1, differences in availability of mobility infrastructure and services do not only occur between, but also within different municipalities. In order to reduce these regional differences, more attention should be paid to the aforementioned underlying factors.

However, accessibility of mobility mostly depends on the characteristics of the user. Therefore, matters of inequality regarding accessibility are based on different aspects as compared to availability. The most prominent factors to contribute to unequal accessibility

are the financial situation of an individual and their physical condition. Based on travel distance and destination, sustainable modes of transportation may either be cheaper or more expensive compared to other modes of transportation (Warnaar et al., 2024). On shorter distances active mobility is a viable option therefore making sustainable mobility accessible. On the other hand, public transport, shared mobility and electric vehicles can be more expensive based on one's destination and travel distance (Warnaar et al., 2024; Jorritsma et al., 2021). Yet, these are the modes of transportation physically impaired people are often forced to make use of due to barriers they encounter with active modes of transportation (Anthony jnr. 2024). Though there are arrangements in place to mitigate the problems these populations face (such as WMO-transit or social assistance, mentioned by respondents 6 and 4 respectively), mostly elderly and physically impaired people still often struggle to access more sustainable modes of transportation (Anthony jnr., 2024).

The final sub-question to be answered entails the contribution of participatory planning to the creation of new policies. Here it was found that levels of equality may be increased by reformations of the planning process itself. As suggested by the results of this research, participatory planning contributes to higher levels of equality by leveling out the playing field in the creation of new policies. With the implementation of the 'Omgevingswet' (the environmental and planning act) that was implemented in 2024, certain levels of participation are already required. However, by using more active forms of participation, policy creation will not be informed by only the perceptions of a limited few. This will result in a more diverse and inclusive creation of policies and therefore higher levels of equality and more just mobility systems.

In short it can be concluded that levels of availability and inequal distribution thereof can mostly be contributed towards the place or area one lives. Another factor contributing to this is the dominant paradigm within the field of mobility that public transportation should be profitable. On the other hand, levels of accessibility are mostly related to more individual factors which include financial and physical aspects as well as lack of knowledge or skills. These factors further increase existing inequalities within mobility systems through increased marginalization of certain populations. This is most notable in populations of age, those facing disabilities and people of low socio-economic status. In contradiction to this, populations of age are found to partake more often in processes of participation. Therefore resulting in greater amounts of influence on the creation of new policies and thus contributing to inequalities of mobility as well.

Based on the findings mentioned above, it can be said that the relation between mobility policies and mobility justice in the Eindhoven Brainport region is complex; policies regarding sustainable mobility may result in both positive and negative effects on equality. However, this research has shown that both societal as well as more individual factors both contribute to the fact that current mobility systems still often enforce inequalities within society (Bastiaanssen & Breedijk, 2024; Sheller, 2018a; Sheller, 2020; Anthony Jnr., 2024). As a result, a mobility system is required that provides a diverse set of sustainable modalities in order to provide sustainable mobility that is accessible to everyone. To further remove any inequalities regarding mobility, it is required to change current paradigms, norms and values that enforce existing injustices (Sheller, 2018a). This is in regard to both individuals and governments and involves the need to transform matters of

equality from a precondition to a central aspect of sustainable mobility. In doing so, levels of unequal mobilities within the Eindhoven Brainport region will likely be reduced, which in turn will result in a more just mobility system. However, before this goal is finally achieved a multitude of obstacles and restrictions, including matters of political will and financial struggles, still need to be overcome.

6. Discussion

During this research, several choices have been made that affected the course of this research. This chapter will provide a reflection on these choices as well as their consequences with regards to this research. Additionally, this chapter will present some of the limitations that were encountered during this research and suggestions for possible future research. Finally, this chapter will reflect on the positionality of the researcher.

6.1 Reflection

Perhaps the most important change that was admitted to this research was to change the conceptual model. Though the concepts that make up the conceptual model remained identical, their relationships were altered over the course of this research. This change was made as previously the conceptual model lacked some of the relations that are now shown. However, during the analysis of the data obtained, it was found that there is also a direct link between the concepts ‘institutions’ and ‘mobility’. Therefore, the choice was made to adjust the conceptual model in order to include this relation as well. As a result, the conceptual model better reflects the findings that were made over the course of this research.

Another choice affecting the course of this research regarded the choice of respondents; based on the feedback of both peers and respondents, several new respondents were interviewed in order to improve the findings of the research. At the start of this research, it was planned to only interview local policymakers in order to obtain knowledge regarding local policies. The effects of these policies would then be estimated based on existing literature. However, in order to improve the reliability of the data, 2 experts in the field of mobility were interviewed so that results could be triangulated. Furthermore, some of the first respondents pointed out the influence of provincial policy on mobility networks. As such, a representative of the province was also interviewed to obtain a broader range of data and include this additional perspective as well.

