# Accessibility sufficiency thresholds as a tool to combat transport poverty?

*The advantages and disadvantages for transport poverty of institutionalising accessibility sufficiency thresholds for employment and education in Dutch planning policy.*

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# Abbreviations

| | |
|---|---|
| ANNO | Agenda Netwerk Noordoost |
| CBS | Centraal Bureau voor de Statestiek |
| GVVP | Gemeentelijk Verkeers- en Vervoersplan |
| LUTI | Land-Use Transport Feedback |
| PBL | Planbureau voor de Leefomgeving |
| TPRI | Transport Poverty Risk Indicator |
| UK | United Kingdom |

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# Preface

Here I would like to take the time to thank some individuals without whose help I would not have been able to complete this Master Thesis. First and foremost, I would like to thank my supervisor Dr. Christian Lamker for the great supervision. His supervision has helped majorly to gain new insights through very useful feedback. Additionally, he always responded quickly and enthusiastically to emails the moments I got stuck. So, a major thanks to you for the smooth Master Thesis process and your enthusiasm Christian!

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Enjoy reading!

Kind regards,

Bregtje van Uffelen

# Abstract

In many cases in the Netherlands, the bike and public transport have longer travel times than the car in particular outside of urban centres. Considering the need to switch to sustainable modes of transport due to climate change and increasing costs of public transport, this could be a problem. In particular when it leads to the inability of people to reach desired destinations and services, like education and employment. This phenomenon of an inability to reach desired destinations is commonly referred to as transport poverty. A report by the *Planbureau voor de Leefomgeving* from 2022 proposes to consider the contribution norms for a minimum level of accessibility (or accessibility sufficiency thresholds) could have to combat the hinder to reach basic services. This research, of an explorative nature, has done so by researching the question; "*What would be the advantages and disadvantages for transport poverty in Friesland of institutionalizing accessibility sufficiency thresholds for education and employment in Dutch planning policy?*". Answers have been found through the conduction of a policy document analysis of Frisian land use and transport policies, interviews with researchers and a focus group discussion with Frisian land use and transport policymakers.

The findings indicate that accessibility sufficiency thresholds alone will not solve transport poverty, as the inability to reach services is often an accumulation of problems. However, accessibility sufficiency thresholds might be beneficial for funding allocation towards places where inaccessibility to services is a problem and, depending on the design, has the potential to stop the trend where services are located at larger distances. A trend a certain group of people is suspected to have difficulty in following. In particular, when a change in accessibility to services occurs and the current housing market prevents relocation. It is, however, important to first gain a better view on the situation of transport poverty within the Netherlands by talking with, rather than talking about, people which experience (extreme) hinder in reaching services. This is important to ensure alignment between the solution and the problem. Even then, it is important to get a better understanding of what is the problem perspective; how much hinder in access to services and for how many people is considered too much?

# Key words

# 1. Introduction

## 1.1 Background

At the end of October 2022, a report from the *Planbureau voor de Leefomgeving (PBL)* came out illustrating a pattern of inaccessibility to basic services from residents living outside of urban centres and non-car owners (Bastiaanssen & Breedijk, 2022). Additionally, it shows that in many cases sustainable modes of transport, like the bike and public transport, are less attractive to use than the car in terms of travel time. Showing that congestion in the Randstad is not the biggest problem but actually limited accessibility through public transport and bikes outside of the city centres. The inability to reach desired destinations which hinders participation in activities normal for society is called transport poverty (Kampert et al., 2019; Martens & Bastiaanssen, 2014).

Transport poverty is a problem as a lack of accessibility impacts the opportunities individuals have and can lead to social exclusion and social isolation (Lucas, 2019). This can impact the quality of an individual's life, like staying unemployed (Martens & Bastiaanssen, 2014). This phenomenon of exclusion due to a lack of transport accessibility is named Transport Related Social Exclusion (Lucas, 2019; Martens & Bastiaanssen, 2014). This risk of exclusion is not equally distributed, rather there is an unequal distribution of the risk of inaccessibility across population groups. Social disadvantage and transport inequalities are correlated (Lucas, 2019). Groups at higher risk for mobility poverty[1] in the Netherlands are; low-income, job searchers, the elderly, migration background, physical disability and living in rural areas (Jorritsma et al., 2018). These groups are not mutually exclusive, which means that the problem can accumulate when several factors overlap with each other.

Another problem, addressed in the PBL report, is that car travel times are always lower than travel times of sustainable modes of transport. Car ownership is expensive. As a consequence, the average car ownership is lower amongst low-income groups (Jorritsma et al., 2018). At the same time, the financial cost of public transport has risen relatively more than costs of car use over a ten-year time span (CBS, 2019). Knowing that financial costs of being mobile is increasing, it is likely that number of people having difficulty to reach desired destinations increases. Dutch media frequently express these concerns (van Gurp, 2023). At the same time, human-induced climate change creates a need to switch from (fuel) car use to sustainable modes of transport, like cycling and public transport (IPCC, 2023). (Fuel) cars have a lower travel time are thus more attractive for an individual to use than sustainable modes, which is against the need for society as a whole to reduce emissions. This could become an argument for the polluter pays principle, which means car usage becomes more expensive. Currently, this is considered in Dutch planning (Rijksoverheid, 2022). Such measures to reduce mobility can make a just climate transition challenging (Kelly et al., 2023), in particular in rural areas where car ownership is higher (Witte et al., 2022). Considering the argument that current travel behaviour is unsustainable and needs to transition towards sustainable travel. As well as the problem perspective that a lack of accessibility has major consequences for individuals and society, the conclusion becomes that the transition to sustainable travel needs to be just.

Within the Netherlands transport poverty remains a relatively unknown concept (Kampert et al., 2019). Transport poverty, like accessibility, is a relative concept (Arranz-López et al., 2019; Lucas, et al., 2016b; Lucas, 2012). It is often addressed that relative to other EU countries the Netherlands does well with regards to social inclusion, in particular, the role of the bike in combination with high density gives the Netherlands an advantage with regard to mobility over other EU countries (Jorritsma et al., 2018). However, other sustainable modes of transport, like buses, metro, trams and pedestrian facilities, are less developed than the bike (Kampert et al., 2019). Considering within country comparison there is a lack of view on the situation of transport poverty in the Netherlands. In 2018, a pilot indicator for the risks of transport poverty was developed by the Centraalbureau voor de Statestiek (CBS) together with the PBL (Kampert et al., 2019). This pilot was on a neighbourhood level and later on a provincial level in Friesland. In Friesland, in 2020, 8.4 per cent of households had a high to very high risk of Transport Poverty, this is almost 26.000 households (CBS, 2022). Due to the available data in Friesland, it has been chosen as the case of this research.

Considering that transport poverty occurs when individuals cannot research services and activities this is not only related to the transport system but also includes land use distribution. For this thesis, the focus lies on the ability to reach services; employment and education. Mobility and accessibility are commonly used concepts in transportation literature. Mobility concerns the transport system itself, while accessibility also concerns the interaction between the land use patterns and the transport system (Curtis & Scheurer, 2010). This means accessibility integrates land uses and the transport system, whose policy fields are often living in separate worlds despite their interdependent nature (Straatemeier & Bertolini, 2020). Therefore, a focus on accessibility rather than mobility can be seen as a way to achieve more integrated planning (Straatemeier & Bertolini, 2020), where people can reach services more easily. A recent study on the prominent mobility and accessibility paradigms in Dutch municipal transport planning indicates that mobility rather than accessibility still dominates transport planning[2] (Akse et al., 2021). This is mainly the case in rural areas, rather than highly urbanised municipalities and municipalities with large urban centres. It shows a slow shift towards accessibility paradigms, with recent policies increasingly including accessibility. However, in implementation, there is a lack of clarity on the definition of what constitutes accessibility (Bastiaanssen & Breedijk, 2022). Therefore, a recommendation for future research emerged out of the PBL report, namely into the possibilities of norms for minimum levels of accessibility, or accessibility sufficiency thresholds. Since the publication of the report, there has been increasing attention towards the creation of accessibility aims in mobility policy, for instance through a new report in March 2023 on how to reach create accessibility aims in mobility policy (Hamersma et al., 2023).

## 1.2 Problem statement

In the Netherlands, a problem has come to the surface where residents living outside of urban centres and non-car owners cannot access basic services within a reasonable time (Bastiaanssen & Breedijk, 2022). Inaccessible services are one of the causes of transport poverty. Despite the lack of overview within the Netherlands on the exact locations where transport poverty occurs, the potential occurrence of it can be viewed as a problem. The view that transport poverty is a problem is normative, and one that I take on. Additionally, basic services are more accessible with cars than with sustainable modes of

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[2] Note: in interviews policy makers addressed that a gap exists between goals written down in policies and "real" world decision making (Akse et al., 2021).

transport, which creates an advantage for car use in terms of reasoned behaviour (RLI, 2014). This is undesirable considering the state of our climate crisis. Aiming for accessibility is increasingly seen as the solution to connect the interdependent policy sectors; land use and transport. However, what constitutes accessibility in Dutch Planning policy is not defined through a threshold, which makes it difficult to implement and creates a lack of accountability.

### 1.2.1 Societal relevance

For individuals, the transport system and distribution of land uses are important to reach services and activities. Exclusion from accessing activities and goods could impact individuals' subjective well-being due to feelings of isolation (Lucas, 2019; Pot et al., 2020). Transport poverty and poverty have a reciprocal relationship (Kampert et al., 2019). Low income groups often live in more peripheral locations, due to low housing prices, where there are fewer services (Lucas et al., 2016a). They also do not benefit as much from transport investments due to gentrification processes after investments and have a higher exposure to traffic-induced air and noise pollution (Lucas, 2019). The societal benefits of increased accessibility differ per service and activity, in this research the focus lies on the services; employment and education.

Accessibility to employment and education has benefits. Research on better employment accessibility illustrates that it can increase job participation, mainly for unemployed low-income, youth and lowly educated groups (Bastiaanssen et al., 2020). A necessary economic advantage in the current the labour market where there are more vacancies than unemployed (CBS, 2023). Improved accessibility to employment also relates to accessibility to other opportunities and therefore potentially increases participation in other activities (Martens et al., 2022). Obtained education level is linked to neighbourhood characteristics, suggesting (amongst others) an influence of population densities (Anderson et al., 2023). While education improves eligibility for employment opportunities and have societal economic benefits (OECD, 2022).

Currently, there is an active debate in planning practice on accessibility as a basic right (Rijksoverheid, 2023) and whether institutionalising accessibility sufficiency thresholds in planning policy on a national level could be the measure for this, this master thesis aims to contribute to a better understanding of possible advantages and disadvantages of institutionalising accessibility sufficiency thresholds for employment and education.

### 1.2.2 Scientific relevance

A recommendation for future research emerged out of the PBL report, namely into accessibility sufficiency thresholds (Bastiaanssen & Breedijk, 2022). Currently, the transport and spatial policies aim for improved accessibility, however, what this exactly entails is missing. In the PBL report, it is advised to consider if and for what accessibility thresholds would be useful (Ibid). There has been some research into sufficiency accessibility thresholds (Allen & Farber, 2020; Lucas, et al., 2016b; Martens et al., 2022; Smart & Klein, 2020). There are, however, very limited studies into implementing these findings into the existing transport planning policies (Allen & Farber, 2020), let alone into Dutch planning policies. It is important to increase the scientific knowledge on accessibility concepts and measures in a Dutch context, to prevent unintended negative consequences like encouraging the unsustainable location and

travel habits which it seeks to reduce (Silva & Larsson, 2019). This thesis aims to contribute to that understanding with its focus on the advantages and disadvantages of accessibility sufficiency thresholds.

The use of accessibility is not new in academic literature (Levine et al., 2019), but there is a gap between academic knowledge on accessibility and the use of the concept by practitioners in the land use and transport-planning field (Akse et al., 2021). This is often discussed as partly being due to a methodological challenge, where the complexity of accessibility measures makes it difficult to implement and comprehend these measures for planning practitioners and therefore also difficult to understand the consequences of the instruments used (Geurs & van Wee, 2004). Additionally, a challenge is also what is seen as a just accessibility level, which is important to understand before acting on it (Silva & Larsson, 2019). Empirical research in different contexts (for different groups) is needed to find out what is seen as a just accessibility level (Lucas, et al., 2016b). Overcoming this methodological challenge could potentially help in understanding the consequences of tailored accessibility instruments for social inequalities (Arranz-López et al., 2019). For the methodological challenge of the TPRI, needs for a focus group with planning practitioners were expressed (Kampert et al., 2019).

### 1.2.3 Research objective and Research Questions

The aim of this research is to contribute to the understanding of what could reduce transport poverty in the Netherlands during the transition to sustainable transport and whether the tool accessibility sufficiency thresholds contribute positively, rather than negatively, to this. This leads to the following research question(s);

*What would be the advantages and disadvantages for transport poverty in Friesland of institutionalizing accessibility sufficiency thresholds for employment and education in Dutch planning policy?*

Sub-research questions;
Sub-RQ1
　　*How are accessibility sufficiency thresholds and transport poverty conceptualised in theory?*
Sub-RQ2
　　*What is the state of transport poverty in Friesland?*
Sub-RQ3
　　*Which institutions currently define accessibility in Friesland and how do they define it?*
Sub-RQ4
　　*Where can accessibility sufficiency thresholds be institutionalised?*
Sub-RQ5
　　*Which accessibility sufficiency threshold designs would be considered for policy implementation?*
Sub-RQ6
　　*What are the expected advantages and disadvantages for planning of institutionalised accessibility sufficiency thresholds for employment and education?*
Sub-RQ7
　　*What are the expected advantages and disadvantages for transport poverty of institutionalised accessibility sufficiency thresholds for employment and education?*

## 1.3 Reading guide

In the next chapter, Chapter 2, the theory is discussed which answers *"How are accessibility sufficiency thresholds and transport poverty conceptualised in theory?"*. The chapter is divided into two parts, first accessibility sufficiency thresholds are defined, after which transport poverty is defined. An overview of the methods is provided in Chapter 3. The chapter that follows, Chapter 4, presents the findings and reflects on these in a discussion. The findings answer the remaining sub-research questions. Section 4.1 answers *"What is the state of transport poverty in Friesland?"*. Section 4.2 answers *"Which institutions currently define accessibility in Friesland and how do they define it?"*. Section 4.3 answers the questions *"Where can accessibility sufficiency thresholds be institutionalised?"* and *"Which accessibility sufficiency threshold designs would be considered for policy implementation?"*. Section 4.4 answers *"What are the expected advantages and disadvantages for planning of institutionalised accessibility sufficiency thresholds for employment and education?"*. Section 4.5 answers *"What are the expected advantages and disadvantages for transport poverty of institutionalised accessibility sufficiency thresholds for employment and education?"*. The answer to the main research question is provided in the conclusion in Chapter 5, as well as recommendations for future research. Finally, the reflection on the thesis process and outcomes is provided in Chapter 6.

# 2. Theoretical Framework

This section answers the sub-research question *How are accessibility sufficiency thresholds and transport poverty conceptualised in theory?.* Academic as well as grey literature was used for this chapter.

## 2.1 Accessibility sufficiency thresholds

### 2.1.1 Defining accessibility

There are different definitions of accessibility (Curtis & Scheurer, 2010). For this research, the definition by Geurs & van Eck (2001) will be used, which is the following;

*"The extent to which the land use-transport system enables (groups of) individuals or goods to reach activities or destinations by means of a (combination of) transport mode(s)"*
(Geurs & van Eck, 2001, p.36)

Geurs & van Eck (2001) describe four *components* embedded in their conceptualisation of accessibility. The four components are depicted in Table 1. The first component, *the transport component*, concerns the transport system. The second component, *the land use component*, concerns firstly, the supply of (activities and) services spatially distributed, secondly, the demand for these services at the origin locations and, finally, the interaction between the supply and demand and its effect on competition (Geurs & van Wee, 2004). Considering that land use is included as an important component of accessibility clarifies that this study concerns spatial accessibility. Some accessibility studies include accessibility through digital spheres (Hamersma et al., 2023), this is outside of the scope of this research. The third component, *the temporal component*, concerns the user's restrictions in terms of time for their desired activity patterns, this includes whether activities and transport opportunities are available at the time they would like to use it (Geurs & van Eck, 2001). For instance, in terms of the time of day and day of the week. The fourth and final component is the *individual component*. This component concerns the "*needs, ability and opportunities*" (Curtis & Scheurer, 2010, p. 57) the transport users have. Considering this, the last component is also where the impact of low income and other socio-economic or demographic factors are considered. A component added by Lucas (2012) concerns the ability of individuals to interact with the transportation system, this includes for example past experiences, but also mental disabilities and language barriers. This has been termed the cognitive component (and is sometimes added due to its importance for social exclusion in transport (Lucas et al., 2016b). For this thesis, the cognitive component was left out.

*Table 1. Accessibility and its components.*

Accessibility: "*The extent to which the land use-transport system enables (groups of) individuals or goods to reach activities or destinations by means of a (combination of) transport mode(s)*"
(Geurs & van Eck, 2001, p.36)

| Component | Definition | Reference |
|---|---|---|
| Transport component | the transport system | (Geurs & van Eck, 2001) |
| Land use component | 1) the supply of (activities and) services spatially distributed 2) the demand for these services at the origin locations 3) the interaction between the supply and demand and how this effects competition | (Geurs & van Wee, 2004) |
| Temporal component | user's restrictions in terms of time for their desired activity patterns, this includes whether activities and transport opportunities are available the time they would like to use it | (Geurs & van Eck, 2001) |
| Individual component | concerns the "*needs, ability and opportunities*" (p. 57) the transport users have | (Curtis & Scheurer, 2010) |

All four components interact with each other, as depicted in Figure 1 and Figure 2, these interactions make accessibility complex and allows for compensation between components (Geurs, 2018; Pot et al., 2023). Figure 1 depicts a simplified version of Figure 2. The black arrows in Figure 1 illustrate a direct impact while the white arrows illustrate an indirect relation or a feedback loop. The land use component consists of the origin and destination locations and therefore influences the transport options available (transport component) and times the transport and opportunities are available (temporal components) (Geurs & van Wee, 2004). Additionally, the individual component also interacts with the land use component, for instance in the Netherlands one of the major contributing factors to car ownership is urban density, the denser a location the lower the car ownership (Witte et al., 2022). The individual component also influences all other components. For instance, an individual's income influences possible living locations which in turn impacts transport options (Lucas et al., 2016a), whether individuals have a driver's licence can influence the transport mode they can take (Jorritsma et al., 2018), the job an individual has influences if and when they need to commute. Each component has a direct impact on accessibility with a feedback loop, this makes all components related. This creates an extensive overview, simultaneously including the interactions of all four components creates complex measures (Geurs, 2018). This is therefore also one of the challenges of accessibility studies, which so far have been unable to take this theory, where all components interact into practice and accessibility research (Ibid).

Besides its multiple interacting components, accessibility also has another methodological challenge, namely that it is essentially a relative concept (Arranz-López et al., 2019). One individuals transport accessibility relative to another individuals transport accessibility as part of a reference group. This means it is not to an objective level, but adapts based on the reference group. Individuals at times adapt their expectations based on the reference group or situation in their direct environment, which means that if access to transport options is lower for a while their accessibility expectations will go down (Delbosc & Currie, 2011; Pot et al., 2020).
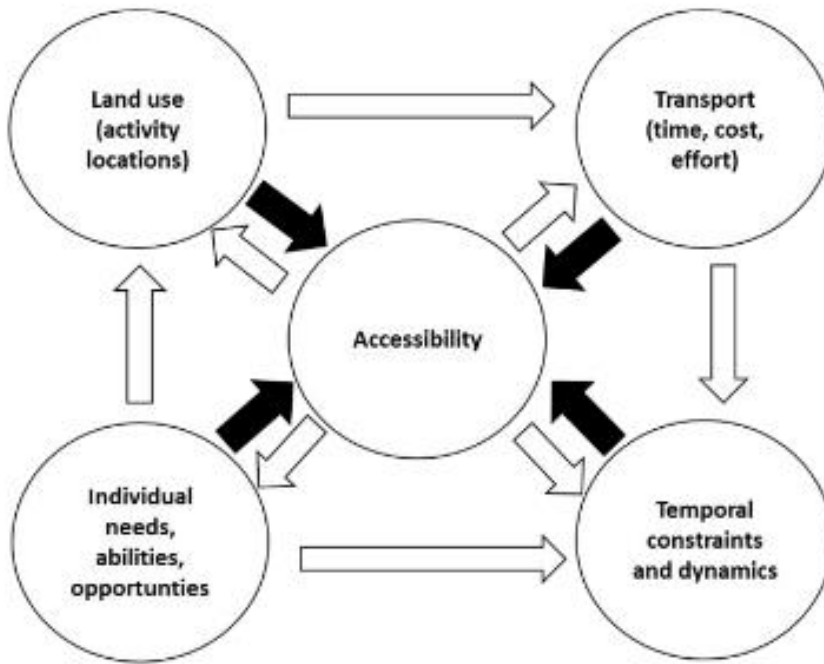
*Figure 1. Simplified scheme of interactions between the four components of accessibility (Geurs, 2018, p.6).*
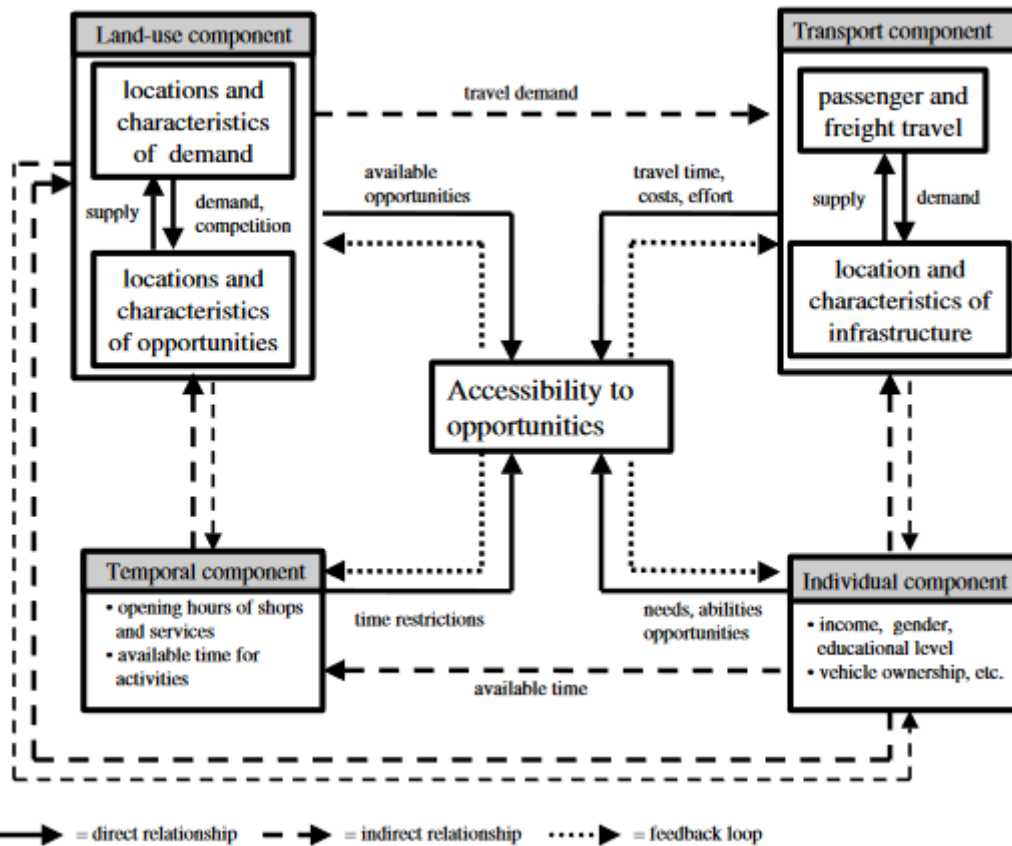


*Figure 2. In-depth scheme of interactions between the four components of accessibility (Geurs & van Wee, 2004, p.129).*

## 2.1.2 Accessibility and mobility interactions

As discussed in the background there is a distinction between accessibility and mobility. An interesting contribution to this distinction has been made by Straatemeier & Bertolini (2020), who use the transport and land use feedback cycle [LUTI] to depict the difference and interaction between accessibility and mobility strategies.

