



Delft University of Technology

## **Addressing transport related social exclusion through transportation policy A novel evaluation method applied to the Amsterdam Transport Region**

Bruno, Matthew; Kouwenberg, Machiel; van Oort, Niels

### **DOI**

[10.1016/j.trip.2024.101177](https://doi.org/10.1016/j.trip.2024.101177)

### **Publication date**

2024

### **Document Version**

Final published version

### **Published in**

Transportation Research Interdisciplinary Perspectives

### **Citation (APA)**

Bruno, M., Kouwenberg, M., & van Oort, N. (2024). Addressing transport related social exclusion through transportation policy: A novel evaluation method applied to the Amsterdam Transport Region. *Transportation Research Interdisciplinary Perspectives*, 26, Article 101177. <https://doi.org/10.1016/j.trip.2024.101177>

### **Important note**

To cite this publication, please use the final published version (if applicable).  
Please check the document version above.

### **Copyright**

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

### **Takedown policy**

Please contact us and provide details if you believe this document breaches copyrights.  
We will remove access to the work immediately and investigate your claim.



# Addressing transport related social exclusion through transportation policy: A novel evaluation method applied to the Amsterdam Transport Region

Matthew Bruno<sup>a,\*</sup>, Machiel Kouwenberg<sup>b</sup>, Niels van Oort<sup>a</sup>

<sup>a</sup> Department of Transport and Planning, Delft University of Technology, Delft, The Netherlands

<sup>b</sup> Policy Advisor for Mobility Research, Amsterdam Transport Region, Amsterdam, The Netherlands

## ARTICLE INFO

### Keywords:

Transport Related Social Exclusion  
Transportation Policy  
Inclusive Mobility

## ABSTRACT

Recent literature has given increasing attention to the different ways in which people can be excluded from transportation systems, with a reduction in economic, social, and recreational opportunities as a result. These theoretical insights into how transport poverty and transport accessibility can be measured and understood do not always relate directly to actual planning processes. Different government agencies have authority over different policy and infrastructure elements and within a transportation authority, different departments have different actors, goals, and approaches. An important first step in making advances in social inclusion is for transportation authorities to be able to evaluate their current approach as a starting point for policy improvements. Presently, however, no systematic method exists for conducting that evaluation. This article refines an existing Transportation Related Social Exclusion (TRSE) framework and develops a method for comprehensively evaluating existing TRSE reduction efforts in transportation policy. It applies this method to the operating agreements for the three public transportation concession areas in the Amsterdam Transport Region, using textual analysis to develop a policy overview for ten dimensions of TRSE. The application of the method reveals that different forms of TRSE receive substantially different levels of attention within the Amsterdam Transport Region. The evaluation serves as a tool for systematically understanding how different dimensions of social exclusion are being addressed, allowing for a starting point for discussing whether or not existing policy is adequate and creating opportunities for incorporating new theoretical concepts into practice.

## Introduction

Since issues of geographical accessibility and social equity first became key components of the research agenda on sustainable transport in the late 1990 s (Lucas, 2019), researchers have created an expanding body of literature on transport related social exclusion (TRSE) and developed accessibility models to better identify the places and population groups that have their travel opportunities limit by the structures of the transportation system (Jones and Lucas, 2012; Lucas, 2012; Lucas et al., 2016a; Lucas et al., 2016b; Martens et al., 2019). One of the key elements in these models is understanding the multiple and often interconnected ways in which people can be excluded from the transportation system (Lewis et al., 2021; Yigitcanlar et al., 2018). Recent scholarship has synthesized and expanded on previous work to identify ten distinct forms of TRSE (Luz and Portugal, 2021).

Examining TRSE from the framework of these ten dimensions has allowed for an exploration of new ways to potentially measure and then

address the effects of TRSE on individuals and communities. The focus on novel policy approaches reflects much of the literature on transport equity in general and TRSE specifically (Benevenuto and Caulfield, 2019; Luz and Portugal, 2021; Schwanen et al., 2015). Novel policy approaches often face challenges from institutional actors with incremental changes often being much easier to implement (Jeromonachou et al., 2004; Rotmans et al., 2001). Making even incremental improvements to policy, however, requires an understanding of what the current policies in order to begin a discussion over how they could be improved. This study provides a method for evaluating how existing transportation policy approaches TRSE. It describes a method of textual analysis to systematically evaluate how each of the different forms of transport related social exclusion are or are not being addressed and applies it to the legally binding documents that form the basis for operating transit service in the Amsterdam Transport Region.

Research has already been conducted to evaluate the specificity of stated equity goals and their accompanying metrics in long range

\* Corresponding author.

E-mail addresses: [m.bruno@tudelft.nl](mailto:m.bruno@tudelft.nl) (M. Bruno), [m.kouwenberg@vervoerregio.nl](mailto:m.kouwenberg@vervoerregio.nl) (M. Kouwenberg), [n.vanoort@tudelft.nl](mailto:n.vanoort@tudelft.nl) (N. van Oort).