The final alteration that was made to this research is in regard to the concept of mobility itself. This was primarily seen as only 1 concept. Though, based on the results that were obtained from the interviews as well as additional literature research, it was found that mobility consisted of several aspects: accessibility, availability and human behavior. As a result, these aspects were not incorporated in the interview guide. However, in order to provide a clear overview of the results it was decided to make a division based on these concepts in the presentation of the results.

6.2 Limitations and future research

During the process of this research, several limitations were encountered. First of all, this research was conducted using 6 respondents. Though theoretical saturation was obtained, this low sample size has made the results more susceptible to outliers. Therefore compromising the validity of this research's findings. Additionally, this small sample size has resulted in limited generalizability of the findings made during this research. As discussed in Chapter 4, both policies and their effects on mobility differ among regions and characteristics of the user. However, as this research was conducted in a small topographical area, its findings are based on the perspectives of respondents with similar backgrounds or experiences. As a result, respondents are subjected to largely similar political and legal systems and cultural values. Therefore, in order to apply this research's findings elsewhere, differences in political and legal systems should be taken into account as well as differences in personal norms and values as they define the attitudes of people towards mobility policies.

As mentioned in the previous paragraph, the aspects of mobility were not included in the interview guide. As a result, the data that was obtained did not cover these topics at an optimum level, thus reducing the reliability of the findings made during this research. As such, future research on this topic could include more detailed questions on these topics in order to gain clearer results and understanding of the relationship between these topics and mobility.

Along with this there are several other matters on which future research could be conducted. First of all, future research could include the perspective of users of sustainable mobility. Based on the results of this research it was concluded that participatory planning was commonly used among policymakers for the creation of mobility policy. As a result, users of sustainable mobility employ a certain degree of influence on the creation of mobility policies. Thus emphasizing the importance of including their perspectives in future research. Additionally, by including a more diverse set of respondents, new insights might arise as compared to those found during this research. Similarly, all respondents of this research were male, therefore limiting the generalizability of this research's findings. Future research could overcome this limitation by including a more diverse set of respondents. Furthermore, this research only focused on inequalities of sustainable mobility among different groups. However, as pointed out by Yuan et al. (2023) little research has yet been conducted on the relation between intersectionality and mobility, therefore highlighting the importance of further research on possible differences within groups.

Secondly, future research on this topic may be conducted using quantitative or mixed methods approaches. As pointed out in Chapter 3, qualitative research is most commonly used in order to identify relevant variables (Creswell, 2003). As a result, the findings made over the course of this research solely point out what variables of mobility are affected by sustainable mobility policies. However, this approach fails to provide information on the significance and strength of these relations. Therefore, a knowledge gap in current literature is left unfilled. By evaluating the strength and significance of the aforementioned

relations, future research may contribute to enhancing the understanding with regards to the effects of mobility policies on equality.

The final limitation of this research is that it has mostly focused on matters of distributive justice. However, as pointed out by Sheller (2018a), mobility justice also includes other notions of justice such as deliberative justice, procedural justice, restorative justice and epistemic justice. Therefore, future research that uses mobility justice as its theoretical lens may be conducted by also including these aspects of justice. For example, this might include research on how histories have shaped current power relations and their effects on the capabilities and restrictions of mobility.

6.3 Positionality

The researcher has little previous experience on the topics of mobility or mobility justice. Therefore, the researcher had to familiarize himself with these concepts at the start of this study. As such, knowledge on these topics mostly originates from literature on these topics that has also been included in the research itself. However, the researcher has done earlier research on the creation of policy, yet this research has focused on policy creation in the field of water management and was conducted in another country. As such, any knowledge on the aforementioned topics stems from lectures provided during the researcher's education.

Furthermore, the researcher is an inhabitant of the Eindhoven Brainport region himself, as well as a regular user of its mobility network. As a result, he was already familiar with several policies and plans for the mobility network of this region. Therefore, this familiarity with local mobility networks informs his reflections during observations and interviews that have been conducted during this research.

7. References

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8. Appendixes

8.1 Interview guide

Introduction

First off, I will shortly introduce myself: my name is Tijn van Grunsven. I study Geography, Planning and Environment at the Radboud University. Currently I'm writing my thesis with the subject of sustainable mobility, which will also be the subject of this interview. Presumably, this interview will take about 45 minutes up to an hour.

Do you still agree to participate in this interview?

In case you no longer wish to participate during this interview it is possible to stop at any given moment. Furthermore, it is possible to alter or delete any answers you have provided during this interview after it has completed. The same goes for the entirety of the interview. All answers you will provide during this interview will be treated confidentially and will be deleted after the research has been completed. In case you desire, your answers will be anonymized, in doing so your identity will remain secret in the future stages of this research as well as in the publication of the research.

Is it fine with you if I were to record this interview? The recording will remain private and will only be used for this research. After the research has been completed I will also destroy the recording.