Since the emergence of discussions around the interaction between transport and land use the reciprocal relationship between transport and land use has been further developed and has been widely used (van Geet et al., 2021). The reciprocal relationship has been commonly depicted in the LUTI cycle, which is illustrated as the inner circle in Figure 3 as an interaction between land use, activities, transport system and accessibility. The thought process goes as follows; land uses determine the locations of activities (Straatemeier & Bertolini, 2020). The locations of activities determine how the transport system is designed and whether the transport options provide possibilities to access activities. The measurement of the combination of land uses and transport options is accessibility, which in turn determines the distribution of new land uses (Ibid). From this stage, the cycle starts again. The LUTI model is a simplified representation, excluding important internal and external influencing factors (Ibid) like the temporal and individual components of accessibility. It is commonly used due to its ease of interpretation for both academics and policymakers.

Straatemeier & Bertolini (2020) position accessibility and mobility strategies on the LUTI model and, therefore, make a relevant contribution. This positioning is depicted in Figure 3 on the outside of the LUTI. Mobility strategies are where the existing distribution of land use influences the design of the transport system (Straatemeier & Bertolini, 2020). Or as Handy (2002) puts it mobility strategies focus on the means to the ends. How activities can be reached through the means; the transport system.  An example of a strategy aimed at reducing mobility is for instance congestion pricing or car-free zones (Ibid). On the contrary accessibility strategies are where the design of the transport system influences the potential of to-be-developed land uses (Straatemeier & Bertolini, 2020). These accessibility strategies take into account which areas lack development potential and which have plenty. Or as Handy (2002) puts it, accessibility strategies focus more on the ends like the potential to reach activities. In particular, which type of activities people want to reach. A Dutch example of accessibility enhancing strategies includes aiming for compact cities, or infill development, by only developing within existing urban areas.
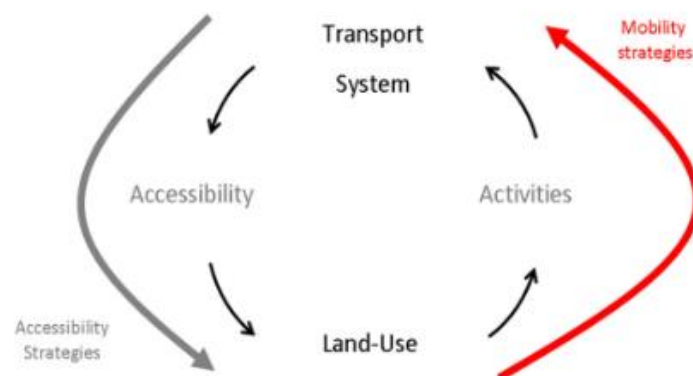


*Figure 3.Interaction between accessibility and mobility strategies (Straatemeier & Bertolini, 2020, p.1716).*

Now that a distinction has been made between accessibility strategies and mobility strategies, it is important to consider that these concepts also have a relationship. This becomes apparent in Straatemeier & Bertolini's (2020) positioning of these strategies on the LUTI cycle, where both strategies influence each other. According to Handy (2002), mobility is related to the *impedance*, or the "*difficulty to reach destinations*" (Handy, 2002, p.4), of accessibility. Therefore, mobility is a part of accessibility. However, it is important to realise that "*good mobility is neither a sufficient or necessary condition for good accessibility*" (Handy, 2002, p. 4).  It could very well be that if mobility is increased it could lead to a decrease in accessibility due to changes in a medium and long-term time frame, like changes in activity and household location choices (Silva & Larsson, 2019). This means that the use of accessibility concepts should be done with careful consideration. When accessibility is used to cover for standard mobility measures it could have negative consequences which it is trying to avoid, like urban sprawl (Ibid). Handy (2002) stresses that combining mobility-limiting and accessibility-enabling strategies together can achieve behavioural change towards more sustainable behaviour.

## 2.1.3 Reaching activities? From origin to destination

Considering the definition of accessibility, an important aspect is what it means to "reach" activities. This could include questions regarding who needs to reach activities, within what (time) frame and what activities need to be reached.

### 2.1.3.1 Justice perspectives

Policy decisions regarding who should have the opportunity to reach activities and what activities should people have the opportunity to reach within certain time frames are decisions which will have an underlying value system attached to them (Lucas et al., 2016b). This depicts what we as a society consider to be a just decision. Policy decisions will inherently have values underlying them, this makes it important to communicate about the value system underlying ga policy decision (Lucas et al., 2016b). There are three commonly discussed value systems.

Utilitarianism is the value system most commonly used in transport literature (Lucas et al., 2016b). Here the perspective of the total population is used to assess what is morally right. In this system, the aim is maximize the good by subtracting the total amount of bad for everyone from the total amount of good for everyone. A common critique of this value system is lack of consideration to the distribution of good and/or bad among population groups. If one population group receives the majority of the negative consequences of a policy decision this is not considered in the evaluation (Ibid). Examples of measures with this underlying value system are Cost-Benefit Analysis and Multi-Criteria Analysis.

Another value system, egalitarianism, uses the perspective that everyone needs to be treated equally (Lucas et al., 2016b). This perspective, based on ideas by John Rawls, aims to benefit members of society least well off by providing "*primary social goods*" (Fainstein, 2014; Lucas et al., 2016b, p. 477). Van Wee and Geurs (2011) transfer Rawls' perspective to transport literature by addressing that accessibility should be considered one of these primary social goods. Effects measured in this value system are depicted in comparable values rather than absolute values (Lucas et al., 2016b).

The value system sufficientarianism aims for everyone to be well-off to a certain threshold (Lucas et al., 2016b). It is based on equity, rather than equality. The creation of such a threshold is a challenge. Defining social exclusion is person- and context-dependent, as it relates to norms (Lucas et al., 2016b).

It is a political choice (Bastiaanssen & Breedijk, 2022). Lucas et al. (2016b) indicate finding the thresholds need to be based on empirical studies which consider both the population group and the geographical context. The extent to which such studies have been conducted highly varies between countries. Grounds for a minimum standard need to consider whether it concerns an opportunity to participate or a level of participation and for which activities.

### 2.1.3.2 Activities; employment and education

The land use patterns are an important aspect of accessibility, one theory on the patterns of these is the central place theory (Atzema et al., 2014). Developed by Walter Christaller and used in the Netherlands for the distribution of spaces in the Dutch Northeast Polder. It distinguishes a hierarchy of settlements, where denser bigger settlements will have more specialist services, while the smaller settlements will cater to more day-to-day needs. This results in patterns where small villages with little amenities surround one bigger settlement with more amenities, with a regional function. It is based on the assumption that consumer-focused service providers decide to settle in places with more consumers as it can result in higher turnovers. This would mean there is a threshold of a minimum number of consumers for a service to be viable and locate in a settlement. These thresholds differ for different services. Additionally, the distance consumers are willing to travel, the so-called range, also differs per service (Ibid). The threshold and range together will create a pattern of hexagons as depicted in Figure 4, where if there is space in the market beyond the threshold and range of a service, a new service will emerge. As discussed in the introduction, the activities this thesis focuses on are accessibility to employment and education. Considering that the range and threshold are different for different services (Atzema et al., 2014), it can be assumed that the range and thresholds are different for each of these activities; education and jobs.
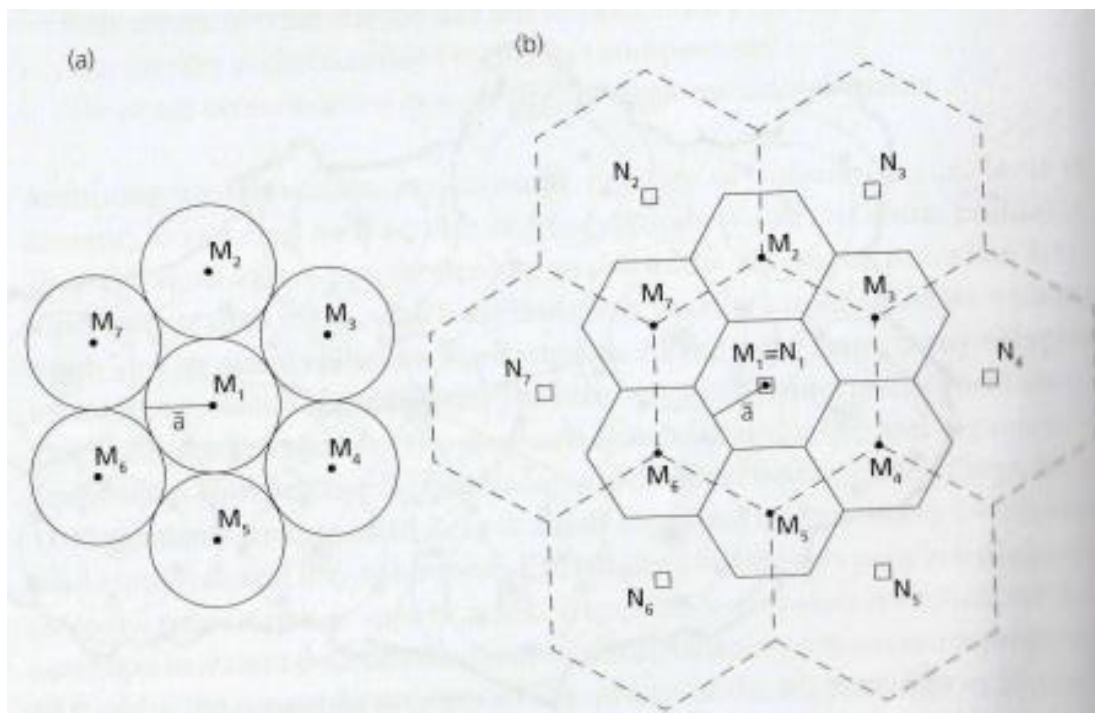


*Figure 4 Visual representation of Walter Christallers Central Place Theory (Atzema et al., 2014, p. 50).*

The central place theory has numerous limitations for its direct translation into practice, mainly due to incorrect assumptions (Atzema et al., 2014). First, many services have a wider range than just the surrounding area (Atzema et al., 2014), an example of this is working from home. Secondly, the concentration of services can also have agglomeration benefits, as they can have shared costs and benefit from each other's services and consumers. The third limitation is that the central place theory assumes rational decision-making where every consumer has the same preferences and income, while in reality, this is not the case. For instance, Pot et al. (2023) found that women, people without access to a car and disabled value the relevance for educational facilities higher. Particularly secondary schools, as primary schools are usually already in closer proximity. Elderly on the other hand value the relevance of educational facilities relatively low (Ibid). Transport of children to school can form a barrier for parents to keep potential work, particularly as it often done in a chain (Bastiaanssen, 2012).

## 2.1.4 Measures for accessibility

It is important to consider two things for operationalising accessibility for use in planning practice. Firstly, that decision-makers can understand and interpret it. Secondly, ensuring it is consistent with users' perceptions (Bertolini et al., 2005). These requirements often create a dilemma between ease of use and interpretation and methodological (dis)advantage (Geurs & van Wee, 2004).

### 2.1.4.1 Infrastructure-based, activity-based and utility-based measures

Following a distinction by Geurs & van Eck (2001) there are three types of accessibility measures; infrastructure-based, activity-based and utility-based. Infrastructure-based accessibility measures play a large role in Dutch national plans (Geurs & van Eck, 2001). These types of measures include "*journey times, congestion and operating speed on the road network*" (Geurs & van Eck, 2001, p. 47). An example of this is a congestion map which indicates the level of congestion for each road. Infrastructure-based measures do not include the activities reached, additionally, they do not consider the effects of improvement of the transport system on land use patterns.

Activity-based measures (sometimes called location-based accessibility measures (Geurs, 2018)) include both the transport system and the land use patterns, which Geurs & van Eck (2001) see as an advantage for this type of measure. There are five types of activity-based measures 1) distance measure, 2) contour measures, 3) potential measures, 4) measures based on balancing factors of spatial interaction models, 5) measures derived from time-space geography. These measures differ. For instance, some weigh all distances within a time contour equally, like distance measure, others weigh distances at a further distance heavier, like potential measures. Other measures include competition. For services, there can be competition, which is the case for both employment and education, considering the limited available spaces. The doubly constrained balancing factors measure tries to include competition. This measure can be used for calculations where competition on both the origin and the destination location exists (like with employment), while a single constrained balancing factor can be used when competition only exists for either origin or destination (like a shop). Each of the activity-based measures has their own advantages and disadvantages (Ibid).

The third type of accessibility measure is utility-based accessibility measures (Geurs & van Eck, 2001). These measures originate from economic theory and are from an individual perspective including mode and demographic characteristics, like income levels. Knowing the constraint that not every individual can be evaluated, a random and non-random component is added to the calculations. The underlying

assumption is that individuals will choose the option best for their utility. An advantage of the utility-based accessibility measure is that it is well grounded in theory (particularly microeconomic theory). However, the utility-based accessibility measure is scarcely used in practical applications. The disadvantage might explain this, as it is difficult to interpret measures as specific knowledge is required to understand the formula used in the calculations and geographical comparisons are difficult with this measure (Ibid).

## 2.1.5 Defining accessibility (and its indicators) in policy

The type of measure used for accessibility influences the conclusions which can be drawn (Geurs, 2018; Geurs & van Eck, 2001). For example, when an infrastructure-based measure would be used in the Netherlands, the Randstad would probably have low accessibility due to congestion (Geurs & van Eck, 2001). However, if an activity-based measure, is used the Randstad would be seen as very accessible due to the high number of employment opportunities within a time range. Currently, in the Netherlands, the measures for accessibility are (mostly) infrastructure-based measures (Geurs, 2018). The strong connection between measure and conclusion means that the choice of an accessibility indicator is highly important (Geurs, 2018).

The choice of an accessibility indicator is dependent on different aspects (Geurs, 2018; Hamersma et al., 2023; Straatemeier & Bertolini, 2020). Aspects include; the goal of the study, the ease to operationalise, the ease of interpretation and usability in evaluations (Geurs, 2018). The extent to which the four accessibility components are present in the calculation differs per accessibility measure, for instance in infrastructure-based measures the land use component is not included (Geurs, 2018). Hamersma et al. (2023) and Straatemeier & Bertolini (2020) have developed ways in which accessibility aims (and its measures or indicators) could be chosen. The approach they take is different, Hamersma et al. (2023) developed a framework for the Dutch national government (see Figure 5 and Figure 6), while Straatemeier & Bertolini (2020) use local approach. According to Hamersma et al. (2023), first, a focus has to be chosen, like which components of accessibility, which spatial scale (local, regional or national) and whether it is about the movement of people, goods or services. The spatial scale is dependent on the type of services, the services needed on the local scale will differ from services needed on a regional, national or international scale. When setting accessibility aims one can either start with choosing (or developing) an accessibility indicator or start with setting the aim and developing the indicator from there (Ibid). Examples of existing indicators are the pilot TPRI by Kampert et al. (2019) and the PBL indicator by Bastiaanssen & Breedijk (2022).

In setting an accessibility aim thought should be given to the design of such an aim (Hamersma et al., 2023). An aim is a statement of a desired outcome, while a norm is the instrument (or rule) which is used to achieve the aim. Aims can be relative (improving from the current situation) or absolute (get to level x), but also closed (number of jobs which should be accessible) or more abstract (improve accessibility) (Hamersma et al., 2023). Closed aims are also called SMART, meaning Specific, Measurable, Achievable, Relevant and Time-bound. Generally, a norm contains an addressed, a belonging and a prescription, examples are employees must reach their job within 15 minutes or students must reach a school within 45 minutes. In an abstract aim. such a prescription, like the 15 minutes example, is not given (Ibid). So, abstract aims do not include a threshold.
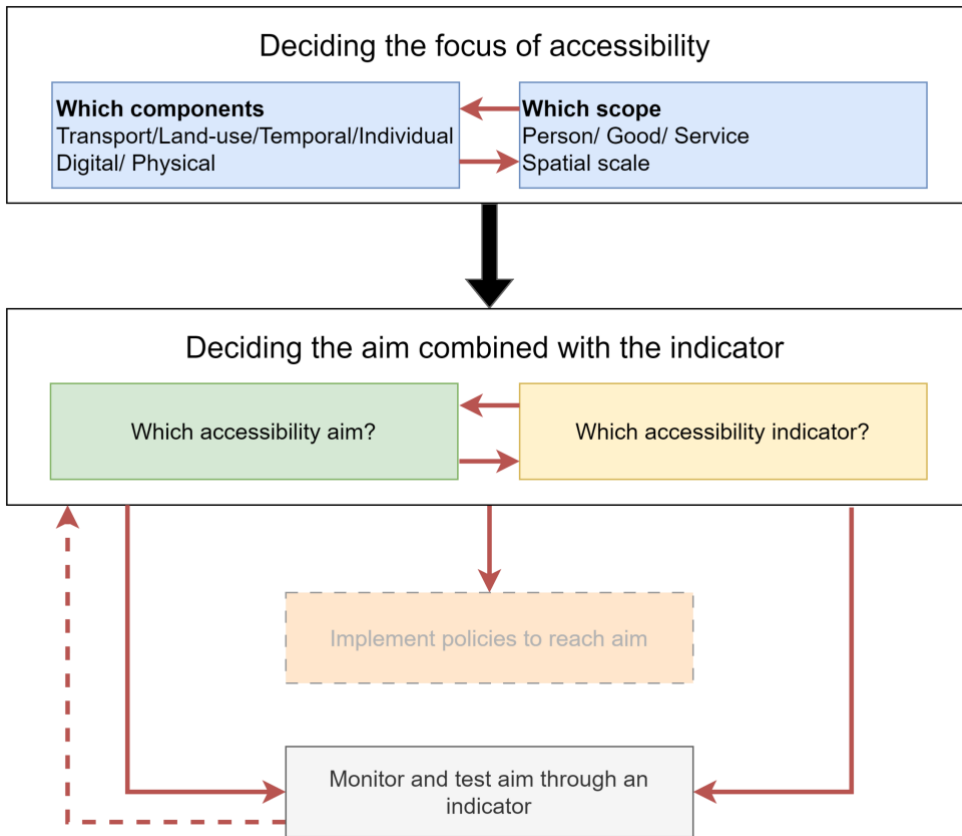
*Figure 5 Simplified depiction of considerations for setting accessibility aims in policy (Hamersma et al., 2023, p. 6).*
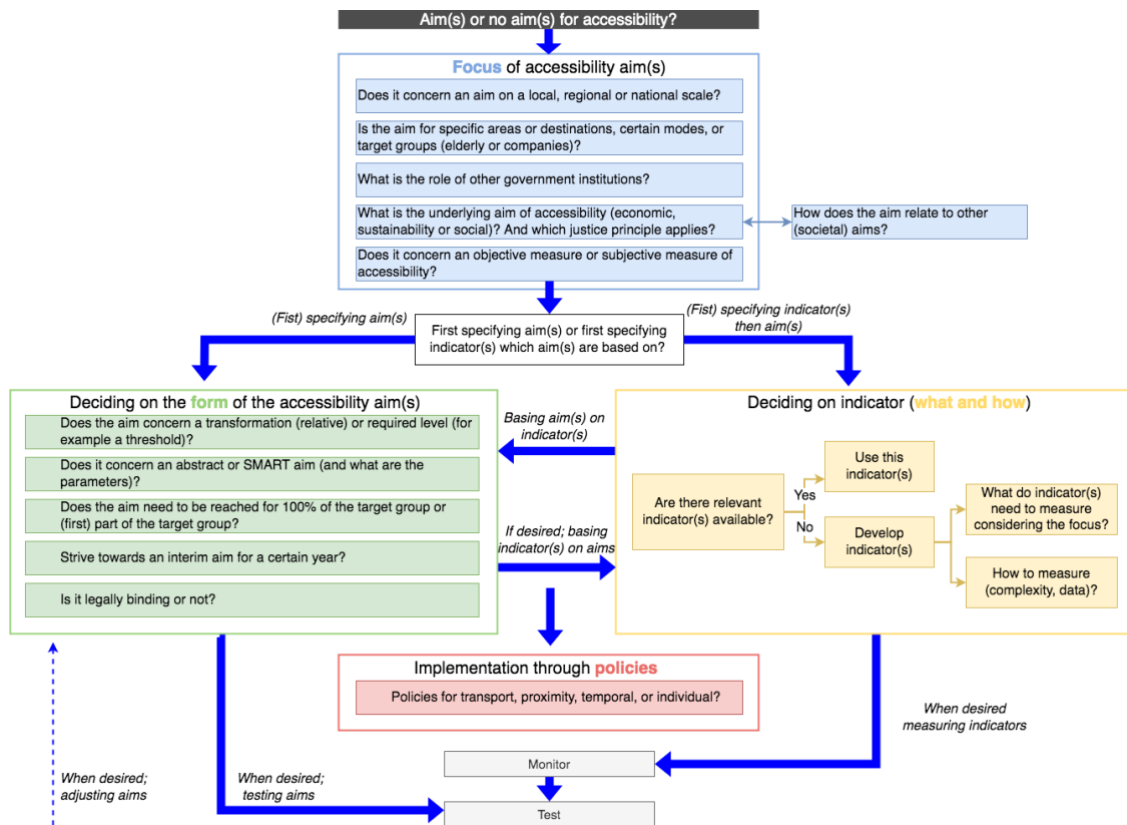


*Figure 6. Detailed depiction of considerations for setting accessibility aims in policy (Hamersma et al., 2023, p. 17).*

Straatemeier & Bertolini (2020) developed an accessibility strategy, named Joint-Accessibility Design for linking land use and transport policy. In this strategy, policymakers start by identifying general wider societal goals, which they wish to achieve. After, which they choose measures to analyse data based on the required needs. So referring back to the framework from Hamersma et al. (2023), Straatemeier & Bertolini (2020) start with the design of the aim, after which the indicator or measure follows. In the next step, policymakers use this to understand changes in accessibility for different spatial interventions. This helps them, in the final step, to identify which combinations of interventions they should choose. Its use in two Dutch case studies, Rotterdam and Almere, indicates that the use of the Joint-Accessibility Design strategy has led to a better understanding of policymakers on the risks and opportunities in land use and transport interventions (Ibid).

## 2.1.6 Designing accessibility sufficiency thresholds

There are some examples of legally binding or non-binding minimum accessibility levels across European countries (Silva & Larsson, 2019). There are few countries in which minimum accessibility levels are legally binding, more examples exist of countries where minimum accessibility levels are not legally binding. Examples of non-binding accessibility standards are designed that certain activities have a reference time or distance in which they should be reached. Another example of the design of a standard is that a certain number of inhabitants needs to be in place to allow for the existence of a public service or public transport connections (Ibid).

Setting a sufficiency accessibility threshold, i.e. a minimum level of accessibility, is a challenge (Geurs, 2018; Martens et al., 2022). It is context-dependent, relational and political (Lucas et al., 2016b). Underlying the development of setting a threshold it should be understood that empirical equality in accessibility is not possible, additionally, it should be understood that accessibility plays a major role in an individual's life (Martens et al., 2022). The norms of the society where the threshold would be set will determine what is considered social exclusion (Lucas et al., 2016b), and therefore what level influences an individual's life too much, which therefore is difficult to determine (Geurs, 2018). The (limited) literature describing a threshold usually takes a distance decay function or travel willingness surveys (done by Arranz-López et al. (2019) for example), which according to Geurs (2018) will probably not suffice to determine a threshold for experiencing social exclusion. Another approach is using subjective accessibility, like for instance mood drops and happiness indexes (Ibid). For instance, after 15 minutes of commute time, average mood levels and life satisfaction both dramatically decline. While longer travel times, between 60 and 90 minutes, generally negatively influence subjective well-being (Ibid). However, this can differ due to different combinations of transport modes and travel length, as a Dutch happiness study found that with longer bike or walking trips happiness can increase (Lancée et al., 2017). Martens (2017) discusses an approach to discover what is viewed as a sufficient level of accessibility, first democratic deliberation and second democratic selection.