<https://doi.org/10.1016/j.trip.2024.101177>

Received 24 April 2024; Received in revised form 16 July 2024; Accepted 21 July 2024

Available online 25 July 2024

2590-1982/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

transportation plans by comparing how different places explicitly conceptualized equity (Manauagh et al., 2015). As Carleton and Porter (2018) have noted, defining equity has always been a challenge and reducing equity to a single standard may mask the challenges faced by specific groups, areas, or individuals. A method for performing a comprehensive evaluation of how a transport agency is addressing each of the different forms of transport related social exclusion, whether explicitly or implicitly, and identifying which forms of exclusion are receiving significant attention and which forms are not being addressed, does not currently exist. This process is necessary in order for transit agencies to understand their own current approach and in order to begin the process of evaluating where it can be improved. This article, therefore, addresses a gap in the literature by developing a method for applying the framework of transport related social exclusion directly to transportation policy as a starting point for identifying where policies and evaluation metrics can be improved.

This article begins within an overview of the literature on transport related social exclusion. It then provides a summary of the 10 different forms of TRSE, including how this article has used different naming conventions than Luz and Portugal (2021) for two of the forms based on the source literature. It then provides a detailed description of the method used in this article for evaluating TRSE in transportation policy documents, including which documents were chosen for evaluation and how they were analysed. The results section presents the outcome of that analysis for each of the ten forms of TRSE, including an overview of the present policy, the evaluation metrics used, and potential limitations of the approach based on the current literature.

The results show that different dimensions of TRSE are given different levels of attention, evaluated through different methods, and addressed through different processes. While the different forms of TRSE are generally addressed similarly throughout the documents there are also some key differences. The results section provides a policy overview for each of the ten forms of TRSE, including examples. The discussion and conclusion section addresses the strengths and limitations of the method and reviews the main findings.

### Transport related social exclusion: Key terms and concepts

TRSE looks at how people who are socially disadvantaged for reasons such as employment status, income, age, or ability, can face limitations in their ability to access transportation services. As income is only one of these factors, people can experience TRSE without having a low income (Yigitcanlar et al., 2018). Rather, social exclusion is defined by an exclusion from economic life, social services, civic life, and social networks (Spoor, 2013). As noted by Benevenuto and Caulfield (2019), applying the broad definition of poverty as used by the United Nations to include a deprivation in access to key destinations means that those suffering from TRSE are by definition poor. TRSE looks at how elements of the transportation system contribute to this transport poverty (Yigitcanlar et al., 2018).

A literature review on TRSE reveals its multiple forms. Church et al. (2000) conducted the first systematic analysis of TRSE, creating a framework that divided the sources of TRSE into seven distinct categories. The categories were not conceptualized as mutually exclusive, but rather designed to reflect distinct mechanisms that could result in TRSE. In other words, while specific cases could be classified under multiples categories, it is also possible to describe a situation in which only a single form of TRSE is applicable. Since the publication of that first analysis, scholars working in the field of TRSE have added categories and changed how the different categories are named and conceptualized (Benevenuto and Caulfield, 2019; Cass et al., 2005; Hine and Mitchell, 2001; Yigitcanlar et al., 2018). Luz and Portugal synthesized this literature to create a list of nine previously identified forms of TRSE and then added digital divide exclusion (Luz and Portugal, 2021).

This article makes minor adjustments in the names of two categories used by Luz and Portugal (2021). The category “exclusion based on fear,

prejudice or feelings” (2021, p. 12) is referred to here by the original category designation from Church et al. (2000): fear-based exclusion. In addition to this name being more direct, the addition of the term ‘prejudice’ in the category name by Luz and Portugal (2021) creates an unclear relationship with issues of discrimination, issues addressed in the second category name that was modified.

Luz and Portugal (2021) refer to social position-based exclusion based on the work of Benevenuto and Caulfield (2019). Benevenuto and Caulfield (2019) focus specifically on the application of the TRSE framework to the Global South. In their discussion of social position, they refer primarily to how transport policies have both intentionally and unintentionally resulted in discrimination based on race and gender, including the intersectionality of these and other forms of identity. In incorporating this category, Luz and Portugal (2021) use the same name but relate it to issues surrounding immigration rather than discrimination, stating, “Because of a lack of language skills and illiteracy, migrants and refugees may face problems reading and understanding public transportation instructions and following the timetables” (Luz and Portugal, 2021, p. 13). This interpretation of social position-based exclusion, which shifts the focus away from transportation policy towards the assumed skill sets of a particular group, is not mentioned by Benevenuto and Caulfield (2019) and involves elements already covered by informational exclusion. Most importantly, Luz and Portugal (2021) adopt the category from Benevenuto and Caulfield (2019) without making any reference to the large body of literature related to racial, ethnic, gender, age and religious discrimination in transportation (Abdelkader, 2014; Adeel et al., 2017; Ayres, 1991; Collins et al., 2023; Currah and Mulqueen, 2011; Duncel Graglia, 2015; Golub et al., 2013; Hashem et al., 2022; Larson, 2018; Law, 2016; Lee et al., 2018; Long, 1954; Najib and Teeple Hopkins, 2019; Reynolds, 2010; Swistara, 2021). Both because of the relevance of this literature on discrimination in transportation to TRSE and because Benevenuto and Caulfield (2019) refer primarily to discriminatory practices when discussing what they refer to as social position-based exclusion, the category has been renamed here “Discrimination-based exclusion” to more directly reflect the issue being described. Table 1 provides an overview of the ten forms, along with their definitions and the academic sources from which they