Do you have any questions or remarks about the interview or the research in advance?

Mobility

1. How would you define mobility?
2. Where lies the focus regarding mobility within your organization (e.g. sustainable, price, quality, access, equality etc.)
3. are the main restrictions on the mobility of persons according to you?
    a. Do you think there are any broader underlying problems that cause these restrictions? (e.g. behavior, politics, economy)
    b. What do you think are the best solutions to these restrictions?
4. How do you think that mobility is influenced by policy for sustainability?
5. What are the main problems regarding the creation of new policy on mobility?

Equality

1. To what degree do you think that mobility contributes to equality/inequality within society?
    a. Do you think that within the creation of policies there should be more/less attention to this?
2. Do you think that the degree of mobility is equally distributed within the Brainport region?
    a. No: are there certain characteristics that influence equal access to mobility?
        i. Which ones?
        ii. What do you think is the cause of this unfair distribution?
        iii. What is being done to eliminate this problem?
    b. Yes: in many other places this is not the case, how do you think that the Brainport has managed to overcome this?

3. How do you think equality of mobility is influenced by the increasing importance of sustainability?
    a. Do you think the opposite can also be a result of increased sustainability?

Institutions

1. To what degree do you think that norms and values relate to the mobility of a person?
2. To what degree do you think that the mobility of a person depends on formal rules?
3. To what degree do you think norms and values affect the creation of policy?

Participation

1. Does your organization make use of participatory policy making? (use of participatory planning in general for experts)
    a. why?
    b. What do you consider to be the benefits?
    c. What do you consider to be the disadvantages?
2. Do you think that the use of participatory policy contributes to equality regarding mobility?
    a. Yes: in what way?
    b. No: Why not?
3. With which parties do you most often collaborate to create new policy?
    a. How do you deal with different power relations during this collaboration?
4. Do you think participatory policy creation affects norms and values of society?

Closure

We have reached the end of the interview, is there anything you would like to add to the answers you have provided? In case you do wish to do so at a later point you can contact me by phone or via email. Do you have any further questions or remarks?
Finally, I would like to remand you that all information that you have provided will remain confidential and your anonymity will be guaranteed during this research. That only leaves me to thank you a lot for you participation. If you want, I can also share the final result with you.

8.2 Codebook

Code name	Definition
Actieve mobiliteit	Regards forms of mobility that require human power to provide movement (e.g. cycling/walking)
Actieve participatie	Participation that is taken to the participants and moves beyond the mere informing of participants
Bereikbaarheid	Mentions the accessibility of mobility with regards to distance
Beschikbaarheid	Mentions the availability of mobility infrastructure and services
Capaciteit	Possibility to process travelers within a mobility system (e.g. road width or number of employees in public transport)
Deelmobiliteit	Mentions of shared mobility
Definitie mobiliteit	Mentions possible definitions of mobility
Diverse mobiliteit	Mentions the use/plans for diverse modes of transportation
Draagvlak	Mentions of public support for policy
EV's	Mentions of electric vehicles
Financiële middelen	Financial resources governments have for the creation/implementation of policy
Financiële toegankelijkheid	Capability of potential users to afford the use of mobility
Fysieke toegankelijkheid	Capability of potential users to make use of mobility despite physical limitations
Gedragsverandering	Mentions of behavioral change
Informatie toegankelijkheid	Capability of potential users to acquire and understand information on mobility
Kansenongelijkheid	Mentions of equality
Kwaliteit mobiliteit	Aspects of mobility contributing to its perceived quality (e.g. comfort/speed)
Levenskwaliteit	Mentions of quality of life
Maatschappelijke normen	Mentions of societal norms
Machtspositie	Unfair distributions of power
Mobiliteit rendabel	Perception that mobility should be profitable
Mobiliteitstransitie	Transition that entails the promotion of more sustainable modes of transportation
Obstakel mobiliteit	Restrictions and obstacles that limit mobility
Openbaar Vervoer	Mentions of public transport
Passieve participatie	Participation that is limited to the mere informing of participants

Persoonlijke waarden	Mentions of personal values
Politiek	Mentions of political process or struggles
Regionale verschillen	Differences based on topographical location
Rol werkgevers	Division of roles between governments and employers
Ruimtetekort	Mentions of space shortages
Samenwerking overheden	Mentions of collaboration between government institutions
Technische oplossing	Solution contributing to the transition of mobility without requiring behavioral change
Tijdsintensief	Mentions of high amounts of time required
Toegankelijkheid	Mentions of accessibility
Transparantie	Possibility for inhabitants to follow the steps of policy creation
Uitkomstenongelijkheid	Mentions of equity
Veiligheid	Mentions of safety
Verschillende doelgroepen	Differences based on the characteristics of a certain population
Wetgeving	Mentions of regulations/policies/legislation