Different design choices for a threshold can be made. It can portray the "*opportunity to participate in activities or revealed levels of participation*" (Lucas et al., 2016b, p.482). Martens & Bastiaanssen (2014) argue for using the opportunity to participate, as people have an interest in guarding varied opportunities even if they function properly for a while with a poor general degree of accessibility. Other questions to consider are also which destinations are included and if a threshold should include personal choices of individuals in the destinations they wish to reach (Lucas et al., 2016b). Arranz-López et al.

(2019) address a need for a minimum accessibility requirement as well as a need for accessibility thresholds for specific target groups. This is what Geurs (2018) calls spatial equity or social equity, where the former is about the "*differences in the spatial distribution of accessibilities*" (p. 15) while the latter is about "*differences in accessibilities between different population groups*" (p. 15).

Lucas et al. (2016b) are a Dutch example of calculating social exclusion through a threshold. They use the Gini index, a measure common in income inequality literature, and the Lorenz curve to distinguish whose accessibility levels are not met. This calculation orders the increase in the percentage of income based on the distribution of the total amount (cumulative) of income over the entire (cumulative) population. The Lorenz curve would bend the situation, for example, if 15 per cent of a country's income comes from 50 per cent of its inhabitants it would mean that the curve would bend to 30 per cent for the share of income for the group as a whole. The area between the Lorenz curve and the equal distribution line is the Gini Index, Figure 7 depicts an example of this. The X and Y axe in this example are based on quantitative accessibility indicators but could also be based on journey times. Applying such a threshold can show the effects of different policy measures.
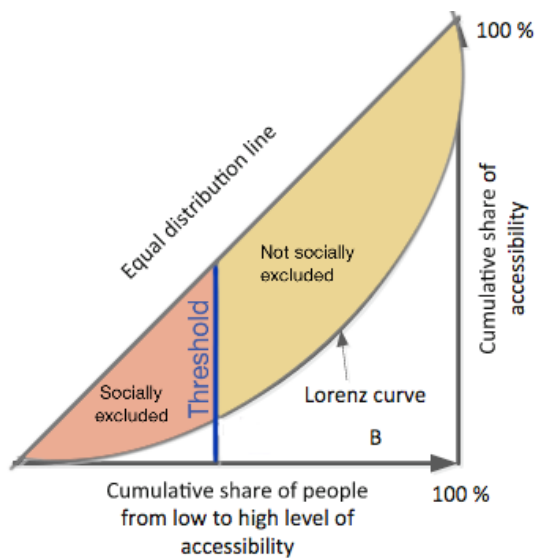


*Figure 7. Example of the use of the Gini index and Lorenz curve. The yellow and red areas are the gini index (Adapted from Lucas et al. (2016b) p. 481).*

The Gini index has been previously used in transportation literature by (Delbosc & Currie, 2011; Karlström & Franklin, 2009; Neutens et al., 2010; Santos et al., 2008; Tian et al., 2011), however, Lucas et al. (2016b) were the first to connect this to egalitarianism and sufficientarianism. The equal distribution line connects to the egalitarian justice perspective while the threshold connects to a sufficientarianism justice perspective. The difference between the equal distribution line and the Lorenz curve illustrates inequality in transport opportunities, while if a threshold is introduced, like the blue line, this means that a certain level is considered social exclusion. Lucas et al. (2016b) applied it to the Netherlands, Den Haag, Delft and Dongeradeel (a former municipality in province Friesland). In using this threshold inhabitants in Dongeradeel always experienced social exclusion. Critiques on using a threshold to identify social exclusion (or transport poverty) are that perceptions of individuals (and their

local geographical context) are not included and could therefore not align with (or consequent policy measures do not actually improve) the experience (Pot et al., 2020).

Another example of the use of accessibility sufficiency thresholds in calculations has been conducted by Martens et al. (2022). Martens et al. (2022) compare two types of analyses in their research, disparity analysis and the "Accessibility Sufficiency Index", the latter explicitly sets an accessibility sufficiency threshold. Disparity analysis examines differences between population groups in transit accessibility, the calculated person-weighted mean accessibility of each population group is compared to the person-weighted mean accessibility of the population as a whole. Martens et al. (2022) findings illustrate that disparity analysis does not consider within-group variations and does not consider whether individuals actually have the opportunity to reach desired destinations, rather just compare groups. The Accessibility Sufficiency Index, however, includes both the number of people experiencing it and the degrees of severity of experiencing inaccessibility. This measure illustrates patterns of inequity, regardless of the threshold level chosen, these insights enable the comparison of geographical areas and the mapping of temporal change.

The examples show that even though accessibility sufficiency thresholds might differ, the use of accessibility sufficiency thresholds in calculations can help to illustrate changes over time and differences across geographical regions (Lucaset al., 2016b; Martens et al., 2022). Both of these examples use several sufficiency accessibility thresholds, to also illustrate the differences with different thresholds.

### 2.1.6.1 Where to implement accessibility sufficiency thresholds?
Accessibility aims and indicators can be set on different government levels. Some authors argue for setting local accessibility aims (Silva & Larsson, 2019; Straatemeier & Bertolini, 2020), while others describe how accessibility aims can be designed for a national level (Hamersma et al., 2023).

Silva & Larsson (2019) emphasize that accessibility sufficiency thresholds should be developed locally rather than top-down. Political and social priorities differ locally, which means there should be opportunities for discussions including societal stakeholders and political ones. The main argument for setting accessibility thresholds locally rather than top-down is that context matters in perceptions of what is considered good or bad accessibility. Examples of such influencing contextual factors are "*scale, gender, social situation and preferred mode of transport*" (Silva & Larsson, 2019, p. 701). Hamersma et al. (2023) describe that national accessibility aims are usually abstract rather than SMART (like a threshold) because of different local and regional contexts.

## 2.1.6 Advantages and disadvantages of accessibility sufficiency thresholds
Research has been conducted on the prioritization of accessibility aims, and their underlying values and objectives (Silva & Larsson, 2019; Straatemeier & Bertolini, 2020). Silva & Larsson (2019) argue for a collaborative local search for minimum and maximum accessibility thresholds to increase the understanding of what should be prioritized in accessibility aims, meaning the problem-setting, and which values and objectives lie at the base of this prioritization. The research conducted by Silva & Larsson (2019) explicitly discusses the advantages and disadvantages of setting (minimum and maximum) accessibility thresholds.

Silva & Larsson (2019) found numerous advantages of minimum accessibility thresholds. Firstly, it has the advantage of possibly contributing to reducing spatial inequality. Second, are potential economic gains. This is mainly connected to increased accessibility to the labour market. Thirdly, potentially avoiding hyper-concentration of services. A fourth advantage is that it could benefit slow modes, like the bike and walking. By not focusing on the use of the most dominant (or fastest) mode, multiple modes can be used, which could result in a mix of functions (Ibid). The fifth benefit is it can reallocate funding priorities (Kelly et al., 2023; Silva & Larsson, 2019).

There are several disadvantages of minimum accessibility thresholds, which urges Silva & Larsson (2019) to argue against top-down (minimum and maximum) accessibility thresholds. Such top-down thresholds lead to standard developments (with a lack of adaptive capacity) as well as a lack of consideration to local contexts. It runs the risk of standardization. Clearly, there are rural and urban differences in terms of the feasibility of the same accessibility targets. Additionally, accessibility Is individual and can therefore differ per person even in the same context. These disadvantages, the local geographical context and individual perceptions, are also found by Pot et al. (2020). Lastly, accessibility thresholds are prone to negative interpretation where the need of minimum accessibility are used to discourage needs for mobility.

Silva & Larsson (2019) not only discussed minimum accessibility thresholds but also maximum accessibility thresholds. This comes from the understanding that accessibility needs to be understood in a holistic way, where an endless increase in accessibility could also bear negative consequences and should therefore (from a certain level) be viewed as a luxury rather than a basic requirement. An example is the expansion of the road system, which improves accessibility (for a while) but has both monetary and environmental costs. Not aiming towards a sufficient level could result in undesired patterns like less sustainable mobility patterns or excessive costs (compared to the societal gains).

## 2.2 Transport poverty

As discussed in the introduction, transport poverty is defined as

> an inability to reach desired destinations, hindering participation in activities normal for society (Kampert et al., 2019; Martens & Bastiaanssen, 2014).

When this hinder in reaching desired destinations leads to "*systematic problems of accessibility to opportunities*" (Martens & Bastiaanssen, 2014, p. 5) and has significant impacts on the quality of an individual's life, like unemployment, it is named transport related social exclusion (Martens & Bastiaanssen, 2014). The next section will elaborate on how this definition came to be and how transport poverty (risk) can be measured.

### 2.2.1 Transport poverty and it's sub-concepts

Defining transport poverty has been difficult (Kelly et al., 2023). Several concepts were used interchangeably to describe the same and different phenomenon resulting in a lack of clarity for the concepts; transport poverty, mobility poverty, accessibility poverty, transport affordability and exposure to transport externalities (Lucas et al., 2016a). Some use transport poverty in a very narrow way, focusing on households inability to cover transport costs (Awaworyi Churchill & Smyth, 2019). Others like Lucas et al. (2016a) use a broader definition. Table 2 depicts Lucas et al.'s (2016a) understanding of transport poverty and related concepts based on the existing literature of the time. From this perspective transport poverty is the overarching concept with four (connected) sub-concepts.

*Table 2. Transport poverty framework (Based on Lucas et al. (2016a) p. 355).*

**Transport poverty;** an inability to reach desired destinations, hindering participation in activities normal for society (Kampert et al., 2019; Martens & Bastiaanssen, 2014). It is an overarching concept for the sub-concepts described below (lucas et al., 2016a)

| Sub-concept | Definition |
|---|---|
| Mobility poverty | "*A systematic lack of (usually motorised) transport that generates difficulties in moving, often (but not always) connected to a lack of services or infrastructures*" (Lucas et al., 2016a, p.355) |
| Accessibility poverty | "*The difficulty of reaching certain key activities- such as employment, education, healthcare services, shops and so on- at reasonable time, ease and cost*" (Lucas et al., 2016a, p.355) |
| Transport affordability | "*The lack of individual/ household resources to afford transportation options, typically with reference to the car (in developed countries) and/or public transport*" (Lucas et al., 2016a, p.355) |
| Exposure to transport externalities | "*The outcomes of disproportionate exposure to the negative effects of the transport system, such as road traffic casualties and chronic diseases and deaths from traffic related pollution.*" (Lucas et al., 2016a, p.355) |

The message of Lucas' transport poverty framework is often used in other literature, however mainly the first three concepts are used, leaving out exposure to transport externalities (Kampert et al., 2019; Kelly et al., 2023). Some even replace it with another concept like personal characteristics (Kampert et al., 2019). The framework by Lucas et al. (2016a) leads to the understanding that someone who cannot meet their daily basic activity requirement, and therefore is transport poor, when one of these situations is true;

- *"There is no transport option available that is suited to the individual's physical condition and capabilities."* (Lucas et al., 2016a, p.356)
- *"The existing transport options do not reach destinations where the individual can fulfil his/her daily activity needs, in order to maintain a reasonable quality of life."* (Lucas et al., 2016a, p.356)
- *"The necessary weekly amount spent on transport leaves the household with a residual income below the official poverty line."* (Lucas et al., 2016a, p.356)
- *"The individual needs to spend an excessive amount of time travelling, leading to time poverty or social isolation"* (Lucas et al., 2016a, p.356)
- *"The prevailing travel conditions are dangerous, unsafe or unhealthy for the individual*." (Lucas et al., 2016a, p.356)

## 2.2.2 Perspectives in transport poverty

According to Jorritsma et al. (2018) there are three main perspectives of transport poverty; the *social capital and capability perspective* advocated by Kauffmann, the *social exclusion perspective* advocated by Lucas, and the *Transport justice perspective* by Martens. These three perspectives shall be shortly discussed.

### 2.2.2.1 Social capital and capability perspective by Kauffman

The social capital and capability perspective is concerned with the interactions between social and spatial mobility and introduces the concept; motility (Kaufmann et al., 2004). Motility "*describes the potential and actual capacity of goods, information or people to be mobile both geographically and socially*" (Kaufmann et al., 2004, p.1). It includes both spatial and social mobility. The former is defined as the geographical movement of things (for example people or social norms) which can be expressed in time and space, and the latter is broadly defined as changes in how resources, individuals or groups are distributed within a social network. There are three interdependent components of motility; *access*, *competence* and *appropriation*. These together with their sub-elements are depicted in Table 3. Restricted by the time, place and the context (options and conditions), the component *access* encompasses the variety of potential mobility which could be influenced by the territories internal dynamics or networks. The constraint "options" includes all the potential available modes of transportation and communication as well as all available services and equipment at any given moment. The constraint "conditions" refers to the logistics and the location-specific costs of the "options", and therefore their accessibility. The second component of motility is *competence.* This component has to do with the skills and abilities required for the other two components, and is therefore interdependent. Competence includes physical ability, acquired skills and organisational skills, like the ability to move from place A to B, the rules and regulations, and the competence to plan (multiple) activities. The third, and final, component of motility is appropriation. This concerns the interpretation and response of

agents to their perceived level of access and competences. Therefore, it includes the why (values, habits and motives) of agents chosen options (Ibid).

*Table 3. Motility and its components as discussed by (Kaufmann et al., 2004)*

| Overarching concept | Motility "*describes the potential and actual capacity of goods, information or people to be mobile both geographically and socially*" (Kaufmann et al., 2004, p.1) | | |
|---|---|---|---|
| Components of motility | Access | Competence | Appropriation |
| Sub-elements of components | Constrained by<br>• options<br>• conditions | Central features<br>• Physical ability<br>• Acquired skills<br>• Organizational skills | Why options are chosen |

### 2.2.2.2 Transport justice perspective of Martens

The transport justice perspective as advocated by Martens (2017) is related to egalitarianism and sufficientarianism and views accessibility as a basic right (Jorritsma et al., 2018). Martens (2017) views that the influence of accessibility on opportunities for activity participation should lie at the base of decision making in transport planning. He describes a combination of person dependent and transport-land use dependent characteristics, that have a stronger relationship when lower levels of accessibility occur. Therefore, this perspective aims towards a sufficient level of accessibility, and proposes approaches which could help discover which ranges are viewed as a (in)sufficient level of accessibility. This would depict a minimum and maximum level of accessibility (Ibid).

### 2.2.2.3 Social exclusion perspective of Lucas

Lucas' perspective describes the relationship between social disadvantage, transport disadvantage and transport poverty (Jorritsma et al., 2018). According to Lucas (2012) transport poverty is caused by the direct and indirect link between the concepts transport and social disadvantage, this relationship is depicted in Figure 8. Transport poverty as a consequence creates inaccessibility, which in turn can lead to social exclusion. Social exclusion as Lucas (2012) describes it is more than just poverty, but is a wider multi-dimensional concept, and is not the same as transport disadvantage. Later, Lucas et al. (2016b) describes that the relationship between inaccessibility and social exclusion can be influenced by several factors and therefore is not necessarily direct. An example of such influencing factors are, firstly, a lack of alignment between population desires and the improved service accessibility, secondly, a lack of willingness and ability of the connected population which prevents them from using the improved accessibility (Ibid). Lucas et al. (2016a) describe that the concepts all interact, like in Figure 9.
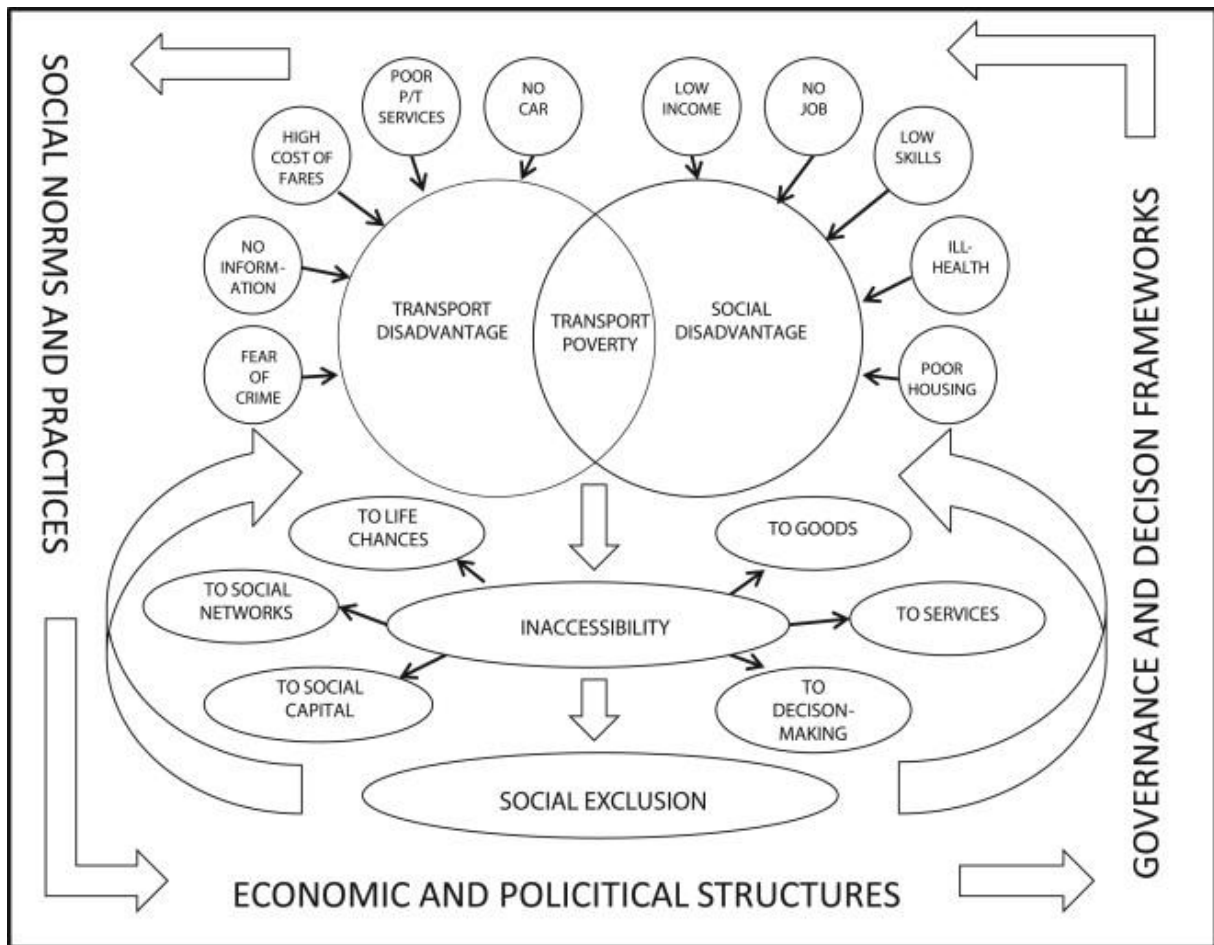
*Figure 8 Depiction of the (in)direct links between transport and social disadvantage which cause transport poverty (Lucas, 2012, p. 107).*
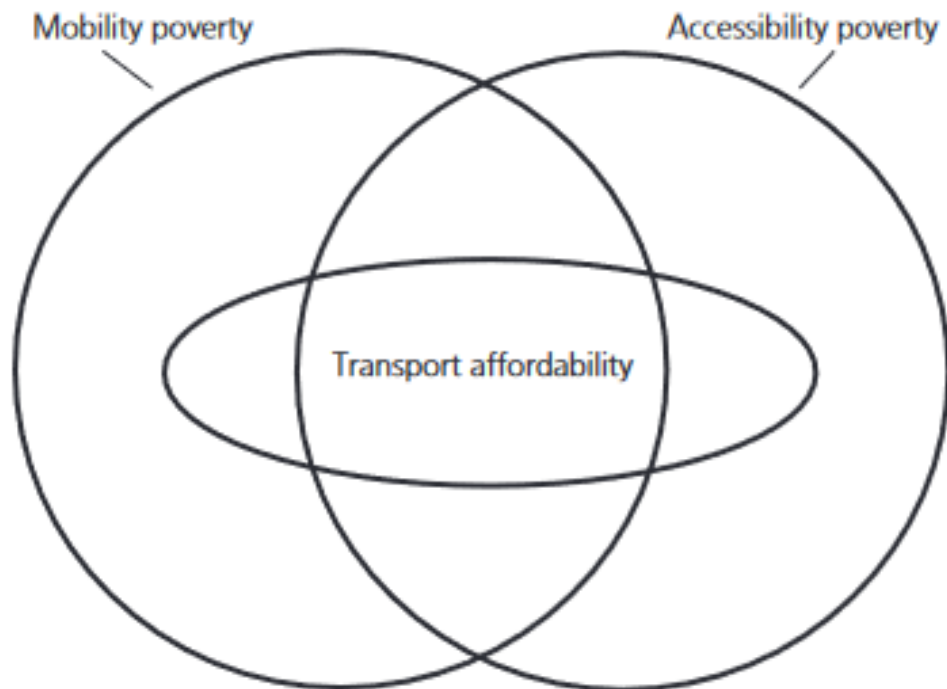


*Figure 9. Visualization of mobility poverty, accessibility poverty and transport affordability (Lucas et al. 2016a, p.355)*

### 2.2.3 Transport poverty (or its sub-concepts) risk indicators

Indicators for transport poverty (or accessibility poverty) are important for the systematic analysis of the state of potential (accessibility) problems within a region as well as compared to other regions (Martens & Bastiaanssen, 2014). A transport poverty risk index can be used to support decision making on funding allocation towards a just sustainable mobility transition and to monitor the progress which has been made (Kelly et al., 2023).

*2.2.3.1 Academic literature on transport poverty risk indicators*

Transport poverty measures which are standardized do not (yet) exist (Lowans et al., 2021), however there has been research conducted into possible TPRI (Kampert et al., 2019; Kelly et al., 2023; Martens & Bastiaanssen, 2014). The systematic literature review on TPRI by Lowans et al. (2021) stress that it is individuals rather than households which experience transport poverty. Although a household has possible restrictions. The review shows that rather than measuring conditions which underly transport poverty, the academic focus lies on the relationship of transport poverty to other conditions (like employment). The transport poverty metrics are differentiated into the sub-concepts of the framework by Lucas et al. (2016a); affordability, accessibility and mobility. They stress that indicators should include a combination of these metrics to gain a holistic perspective on transport poverty risk, examples of such a composite indicator can be found in Berry et al. (2016) and Kelly et al. (2023).

Following the distinction of the research by Lowans et al. (2021), Kelly et al. (2023) developed a TPRI for Ireland, whose weight can be adjusted to the local context and whose categories can individually be viewed. In this indicator transport affordability is weight 40%, while the other two transport poverty sub-categories are weight 30%. Included variables in transport affordability are; social class ratio (15%), commute or car fuel cost (20%) and public transport fare costs (5%). The variables used for transport accessibility are accessibility to services (20%) and public transport density (10%). The services included are job opportunities, "*supermarkets, schools, healthcare, and public transport links*" (Kelly et al., 2023, p.5). For the mobility poverty variable, the per person ratios were used for car drivers and car passengers (10%), public transport (10%) and active travel (10%). Small Areas were used, which are clustered areas of between 80-120 residences.

An accessibility poverty risk indicator has been developed by Martens & Bastiaanssen (2014). The underlying argumentation of this indicator is that due to the natural distribution through concentration of spaces it is impossible to have complete equality (read; egalitarian justice) among groups. Therefore, the distribution of accessibility among population groups needs to be identified. As this indicator considers accessibility poverty, this means groups were made based on space (residential location) and transport mode (availability of transport modes; public transport or car availability). The indicator considers the depth and width of accessibility poverty. The depth is the degree of inaccessibility experienced, while the width is the number of people impacted. If one falls below the threshold, it means that the accessibility needs of those groups should have priority. It was inspired by income poverty (risk) literature, due to the development of an income poverty line. To account for the depth the Gini coefficient is used, which gives more weight to poorer within the poor category, meaning it is relative. The article also discusses multiple limitations.