**Table 1**  
The 10 Types of TRSE, adapted from Luz & Portugal (8).

Category	Definition	Source
Exclusion from facilities	The absence of or excessive distance to key opportunities	Church et al., 2000
Geographical exclusion	Residence is too far from or not connected to the transportation system	Church et al., 2000; Hine & Mitchell, 2001
Space exclusion	Certain groups are not welcome in controlled or surveilled spaces	Church et al., 2000; Hine and Mitchell, 2001
Physical exclusion	The transport system has material barriers that prevent some people from using it	Church et al., 2000
Time-based exclusion	The transport system is not fast enough or does not operate when a person needs it	Church et al., 2000
Fear-based exclusion	Concerns about safety prevent people from using the transport system	Church et al., 2000
Informational exclusion	Lack of knowledge about the transport system prevents people from using it	Yigitcanlar et al., 2018
Economic exclusion	The costs of the transport system limit the ability of people to use it	Church et al., 2000
Digital divide exclusion	Inability to use or access certain technologies prevents people from using the transportation system	Luz and Portugal, 2021
Discrimination-based exclusion	People face barriers to access because of some element of their identity	Adapted from Benevenuto and Caulfield, 2019

were taken.

## Methods

The evaluation method developed in this article involves a six step process (see Fig. 1). The following subsections provide a detailed explanation for each of these steps.

### Case study selection

The process begins by defining a case study area. The Amsterdam Transport Region was chosen here because it covers both urban and rural areas and includes communities with distinct characteristics and significantly different access to transportation services. Selecting this region as a case allows for an examination of how a transportation authority addresses the elements of TRSE in a geographically and socially diverse area.

The Amsterdam Transport Region is responsible for financing transportation projects across 14 different municipalities of varying size, including negotiating the contracts for the companies that operate public transportation in their service areas (Amsterdam Transport Region, 2022) [see Fig. 2].

### Document selection

The analysis requires selecting documents that reflect the current policy of the area under consideration. While the Amsterdam Transport Region produces a number of policy documents that outline how they intend to achieve a variety of long term goals (Vervoerregio Amsterdam, 2017), they also serve as the responsible agency for executing contracts related to operating regional public transportation (Vervoerregio Amsterdam, 2017). The conditions for private companies to provide transit service in these areas are established through the development of concession agreements, legally binding documents that state the minimum requirements that the transit provider must meet (Amsterdam,

2016a). The concession documents, approximately 100 pages in length each, state the actual conditions under which the transit system must operate, providing insights into how the different forms of TRSE are addressed in practice. The analysis here, therefore, is based on the three most recent concession documents from the Amsterdam Transport Region: the 2013 Amsterdam Program Requirements (Stadsregio Amsterdam, 2013), the 2016 Amstelland-Meerlanden Program Requirements (Amsterdam, 2016a), and the 2021 Zaanstreek-Waterland Program Requirements (Vervoerregio Amsterdam, 2021).

### Coding scheme development

Because references to different types of social exclusion can appear both directly and indirectly, the text of each document was coded to track where and how each of the dimensions of social exclusion were addressed. Physical and cognitive exclusion were separated into separate codes because they are addressed by different sets of policies. For each type of social exclusion, two codes were created: one for locations in the document where a type of social exclusion was addressed and another for text that might have an influence on a type of social exclusion. For example, language that addressed providing discounts to people with low incomes would be coded with economic.a and language that simply discussed the cost of using the transport service would be coded with economic.i.

### The coding process

The three concession documents were uploaded into the qualitative analysis program Atlas.ti., a software program that allow for manual qualitative coding. Every time any element of the text addressed or acknowledged any form of transportation related social exclusion, the sentence was highlighted and a code was applied for the relevant form of TRSE. Where a specific sentence referred to more than one type of TRSE, it was coded for both types.

### Output organization

After the coding was completed, the highlighted sections were exported to an Excel document. The quotes were then organized by type of exclusion and concession area to develop an overview of the policy approach for each type and to identify any differences between concession areas. Because the concession agreements originate with the same agency, the differences were minimal and the documents often contained similar or identical language. The agreements, however, were approved between 2013 and 2021, and some changes did occur over time. In the results section, the approach should be assumed to be the same for each of the three concession areas unless differences are specifically noted.

### Output analysis

After reading the highlighted quotes for type of TRSE, it became clear that different forms of TRSE had different levels of attention in the documents. Based on these differences, the forms of TRSE were organized into four categories [see Table 2]. For each of these categories, the output of highlighted quotes was used to define the approach and evaluation metric for each of the forms of TRSE.