*2.2.3.2 Transport Poverty Risk Indicator tested in the Netherlands*

The aim of the Dutch TPRI is to identify transport poverty risk areas and whether the risk areas are created due to location specific circumstances or household characteristic (Kampert et al., 2019). The location specific circumstances are where land use or transport policymakers could intervene. The risk of transport poverty is reflected in one score for each household. These scores have a range between 0 and 2. 0 indicating very low risk, while 2 indicates very high risk. For interpretation, location specific knowledge is required which is why policymakers should have a key role in the interpretation. The multi-dimensional nature of transport poverty makes it that if a household scores high on one of the indicators it does not automatically mean they have a high risk on transport poverty (Fernandes et al., 2022). The pilot indicator has been tested in the municipalities Utrecht and Heerlen and the province Friesland.

The Dutch TPRI measures mobility poverty, accessibility poverty, transport affordability and adds household circumstances (Kampert et al., 2019). For each of these categories variables were chosen by Kampert et al. (2019) to operationalise it, as is depicted in Figure 10. In the calculations, each variable is given the same weight. These variables can also belong to multiple categories. Lack of data availability and increased complexity of the indicator are named as reasons for the exclusion of some important variables, like distance to jobs, type of public transport stop and schedule of public transport availability. Exclusion of these variables means there is a chance of over- or underestimating the households risk of transport poverty. It is also important to stress that this measure looks at the risk of transport poverty rather than the actual experience (Ibid).



*Figure 10. Pilot Transport Poverty Risk Indicator which has been tested in the Netherlands (translated and adapted from Kampert et al. (2019) p. 6).*

## 2.2.4 Transport poverty in the Netherlands

Although limited, there has been research conducted on transport poverty in the Netherlands. Research into transport poverty has existed longer, and is thus more developed, in the UK, Germany, Flanders, United States of America and Australia (Jorritsma et al., 2018). Considering transport poverty in the Dutch context is important because of the socio-spatial mobility context in the Netherlands (Jorritsma et al., 2018), like the distribution of services and the biking culture (Jorritsma et al., 2018; Martens, 2013). What is considered a rural area in the Netherlands, might not be considered a rural area in other countries as proximity to services still remains relatively close (Pot et al., 2020). This section discusses the Dutch transport poverty research. Main contributors to Dutch transport poverty research include Bastiaanssen (2012) Martens (2013) Martens & Bastiaanssen (2014) Pot et al. (2020) (2023). Transport poverty perspectives used by researchers differ, Martens mainly discus transport justice perspective, while Pot et al. (2020, 2023) and Bastiaanssen (2012) use the capabilities approach.

The Dutch cycling culture is often discussed as limiting the occurrence of transport poverty, however findings by Martens (2013) indicates that cycling plays a limited role in access to work locations in suburban areas. The bike is used more intensely by groups at risk of transport poverty ("*low income groups, women, ethnic minorities, the elderly, travel-impaired persons, as well as households without cars*" p.21) than groups not at risk of transport poverty. However, unexpectedly, they do not use the bike more for long distances. Indicating bike usage is similar to groups not at risk of transport poverty despite a higher frequency. Another finding is lower bike use in winter, childcare trips and evening hours, meaning that mobility is reduced on those occasions. Routes to suburban work locations are considered too long to cycle. While, public transport connections are also not seen as a viable option to suburban work locations, due to time and cost. Pot et al. (2020) depict a slightly different picture. Their findings indicate that during daytime the participants did not indicate to experience difficulty in reaching education and work locations. However, that changes for traveling in non-working hours.

Research by Bastiaanssen (2012) revealed that transit alternatives and travel costs reduced the possible action space for both unemployed men and women in Rotterdam Zuid. Transport options did not match the needs of the unemployed men and women, as most of the business parks have poor public transport connections. In particular women are dependent on public transport, which is unavailable at irregular work times and locations. Bastiaanssen (2012) therefore argues that it is likely available transport options which limits the action space and cause transport poverty in that case, rather than land use patterns of business parks and allocation of unemployed residents. In a later article, Bastiaanssen et al. (2013) also argued that work locations have relocated to suburban areas, in particular work locations that do not require a high education level. Public transport investments typically do not target these areas, while continued investment in public transport can reduce transport poverty. A land use strategy was discussed as a solution as well, (public) transit-oriented development for employment locations (Ibid).

A study on factors explaining perceived accessibility in Dutch rural areas by Pot et al. (2023) indicates that there is a significant association between near opportunity locations and higher levels of perceived accessibility, however, the variance is very low. Individual (or social) factors explain more of the differences in mean perceived levels of accessibility. Therefore, despite that spatial data has the advantage that it is unbiased, while perceived accessibility has the disadvantage that preference adaption to disadvantaged situations can occur, spatial data alone does not reflect the heterogeneity

of the population (Ibid). This finding of a lack of consideration for the heterogeneity of the population is consistent with other research. Like differences in the role of mobility opportunities to employment for different genders (Bastiaanssen, 2012) and a lack of consideration to within group variation in disparity analysis (Martens et al., 2022)

Earlier work by Pot et al. (2020) found that the geographical local context both directly and indirectly influences the underlying dynamics of transport poverty. The direct influence can be both objective and subjective. From an objective perspective, large distances will add to the complexity of the public transport journey and will therefore be more prone to disruptions. From a subjective perspective, an increase in distance can increase the perceived social and transport barriers, like the opportunity to schedule multiple appointments in one day. The indirect influence of the local geographical context is that the local social norms alter travel behaviour, for instance the perception of one's own transport poverty (or in accessibility) is influenced by what is considered a normal level of accessibility in their surroundings (Ibid). While, social capital can sometimes also mitigate individual factors of influencing transport poverty, like when someone in the social network can drive them to locations (Pot et al., 2020).

A difference exists between men and women in the action space to work locations, where women have a lower participation due to this different action space (Bastiaanssen, 2012). Women (more often) have child care responsibilities which means their travel patterns are often connected to dropping off and picking up children from school, which happens more with public transport. This limits the women's potential work places to a geographically limited area. Men on the other hand often have a wider geographical range available due to (work)car availability, which helps them to remain employed. Pot et al. (2020) finds this constraint in activity patterns for family members of adolescents.

Research on the spatial distribution of people at risk for transport poverty is not consistent. The application of the transport poverty risk indicator by Martens & Bastiaanssen (2014) in Amsterdam depicted that high risk of accessibility poverty concentrates in urban and suburban areas, this is attributed to the high share of low income households as well as an inadequate transport system. However, rural areas struggle more with regard to the depth of accessibility poverty, meaning how severely it impacts individual's opportunity to participate. In the application of the pilot TPRI by Fernandes et al. (2022) it becomes clear there are certain neighbourhood which have a large number of people with a high risk of transport poverty. These neighbourhoods can be found both in rural and urban areas. Similarly, to this, international transport poverty risk research finds that it is not restricted to only rural or urban regions (Kelly et al., 2023).

## 2.3 Conceptual Framework

The theories described in the previous chapter led to the creation of the conceptual model (Figure 11). This model illustrates the four components of accessibility which interact with each other (Geurs, 2018). The thick lines are direct impacts, while the dotted lines are indirect impacts. Accessibility sufficiency thresholds are minimum levels of accessibility (Silva & Larsson, 2019). It is argued that setting accessibility sufficiency thresholds concerns the spatial components of accessibility, the land use and transport component. Suggesting a threshold is an accessibility or mobility strategy depending on which component(s) are included in its design, like Straatemeijer & Bertollini (2020) discus the interaction between land use and transport. Policy decisions regarding aims for individual's activity opportunities are framed by an underlying value system; a justice perspective (Lucas et al., 2016b). Knowing this, designing an accessibility aims is based on a justice perspective, a minimum level suggests sufficientarianism. Accessibility aims require an underlying measure to monitor the progress made (Hamersma et al., 2023). These measures can have many different forms (Curtis & Scheurer, 2010). The type of measure which is used will influence the conclusions that are drawn from it (Geurs, 2018; Geurs & van Eck, 2001).

Transport poverty is an umbrella concept for an inability to reach desired destinations, hindering participation in activities normal for society (Kampert et al., 2019; Martens & Bastiaanssen, 2014). It includes the sub-concepts; accessibility poverty, mobility poverty and transport affordability (Lucas et al., 2016a). Mobility poverty and accessibility poverty reflect spatial elements of transport poverty. By measuring accessibility and setting a threshold it could be argued that individuals falling below such a threshold are (to a degree) accessibility poor. Such a threshold or measure is not set in the Netherlands. However, a pilot indicator has been used to measure transport poverty risk within the province Friesland (Fernandes et al., 2022). The spatial variables included in this indicator are *transport options* and *proximity of services* (Kampert et al., 2019). An accessibility sufficiency threshold would be a spatial tool and can thus be expected to influence accessibility poverty and mobility poverty, or the *transport options* and *proximity or services* of the TPRI. However, the *proximity of services* variable of the indicator does not include employment and education.
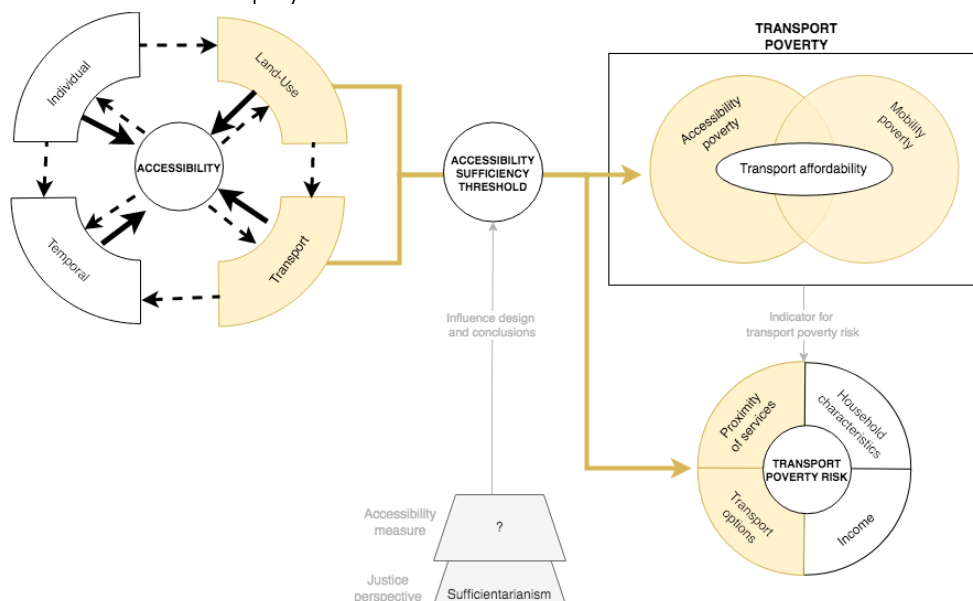


*Figure 11 Conceptual model (Based on literature by Geurs (2018) Kampert et al. (2019) Lucas et al. (2016a).*

# 3. Methodology

The following chapter discusses the methodology.

## 3.1 Research design

Considering the research question; *What would be the advantage and disadvantage for transport poverty in Friesland of institutionalizing accessibility sufficiency thresholds for employment and education in Dutch planning policy?* the research is qualitative and of an explorative nature. Qualitative research is an interpretive approach, which can be used for exploring new topics like an explorative study (Hennink et al., 2020). Subjective influences are present in a qualitative approach, therefore there is a need for reflexivity; where the research reflects on the potential influence of their subjectivity on the data collection and analysis and makes this explicit (Ibid).

Figure 12 depicts how each sub-research question is answered. The research started with a literature review to provide a theoretical base and to answer Sub-RQ1. Following this, the empirical data collection phase started. A policy document analysis was conducted, this is a descriptive method used to answer Sub-RQ2 and Sub-RQ3. Next, interviews with researchers were held as input for the focus group with land use and transport policymakers. Focus groups are often used for topics which are unknown (Stewart et al., 2007) and therefore can be used as a prescriptive method. The researcher interviews and focus group answered research question Sub-RQ4 until Sub-RQ7.
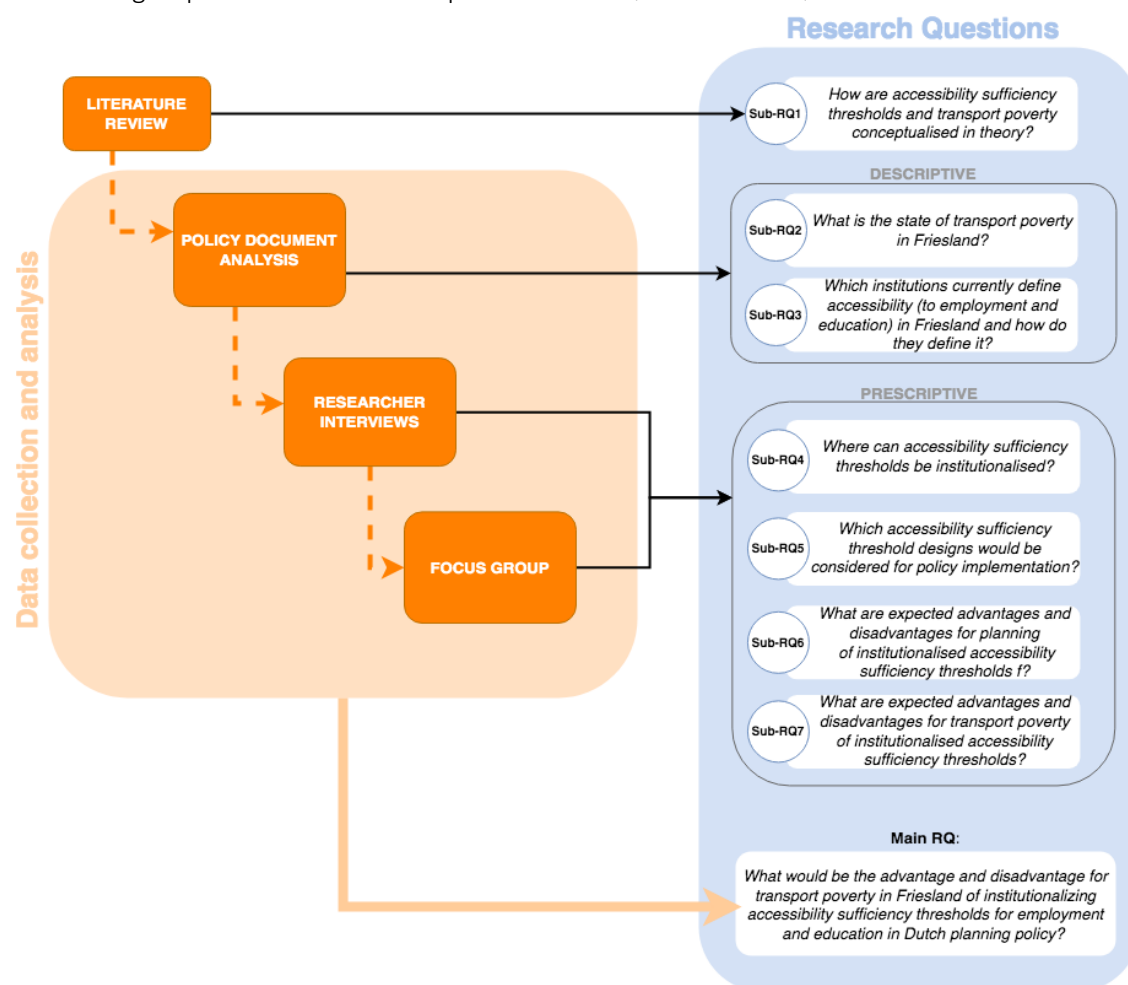


*Figure 12. Connections in the research design.*

## 3.2 Literature review

To create the theoretical framework, academic as well as grey literature was consulted. This is important for embedding it in a wider academic context and to justify the necessity of the research (Hennink et al., 2020). *Smart-cat*, *scopus* and *google scholar* were used to find peer reviewed literature, using the search terms like "accessibility", "accessibility threshold" "origen and destination", "distributive justice and equity in transportation", "transport poverty" and "transport related social exclusion". Furthermore, snowballing was used to acquire more academic articles from relevant articles. Additionally, grey literature, like government reports, was also used because of the limited academic literature from within a Dutch context. The grey literature provides knowledge on the Dutch institutional context as well as the Dutch context of transport poverty. Only English and Dutch literature where consulted due to language barriers.

## 3.3 Case study

Case study research is an in-depth analysis of a specific example with the advantage of contributing to context depend and in-depth knowledge (Flyvbjerg, 2006).

### 3.3.1 Case selection

A case was selected based on an intensity (or information oriented) sampling strategy, which resulted in the selection of the province of Friesland as the case. An information-rich case is particularly useful in single case studies (Flyvbjerg, 2006). According to Punch (2014) an intensity sampling strategy bases case selection on the occurrence of a phenomenon as well as high information availability about the phenomenon. The province Friesland is information-rich due to the use of the pilot TPRI in the case and a published report about transport poverty. It is the only province where this has happened, therefore, there is relatively much information available surrounding transport poverty.

### 3.3.2 Case description

Friesland is one of the Netherlands most rural regions. Compared to the Dutch average, inhabitants of province Friesland travel (on average) the largest distances, having been in the top three since 2018[3] (Fernandes et al., 2022). While the average total travel times between the Dutch average and the Frisian average are relatively small.

#### *3.3.2.1 Transport poverty risk in Friesland*

Research has been conducted into who experience transport poverty and where in Friesland these people live, detailed to a neighbourhood level (Fernandes et al., 2022). The TPRI from the CBS was used and combined with data from a monthly survey of the Fries Sociaal Planbureau and public transport stops.

The pilot indicator shows that 8.4 percent of Frisian households have a high to very high risk of transport poverty (Fernandes et al., 2022). This comes down to a total of 25.714 households. Figure 13 depicts the spatial distribution based on the TPRI for each municipality. It portrays the share of households with high to very high risk of transport poverty. The municipalities with the most households with a high risk are Harlingen, Smallingerland and Ooststellingswerf (CBS, 2022). Within municipalities there are also

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[3] Data until 2021

large differences in risk of transport poverty, there is a small share of neighbourhoods which score relatively high on households with high risk of transport poverty. The multidimensional nature of transport poverty means that a combination of factors stack up, this combined with singular high score create high or very high risk of transport poverty at several locations (Fernandes et al., 2022).

The survey of the Fries Sociaal Planbureau depicts that the majority of the respondents indicate an ability to move from A to B by themselves (Fernandes et al., 2022). Considering the willingness to travel (one-way) to or from an employment or educational facility, the survey shows that 66% would travel a maximum of 45 minutes. Most respondents use a car (62%), a regular bike (23%) or an e-bike (15%), while the train and bus are used a lot less to travel to employment or educational facilities, respectively 6% and 4% (Ibid).

There is a correlation between urbanity and percentage of the respondents which use the car or regular bike. In areas where the number of inhabitants are lower than 500, 79% of the respondents use the car more than twice a week and 26% of the respondents use the regular bike more than twice a week. While in areas where the number of inhabitants is higher than 5000, 54% of the respondents use the car more than twice a week and 47% of the respondents use the regular bike more than twice a week. There is also a correlation between how often respondents leave their residence and ownership of a driver's license, 88% respondents who own a driver's license leave their residential village twice a week, while only 50% of the respondents who do not own a driver's license do this.
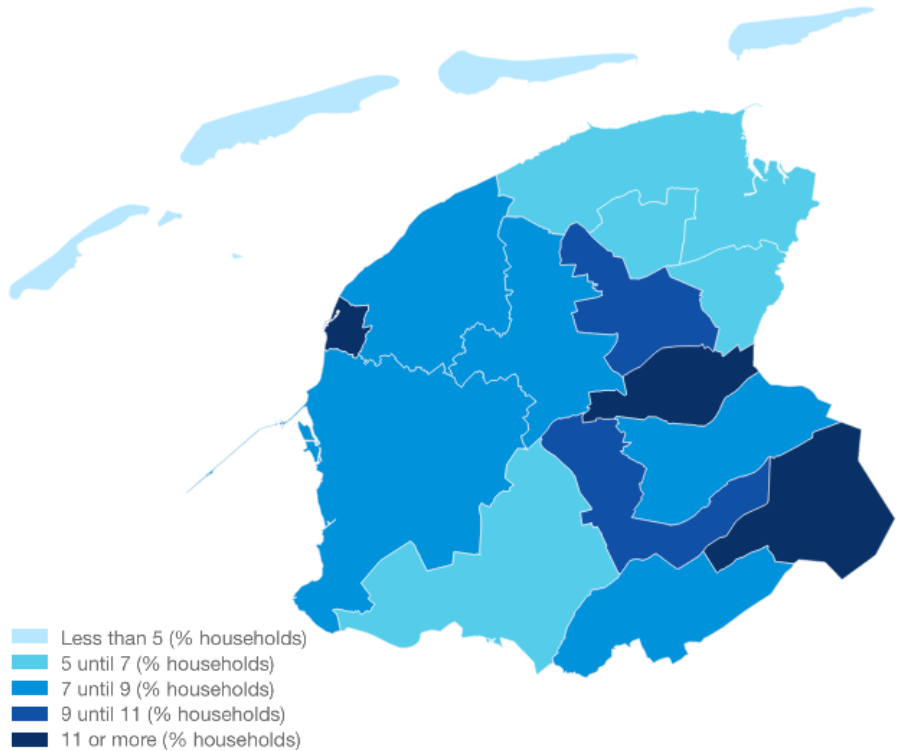


Figure 13. The percentage of households with a (very) high risk of transport poverty per Frisian municipality[4] (CBS, 2022, p.1).

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[4] Neighbourhoods with the number of households lower than 30 were not included to enable privacy, this is the case for 146 out of 841 neighbourhoods (Fernandes et al., 2022). Data from similar neighbourhoods were used instead.

## 3.4 Data collection techniques

The next section discusses the data collection techniques.

### 3.4.1 Policy document analysis

Policy document analysis is a qualitative research approach with multiple purposes. For instance, it can be used to gather context dependent knowledge as well as possible questions for conducting interviews (Bowen, 2009; Fischer & Miller, 2006), or in this case focus groups. Additionally, it can be used for verification of findings (Bowen, 2009). For this research, the aim of the policy document analysis is to see what the state of transport poverty is in the case and how accessibility is currently defined in policy, which institution(s) do this and if accessibility thresholds are currently used.

Each Dutch municipality is required by law to provide frameworks for its policies with regards to transport (Akse et al., 2021). These documents from municipalities within the province of Friesland were used for the analysis, as well as an overarching document on transport by the province. Another criterion for the selection of policy documents was that they were the most recently published transport policies. Additionally, that they were published before April 5th 2023 as that was the start date of the policy document analysis.

Knowing there should be policy documents for the province and each of the 18 municipalities, it was expected to analyse 19 transport policy documents and 19 land-use policy documents. However, this is not the case. Not all policy documents were available. In the end 26 documents have been analysed, as is depicted in Table 4. Appendix 1 – Data Collection Techniques | List of Policy Documents contains an overview of the policies which fit the selection criteria, it also includes explanations regarding the exclusion of policy documents.

*Table 4. Number of land use and transport policy documents analysed.*

| POLICY DOCUMENTS | | COUNT |
|---|---|---|
| Land-use policy documents | | 15 |
| *Omgevingsvisie* | | |
| *Structuurvisie* | | |
| Transport policy documents | | 11 |
| *Regionaalmobiliteits programma* | | |
| *Gemeentelijk Verkeer- en Vervoersplan* | | |
| *Mobiliteitsvisie* | | |
| | Total | 26 |

### 3.4.2 Interviews with researchers

Two interviews were held with researchers to prepare for the focus group, gain knowledge about the case and gain insights on their expertise regarding possible advantages and disadvantages. The first researcher was chosen based on the knowledge regarding accessibility thresholds, the second researcher was chosen based on knowledge about transport poverty in the case study. The interviews were transcribed, Table 5 shows the length of the interviews, Appendix 2 shows the interview guide.

*Table 5. Interviewee characteristics.*

| INTERVIEWEES | EXPERTISE | DATE | LENGTH |
|---|---|---|---|
| Researcher 1 | Accessibility thresholds transport poverty | 07-06-2023 | 40:32 minutes[5] |
| Researcher 2 | Knowledge of transport poverty in the case | 09-06-2023 | 31:26 minutes[6] |

### 3.4.3 Focus group

The ability to uncover interactions, gathering substantial information in short time periods and its use for unknown topics are the reasons for choosing focus group as a method for this research (Hennink et al., 2020; Punch, 2014; Stewart et al., 2007). The multi-disciplinary nature of accessibility means that multiple policy fields have to interact (Kampert et al., 2019). The main contribution of focus group research is uncovering insights from group interactions which are less accessible than in an individual interview setting (Punch, 2014). Therefore, it was decided to use a focus group to uncover land use and transport interactions.

An important consideration for focus groups is the role of the researcher. The role of the researcher is less traditional. Rather it is a facilitative and moderating role (Punch, 2014). Focus groups have the risk of three kinds of biases created by the researcher (Stewart et al., 2007), one of which is the risk of is a personal bias. Knowledge development is influenced by the interactions between the researcher and the participants (Hennink et al., 2020). As indicated in the introduction, I have a normative understanding that transport poverty is a problem which should be tackled, probably through sufficiency accessibility thresholds. This normative belief could have influenced the focus group discussion. I have tried to prevent this by explicitly indicating at the start that it mainly is a discussion between the participants. However, during the discussions I noticed the conversation continued to be led (partially) by my eye contact.

Another important consideration for this research approach was the design of the focus groups, like the participant selection criteria, location and length of the discussion. Focus groups are advised to consist of 6 to 12 participants (Hennink et al., 2020; Stewart et al., 2007). The multi-disciplinary nature required participants to come from the transport and land use policy sectors. Additionally, the need to consider the government level for implementation requires participants to be multi-level, therefore both from a provincial level and a municipal level. The location of the focus group should not be a barrier to participate (Stewart et al., 2007), therefore travel times were considered for the choice of location; in the province of Friesland. The length of the discussion was set at maximum 2 hours due to risk of exhaustion (Stewart et al., 2007).

The municipality selection criteria were the availability of the policy documents, the substance of the policy documents and transport poverty risk in the municipality. Appendix 3 has an overview of these

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[5] excluding technical issues, explaining the consent form and a personal question at the end

[6] exluding the consent form explanation

characteristics. One municipality was chosen of each risk group (low-risk, medium-risk and high-risk), to ensure there was no bias for municipalities with only high transport poverty. This led to the selection of the municipalities Harlingen, Noardeast-Fryslân and Opsterland. Of each municipality and the province, a land-use planner and a transport planner were invited to participate in the focus group. Table 6 depicts an overview of the involved participants, Appendix 4 includes more characteristics. One transport planner could not be available on the selected date. Another policymaker cancelled the day before the focus group due to personal circumstances. Additionally, one municipality only provided contact details for one policymaker, whom indicated representing both transport and land use.

The discussion guide, as depicted in Appendix 5, provided the direction of the focus group discussion (Stewart et al., 2007). The guide was based on the information from literature, the policy document analysis and the interviews with researchers and used the order common for focus group discussion guides, first warm-up questions, transition questions, key questions and finally closing questions (Hennink et al., 2020). Familiarity was expected, as participants come from similar work locations. This creates risk of over-disclosure, pre-existing shared knowledge, less anonymity and less depth (Hennink et al., 2020). Some of the policymakers did know each other, however, not all participants knew each other. After the focus groups, the recordings were transcribed as well as anonymised by hand.

*Table 6. Focus group characteristics.*

| LAND USE PARTICIPANTS | | TRANSPORT PARTICIPANTS | | DATE | LENGTH |
|---|---|---|---|---|---|
| Pseudonym | N times spoken | Pseudonym | N times spoken | 28-06-2023 | 1 hour and 20 minutes[7] |
| Land-use_ Planner_Province | 67 | Transport_ Planner_Harlingen | 77 | | |
| Land-use_ Planner_Municipality | 27 | Transport_ Planner_Noardeast | 65 | | |
| | | Transport_ Planner_Opsterland | 57 | | |

# 3.5 Data analysis

The analysed data consists of policy documents and focus group transcripts. Concepts present in data are named codes (Hennink et al., 2020). Codes are useful for the identification of issues and sorting findings in smaller categories. Initially codes were developed deductively, based on literature. These were enhanced inductively, derived from data. This was done in Atlas.ti. The policy document analysis, interviews and focus groups were used to answer different sub-research questions, therefore different codebooks were developed for the analysis. The codebooks can be found in Appendix 6. Indicators mentioned by Lucas et al. (2016a) were used for defining transport poverty sub-categories. The operationalization of the most important concepts for the policy document analysis are depicted in Table 7.

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[7] Excluding explanation of consent form and an eight-minute delay.

*Table 7. Operationalization of codes for the policy document analysis.*

| CODE | DEDUCTIVE | OWN OPERATIONALIZATION |
|---|---|---|
| Accessibility aims | An accessibility aim is a statement of a desired accessibility outcome. (Hamersma et al. 2023) | Aims for spatial accessibility<br><br>Can be relative or absolute, SMART or open |
| Accessibility sufficiency Threshold | A minimum or maximum level of accessibility (Silva & Larsson, 2019) | If a minimum or maximum is accessibility is defined<br><br>Can be within a location (like a village) or within a time frame (like 40 minutes)<br><br>Can concern a land use or a transport mode |
| Transport poverty | An inability to reach desired destinations, hindering participation in activities normal for society (Kampert et al., 2019; Martens & Bastiaanssen, 2014). | If it was coded as one of the three sub-concepts (mobility poverty, accessibility poverty or transport affordability) it also counts as transport poverty<br><br>Hinder was also taken as an inability to reach desired destinations<br><br>When a decrease in accessibility is discussed but the cause is not mentioned |
| Mobility poverty | *"There is no transport option available" ("that is suited to the individual's physical condition and capabilities")* (Lucas et al., 2016a, p.356). | Lack of transport options which makes moving from place A to B difficult<br><br>Limited access to the transport option (access to the stop for instance)<br><br>Limited available transport options (only possible to bike, bad connection, no parking spaces) |
| Accessibility poverty | *"The existing transport options do not reach destinations where the individual can fulfil his/her daily activity needs, in order to maintain a reasonable quality of life."* (Lucas et al., 2016a, p.356) | Difficulty of reaching key activities at reasonable time, ease and cost<br><br>Decrease in available key activities (expected to make an increase in travel time to key activities)<br><br>Description of lack of opportunity to access a key activity (like education or employment) |
| Transport affordability | *"The necessary weekly amount spent on transport leaves the household with a residual income below the official poverty line."* (Lucas et al., 2016a, p.356) | Lack of personal or household resources to afford transport options<br><br>Pressure on the affordability of public transport<br><br>Difficulty to afford certain transport options |

## 3.6 Ethics

During research, it is important to consider "informed consent, self-determination, minimization of harm, anonymity and confidentiality" (Hennink et al., 2020, p. 70). Ethics is particularly important when research requires the participation of people, which was done in this research. Before conducting the interviews with researchers and the focus group, participants were send an *information sheet* and *agreement to participate*. Both the *information sheet* and the *agreement to participate* are developed by the University of Groningen Research Ethics Committee (University of Groningen, 2016). These pre-made sheets were adapted to the descriptions of this research and are available in Appendix 7. These sheets were discussed before questions were asked, and permission was always asked before the recording was started. All but one participant signed the agreement to participate. One of the focus group participants via email indicated to find it not necessary to sign an agreement to participate.

After conducting interviews and the focus groups, the recordings were transcribed. The participants have been asked whether they would like to check the transcripts. None of the participations made use of this option. For the transparency, the Dutch quotes are provided in Appendix 8. One policymaker and both researchers indicated a preference for anonymity. The pseudonym was adapted to this. It was decided to use a pseudonym for the other policymakers as well, due to ease of interpretation. The transcripts and the recordings will be deleted after the Master Thesis is uploaded to the RUG thesis research portal.

# 4. Findings and discussion

The next chapter depicts the data gathered from the analysis of 26 policy documents, two interviews with researchers and one focus group discussion with five policymakers. The data is discussed and interpreted in this chapter, as is common with qualitative research (Hennink et al., 2020). A limit for the interpretation of the quantitative depiction of the policy document analysis has to be considered. The length and number of policy documents differed per municipality, this can skew the depiction towards longer documents.

## 4.1 Transport poverty in Friesland

The next section answers the sub-research question: *What is the state of transport poverty in Friesland?*

### 4.1.1 Signals of transport poverty in Friesland

The transport documents explicitly mention *transport poverty* (*vervoersarmoede*) [20 times] and *mobility poverty* (*mobiliteitsarmoede*) [8 times], while *accessibility poverty* (*bereikbaarheidsarmoede*) is not explicitly mentioned. Despite lack of an explicitly mention, implicit reference is more frequently found for accessibility poverty than mobility poverty or transport affordability. Signals of accessibility poverty found include disappearing facilities, traveling large distances to reach facilities, groups altering education choices because of limited opportunities and limited employment opportunities. Discovered signals for mobility poverty include elements in the build environment which limit the mobility of physically impaired (or elderly) and the difficulty to use (a variety of) transport modes to access locations. The latter is particularly the case for public transport. Signals of transport affordability include difficulty of households to afford public transport, unaffordability of electric vehicles and difficulty in to keep public transport affordable while simultaneously investing to reduce public transport emissions. For the unaffordability of electric vehicles, e-bikes and car sharing is described as a possible solution.

The focus group, also discussed signals which potentially point to transport poverty. Inhabitants of the province of Friesland generally have a lower educational level than inhabitants of other provinces (Land_Use_Planner_Province). This suggests either a lack of highly educated employment opportunities or a lack of access to educational facilities. Signals which could be used to recognize transport poverty for accessing employment locations is a high number of unemployed inhabitants within the municipality or an inability to fill vacancies and as consequence (employment)locations remain vacant.

A signal that limits transport poverty was also discussed. Social cohesion in villages is discussed as potentially limiting transport poverty (focus group). This is consistent with Pot et al. (2020). This is mainly the case in villages as a neighbourhood in a city usually has less social cohesion (focus group).

#### 4.1.2.1 Groups

Groups were mentioned which experience difficulty to reach destinations or for which targeted transport measures are in place, likely to reduce the occurrence of transport poverty. The groups ordered from most to least mentioned are mobility or mentally impaired, elderly, children or pupils, people dependent on public transport (or non-car owners/ non-driver's license owners), vulnerable, cyclists or pedestrians, low income and unemployed.

Surprising about these findings is that low income and unemployed are so little mentioned in the policy documents, while literature suggests these groups are (more) likely to be transport poor or at least experience a hinder in accessing activities (Bastiaanssen, 2012; Jorritsma et al., 2018). This could have several explanations. Firstly, it could be that these groups actually do not experience transport poverty as much as would be expected from academic literature. This could be explained by the finding by Lowans et al. (2021) that research has mainly been concerned with conditions that have a relationship with transport poverty rather than conditions underlying it. Secondly, that transport poverty is individual and thus within group variation (Lowans et al., 2021; Martens, 2021; Pot et al., 2023) could explain this. Thirdly, a lack of view on the situation of transport poverty in the case. Transport_Planner_Opsterland suggests the inhabitants which experience transport poverty are unlikely to approach the municipality about their problems. Additionally, the provincial transport policy indicates the need to conduct research on the transport poverty in Friesland (Provincie Friesland, 2022), similarly Jorritsma et al. (2018) discuss a research need for transport poverty in the Netherlands. A start has been made in the systematic assessment of transport poverty in Friesland through the pilot TPRI (Researcher 2).

### 4.1.2.2 Spatial distribution

Municipalities with a high risk of transport poverty according to the TPRI do not discuss transport poverty more frequently. Figure 14 depicts the implicit reference to the sub-concepts of transport poverty per municipality and province. Transport affordability is most discussed by the regional policy documents, likely due to the provincial responsibility for the public transport concessions. Harlingen, Smallingerland and Ooststellingewerf would be expected to have a higher count of transport poverty descriptions, considering the map of Frisian municipalities depicting the percentage of households with a high to very high risk of transport poverty per municipality. Instead, Harlingen and Oostellingewerf do not mention signs of transport poverty. Fernandes et al. (2022) also indicate a list of ten neighbourhoods which have the highest percentage of households with a high to very high risk of transport poverty, the municipalities are Opsterland, Tytsjerksteradiel, Weststellingwerf, Waadhoeke, Ooststellingwerf, Smallingerland, Noardeast-Fryslân and Leeuwarden. Only Ooststellingewerf and Waadhoeke are missing, for both these municipalities only one policy document could be included. An explanation could be that transport poverty does not occur based on municipal borders, rather on an individual level. This is consistent with the finding by Lowens et al. (2021) that individuals rather than households experience transport poverty, as well as the finding by Kelly et al. (2023) that risk can be found across both rural or urban areas.

The policymakers participating in the focus group had all read the report on transport poverty risk by Fernandes et al. (2022). Some policymakers expressed to find the findings regarding distribution of transport poverty risk surprising, expecting areas with sparsely distributed facilities to have more individuals with a risk of transport poverty. A neighbourhood in Harlingen was discussed where the socio-economic characteristics in combination with the public transport availability explain the high number of households with a high risk on transport poverty. The key opportunities, however, like a hospital and a supermarket are in close proximity to that neighbourhood. This type of discussion is in line with a wider academic discussion on transport poverty; whether the term accessibility poverty should be taken on instead. This academic debate was addressed by researcher 1. Additionally, the focus group discussed that if lack of accessibility becomes the factor with the most weight to not participate, then it is viewed as a problem (Transport_Planner_Opsterland).
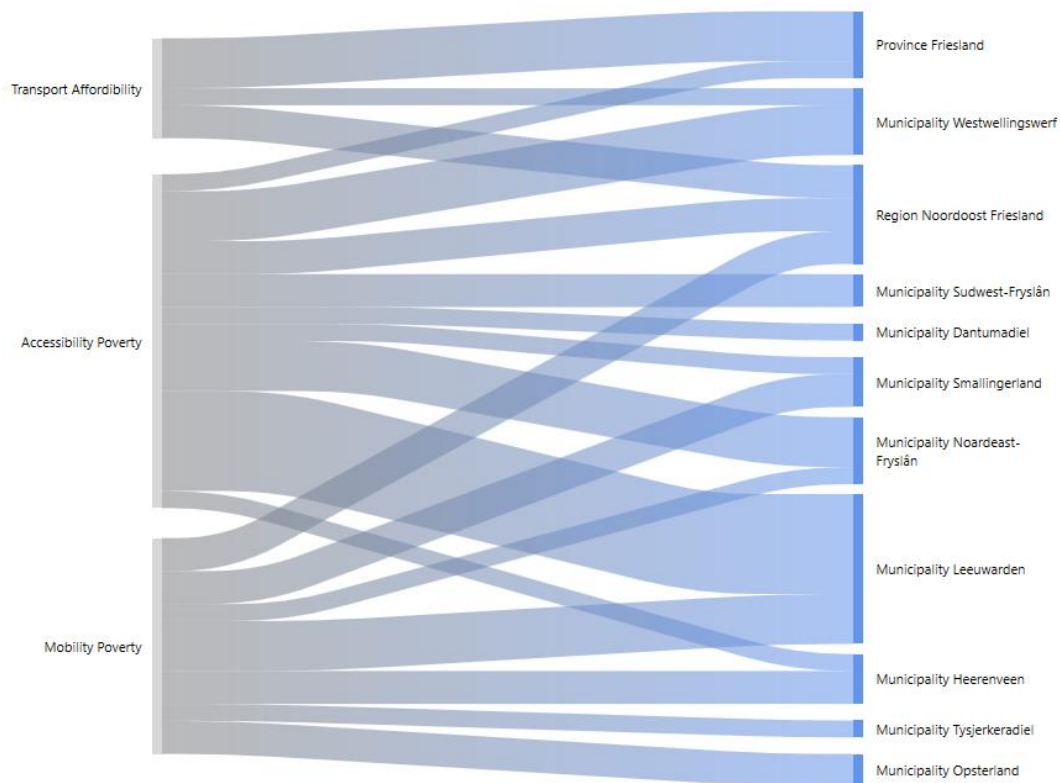
*Figure 14. Shankly diagram implicit mention of transport poverty sub-concepts per municipality.[8]*

### 4.1.2.3 Transport Poverty Risk Indicator

During the interviews both researchers agree that the insight into transport poverty should be improved, however they do have different opinions on the use of the pilot TPRI. Both researchers discuss a limit of the pilot TPRI, namely, the weight of the factors included. All factors are weight equally in the indicator (Fernandes et al., 2022; Kampert et al., 2019), however some factors probably influence transport poverty more than others. Lack of agreement on the weight of factors has also been described as a limit to other TPRI's (Kelly et al., 2023). In particular, due to the influence of the local geographical context on the experience of transport poverty, which is also found in Dutch transport poverty research (Pot et al., 2020). The possibility of using accessibility experience research to improve argumentation behind the weight distribution of transport poverty variables was discussed.

Another critique was expressed regarding the academic soundness and the proximity factor. This proximity factor includes proximity to family and proximity to supermarkets, which is not the entirety of services which inhabitants need to use. An argument against including more services (like employment or education) discussed was that needs are not the same across the population, as well as limited data availability. This limited data availability was also mentioned for cycling path data. The

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[8] Important to consider the limitations of this depiction; some municipalities had two documents, other municipalities have only one or non. Also, some documents are longer than others.

barrier of data availability for the development of a TPRI is consistent with the finding by Lowans et al. (2021) who indicate that better data availability would lead to better metrics. This quote illustrates potential argumentation against the use for this indicator;

*"I have never seen a scientifically sound study that showed that in the context of transport poverty it mattered whether your mother lives within, what was it, 40 km or x number of km? And that this is weighted as much as having a certain income or having a car. They basically take dissimilar indicators and combine them into a method where they add up points [per indicator scored] and then you would run a certain risk [of transport poverty]"*
Researcher

Literature suggest a role of residential self-selection to explain perceived accessibility in rural areas (pot et al., 2023), the findings in this thesis suggest that acting on residential self-selection is restricted for some. Residential self-selection suggests that individuals base their residential location on preferred transport behaviour and modes available (Ettema & Nieuwenhuis, 2017) The policy document analysis suggests residential self-selection is limited for elderly (in terms of facilities nearby) but also for youth (in terms of the housing market). The latter was also discussed in the focus group by Transport_Planner_Opsterland, indicating that difficulty in finding housing in Groningen near the educational facility means that students continue to live at home, become very dependent on the transport options in their local villages and experience difficulty in their opportunity to study. Additionally, Transport_Planner_Harlingen discussed that in the current housing market it becomes difficult to move if a change in situation occurs, like a bus stop disappears or a school closes. In particular also concerning the financial cost of moving.

## 4.2 Defining accessibility in policy

The following section focusses on answering the sub-research question*: Which institutions currently define accessibility in Friesland and how do they define it?*.

### 4.2.1 Responsibilities of institutions which define accessibility

The municipal and provincial responsibility for accessibility differs. The province is responsible for the affordability, routes and the frequency of the public transport (Gemeente Noardeast-Fryslân, 2021; Gemeente Smallingerland, 2013). This is shared with the provider. The province creates the bigger lines of the public transport, accessibility between the public transport stops, while the municipality is responsible for door-to-door access (Gemeente De Fryske Marren, 2015). This means that accessible public transport stops for mobility impaired is a municipal responsibility (Gemeente Smallingerland, 2013).

The range and threshold of a service determines the responsible institution. Some services are not important for the regional scale but are important facilities for on a local scale and therefore are a municipal responsibility (Gemeente Noardeast-Fryslân, 2021; Gemeente Smallingerland, 2013). The province takes on a supportive role in decisions regarding the spatial distributions of services (Provincie Friesland, 2020). Municipalities do not have direct influence on all services, for instance concerning care and educational facilities the municipal control is limited (Gemeente Weststellingwerf, 2019). Municipalities are formally only responsible for the educational building. There are national guidelines for education and multiple other parties are also involved (Ibid). Therefore, accessibility is not only perceived as a governmental responsibility. For instance, the educational facility and parents are also perceived as having a role in preventing overcrowding at drop of and pick up moments at (primary) schools (Gemeente Smallingerland, 2013).

### 4.2.2 Accessibility definitions from policy documents

During the policy document analysis, a translational difficulty was discovered. The Dutch words *bereikbaarheid* and *toegankelijkheid* are both used in the policy documents. The difference was discussed with researcher 1, whom distinguished this in own research as; *accessibility* is *bereikbaarheid*, while *access to* is *toegankelijkheid*.

In the policy documents, *accessibility* is mentioned more than *access to* or *mobility*, as is depicted in Table 8. *Accessibility* is named 443 times, *access to* 99 times, while mobility is named 333 times. If only the word frequency is considered it seems to contradict the finding of Aske et al. (2021) that the mobility paradigm remains dominant in transport policies. However, Aske et al. (2021) take a more in-depth approach than word frequencies to consider what is defined as an accessibility or mobility paradigm.

*Table 8. Word frequencies of Accessibility, Access to and Mobility in Frisian transport and land use policies.*

| WORD | COUNT IN TRANSPORT POLICY | COUNT IN LAND USE POLICY | TOTAL COUNT |
|---|---|---|---|
| Accessibility (*Bereikbaarheid*) | 326 | 117 | 443 |
| Access to (*Toegankelijkheid*) | 68 | 27 | 99 |
| Mobility (*Mobiliteit*) | 269 | 64 | 333 |

A deeper look into the definition of accessibility in the Frisian policy documents illustrates that accessibility is defined differently across the policy documents. Accessibility is not always defined broadly, like the definition of Geurs & van Eck (2001). Rather several policy documents use a narrow definition of accessibility, where only one or two components are mentioned, or do not explicitly define it at all. The explicit definitions were mainly found in the transport policy documents.

The most common accessibility components mentioned in the explicit definitions are the land use component (11 times) and the transport component (9 times), and the temporal component (7 times). Least mentioned is the individual component (1 time). Elements of the land use components which are described are destinations or spread of facilities/ services. Specification which destinations or facilities are meant is often missing. The elements of the transport component found are the different transport modes, like public transport, access to stops and parking spaces or more generally access over water and roads. The elements of the temporal component which are described are usually travel times or travel speed. Surprisingly, frequency or the moments when a transport option is available is only mentioned ones in the explicit definitions. The individual component found only describes the opportunity to choose how to travel.

Different kinds of aims for accessibility can be found in the policy documents, examples are depicted in Table 9. Similar to the findings by Hamersma et al. (2023) the majority of the accessibility aims are open, rather than SMART. Additionally, accessibility aims are more often absolute than relative. The next section will discuss the SMART aims, the thresholds.

*Table 9. Examples of types of aims found in the policy documents. Table design is based on Hamersma et al. (2023) p. 15*

|  | Closed (SMART) | Open (Abstract) |
|---|---|---|
| Relative | *"In every village, we provide access to a primary school, meeting place or sports location"* (Gemeente Achtkarspelen, 2021, p. 14) | "Accessibility of services remain good" (Gemeente Smallingerland, 2020, p.42) |
| Absolute | *"We work towards a city with good services using the widest meaning of the term, from stores to parks, from schools to medical facilities, from the catering industry to sports opportunities. And as much as possible accessible within fifteen minutes for our inhabitants"* (Gemeente Leeuwarden, 2021, p. 31) | *"a minimum level of accessibility in the rural area is important"* (Provincie Friesland, 2022, p. 9) |

*4.2.2.1 Accessibility sufficiency thresholds*
Several accessibility sufficiency thresholds were found in the policy documents, they exist on multiple levels. On a national level, there are accessibility sufficiency thresholds in place for care facilities, for

example the ambulance is allowed to take maximum 15 minutes in 95 per cent of the cases to be on location after an emergency call (Gemeente Smallingerland, 2013; Wettenbank, 2023).