## Results

This section organizes the forms of TRSE by the level of attention that they are given in the concession documents, provides an overview of the approach taken for each form, and details the assessment metrics when applicable, including any notable differences between the concession areas and a brief discussion of the potential limitations of the described approaches.

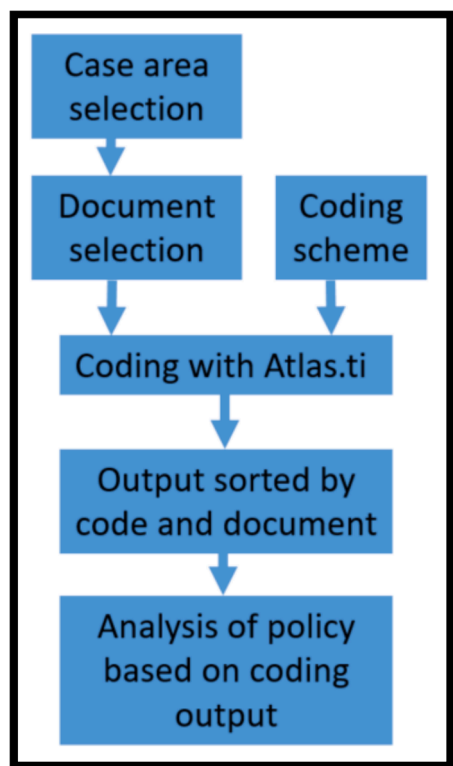


Fig. 1. An Overview of the Evaluation Process.



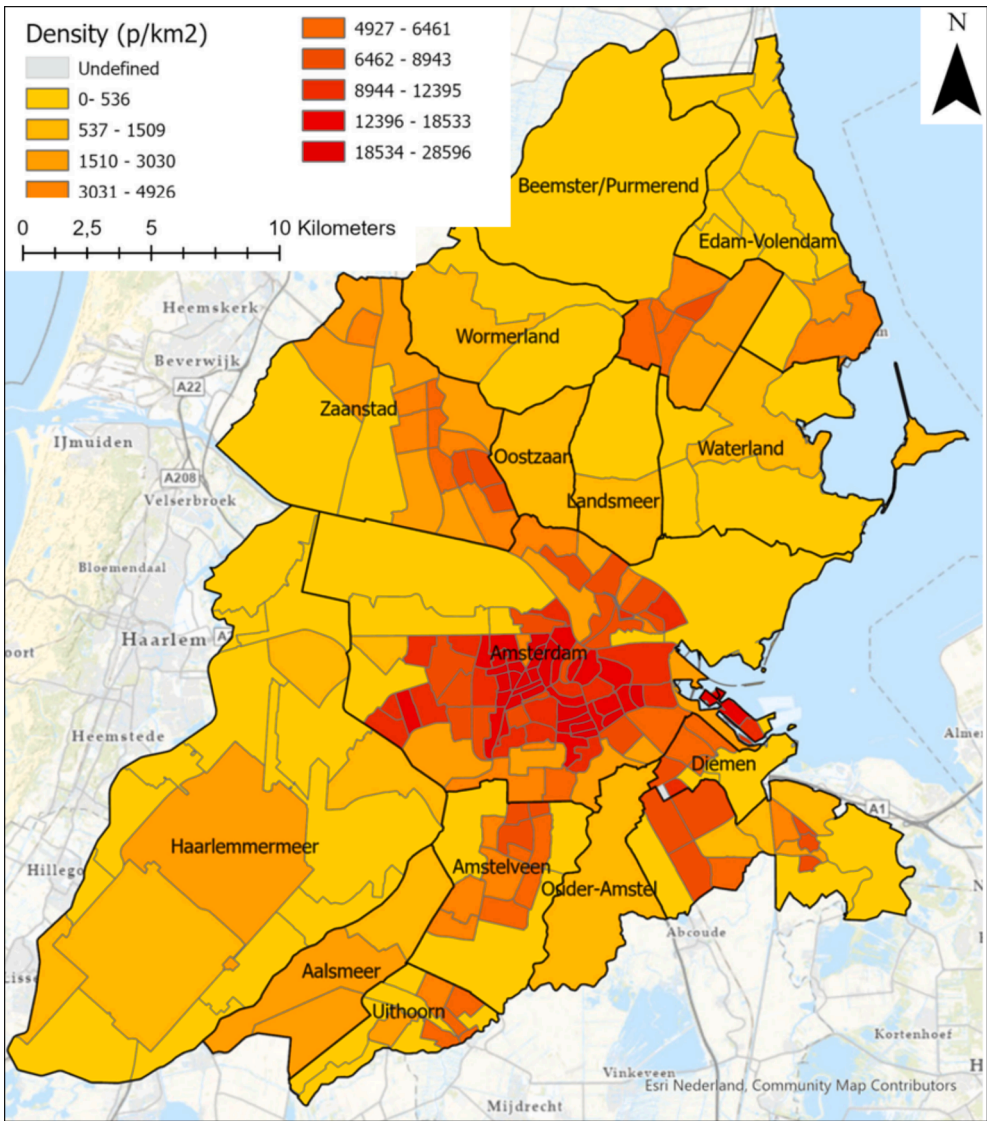


Fig. 2. The Amsterdam Transport Region, including the population density within each of the 14 municipalities.