On the provincial level an accessibility sufficiency threshold is in place aiming towards public transport availability in all villages on the main land within the province (Provincie Friesland, 2022). This is connected to the geographical distribution of transport options rather than a contour in terms of time. This threshold is only connected to the transport component, excluding the three other accessibility components. In this same document, the need for a minimum level of accessibility in rural areas is discussed. During the focus group the policymakers were asked how a minimum level of accessibility is interpreted. After a short deliberation, it was concluded that a definition of a minimum level of accessibility does not exist and is difficult to define. The deliberation concerned which elements such a definition should consider, what is a basic service, and why it currently is not in place.

On a municipal level, thresholds were found in land use, as well as transport policies. Unsurprisingly, the thresholds found in the transport policies relate more to the transport options, while the thresholds found in land use policies relate more to services. An example of a threshold from a transport policy document is that 100 meters is seen as an acceptable walking distance from a home to parking space (Gemeente Ooststellingwerf, 2013). An example of a threshold from a land use plan is "*In every village, we provide access to a primary school, meeting place or sports location*" (Gemeente Achtkarspelen, 2021, p. 14). Similar thresholds like this one were also found for in Gemeente Opsterland (2022) and Gemeente Leeuwarden (2021), Gemeente Leewarden added a time span of 15 minutes for one geographical area. Indicating a threshold indicate a spatial minimum (within a village) or a temporal minimum (15 minutes).

### 4.2.2.2 Accessibility to the facilities education and work

As expected, the land use policy documents are more concerned with the services than the transport documents, this becomes apparent from the higher word frequency for services in land use policy documents (see Table 12). Work is mentioned more than education. Despite the policy documents higher word frequency of work opportunities, policymakers in the focus group indicated that the government institutions have more difficulty controlling work locations, as compared to educational facilities. This is due to the role of the market to decide where to locate. Some policy documents discuss a similar difficulty (Gemeente Weststellingwerf, 2019).

*Table 10. Word frequency education and work in Frisian transport and land-use policies.*

| CATEGORY | DUTCH WORD | COUNT IN TRANSPORT POLICY | COUNT IN LAND USE POLICY | TOTAL COUNT |
|---|---|---|---|---|
| Education | Educatie | 49 | 10 | 59 |
| | Onderwijs | 18 | 92 | 110 |
| | Opleiding | - | 7 | 7 |
| Work | Bedrijven | 76 | 365 | 441 |
| | Werk | 61 | 73 | 134 |
| | Werkgelegenheid | 23 | 126 | 149 |

Integrations between available education and employment opportunities are often discussed in the policy documents (Gemeente Harlingen, 2012; Gemeente Leeuwarden, 2021; Gemeente Noardeast-Fryslân; 2021; Gemeente Smallingerland, 2020). Indicating that the level of education (opportunities) will determine the type of employment opportunities suited for the skills of the employee. The travel patterns to these different services are not always similar (ANNO, 202). Additionally, the influence of population increase or decline on the availability of services is discussed, for instance shrinking regions have difficulty keeping primary schools open (Gemeente De Fryske Marren, 2022; Gemeente Noardeast-Fryslân; 2021). Housing availablility play a part in this availability of services. Educational facilities and employment opportunities with a regional span are located amongst others in the municipalities Leeuwarden, Drachten and Harlingen (Gemeente Harlingen, 2012; Gemeente Leeuwarden, 2021; Gemeente, Smallingerland, 2013). There are instances where lack of available education or work opportunities are discussed (ANNO, 2020; Gemeente Westwellingswerf, 2019), as is depicted in the quote below. Similarly to Hamersma et al. (2023), digital accessibility is discussed as a potential solution (Gemeente Achtkarspelen, 2021; Gemeente Tytsjerksteradiel, 2021; Provincie Friesland, 2022).

*"In Noordwolde, for example, labour mobility is a clear theme. There is a lack of opportunities to work in the region. Attention to routes to work is therefore necessary"*
(Gemeente Westwellingswerf, 2019, p.47)

### 4.2.2.3 Measures underlying accessibility

Unfortunately, the description of the measures underlying accessibility is limited in the policy documents. Measures mentioned are the Integrated Mobility Analysis (IMA) (Gemeente Ameland, 2022; Provincie Friesland, 2022), traffic model calculations (Gemeente Smallingerland, 2013) or generally that it is based on data and measurements (Gemeente Tytsjerksteradiel, 2021). A measure discussed is the comparison between traffic intensity and road width, which indicates congestion (Gemeente Leeuwarden, 2003). It is perceived as a problem when it reaches above 80%. Participatory methods, such as surveys and group discussions, are also employed for the creation of the transport policies (Gemeente Heerenveen, 2017; Gemeente Tytsjerksteradiel, 2021; Gemeente Waadhoeke, 2021).

The limited description of the measures underlying accessibility within the municipal and provincial policies make it difficult to reflect on the soundness of the measures based only these documents. According to Researcher 1 all municipalities have access to nationally provided traffic models. A national policy document which describes the IMA explains it measures the number of locations accessible within a time contour (Ministerie van Infrastructuur en Milieu, 2021). Currently, only travel speed is included in these calculations, despite acknowledging importance of the factors travel comfort and cost for analysing accessibility. From this description, it seems facilities within the same contour have equal weight. Future research could include national policy documents to gain an in-depth understanding of the measures underlying accessibility in the Dutch context.

# 4.3 Considerations on the location and design of accessibility sufficiency thresholds

The next section answers the sub-question*; Where can accessibility sufficiency thresholds be institutionalised?* and *Which accessibility sufficiency threshold designs would be considered for policy implementation?.*

## 4.3.1 Design of accessibility sufficiency thresholds

The potential design of accessibility sufficiency thresholds was discussed with the researchers and used as input for the focus group discussion guide. This led to a distinction between absolute and relative thresholds, Figure 15 depicts a visual representation of the difference between the two types.
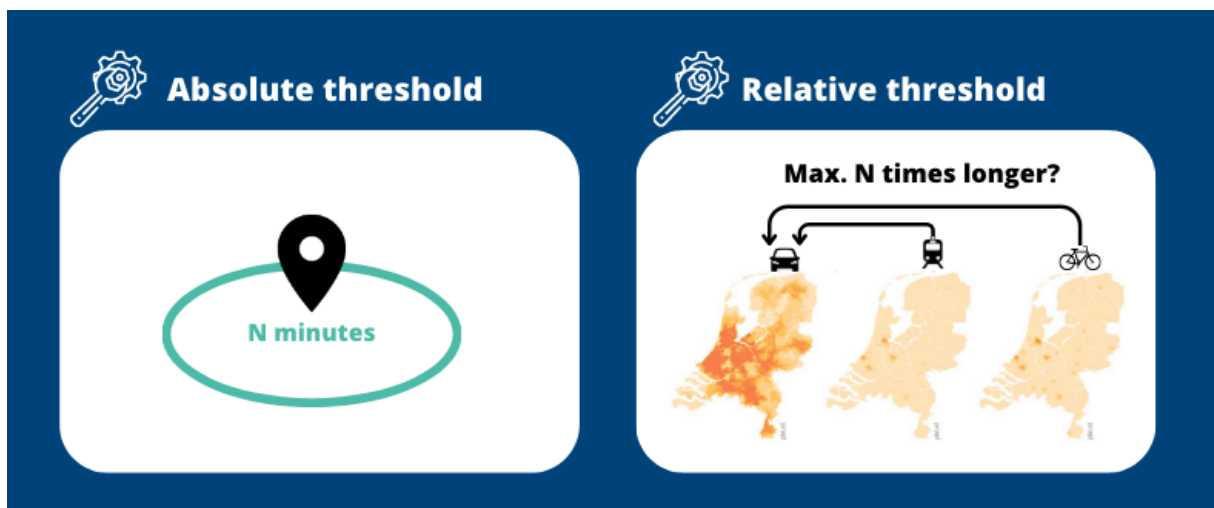


*Figure 15. Visualization of absolute and relative thresholds. Own creation. The map is from Bastiaanssen & Breedijk (2022) p.38*

### 4.3.1.1 Absolute accessibility sufficiency thresholds

Absolute accessibility sufficiency thresholds are similar to what Hamersma et al. (2023) describe as a "norm". It contains an addressed, a belonging and a prescription. Examples are employees must reach their job within 15 minutes or students must reach a school within 45 minutes. It is a minimum level of accessibility. Both researchers discussed this type of threshold and indicated the need to differentiate based on area density, to consider feasibility of achieving the aim. Researcher 2, for instance, discussed that it should be possible in an urban area like Leeuwarden that basic services are reached within 15 minutes, while more rural regions a threshold of for instance 45 minutes would suffice.

### 4.3.1.2 Relative accessibility sufficiency thresholds

Another type of accessibility sufficiency threshold, the relative type, was discussed by researcher 1. This is a different relative accessibility threshold than discussed by Hamersma et al. (2023). Hamersma et al. (2023) discussed relative thresholds to be a threshold relative to the previous situation, like a better accessibility than in 20xx. Researcher 1, however, discussed a relative accessibility sufficiency threshold between transport modes. This researcher discussed using the most dominant transport mode as a reference point and the threshold is set as a relative limit between the different transport modes. So, a comparison is made between travel times of different transport modes to reach desired locations. In

the Netherlands, the most dominant transport mode is the car. Therefore, the example discussed is that a bike is allowed to take maximum x times longer than a car. Defining x is a political choice. For instance, if the political arena decides that x would be two, it would mean travelling by bike would be allowed to take maximum twice as long as travelling by car. In this example if it takes 30 minutes by car it would be allowed to take 1 hour by bike. If it is above said threshold (x), that would mean that policy priority, and thus investment, should be allocated to the area where the threshold is not met. This type of threshold is a combination of a minimum accessibility threshold for one mode and a maximum accessibility threshold for the other mode, similar to Silva & Larssons (2019) whom discussed a combination of minimum and maximum thresholds.

### 4.3.1.3 Proposed thresholds to fuel the focus group discussion

Two absolute and one relative accessibility sufficiency thresholds were proposed to start the focus group discussion. The absolute accessibility sufficiency thresholds proposed was described as; suppose you would need to have the opportunity to reach X number of schools within X number of minut*es.* Later the policymakers were asked to reflect on the same statement but for the opportunity to reach jobs. After the two types of absolute accessibility thresholds were discussed, a relative accessibility threshold was discussed, which is; suppose we propose a minimum value, for example that you may take maximum X times as long to travel by public transport or bicycle as by car. For example, if X is two and it takes half an hour by car, you can take a maximum of 1 hour for your journey by bicycle or public transport.

### 4.3.1.4 Additional design considerations

During the focus group discussion of the absolute and relative threshold, additions were made to the design of the accessibility sufficiency thresholds. An interesting perspective, discussed by Land_Use_planner_Municipality, was that it might make more sense to set a threshold from the perspective of the service rather than from inhabitants. For instance, this would mean X number people should be able to reach the service. This is constant with how a threshold is described in Walter Christallers central place theory (Atzema et al., 2014). Another addition discussed, specifically for employment locations, was that the variety of types of employment should be included in such a threshold. If not, this could have negative consequences for the quality. Adding a large distribution centre which creates a lot of employment opportunities fulfils the threshold requirement, however is not seen as a positive influence on the local environments quality.

## 4.3.2 Where?

The researchers argued against one standard accessibility threshold for the entire Netherlands, but indicated that distinctions would have to be made. For instance, a distinction based on population density. Densely populated areas and scarcely populated areas have different feasibilities in terms of proximity to services, in particular if the quality of the service needs to remain high. Another distinction discussed by both researchers is the assumption that accessibility perceptions differ between regions. The distance inhabitants of the Randstad are willing to travel will differ from the distance Frisian inhabitants are willing to travel. The discussion in the focus group acknowledged this difference as well. This was illustrated with an example from the Island Ameland, where the creation of a bridge was proposed as a solution if the ferry disappears. The inhabitants of the island viewed this proposal negatively as it would decrease the island feeling and change the tourism economy. These findings are

consistent with the academic literature where local geographical norms influence accessibility expectations (Pot et al., 2020).

During the focus group, there were several advantages and disadvantages discussed of national accessibility sufficiency thresholds. Advantages include that it provides (financial) resources which are necessary to provide (public) transport options, it makes accessibility levels concrete and measurable, and lastly, it helps to reduce inequalities, particularly between regions and within urban areas. The discussed disadvantages were that not every region is the same and that inaccessibility can be a luxury.

The discussion also highlighted advantages and disadvantages of setting thresholds locally. Similarly, to setting national thresholds, it makes accessibility concrete, clear and measurable. A local threshold, however, also has the advantage that it is specifically targeted to local problem perceptions. A major disadvantage was discussed, namely that a municipality alone is unable to solve the problem as accessibility suggests a network of transport options to services. An example was discussed of wanting inhabitants to have access to an applied sciences education facility, which does not have the range to be solved on a local level.

Considering the specific advantages and disadvantages of each governmental level and their responsibilities, it was discussed that the responsibility for accessibility is shared amongst the national, regional and local level (Provincial_land_use_planner). Equity amongst regions is a national responsibility, while the province can provide public transport and the municipality can provide targeted measures.

# 4.4 Expected advantages and disadvantages

This section focusses on the sub-research question *What are the expected advantages and disadvantages for planning of institutionalised accessibility sufficiency thresholds for employment and education?.*

Advantages were slightly more discussed than disadvantages, however, this differs between the interviews with researchers and the focus group. In the focus group, disadvantages were discussed more than advantages. In particular the transport planners discussed the disadvantages more frequently, while land use planners more frequently discussed advantages. The researchers also discussed advantages more frequently. The following chapter will have a distinction between absolute and relative accessibility sufficiency thresholds.

## 4.4.1 Advantages of accessibility sufficiency thresholds

Five advantages of accessibility sufficiency thresholds were discussed. Firstly, it is beneficial for argumentation behind the allocation of government funds (focus group, researchers). For instance, when the threshold is not met for a mode of transport, this means this mode should have policy priority, and therefore governmental funds. This is consistent with Silva & Larsson (2019) and Kelly et al. (2023). The second advantage is that it can make accessibility measurable (focus group). Lucas et al. (2016b) and Martens et al. (2022) similarly discuss that the use of thresholds in calculations can help to illustrate changes over time and differences across geographical regions. The third advantage is that citizens and companies gain a right to demand a minimum level of accessibility from the government (focus group, researchers). This is consistent with Kelly et al. (2023). Additionally, recently the minister and state secretary similarly stated that the right for a minimum level of accessibility should be a starting point for future policy (Rijksoverheid, 2023). This right also gives the government a tool to demand a level of accessibility from public transport providers, and provides a shift in focus from monetary efficiency towards community needs (researcher 2). The fourth advantage is that it could increase awareness amongst policymakers (researcher 1). Several examples were given in the focus group where land use transport integration is not considered, in particular with employment locations. Provincial_Land_Use_Planner indicated that car accessibility is often an important requirement for job locations. The focus group agreed that now, an increased understanding of the locational choice of facilities near transport options is coming back. However, examples were given of several public transport stops (Hindeloopen and Feanwâlden) where this was barely considered. Research also confirms, public transport stops in Friesland often have the lowest rating in the Netherlands concerning quality and services of public transport transfer stations (Gemeente Smallingerland, 2013). Figure 16 illustrates an example of this. These examples show that land use-transport integration is not always considered in the planning cycles, and should therefore be improved. The focus group agreed with this, however, were unsure of the role legally binding accessibility sufficiency thresholds should play in this. The final advantage is that it will help improve transport inequality in general, not only specifically transport poverty. This was discussed by researcher 1 and is consistent with findings by Silva & Larsson (2019). The argumentation behind this is that transport poverty, how it is currently defined, consists of a very extreme group. Hinder is reaching services, however, is something that many people experience. This indicates a different justice perspective, one where the majority of the population should benefit (utilitarian).

*Figure 16. Illustration of a lock of land use surrounding the station Hindeloopen (Stationsweb, 2009, p.1).*

Two advantages of setting an absolute threshold were discussed, namely creating clarity and exercising control over the transport options to increase (variety) of employment options within reach. The first advantage, creating clarity, illustrates that a communal problem perspective is created. Such a communal problem perspective is useful to monitor and test progress. The second advantage, increasing opportunities within reach, is related to a mobility strategy. It was discussed in the focus group that there is more power over transport options than over distribution of land uses, in particular when it comes to employment opportunities. The creating of the Lelylijn, could increase the (variety) of employment options within reach.

Several advantages where discussed of relative accessibility thresholds. Firstly, mode choice is (partly) dependent on travel time. Therefore, creating more equal travel times between transport modes could help the sustainability trajectory. Secondly, as compared to the absolute threshold focus group participants agreed that the relative accessibility sufficiency threshold creates clarity which institution should undertake action. The province and municipality have different roles when it comes to transport and land use as discussed earlier. The institutions understood their responsibility better with the relative accessibility sufficiency threshold. The province has public transport responsibility, while the municipality needs to consider a good connection to the public transport network when a location is developed.

## 4.4.2 Disadvantages of accessibility sufficiency thresholds

Several disadvantages of accessibility sufficiency thresholds were discussed. Firstly, setting a threshold could restrict the planning system (focus group). Secondly, it is politically difficult to realise. During the focus group discussion, one of the policymakers described politician's unwillingness to set strict aims on issues which they cannot control. The uncontrollable aspects of accessibility, particularly the market

dependent nature of employment locations and the number of teachers in the region, led this policymaker to say it is unlikely there would be political support for institutionalising accessibility sufficiency thresholds. This is consistent with the views of the researchers and findings by Silva & Larsson (2019). Thirdly, accessibility is an individual's experience and therefore perceived differently amongst individuals, but also between different geographical locations. Therefore, setting a standard accessibility sufficiency thresholds will not help everyone's (perceived) accessibility problems. This is constant with findings by Silva & Larsson (2019) and Pot et al. (2020). The last disadvantage suggests increased accessibility could come at the cost of other aims like quality, sustainability and variety of options available (focus group). The advantage of concentration is specialization. The quality of services could decrease if accessibility is an overruling requirement. Educational facilities, for instance, have a quality threshold, namely number of pupils. This is in place to keep service quality intact.

Several limitations of absolute thresholds for employment opportunities were discussed. The most important limitation is the limited control over the market. In comparison to education, employment opportunities cannot be controlled according to the policymakers. Examples were provided of the existing context where market parties threaten to leave the municipality if they do not get their way. There is control over some employment options, for instance government jobs. Control over the geographical distribution of these government jobs have been used in the past. However, the majority of employment opportunities lie out of the governments hands and therefore when it comes to land use strategies are perceived as difficult. Another limitation is the problem perspective for employment options. One policymaker discussed that employed individuals who currently experience difficulty to access their work location made their own choice. A limitation discussed by researcher 1 is that an absolute threshold does not consider differences between modes.

One disadvantage of relative thresholds was discussed. Having infrastructure does not automatically mean it will be used (focus group). This deliberation indicates that improvements of cycling or public transport infrastructure needs to be combined behavioural measures. Only then will behaviour be changed.

# 4.5 Expected advantages and disadvantages for transport poverty

The next section discussed the sub-research question; *What are expected advantages and disadvantages for transport poverty of institutionalised accessibility sufficiency thresholds for employment and education?*.

## 4.5.1 A double edged sword

*"I think precisely because we used to be less accessible, we had more services in close proximity and now that we actually become more accessible, the vast majority of people, that because of that services relocate to larger distances and a certain category cannot follow [that pattern of travelling larger distances]"*
(Focus group)

This quote, illustrates if a threshold is badly designed and continues to increase mobility for the many, it could result in concentrated land uses at larger distances, which are difficult to access for the few who experience difficulty in travelling larger distances. The trend of services relocating which increases distances is also confirmed by policy documents (Gemeente Noardeast-Fryslân, 2021; Gemeente Smallingerland, 2020). Silva & Larsson (2019) similarly discuss an increase in mobility could lead to a decrease in accessibility due to changes in a medium and long-term time frame, like changes in activity and household location choices. The need to travel larger distances dependents partly on the locations where people (have the opportunity to) live. Living in the places where services are concentrated, means having lower mobility needs.

Reflecting this back on the accessibility threshold found on the provincial level, aiming to connect every village to a public transport option, suggests it has the potential that services relocate to larger distances and increase travel distance. The most dominant mode, the car, might already have made such a pattern. In particular, considering that Frisians have the largest travel distances in the Netherlands (Fernandes et al., 2022). At the same time, public transport is a more affordable transport option for individual use than the car (Witte et al., 2022) and available public transport options potentially help increase mobility for some of the transport poor (researcher 2). The balance between these factors cannot be determined from the analysis in this thesis and therefore requires more research.

On the other hand, if the design of the accessibility sufficiency threshold helps redistribute land uses and decreases proximity it could improve accessibility also for the transport poor. This suggest a need to include land use in the design of a threshold. The proposed accessibility thresholds are different than the accessibility threshold found on the provincial level, one including land use, the other relative between transport modes. The relative threshold increases access with the bike, a slow mode, which would suggest that the proximity of services is decreased to cycling distances.

## 4.5.2 Advantages of accessibility sufficiency thresholds for transport poverty

Several advantages for transport poverty of the proposed accessibility threshold were discussed. Firstly, both researchers indicate there to be a relationship between accessibility thresholds and transport poverty. It impacts one of the TPRI variables, the *transport options* variable (researcher 2). Additionally, it can change the problem perspective, from congestion and efficiency oriented towards accessible services (researchers). This means it helps people to reach destinations. Researcher 1 also discussed a connection between travel time and travel costs. An increased travel time indicates a higher travel cost. If an accessibility threshold decreases travel times, this would suggest lower travel costs. One policymaker in the focus group, discussed opportunity to chances as a main advantage. The possibility

to allocating funds towards areas where the chances to opportunities are lower could (potentially) decrease unequal chances.

### 4.5.3 Disadvantages of accessibility sufficiency thresholds for transport poverty

Some limits of the accessibility sufficiency thresholds were discussed. Transport poverty is more than a spatial issue (focus group, researcher 2). Therefore, only solving the spatial aspect will not solve transport poverty. For instance, some cannot ride a bike or do not understand Dutch. A better network does not solve this. This is in line with findings by Pot et al. (2023). One of the researchers, therefore, indicated it should be a broad welfare approach, suggesting a policy package. Another limit discussed, is that national thresholds do not consider local problems and therefore do not solve them (focus group). Lastly, the focus group discussed that aiming to high might decrease the reliability of the public transport system if it is not sustainable in the long run. This potentially could hurt available public transport, changing a situation, impacting people's accessibility.

One argument which was not discussed in the focus groups and interviews but was found in literature is that creating relative threshold of a maximum difference, like between least and most fortunate, does not ensure a sufficient accessibility for everyone (Martens et al., 2022). The threshold proposed in the group was a relative threshold between modes and is therefore dependent on accessibility of the most dominant mode.

# 5. Conclusion

The question researched in this thesis is

*What would be the advantages and disadvantages for transport poverty of institutionalizing accessibility sufficiency thresholds for employment and education in Dutch planning policy?*

The findings suggest that institutionalising accessibility sufficiency thresholds in Dutch planning policy are unlikely to solve transport poverty in its entirety, due the multi-disciplinary nature of the problem. Transport poverty is not only spatial disadvantage, but also social disadvantage. Therefore, to align the solution with the problem, the solution cannot only be spatial. Rather a policy package including non-spatial instruments would be required, like a broad welfare approach. This is not to say that there is no relation between accessibility sufficiency thresholds and transport poverty. Depending on the design of a threshold land uses or access to transport options could be redistributed. If such an instrument is institutionalised, care in the design should be given to the proximity of land uses. As increased mobility for some can lead to decreased mobility for others, due to medium and long-term effects.

The findings illustrate that a start has been made within the case to systematically measure transport poverty through the transport poverty risk indicator (TPRI). However, the view on the situation remains limited due to the limitations of the TPRI, like the weight of the variables, included variables of proximity and whether the risk aligns with perceived (or experienced) accessibility. In some policy documents, there was evidence found of difficulty to reach employment and/or education. Deliberation during the focus group suggests that transport poverty can be sparked when a change in situation occurs, like when a service or bus stop disappears. A change in situation combined with the current housing crisis restricting relocation options is suspected to play a role in the occurrence of transport poverty.