Table 2  
Summary of Results.

Level of attention	Exclusion Type
Addressed in a separate, named section	Fear-based exclusion; informational exclusion
Addressed throughout the documents	Time-related exclusion, physical exclusion, exclusion from facilities
Addressed indirectly or to a limited degree	Digital divide exclusion; geographic exclusion; economic exclusion; cognitive exclusion
Not addressed	Space exclusion; discrimination-based exclusion

Addressed in a separate, named section

Two different types of TRSE were directly named and addressed in all three of the concession documents: fear-based exclusion and informational exclusion. Each of these types of TRSE received their own section headings that detailed specific policies for addressing them as described in the following sub-sections.

Fear-based exclusion

Approach. The concession documents use the term ‘social safety’ to

describe reducing fear-based exclusion and each have a full section dedicated to this topic. The agreements specify security procedures and require working with other agencies to ensure people feel safe when using transit. They refer to a separate uniform policy on social safety for the Amsterdam Transport Region, the Policy Framework for Social Safety 2017–2021 (Amsterdam, 2016b). This document outlines specific rules for monitoring and reporting incidents around public transportation and details how public transportation providers must co-ordinate with the police and local agencies (Amsterdam, 2016b). The concession documents also specify the minimum amount that the public transportation providers must spend on monitoring, security, and ticket control (Amsterdam, 2016a).

Evaluation metric. The level of social safety around public transportation in the Amsterdam Transport Region is evaluated based on three different metrics: (1) the general attitude of passengers regarding safety and public transportation and the specific sense of safety that passengers have while riding public transportation (based on passenger surveys); (2) the number of registered safety-related incidents; and (3) the estimated percentage of people riding without paying, as the majority of incidents of aggression in public transportation begin with ticket controls of people who have not paid (ANP, 2018; NOS, 2015; Amsterdam,

2016a).

**Limitations.** The agreements focus primarily on monitoring and reporting incidents and coordinating with other agencies to reduce the number of incidents. They do not make an effort to define the qualities of a public transportation system that is experienced as safe, including addressing a generalized fear of crowding that became a greater topic of discussion during the pandemic (Ozbilen et al., 2021). They also do not include any gender specific policies. Research has shown significant gender differences in the perception of safety on public transit (Namgung and Akar, 2014; Ouali et al., 2020) and identified a need for more explicitly addressing gender-based safety needs of transit users (Chowdhury and van Wee, 2020).

#### Informational exclusion

**Approach.** Each agreement dedicates a section to outlining the specific information that needs to be provided to people using the transit system, the formats in which it is to be provided, and the type and format for notices when the information changes. The agreements go into considerable detail, requiring the provision of real time information at stops, within buses and at information kiosks about schedules, payment, discounts, routes, and services. They also require transit data be provided in standardized formats for use across different transit apps (Stadsregio Amsterdam, 2013, 2016; Vervoerregio Amsterdam, 2021).

**Limitations.** The concession documents provide very detailed requirements for what information needs to be provided and how, but do not include monitoring to determine if people actually have the information they need to use the transit system. Additionally, there is no requirement in the concession documents to evaluate the language needs of communities and take reasonable steps to minimize language barriers, as in the case in United States, for example, where people who speak a language other than English are entitled to equal treatment of English speakers in all federally funded programs, including public transportation (Chen et al., 2007) (U.S. Department of Transportation, 2016). Information is only provided in Dutch and English even though the combined number of Turkish and Arabic speakers in the Netherlands is greater than the number of English speakers (Schmeets and Cornips, 2021).

#### Addressed throughout the documents

Time-related exclusion, physical exclusion, and exclusion from facilities do not have their own section headings within the concession agreements but still receive substantial attention throughout the documents.

#### Time related exclusion

**Approach.** The concession agreements consistently recognize the importance of providing fast and reliable public transportation, focusing on following the set schedules and having direct connections between key locations. The Amstelland-Meerland agreement states a specific goal of “striving for facilities in the city center being accessible from every suburban center within 45 min” (Amsterdam, 2016a, p. 8). The concession agreements in general specify the frequency of the service between named key locations, including which locations require direct service or service with no more than one transfer. The agreements also specify service times, including the minimum hours, lines, frequencies and locations of the limited night services.

**Evaluation metric.** The agreements focus on the restitution that riders will receive if their transit service is excessively late. It also includes the goals for service reliability, specifying that delays and service failures

should be kept to a minimum.

**Limitations.** The agreements have clearly defined operation times, but the connection between these times and their underlying goal, ensuring people can reach their destinations when they need to, are not fully transparent. Specifically, the literature on transport poverty suggests that many people are unable to accept jobs that are not transit accessible at the times of their work (Sanchez et al., 2004; Bastiaanssen, 2012; Cervero and Landis, 2002). The concession agreements do not address shift work, with the exception of specifically providing night service to Schiphol Airport, a major employer with significant night operations (Stadsregio Amsterdam, 2013).