Within the case, several aims towards minimum accessibility levels were found. On a regional level a threshold was found which aims for access to a public transport option in each village on the main land. Additionally, on a municipal level, thresholds were found that determine which services are considered necessary in each village. This suggests that within current accessibility aims the threshold is often geographical, like a village, rather than temporal, like 15 minutes. Additionally, as illustrated in the provincial threshold it indicates that thresholds do not always include land uses. However, it is also consistent the provincial responsibility for the public transport (concessions).

Including land use in accessibility aims is perceived as difficult due to a lack of control, in particular concerning locations for employment. Other discussed disadvantages include, amongst others, potentially restricting the planning system, lack of consideration to individual (perceptions of) accessibility and potential disadvantages for the quality and variety of available services. The most prominently discussed advantages include reallocating government funds towards places where service accessibility is a problem, making accessibility measurable, increase awareness amongst policymakers and reduce transport inequality. The advantages and disadvantages differed based on the threshold design and location of implementation. However, there was an overall agreement that thresholds should be differentiated, based on density, regions or both.

## 5.1 Recommendations for future research

Future research, should first and foremost increase the understanding of transport poverty in the case. In-depth research into perceived accessibility has potential to improve the view of the situation as well as the (weights of the variables within) the TPRI. Additionally, another potential research path could investigate the role of a policy package to reduce transport poverty. Particularly considering short and long-term measures and effects. The scope of the thesis prevented a deeper understanding of the underlying accessibility measures in place (on a national level) in the Dutch context. Therefore, another recommendation is to investigate underlying accessibility measures in the Dutch context because of their influence on conclusions which are drawn and subsequent allocation of government funds. Finally, the answers for the prescriptive sub-research questions have been based on a low number of participants (two researchers and five policymakers) it is therefore recommended to have more focus group discussion to increase reliability of the findings. A potentially interesting addition to a focus group could be to include policymakers from the social domain, to include a view on affordability. Another, interesting path could be to use the approach by Martens (2017) to discover views on what is considered sufficient accessibility.

# 6. Reflection

## 6.1 Reflection on process

Overall, the process of writing this thesis went well. The topic is currently relevant and has been much discussed in research and politics over the past few months. This helped with a willingness of participants to cooperate, which has benefitted the ability to finish this thesis. In particular the conversations with researchers have helped gain a new perspective on the studied literature. Another aspect which benefitted the process was the choice for a policy document analysis. Conducting the policy document analysis was not only useful for the data required, but is also a reliable method useful for research with a tight schedule.

There were also moments that did not go well. Those moments often occurred due to uncertainties, some of which could have been prevented by better risk management. An example of the occurrence of an uncertainty occurred the day before the focus group when one of the participants cancelled. Initially eight participants had been invited. This cancellation led to the total number of participants to come down to five, one participant lower than the advised minimum amount (Hennink et al., 2020; Stewart et al., 2007). Better risk management could have prevented this low number of participants, by inviting more participants. In hindsight worries concerning the location did not have to postpone the invitations to participants of the focus group. This knowledge could have helped to (better) stick to the time planning.

Qualitative methods are prone to subjectivity; therefore, a researcher must be reflective (Hennink et al., 2020). During the data analysis, the subjective nature of qualitative research created doubt during interpretation of the data. In particular during the operationalization of transport poverty. What does the inability to reach a destination mean? Is that only when a person decides not to go? Or does it also include if a person decides to cycle for one and a half hour? I suspect that different researchers will have different answers to these questions. I personally consider experiencing a hinder to reach destinations to be a part of transport poverty, where these hinders creates degrees of transport poverty.

## 6.2 Reflection on outcomes

The outcomes are consistent with the majority of the existing literature and the number of policies analysed suggests knowledge on the accessibility aims is proficient. Additionally, the interactive nature of the focus group provided many insights into land uses and transport interaction. This is consistent with the main advantage of focus group discussions to provide substantial amounts of information in short time frames (Hennink et al., 2020). However, focus groups can make the information more superficial, which is also the case for this thesis. In particular the understanding of perceived transport poverty is seen as a limit in this research, as well as the few participant views which underlie the answers to the prescriptive sub-research questions.

The subjective nature of qualitative research has its limits, particularly as the coding was conducted by one person with an own normative view. To provide reflection, quotations and their codes were recoded after the first round. Another limit is the quantitative depiction of the policy document findings, which skew the depiction towards longer documents due to the different length and number of policy documents per municipality. Some of the policy documents were older than others (the oldest from 2003), this means the situation of transport poverty could have changed majorly.

# 7. References

Akse, R., Thomas, T., & Geurs, K. (2021). Mobility and accessibility paradigms in Dutch policies: An empirical analysis. *Journal of Transport and Land Use*, 14(1), 1317–1340.

Allen, J. & Farber, S. (2020). Planning transport for social inclusion: An accessibility-activity participation approach. *Transportation Research Part D: Transport and Environment*, 78, 102212.

ANNO (2020). Mobiliteitsvisie voor Noordoost Fryslân.

Arranz-López, A., Soria-Lara, J.A. & Pueyo-Campos, Á. (2019). Social and spatial equity effects of non-motorised accessibility to retail. *Cities*, 86, 71–82.

Atzema, O., Rietbergen, van T., Lambooy, J. & van Hoof, S. (2014). *Dynamics in Economic Georgraphy*. 1st English language Edition. Bussum: Coutinho.

Anderson, E., Janssen, H., Ham, van M. & Malmberg, B. (2023). Contextual poverty and obtained education level and income in Sweden and the Netherlands: A multi-scale and longitudinal study. *Urban studies,* 60(5), 885-903.

Awaworyi Churchill, S. & Smyth, R. (2019). Transport poverty and subjective wellbeing. *Transportation Research Part A: Policy and Practice*, 124, 40–54.

Bastiaanssen, J. (2012). *Verkeersarmoede op Zuid; Een verkennend onderzoek naar de mate waarin verplaatsingsmogelijkheden van invloed zijn op de arbeidsre-integratie van werklozen*. Radboud Universiteit Nijmegen.

Bastiaanssen, J. & Breedijk, M. (2022). *Toegang voor iedereen?*. 4932. Den Haag: Planbureau voor de Leefomgeving.

Bastiaanssen, J., Donkers, H. & Martens, K. (2013). Sociale uitsluiting door gebrek aan vervoersmogelijkheden. *Geografie.*

Bastiaanssen, J., Johnson, D. & Lucas, K. (2020). Does transport help people to gain employment? A systematic review and meta-analysis of the empirical evidence. *Transport Reviews*, 40(5), 607–628.

Berry, A., Jouffe, Y., Coulombel, N. & Guivarch, C. (2016). Investigating fuel poverty in the transport sector: Toward a composite indicator of vulnerability. *Energy Research & Social Science*, 18, 7–20.

Bertolini, L., le Clercq, F., & Kapoen, L. (2005). Sustainable accessibility: A conceptual framework to integrate transport and land use plan-making. Two test-applications in the Netherlands and a reflection on the way forward. *Transport Policy*, 12(3), 207–220.

Bowen, G.A. (2009). Document Analysis as a Qualitative Research Method. *Qualitative Research Journal*, 9(2), 27–40.

[CBS] Centraal Bureau voor de Statestiek. (2022). *Gebrek aan vervoersmogelijkheden voor 1 op de 12 Fryske huishoudens*. Retrieved on December 5, 2022 from https://www.cbs.nl/nl-nl/nieuws/2022/49/gebrek-aan-vervoersmogelijkheden-voor-1-op-de-12-fryske-huishoudens

[CBS] Centraal Bureau voor de Statistiek. (2019). *Ontwikkeling openbaar vervoer verses autokosten*. Retrieved on August 16, 2023 from https://www.cbs.nl/nl-nl/maatwerk/2019/36/ontwikkeling-openbaar-vervoer-versus autokosten#:~:text=De%20prijzen%20van%20het%20openbaar,lagen%20gemiddeld%20een%20kwart%20hoger.

[CBS] Centraal Bureau voor de Statistiek. (2023). *Spanning op de arbeidsmarkt*. Retrieved on March 12, 2023 from https://www.cbs.nl/item

Curtis, C. & Scheurer, J. (2010). Planning for sustainable accessibility: Developing tools to aid discussion and decision-making. *Progress in Planning*, 74(2), 53–106.

Delbosc, A. & Currie, G. (2011). Using Lorenz curves to assess public transport equity. *Journal of Transport Geography*, 19(6), 1252–1259.

Ettema, D. & Nieuwenhuis, R. (2017). Residential self-selection and travel behaviour: What are the effects of attitudes, reasons for location choice and the built environment?. *Journal of Transport Geography*, 59, 146-155.

Fainstein, S.S. (2014). The just city. *International Journal of Urban Sciences*, 28(1), 1-18.

Fernandes, C. de M., Mulder-Wu, S. & Dekker, M. (2022). *Ferfiersearmoed YN Fryslân: WA en WêR?*. DataFriesland.

Fischer, F., & Miller, G. J. (2006). *Handbook of Public Policy Analysis: Theory, Politics, and Methods*. Baton Rouge: Taylor & Francis Group.

Flyvbjerg, B. (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry*, 12(2), 219–245.

Gemeente Achtkarspelen (2021). Omgevingsvisie.

Gemeente Ameland (2022). Vervoersvisie Ameland concept.

Gemeente Ameland (2011). Structuurvisie.

Gemeente Dantumadiel (2010). Structuurvisie.

Gemeente De Fryske Marren (2015). Gemeentelijk Verkeers- en Vervoersplan De Fryske Marren.

Gemeente De Fryske Marren (2022). Omgevingsvisie.

Gemeente Harlingen (2020). Mobiliteitsvisie Harlingen versie 2.0 CONCEPT.

Gemeente Harlingen (2012). Structuurvisie Gemeente Harlingen 2025 *Stadsvisie Deel 2.*

Gemeente Heerenveen (2017). Gemeentelijk Verkeers- en Vervoersplan.

Gemeente Leeuwarden (2003). Gemeentelijk Verkeers- en Vervoersplan.

Gemeente Leeuwarden (2021). Omgevingsvisie.

Gemeente Noardeast-Fryslân (2021). Uitgangspuntennotitie omgevingsvisie.

Gemeente Ooststellingwerf (2013). Gemeentelijk Verkeers- en Vervoersplan.

Gemeente Opsterland (2010). Gemeentelijk Verkeers- en Vervoersplan.

Gemeente Opsterland (2022). Omgevingsvisie.

Gemeente Schiermonnikoog (NA). Structuurplan.

Gemeente Smallingerland (2013). Gemeentelijk Verkeers- en Vervoersplan.

Gemeente Smallingerland (2020). Omgevingsvisie.

Gemeente Súdwest-Fryslân (2021). Omgevingsvisie 1.0.

Gemeente Tytsjerksteradiel (2021). Ontwerp Omgevingsvisie Tytsjerksteradiel.

Gemeente Vlieland (2022). Omgevingsvisie.

Gemeente Waadhoeke (2021). Mobiliteitsvisie Waadhoeke.

Gemeente Weststellingwerf (2019). Omgevingsvisie Weststellingwerf – Ruimte voor kwaliteit.

Geurs, K.T. (2018). *Transport Planning With Accessibility Indices in the Netherlands*. Vol. 2018/09. Organisation for Economic Co-operation and Development (OECD), International Transport Forum, Paris.

Geurs, K.T. & Wee, van B. (2004). Accessibility evaluation of land-use and transport strategies: Review and research directions. *Journal of Transport Geography*, 12(2), 127–140.

Geurs, K.T. & Eck, van J. (2001). *Accessibility measures: Review and applications. Evaluation of accessibility impacts of land-use transportation scenarios, and related social and economic impact*. RIVM report 408505006. Urban Research Center, Utrecht Univerisity.

Gurp, van T. (2023). Reizigers boos over prijsverhoging van NS: Reizen wordt voor sommige onbetaalbaar. Retrieve on 21 August, 2023 from https://www.nu.nl/economie/6276593/reizigers-boos-over-prijsverhoging-ns-trein-wordt-voor-sommigen-onbetaalbaar.html

Hamersma, M., Moorman, S., 't Hoen, A. & Arendsen, K. (2023). *Op weg naar bereikbaarheidsdoelen in mobiliteitsbeleid, Achtergrondnotitie*. Den Haag: Kennisinstituut voor Mobiliteitsbeleid (KiM).

Handy, S.L. (2002). *Accessibility- vs. Mobility-Enhancing Strategies for Addressing Automobile Dependence in the U.S.* UC Davis: Institute for Transportation Studies.

Hennink, M. M., Hutter, I., & Bailey, A. (2020). *Qualitative research methods*. 2nd edition. SAGE Publications.

[IPCC] Intergovernmental Panel on Climate Change (2023). Summary for Policymakers. In: *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (1-34). Geneva, Switzerland; IPCC.

Jorritsma, P., Berveling, J., de Haas, M., Bakker, P. & Harms, L. (2018). *Mobiliteitsarmoede: Vaag begrip of concreet probleem?*. Den Haag: Kennisinstituut voor Mobiliteitsbeleid (KiM).

Kampert, A., Nijenhuis, J., Nijland, H., Uitbeijerse, G. & Verhoeve, M. (2019). *Indicator risico op vervoersarmoede—Inzicht op buurtniveau*. Den Haag: Centraal bureau voor de Statestiek (CBS).

Karlström, A. & Franklin, J. P. (2009). Behavioral adjustments and equity effects of congestion pricing: Analysis of morning commutes during the Stockholm Trial. *Transportation Research Part A: Policy and Practice*, 43(3), 283–296.

Kaufmann, V., Bergman, M. M. & Joye, D. (2004). Motility: Mobility as capital. *International Journal of Urban and Regional Research*, 28(4), 745–756.

Kelly, J. A., Kelleher, L., Guo, Y., Deegan, C., & Patil, A. (2023). Transport poverty risk − A composite spatial index to support policy design and investment targeting as part of a just climate transition. *Environmental and Sustainability Indicators*, 18, 100254.

Lancée, S., Veenhoven, R., & Burger, M. (2017). Mood during commute in the Netherlands: What way of travel feels best for what kind of people? *Transportation Research Part A: Policy and Practice*, 104, 195–208.

Levine, J., Grengs, J. & Merlin, L. A. (2019). 2. Evolution of the Accessibility Concept. In *2. Evolution of the Accessibility Concept* (pp. 35–46). Ithaca: Cornell University Press.

Lowans, C., Furszyfer Del Rio, D., Sovacool, B. K., Rooney, D. & Foley, A. M. (2021). What is the state of the art in energy and transport poverty metrics? A critical and comprehensive review. *Energy Economics*, 101, 105360.

Lucas, K. (2012). Transport and social exclusion: Where are we now?. *Transport Policy*, 20, 105–113.

Lucas, K. (2019). A new evolution for transport-related social exclusion research? *Journal of Transport Geography*, *81*, 102529.

Lucas, K., Mattioli, G., Verlinghieri, E. & Guzman, A. (2016a). Transport poverty and its adverse social consequences. *Proceedings of the Institution of Civil Engineers - Transport*, 169(6), 353–365.

Lucas, K., Wee, B., van & Maat, K. (2016b). A method to evaluate equitable accessibility: Combining ethical theories and accessibility-based approaches. *Transportation*, 43(3), 473–490.

Martens, K. (2013). Role of the Bicycle in the Limitation of Transport Poverty in the Netherlands. *Transportation Research Record*, 2387(1), 20–25.

Martens, K. (2016). *Transport justice: Designing fair transportation systems*. 1st Edition. New York: Routledge.

Martens, K. & Bastiaanssen, J. (2014). *Een index om het risico op bereikbaarheidsarmoede te meten*. Eindhoven: Colloquium Vervoersplanologisch Speurwerk.

Martens, K., Singer, M.E. & Cohen-Zada, A.L. (2022). Equity in Accessibility: Moving From Disparity to Insufficiency Analyses. *Journal of the American Planning Association*, 88(4), 479–494.

Ministerie van Infrastructuur en Milieu (2021). Integrale Mobiliteitsanalyse 2021.

Neutens, T., Schwanen, T., Witlox, F. & De Maeyer, P. (2010). Equity of Urban Service Delivery: A Comparison of Different Accessibility Measures. *Environment and Planning A: Economy and Space*, 42(7), 1613–1635.

OECD (2022). *Economic & social outcomes*. Retrieved on August 21, 2023 from https://gpseducation.oecd.org/revieweducationpolicies/#!node=41761&filter=all

Pot, F.J., Koster, S., & Tillema, T. (2023). Perceived accessibility in Dutch rural areas: Bridging the gap with accessibility based on spatial data. *Transport Policy*, 138, 170–184.

Pot, F.J., Koster, S., Tillema, T. & Jorritsma, P. (2020). Linking experienced barriers during daily travel and transport poverty in peripheral rural areas: The case of Zeeland, the Netherlands. *European Journal of Transport and Infrastructure Research*, 20(3), 29-46.

Provincie Friesland (2020). Omgevingsvisie – De romte diele.

Provincie Friesland (2022). Regionaalmobiliteits Programma.

Punch, K.F. (2014). *Introduction to social research: Quantitative and qualitative approaches*. 3rd Edition.

SAGE Publications.

University of Groningen (2016). *Research Ethics Committee Faculty of Spatial Sciences*. Retrieved on February 12, 2023 from https://www.rug.nl/research/ursi/organization/research-ethics-committee

Rijksoverheid. (2022). *Plannen kabinet met betalen naar gebruik.* Retrieved on June 24, 2023 from https://www.rijksoverheid.nl/onderwerpen/belastingen-op-auto-en-motor/plannen-kabinet-met-betalen-naar-gebruik

Rijksoverheid. (2023). *Kabinet maakt werk van recht op bereikbaarheid voor elke Nederlander*. Retrieved on March 17, 2023 from https://www.rijksoverheid.nl/actueel/nieuws/2023/03/17/kabinet-maakt-werk-van-recht-op-bereikbaarheid-voor-elke-nederlander

[RLI] Raad voor de Leefomgeving en Infrastructuur. (2014). Influencing behaviour: more effective environmental policy through insight into human behaviour. ISBN 978-90-75445-00-8. Den Haag: RLI.

Santos, B., Antunes, A. & Miller, E. J. (2008). Integrating Equity Objectives in a Road Network Design Model. *Transportation Research Record: Journal of the Transportation Research Board*, 2089(1), 35–42.

Silva, C. & Larsson, A. (2019). Is there such a thing as good enough accessibility? *Transportation Research Procedia*, 41, 694–707.

Smart, M.J. & Klein, N.J. (2020). Disentangling the role of cars and transit in employment and labor earnings. *Transportation*, 47(3), 1275–1309.

Stationsweb (2009). *Station Hindeloopen*. Retrieved on August 8, 2023 from https://www.stationsweb.nl/afbeelding.asp?dir=hindeloopen&num=28

Stewart, D.W., Shamdasani, P.N. & Rook, D.W. (2007). *Focus groups: Theory and practice.* 2nd Edition. SAGE Publications.

Straatemeier, T. & Bertolini, L. (2020). How can planning for accessibility lead to more integrated transport and land-use strategies? Two examples from the Netherlands. *European Planning Studies*, 28(9), 1713–1734.

Tian, Q., Huang, H.-J., Yang, H. & Gao, Z. (2011). Efficiency and Equity of Ramp Control and Capacity Allocation Mechanisms in a Freeway Corridor. *Procedia - Social and Behavioral Sciences*, 17, 509–531.

van Geet, M. T., Busscher, T., Lenferink, S. & Arts, J. (2021). Finding the right tools for the job: Instrument mixes for land use and transport integration in the Netherlands. *Journal of Transport and Land Use*, 14(1), 125–149.

Wettenbank (2023). *Regeling tijdelijke wet ambulance zorg*. Retrieved on August 11, 2023 from https://wetten.overheid.nl/BWBR0032159/2020-07-01

Witte, J.J., Zijlstra, T. & Bakker, S. (2022). *Verklaringen voor de verschillen in autobezit bij Nederlandse huishoudens*. Den Haag: Kennisinstituut voor Mobiliteitsbeleid (KiM).

# Appendix 1 – Data Collection Techniques | List of Policy Documents

It was expected to analyse a total of 19 transport policy documents and 19 land-use policy documents, as there should be policies documents for each of the 18 municipalities and for the province. However, this is not the case as not all of the policy documents were available. Three island municipalities do not have transport policy documents; Terschelling, Vlieland and Schiermonnikoog. Two municipalities were working on a new transport policy document, this was the case for Municipality Westwellingwerf and Sudwest-Fryslan. The Municipalities Achtkarspelen, Dantumadiel, Noardeast-Fryslân and Tytsjerksteradiel all had old transport policies for the individual municipalities. These municipalities did have an overarching communal regional mobility vision which was used instead of the municipal transport policies. This regional mobility vision is also used for the development of the municipalities *omgevingsvisie* (ANNO, 2020). A new omgevingsvisie is developed for Waadhoeke and therefore cannot be included. Terschelling could not find a land use policy document. Ooststellingswerf did not have a land-use policy that could be downloaded and did not respond (on time) to a request for it.

| Institution | Policy Document[9] | Name | Dates | Pages |
|---|---|---|---|---|
| Province Friesland | Regionaal Mobiliteitsprogramma | Provincie Friesland (2022). | 2022-2050 | 90 |
| | Omgevingsvisie - De romte diele | Provincie Friesland (2020). | 2020 -2050 | 111 |
| Netwerk Noordoost (Region Noordoost Friesland; Municipalities Achtkarspelen, Dantumadiel, Noardeast-Fryslân en Tytsjerksteradiel, Wetterskip Fryslân en de provincie Fryslân) | Mobiliteitsvisie voor Noordoost Fryslân | ANNO (2020). | 2020-2030 | 28 |
| Municipality Achtkarspelen | | | | |
| | Omgevingsvisie | Gemeente Achtkarspelen (2021). | 2021-2040 | 18 |
| Municipality Ameland | Vervoersvisie Ameland concept | Gemeente Ameland (2022). | 2022-2040 | 32 |
| | Structuurvisie | Gemeente Ameland (2011). | 2011 -2021 | 78 |
| Municipality Dantumadiel | | | | |
| | Structuurvisie | Gemeente Dantumadiel (2010). | 2010-2020 | 96 |

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[9] Ordered per government institution, first the transport policy then the land use policy

| | | | | |
|---|---|---|---|---|
| Municipality De Fryske Marren | GVVP De Fryske Marren | Gemeente De Fryske Marren (2015). | 2015-? | 35 |
| | Omgevingsvisie | Gemeente De Fryske Marren (2022). | 2022-2030 | 77 |
| Municipality Harlingen | Mobiliteitsvisie Harlingen versie 2.0 CONCEPT | Gemeente Harlingen (2020). | 2020-2030 | 45 |
| | Structuurvisie Gemeente Harlingen 2025 *Stadsvisie Deel 2* | Gemeente Harlingen (2012). | 2012-2025 | 51 |
| Municipality Heerenveen | GVVP | Gemeente Heerenveen (2017) | 2017-2027 | 25 |
| | | | | |
| Municipality Leeuwarden | GVVP | Gemeente Leeuwarden (2003). | 2003-2023 | 96 |
| | Omgevingsvisie | Gemeente Leeuwarden (2021). | 2021-2028 | 60 |
| Municipality Noardeast-Fryslân | | | | |
| | Uitgangspuntennotitie omgevingsvisie | Gemeente Noardeast-Fryslân (2021). | 2021 -? | 32 |
| Municipality Ooststellingwerf | GVVP | Gemeente Ooststellingwerf (2013). | 2013-2018 | 87 |
| | | | | |
| Municipality Opsterland | GVVP | Gemeente Opsterland (2010). | 2010- | 65 |
| | Omgevingsvisie | Gemeente Opsterland (2022). | 2022-2030 | 56 |
| Municipality Schiermonnikoog | | | | |
| | Structuurplan | Gemeente Schiermonnikoog (NA). | | 58 |
| Municipality Smallingerland | GVVP | Gemeente Smallingerland (2013). | 2013-? | 62 |
| | Omgevingsvisie | Gemeente Smallingerland (2020). | 2020-2040 | 84 |
| Municipality Súdwest-Fryslân | | | | |

| | | | | |
|---|---|---|---|---|
| | Omgevingsvisie 1.0 | Gemeente Súdwest-Fryslân (2021). | 2021-? | 92 |
| Municipality Terschelling | | | | |
| | | | | |
| Municipality Tytsjerksteradiel | | | | |
| | Ontwerp Omgevingsvisie Tytsjerksteradiel | Gemeente Tytsjerksteradiel (2021). | 2021-2040 | 19 |
| Municipality Vlieland | | | | |
| | Omgevingsvisie | Gemeente Vlieland (2022). | 2022- 2050 | 55 |
| Municipality Waadhoeke | Mobiliteitsvisie Waadhoeke | Gemeente Waadhoeke (2021). | 2021 – 2026 | 71 |
| | | | | |
| Municipality Weststellingwerf | | | | |
| | Omgevingsvisie Weststellingwerf – Ruimte voor kwaliteit | Gemeente Weststellingwerf (2019). | 2019-? | 74 |

Replaced with the regional mobility vision by the region Noordoost friesland. The municipal documents seemed inactive, either were not found (Municipality Dantumadiel) or to old (Municipalities Achtkarspelen, Noardeast-Fryslân en Tytsjerksteradiel).