#### Physical exclusion

**Approach.** The approach to limiting physical exclusion has two main components in the concession documents:

- (1) Buses must have a functioning wheelchair lift and be able to accommodate at least one wheelchair.
- (2) Every resident must have a bus stop within a specified minimum distance of their home.

The documents also describe specific guidelines for people with sight impairments, including braille on the stop buttons and auditory announcements of all stops.

**Evaluation metric.** The documents define physical accessibility by specific technical standards for wheelchair access and wheelchair priority areas. The documents also address physical exclusion by limiting the distance between people’s homes or work areas and public transportation (90 % of addresses need to be within 800 m of a high speed transit line or within 400 m of standard bus stop). Hospitals and care facilities need to have a stop with 250 m of the main entrance (Stadsregio Amsterdam, 2013).

**Limitations.** The agreements focus on access for a single wheelchair and specific rules for specific types of disabilities. They do not address physical accessibility challenges experienced by caregivers travelling with young children in strollers or accompanying an elderly person with mobility challenges (Murillo-Munar et al., 2023). They do not address the broader universal design paradigm that combines inclusive trans-generational design, barrier-free design, accessible design, and assistive technologies to create systems that destigmatize aging and disability (Audirac, 2008) and that broadly reduce the risk of physical exclusion for people of all abilities (Audirac, 2008; Sze and Christensen, 2017; Zajac, 2016) Venkataram et al. (2023) refer to this as “immediate usability” – a transportation provider designing the system so that a person can independently use it without excessive dependence on the assistance of employees, caregivers or strangers.

#### Exclusion from facilities

**Approach.** The concession agreements try to ensure that the provided coverage connects people with where they want to go. The agreements try to reduce exclusion from facilities by providing detailed lists of locations that must have either direct connections or can be reached with a minimum of a single transfer.

**Evaluation metric.** The agreements state that the provider must, at a minimum, have transit service between specific locations named in the document.

**Limitations.** The attributes of required locations are not explicitly defined in the documents, with a clear focus on places with either high

densities or concentrations of commercial activity. Studies on transport poverty have highlighted the need for connecting low income workers with industrial employment centers that often have limited service by public transport (Bastiaanssen and Breedijk, 2022; Benevenuto and Caulfield, 2019; Lucas, 2019). The concession documents do not address this form of exclusion from facilities.

#### *Addressed indirectly or to a limited degree*

Economic exclusion, digital divide exclusion, and geographical exclusion are not specifically named in the documents but are given a limited amount of attention in some form.

#### *Economic exclusion*

**Approach.** The concession agreements primarily focus on making sure people are aware of prices, subscriptions, and payment options. There are some specific rules about making sure people do not pay the base travel price twice or are not charged for specific services. The concession operators, however, seem to have limited control over fares as these are set by a national agreement. Further, the concession agreements specifically limit the ability of the concession provider to change prices (Vervoerregio Amsterdam, 2021, p. 83).

**Evaluation metric.** Within the concession documents, the cost of using public transportation is simply measured against the costs as specified by various price agreements, including the national tariff (Vervoerregio Amsterdam, 2021, p. 83). The documents state that passengers must be made aware of the prices, but do not include any mechanism for ensuring that low-income passengers can afford to use the system.

**Limitations.** Economic exclusion is one of the key forms of TRSE. Literature has addressed the link between the ability of people to pay for transportation and the opportunities that they have available to them (Brown, 2018; Cervero and Landis, 2002; Yigitcanlar et al., 2018). Further, the average cost of public transportation in the Netherlands is the highest in the European Union (ANP, 2019). Low income has been found to be a key limiting factor for people's transport options to activities and employment as economic factors are often a prime determinant of accessibility (Yigitcanlar et al., 2018). The ability to address this barrier at the level of concession area seems quite limited leaving open the question of how it can be effectively addressed.

#### *Digital divide exclusion*

**Approach.** The concession agreements do not directly address the need to ensure that people without smartphones and/or internet access can make full use of the transit system, but they do consistently require offline alternatives for acquiring personalized travel cards and obtaining travel information. Additionally each of the concession areas is required to staff a certain number of information booths at stations. Further, the agreements require that travel cards be made available at a wide variety of physical locations and people need to be able to submit complaints by mail to a physical address.

**Evaluation metric.** The concession documents list the specific non-digital formats in which information needs to be provided.

**Limitations.** A literature review of 25 recent papers on digital inequality in transport services summarized how factors related to age, income, education, ethnicity and geographic region can all result in increased vulnerabilities to digitalization (Durand et al., 2022). A study involving interviews with twenty-two experts on inclusivity and digitalization found that while many emphasized the importance of inclusive design, the policy tool most often advocated for was the provision of non-digital

alternatives (Durand et al., 2023a). This conclusion is in alignment with other research showing that a transition to digitalization can provide benefits to some passengers while excluding others (Durand et al., 2023b; Golub et al., 2022; Owusu-Agyemang et al., 2024a, 2024b; Van Holstein et al., 2021). While non-digital options are often presented for specific situations, none of the agreements have a general rule that any services that are available online or through an app must also be available in an alternative non-digital format.

#### *Geographical exclusion*

**Approach.** The concession documents acknowledge the challenges of geographical exclusion without explicitly addressing how these challenges can be addressed. The concession agreements state minimum density levels that must be met for an area to require some form of fixed transit service, but only suggest possibilities for areas that do not meet this minimum threshold. For example, the concession agreement for Zaanstreek-Waterland classifies different areas by density and notes that alternatives to traditional public transportation are necessary for lower density places: "In less urban areas, greater use is made of individual, flexible and small-scale transport, such as the car, the (electric) bicycle and target group transport that connects to nodes" (Vervoerregio Amsterdam, 2021, p. 25).

**Evaluation metric.** Level of service is defined by population density with service not required for areas below a certain threshold. Each of the three concession areas use the same metric to determine the minimum requirements for receiving fixed transit service: Neighborhoods must have more than 1,000 residents and at least 20 residents per hectare. Business areas must contain at least 2,000 employees and at least 40 employees per acre (Stadsregio Amsterdam, 2013, 2016; Vervoerregio Amsterdam, 2021).

**Limitations.** The agreements do not so much address geographical exclusion as acknowledge it, noting that people who live in areas below a certain level of density will not have regular transit service. While the agreements note that alternatives should be provided to people who fall outside of these minimum thresholds, they do not specify the minimal level of service for people in low density areas or how it should be provided.

#### *Cognitive exclusion*

**Approach.** Only one of the three concession documents Zaanstreek-Waterland, addresses cognitive exclusion, specifying that travel information needs to be written at level B1 of the European Reference framework (Vervoerregio Amsterdam, 2021).

**Evaluation metric.** The specific texts used by the transit agency must be approved and verified to be at this level at least three months prior to the start of the concession agreement.

**Limitations.** In the Netherlands, 18 % of the population has difficulty with reading, writing or basic math (Foundation for Reading & Writing, 2018). The challenges they face in using the transit system and understanding complex fare structures could be more directly addressed in each of the concession areas.

#### *Not addressed*

Space exclusion and discrimination-based exclusion, are not mentioned either directly or indirectly in any of the concession agreements. The sections below discuss the relevance of each for public transportation and how future research could suggest possibilities for addressing them in concession agreements.



### Space exclusion

Space exclusion refers specifically to whether or not people have access and feel entitled to use transit services. This type of exclusion occurs most often in gated communities (Luz and Portugal, 2021). While the Netherlands does not have the type of gated communities seen in the United States and South Africa where access is only possible through a secured entrance, it does have more than a hundred private residential communities that use design elements such as moats and bushes to create limited entry points that discourage access for non-residents (Schuilenburg and Van Steden, 2015). A study that focused specifically on how the gated community concept has been adapted to the Netherlands identified six common types of communities that limited access for non-residents in multiple ways, ranging from central courtyards only accessible from within the complex to modern day castles that included fortress style walls (Hamers et al., 2007). While many of these communities may not have transit stops located within them, they may create physical barriers between people's residence and the nearest transit stop. In these situations, the linear distance to a stop may meet the requirements, but the actual travel distance may be much farther. Additional research could lead to a better understanding of how these closed off communities affect transit access.

### Discrimination-based exclusion

None of the concession agreements make any direct mention of the system being open to all people regardless of their identity or make any note of a general or specific policy against discrimination. The literature on transportation equity documents the many different ways in which discrimination, both intentional and unintentional, can have an impact on passengers. This includes how religious discrimination can affect people's sense of safety while traveling (Abdelkader, 2014; Najib and Teeple Hopkins, 2019); the impact of gender and gender related transportation policies on mobility (Adeel et al., 2017; Currah and Mulqueen, 2011; Duncel Graglia, 2015; Law, 2016; Priya Uteng et al., 2019); how ethnic and racial discrimination can both shape the travel experience of individuals and have systemic impacts on the transportation system as a whole (Golub et al., 2013; Larson, 2018; Long, 1954; Swistara, 2021); and how the intersectionality of these and other identity factors can compound the impacts of transportation-related discrimination (Ayres, 1991; Benevenuto and Caulfield, 2019; Hashem et al., 2022; Lee et al., 2018). There seems to be a considerable amount of opportunity for building on this research to determine how these identity factors impact social inclusion in transportation in the Netherlands and for incorporating the results of that research into concession agreements.

### Discussion and conclusion

The method developed and applied here demonstrates the ability to systematically identify TRSE policy based on its ten different identified forms. The results show that different forms of TRSE can receive substantially different levels of attention. This evaluation provides clarity on what the existing policy is in order to create opportunities for improvement and to develop plans for further research into how these areas of TRSE could be addressed more systematically. It is important to note that the method only reveals existing policy, not the degree to which different forms of TRSE constitute a problem in the study area. For forms of TRSE that were not addressed in the concession documents, the results of applying the method, therefore, serve as a rationale for investigating the extent of these forms as a step towards determining the necessity of developing policies to address them. Similarly, a particular form of TRSE being addressed frequently does not necessarily mean it has been better addressed than one only briefly mentioned. The purpose of highlighting where and how different forms of TRSE are mentioned is to demonstrate the challenge of identifying existing policies, which can be both systematic and fragmented, implicit and explicit.