Not found, either developing a new one (Municipality Waadhoeke, Weststellingwerf) or could not find one in general (Municipality Schiermonnikoog, Terschelling, Vlieland).

Unable to download and therefore unable to put into Atlas.ti

# Appendix 2 – Data Collection Techniques | Interviews with researchers | Interview guide

## 2.1 Interview guide 1

### Before interview

- Thank researcher.
- Introduce myself and my topic
  - o For EIP. RQ; What would be the advantages and disadvantages for Transport Poverty of institutionalizing accessibility sufficiency thresholds in Dutch planning policy?
- Discuss consent form
  - o Say it is voluntary, can stop at any moment
  - o Is to ok to name you in my research?
  - o Data will be stored on a password protected computer, will be deleted after the completion of my thesis.
  - o Ask to record. Start recording.
  - o Do you have any remaining questions around the consent form?

### Interview questions

1. ███████████████████████████████████████████████████████████
   ████████████████████?
2. ███████████████████████████████████████████████████████████
   ███████████████████████████████████████████?
   a. Is er uitgezocht op welke plek dit het beste gedaan kan worden? Wat kwam daaruit?
3. Heeft u een voorstel wat een goede normering van minimale bereikbaarheid zou zijn?
4. Wat zouden volgens u voordelen zijn van het invoeren van normeringen voor minimale bereikbaarheid in Nederlands beleid?
5. Wat zouden volgens u de nadelen zijn van het invoeren van normeringen voor minimale bereikbaarheid in Nederlands beleid?
6. Heeft u verder nog dingen die u zou willen toevoegen die we nog niet besproken hebben?

### After interview

- Short summary of the main messages I gained
- Thank again
- Would you like to receive a summary of the findings when it is done?
- Could you send a filled in consent form?

## 2.2 Interview guide 2

### Before interview

- Thank researcher for taking the time.
- Introduce myself and my topic
  - o For EIP. RQ; What would be the advantages and disadvantages for Transport Poverty of institutionalizing accessibility sufficiency thresholds in Dutch planning policy?
- Discuss consent form
  - o Say it is voluntary, can stop at any moment
  - o Is to ok to name you in my research?
  - o Data will be stored on a password protected computer, will be deleted after the completion of my thesis.
  - o Ask to record. Start recording.
  - o Do you have any remaining questions around the consent form?

## Interview questions
1. Wat is volgens u vervoersarmoede en waarom heeft u dit onderzocht?
2. Is er volgens u een goed beeld bij de situatie van vervoersarmoede in Friesland? Zo nee, Wat is er nog nodig om dit wel te krijgen?
   a. Voldoende data?
3. Zijn alle elementen van de indicator voor risico op vervoersarmoede goed onderbouwd?
4. ███████████████████████████████████████████████████████████ ?
   a. Waarom wel, waarom niet?
   b. Wat is de relatie tussen werk en vervoersarmoede?
5. U bent bekend met het rapport van het PBL, heeft u tijdens uw onderzoek ook aan normeringen voor minimale bereikbaarheid gedacht toen u hiermee bezig was?
   a. Zo ja; wat voor? Zo nee, waarom niet?
6. Heeft u een voorstel wat een goede normering van minimale bereikbaarheid zou zijn die toegevoegde waarde zou hebben voor vervoersarmoede?
7. Wat zouden volgens u voordelen zijn van het invoeren van normeringen voor minimale bereikbaarheid in Nederlands beleid?
   a. Zijn er voordelen voor vervoersarmoede?
8. Wat zouden volgens u de nadelen zijn van het invoeren van normeringen voor minimale bereikbaarheid in Nederlands beleid?
   a. Zijn er nadelen voor vervoersarmoede?
9. Heeft verder nog dingen die u zou willen toevoegen?

## After interview
- Short summary of the main messages I gained
- Thank again
- Would you like to receive a summary of the findings when it is done?
- Could you send a filled in consent form?

# Appendix 3 – Selection of municipalities for focus group participation

| Municipality | Both Policy documents available?* | Percentage Transport Poverty Risk** | Category Transport Poverty Risk (TPR) | Neighbourhood with top 10 high TPR or top 20 | Interesting quotes? | Quote |
|---|---|---|---|---|---|---|
| Gemeente Achtkarspelen | Yes | 6.1 | Low | | Yes*** | *"We also want our residents to have good access to necessary facilities. In each village we provide access to a primary school, meeting place or sports location"* (Gemeente Achtkarspelen, Omgevingsvisie, p. 14) |
| Gemeente Ameland | Yes | 1.4 | Low | | | |
| Gemeente Dantumadiel | No, one | 6.8 | Low | | Yes*** | |
| Gemeente De Fryske Marren | Yes | 5.9 | Low | | | |
| Gemeente Harlingen | Yes | 13.9 | High | Top 20 | | |
| Gemeente Heerenveen | No, one | 10.7 | High | | | |
| Gemeente Leeuwarden | Yes | 7.7 | Middle | Top 10 | Yes | *"We are working on a city with good facilities in the broadest sense of the word, from shops to parks, from schools to medical facilities, from catering to sports facilities. And as much as possible within fifteen minutes accessible to our residents"* (Gemeente Leeuwarden, Omgevingsvisie, p.31) |
| Gemeente Noardeast-Fryslan | Yes | 6.9 | Low | Top 10 | Yes*** | *"The tension between proximity on the one hand and quality on the other is interpreted differently by different parties (residents, experience experts, experts) and for different facilities."* (Gemeente Noardeast-Fryslan, Omgevingsvisie, p.9) |
| Gemeente Oosstellingwef | No, one | 11.3 | High | Top 10 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Gemeente Opsterland | Yes | 8.4 | Middle | Top 10 | | *"We want to keep the basic facilities (accessible) in every village."* (Gemeente Opsterland, Omgevingsvisie, p.9) |
| Gemeente Schiermonninkoog | No, one | 2.6 | Low | | | |
| Gemeente Smallingerland | Yes | 11.2 | High | Top 10 | | |
| Gemeente Sudwest-Fryslan | No, one | 8.2 | Middle | Top 20 | | |
| Gemeente Terschelling | No, neither | 4.8 | Low | | | |
| Gemeente Tytsjerksteradiel | Yes | 9.9 | High | Top 10 | Yes*** | |
| Gemeente Vlieland | No, one | 2.9 | Low | | | |
| Gemeente Waadhoeke | No, one | 7.7 | Middle | Top 10 | | |
| Gemeente Weststellingwerf | No, one | 8.9 | Middle | Top 10 | Yes | *"In Noordwolde, for example, labour mobility is a clear theme. There is a lack of opportunities to work in the region. Attention to routes to work is therefore necessary."* (Gemeente Weststellingwerf, Omgevingsvisie, p.47) |

*The regional transport policy document (ANNO) was counted as a policy document for Achtkarspelen, Dantumadiel, Noardeast-Fryslan and Tytsjerksteradiel.

** Percentage of population within the municipality with high to very high risk of transport poverty. Based on Fernandes et al. (2022)

***The regional transport policy document (ANNO) had an interesting quote and was counted for Achtkarspelen, Dantumadiel, Noardeast-Fryslan and Tytsjerksteradiel. The interesting quote is the following: "*In our region, it happens that students choose a different study and school than they actually want to go, because of the travel distance and possibilities*" (ANNO, 2020, p.11)

# Appendix 4 – Data Collection Techniques | Focus group | Participant Characteristics

| Land-Use or Transport planner | Government Institution | Length of work experience in current position |
|---|---|---|
| Land-use Planner | Provincie Fryslan | 29 years |
| Transport Planner | Gemeente Harlingen | 0.5 years in current position (5.5 years in similar position but at another place) |
| Land-use Planner | Municipality, to ensure anonymity institution remains unnamed | 1 year |
| Transport planner | Gemeente Noardeast Fryslan | 15 years |
| Transport planner | Gemeente Opsterland | 1 year 10 months |

# Appendix 5 – Data Collection Techniques | Focus group | Discussion Guide

Bring to the focus group:
- Name cards
- Print out of the figure of a relative and an absolute threshold (on separate papers) two types of accessibility thresholds + pens for thoughts write down
- Discussion guide print out for myself.

### Intro

Introduce myself (if physical, do a coffee/ tea round/ how was every ones travel there)

Introduce topic

Ask permission to record.

Can leave at any moment if they want. Will take 1,5 hours. 10-minute break in between? I will write some notes in between, I am paying attention though.

### Opening question

Everyone;
- Wat is uw naam, functie, werkduur, provincie of gemeente en hoe ben je hier vandaag gekomen?

### Warming-up questions

1. Ik kwam deze quote tegen; "*In onze regio gebeurt het dat scholieren voor een andere studie en school kiezen dan ze eigenlijk heen willen, vanwege de reisafstand en mogelijkheden*." (ANNO, 2020, p.11) Is dit iets wat jullie herkennen in jullie gemeentes?
- Waar herkent u dit aan?
- Ziet u dit bij bepaalde doelgroepen of in bepaalde gebieden?

2. Komt dit ook voor bij het bereiken van banen?
- Waar herkent u dit aan?
- Ziet u dit bij bepaalde doelgroepen of in bepaalde gebieden?

3. Het Regionaal mobiliteitsprogramma van de provincie noemt dat er een basisniveau van bereikbaarheid in de landelijke gebieden belangrijk is. Hoe interpreteren jullie dit basisniveau?

### Transition question

4. Nu we besproken hebben of het gebeurd dat mensen banen of educatie niet kunnen bereiken; is het een probleem als mensen ergens niet kunnen komen?
- Zit daar een verschil in doelgroepen in? Is het voorbepaalde doelgroepen erger om langer te reizen?

5. Nu we besproken hebben of jullie dit (vervoersarmoede) als een probleem zien, welke overheid laag heeft de verantwoordelijkheid om hier wat aan te doen?
- *Welk beleidsdomein?*

6. Wat zouden een voor en nadelen zijn van een nationaal vastgestelde doel voor minimale bereikbaarheid?

7. Wat zouden voor- en nadelen zijn van een lokaal vastgestelde doel voor minimale bereikbaarheid?

<u>Key questions</u>
absolute

8. Stel er zou een minimumwaarde zijn voor bereikbaarheid, bijvoorbeeld je moet scholen (basis, middelbare en hogere school) binnen N minuten bereiken, bijvoorbeeld 45 minuten of 20 minuten.
- Wat zouden daar voor- en nadelen van kunnen zijn?
- Helpt dit met het probleem op lossen waar we het in het begin over hadden?

9. Stel je zou ditzelfde voor banen doen, dat je binnen N minuten N-banen moet kunnen bereiken.
- Wat zouden daar voor- en nadelen van kunnen zijn?
- Zou dit het probleem op lossen waar we het in het begin over hadden?

<span style="color:red">5 minute break</span>

relative

10. Stel we zouden een minimumwaarde voorstellen, bijvoorbeeld dat je met het ov of de fiets er minimaal N keer zo lang over je reis mag doen als met de auto. Bijvoorbeeld als N twee is en het duurt een half uur met de auto dan mag je maximaal 1 uur doen over je reis met de fiets of het ov.
- Wat zouden daar een voor- en nadelen van kunnen zijn?
- Zou dit aan een bepaalde bestemming gekoppeld moeten zijn? Of een bepaalde groep?[10]
- Zou dit het probleem op lossen waar we het in het begin over hadden?

11. Bereikbaarheid gaat over individuele factoren, locaties die je wil bereiken, wanneer het OV gaat en de vervoersmogelijkheden. Welke onderdelen hiervan zouden we in een basisniveau voor bereikbaarheid moeten hebben?[11]

<u>Closing questions</u>
12. Wat is voor u het belangrijkste wat we besproken hebben vandaag?

Next steps research:
- Thank you for participating!
- Who would like to receive the main findings of the thesis?
- I will email to ask for the use of quotes.

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[10] Question had to be skipped due to time constraints
[11] Question had to be skipped due to time constraints

# Appendix 6 - Coding

## 6.1 Policy documents

| CODE GROUP | CODE | DESCRIPTION | INDUCTIVE/ DEDUCTIVE |
|---|---|---|---|
| Accessibility | Accessibility definition | Explicit definition of spatial accessibility [bereikbaarheid, toegankelijkheid] | Deductive |
| | Accessibility definition component – Transport | the transport system (Geurs & van Eck, 2001) | Deductive |
| | Accessibility definition component – Land Use | the supply of (activities and) services spatially distributed 2) the demand for these services at the origin locations 3) the interaction between the supply and demand and how this effects competition. (Geurs & van Wee, 2004) | Deductive |
| | Accessibility definition component – Temporal | user's restrictions in terms of time for their desired activity patterns, this includes whether activities and transport opportunities are available the time they would like to use it (Geurs & van Eck, 2001) | Deductive |
| | Accessibility definition component – Individual | concerns individual transport users desires, competences and opportunities (Curtis & Scheurer, 2010) | Deductive |
| | Accessibility aim | Aims for spatial accessibility<br><br>Can be relative or absolute, SMART or open | Deductive |
| | Accessibility aim – SMART | Specific, Measurable, Achievable, Relevant and Time-bound (Hamersma et al., 2023) | Deductive |
| | Accessibility aim – Abstract | Not SMART but vague/ open (Hamersma et al., 2023) | Deductive |

| | | | |
|---|---|---|---|
| | Accessibility aim – Relative | An aim which is connected to the current situation (example; improved accessibility) (Hamersma et al., 2023) | Deductive |
| | Accessibility aim – Absolute | An aim which is connected to a certain level (example; good accessibility) (Hamersma et al., 2023) | Deductive |
| | Accessibility sufficiency Threshold | If a minimum or maximum is accessibility (reaching destinations) is defined. For instance, accessibility thresholds in width of pavements were excluded.<br><br>Can be within a location (like a village) or within a time frame (like 40 minutes). Minimum level of facilities without mention of a time frame or location was coded as an accessibility aim, rather than a threshold. Despite the knowledge that a municipal document of course has a spatial boundary (the municipality).<br><br>Can concern a land use or a transport mode | Deductive |
| | Accessibility measure | When the method used to measure accessibility is mentioned. | Inductive |
| | Accessibility to education | Access to schools [basisschool, middelbareschool, hbo, wo] | Inductive |
| | Accessibility to work | Access to employment locations [bedrijventerrein, werk] | Inductive |
| | Responsibility | Which institution is responsible for providing accessibility | Inductive |
| Transport poverty | Transport poverty | Hinder was also taken as an inability to reach desired destinations<br><br>If it was coded as one of the three sub-concepts (mobility poverty, accessibility poverty or transport affordability)<br><br>In a decrease in accessibility is discussed but the cause is not mentioned | Concept deductive; operationalization inductive |

| | | | |
|---|---|---|---|
| | | | |
| | Mobility poverty | Lack of transport options which makes moving from place A to B difficult<br><br>Limited access to the transport option (access to the stop for instance)<br><br>Limited available transport options (only possible to bike, bad connection, no parking spaces) | Concept deductive; operationalization inductive |
| | Accessibility poverty | Difficulty of reaching key activities at reasonable time, ease and cost<br><br>Decrease in available key activities (expected to make an increase in travel time to key activities)<br><br>Description of lack of opportunity to access a key activity (education, employment) | Concept deductive; operationalization inductive |
| | Transport affordability | Lack of personal or household resources to afford transport options<br><br>Pressure on the affordability of public transport<br><br>Difficulty to afford certain transport options | Concept deductive; operationalization inductive |

| | Transport poverty group | The part of the population experiencing transport poverty. This includes when a measure is mentioned to reduce the risk of transport poverty for a certain group. | Inductive |
|---|---|---|---|
| | Transport poverty definition | Explicit definition in the policy document of transport poverty or one of its sub-concepts | Inductive |

## 6.2 Interviews and focus group

| CODE GROUP | CODE | INDUCTIVE/ DEDUCTIVE |
|---|---|---|
| Advantages | For planning | Inductive |
| | For transport poverty | Inductive |
| Disadvantages | For planning | Inductive |
| | For transport poverty | Inductive |
| Transport poverty | Signals of transport poverty | Inductive |
| | Problem perspective | Inductive |
| | Needs to understand transport poverty better | Inductive |
| | TPRI | Deductive |
| Threshold design | Relative threshold | Deductive |
| | Absolute threshold education | Deductive |
| | Absolute threshold employment | Deductive |
| Where | National | Inductive |
| | local | Inductive |
| Justice perspective | Utilitarian | Deductive |
| | Sufficientarian | Deductive |

# Appendix 7 – Information Sheet and Agreement to Participate

## 7.1 Information sheet – Research Ethics Committee (REC)

<u>Research project</u>: Master Thesis
<u>Title:</u> The advantages and disadvantages of institutionalising accessibility sufficiency thresholds for Transport Poverty in the Netherlands.
<u>Subtitle</u>: An explorative study.

Thank you very much for taking the time to consider getting involved in my research project.

### Topic explanation

In many cases in the Netherlands sustainable modes of transport, like the bike and public transport, are less attractive to use than the car in terms of travel time in particular outside of urban centres. Considering the need to switch to sustainable modes of transport due to climate change this could be a problem. In particular when it leads to the inability of people to reach desired destinations and services, like education and jobs. This phenomenon of an inability to reach desired destinations is commonly referred to as Transport Poverty. A report by the Planbureau voor de Leefomgeving from 2022 proposes to consider the contribution accessibility thresholds could have to combat the inability of people to reach basic services. This would mean aims of minimum accessibility levels are explicitly defined in policy. To research the possible advantages and disadvantages of introducing accessibility (sufficiency) thresholds in Dutch policy this master thesis focuses on the question; What would be the advantages and disadvantages for Transport Poverty of institutionalizing accessibility sufficiency thresholds in Dutch planning policy?

### Confidentiality and participant rights

- The interviews will be audio-recorded and notes will be taken during the interview.
- You have the right to ask to have the recording turned off whenever you decide and you may also end the focus group at any time.
- If you wish so you will be sent a copy of the focus group notes, and you will have the opportunity to make corrections or request the erasure of any materials you do not wish to be used.
- The information you provide will be kept confidentially in a file on my password protected computer until my research is completed.
- The main use of the information you provide will help me towards my master thesis, which upon completion will publicly be available on Internet.
- Unless you have given explicit permission to do so, personal names or any other information which would serve to identify you as an informant will not be included in this research.

### As a participant you have the right to:

- decline to participate;
- decline to answer any particular question;
- ask for the audio-recorder to be turned off at any time;
- end the interview at any time

- withdraw from the study up until the moment the research has been published;
- ask any questions about the study at any time during participation; and
- ask for the erasure of any materials you do not wish to be used in any reports of this study.

Once again I thank you for taking the time to find out more about my research. I am at your disposal for any questions you might have. You can also contact my supervisors at the address below.

Yours sincerely,

Bregtje van Uffelen

Researcher contact details
A.B. van Uffelen
a.b.van.uffelen@student.rug.nl

Supervisor contact details
C.W. Lamker
c.w.lamker@rug.nl

# 7.2 Agreement to participate - Research Ethics Committee (REC)

Research project: Master Thesis
Title: The advantages and disadvantages of institutionalising accessibility sufficiency thresholds for Transport Poverty in the Netherlands.
Subtitle: An explorative study.

The purpose of the research is to discover what would be advantages and disadvantages of implementing accessibility thresholds.

- I have read and I understand the information sheet of this present research project.
- I have had the opportunity to discuss this study. I am satisfied with the answers I have been given.
- I understand that taking part in this study is voluntary and that I have the right to withdraw from the study until the moment that the study has been published, and to decline to answer any individual questions in the study.
- I understand that my participation in this study is confidential. Without my prior consent, no material, which could identify me will be used in any reports generated from this study.
- I understand that all information I provide will be kept confidentially on a password protected computer.

Please circle YES or NO to each of the following:

I consent to my interview being audio-recorded                                    YES / NO

I wish to remain anonymous for this research                                       YES / NO

If YES
My first name can be used for this research                                        YES / NO

OR
A pseudonym of my own choosing can be used in this research                        YES / NO

"I agree to participate in this individual interview and acknowledge receipt of a copy of this consent form and the research project information sheet."

Signature of participant:          _____Date: _____

"I agree to abide by the conditions set out in the information sheet and I ensure no harm will be done to any participant during this research."

Signature of researcher: _____ Date: _____

Please fill in the following information. It will only be used in case you want to be sent a copy of interview notes so that you have the opportunity to make corrections.

Email:

# Appendix 8 – Quotes before English translation

## 4.1 Transport poverty in Friesland

"*ik heb nog nooit een wetenschappelijk verantwoorde studie gezien die aantoonde dat het in het kader van vervoersarmoede wat uitmaakte of jouw moeder binnen, wat was het, 40 km of x aantal km woont? En dat dit even zwaar wordt gewogen als het hebben van een bepaald inkomen of het hebben van een auto. Ze nemen in feite ongelijksoortige indicatoren en combineren die in een methode waarbij ze [per gescoorde indicator] punten optellen en dan zou je een bepaald risico [op vervoersarmoede] zou lopen*." (Researcher)

## 4.2 Defining accessibility in policy

"*Voorzieningen goed bereikbaar blijven*" (Gemeente Smallingerland, 2020, p.42)

"*We werken aan een stad met goede voorzieningen in de breedste zin van het woord, van winkels tot parken, van scholen tot medische voorzieningen, van horeca tot sportmogelijkheden. En zoveel mogelijk binnen een kwartier bereikbaar voor onze inwoners*" (Leeuwarden, 2021, p. 31)

"*Ook willen we dat onze inwoners een goede toegang hebben tot noodzakelijke voorzieningen. In elk dorp zorgen we voor toegang tot een basisschool, ontmoetingsplek of sportlocatie.*" (Gemeente Achtkarspelen, 2021, p.14)

"een basisniveau van bereikbaarheid in het landelijk gebied belangrijk."(Provincie Friesland, 2022, p. 9)

"*Zo is in Noordwolde de arbeidsmobiliteit een duidelijk thema. Men mist de mogelijkheden om in de regio aan het werk te gaan. Aandacht voor routes naar werk is daarom noodzakelijk*" (Gemeente Westwellingswerf, 2019, p.47)

## 4.5 Expected advantages and disadvantages for transport poverty

"*Ik denk juist omdat wij vroeger minder bereikbaar waren, we meer die voorzieningen dichtbij hebben en nu we eigenlijk juist meer bereikbaarder worden, he het overgrote deel van de mensen, dat het daardoor ook is dat die voorzieningen wat meer wegtrekken en een bepaalde categorie daar gewoon niet in mee kan komen.*" (Focus group)