### Limitations

For transportation agencies wishing to address TRSE, the multifaceted nature of the issue can present challenges when trying to apply theory to practice. The method presented here provides a starting point for systematically identifying current standards as a framework for developing improved policy across multiple dimensions of TRSE. The method's strength is in providing a comprehensive overview of which forms of exclusion are being addressed and how. The method does not reveal whether or not existing policy is adequate, but by pairing potential barriers with the policies that address those barriers, it provides a framework for asking focused questions about the adequacies of those policies, allowing for research that would look into confirming potential problem areas, including the sources of those problems and the structures that would need to change in order to address them. This additional research would go beyond examining the policy documents and could involve such steps as structured interviews with officials, operators, and, most importantly, the actual users of the transportation system.

Additionally, in the case discussed here, the concession agreements are only one policy tool for addressing TRSE and are limited to public transportation. The coding method revealed multiple existing inter-agency agreements and legal requirements that both defined and limited how the different forms of TRSE could be addressed through the concession agreements. For example, addressing social safety is part of a multiple agency coalition (Stadsregio Amsterdam, 2013, 2016; Vervoerregio Amsterdam, 2021) and potential solutions to economic exclusion were limited by national agreements on fare prices (DOVA, 2022).

### Conclusion

The analysis conducted here examined concession agreements because their status as legally binding documents meant they reflected not simply policy goals, but the translation of inclusivity policy into practice. It used a systematic review process to determine which areas of TRSE were being explicitly addressed, which were being implicitly addressed, and which were not being addressed. It then discussed the specific policy context for each form of TRSE, highlighting insights from existing literature and suggesting directions for future research.

The case presented here reviewed the agreements between the Amsterdam Transport Region and bus operators but the method can just as readily be applied to transportation systems in other geographic contexts that may operate very differently. It could be applied to any agency agreement, policy document, or training material, whether completed or in draft form, that addresses issues of TRSE either directly or indirectly.

Not every document needs to cover every form of TRSE, but by creating a means for clearly reviewing which forms are covered and which are not, the method can help clarify which elements of inclusive mobility are being addressed and allows for a more direct discussion about whether missing elements should be addressed elsewhere. The analysis, therefore, assists in the translation of theoretical concepts into practical application, facilitating discussions both on the current approach to TRSE within existing policy and on what additional steps might need to be taken to better understand the areas of TRSE that are not being addressed.

### CRedit authorship contribution statement

**Matthew Bruno:** Writing – original draft, Methodology, Data curation, Conceptualization. **Machiel Kouwenberg:** Writing – review & editing, Supervision, Resources, Conceptualization. **Niels van Oort:** Writing – review & editing, Supervision, Project administration, Conceptualization.



## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request.

## Acknowledgments

The research was conducted with the support and financing of the Amsterdam Transport Region through their funding of the project Advancing Socially Inclusive Mobility in the Amsterdam Transport Region, a research project within the Smart Public Transport Lab in the Department of Transportation and Planning at Delft University of Technology. The author would like to thank everyone at both the Amsterdam Transport Region and TU Delft that donated their time and considerable knowledge to improving this article.

## References

- Abdelkader, E., 2014. Savagery in the subways: anti-muslim ads, the first amendment, and the efficacy of counterspeech. *Asian American Law Journal* 21. <https://heinonline.org/HOL/Page?handle=hein.journals/aslj21&id=49&div=&collection=>.
- Adeel, M., Yeh, A.G.O., Zhang, F., 2017. Gender inequality in mobility and mode choice in Pakistan. *Transportation* 44 (6), 1519–1534. <https://doi.org/10.1007/S11116-016-9712-8/METRICS>.
- Amsterdam Transport Region. (2022). Vervoerregio Amsterdam: Veertien gemeenten werken samen aan bereikbaarheid en leefbaarheid [Amsterdam Transport Region: Fourteen Municipalities Working Together on Accessibility and Livability]. <https://www.vervoerregio.nl/pagina/20170321-vervoerregio-amsterdam-veertien-gemeenten-werken-samen>.
- Stadsregio Amsterdam., 2013. Programma van Eisen: Aangepaste Concessie Amsterdam 2012 [Program of Requirements: Adapted Amsterdam Concession 2012].
- Stadsregio Amsterdam., 2016. Programma van Eisen: Concessie Amstelland-Meerlanden 2018 [Program of Requirements: Amsterdam-Meerland Concession 2018].
- Stadsregio Amsterdam, MuConsult., 2016. Beleidskader Sociale Veiligheid Openbaar Vervoer 2017-2021 [Policy Framework for Public Transportation Social Safety 2017-2021].
- Vervoerregio Amsterdam., 2017. Beleidskader Mobiliteit [Mobility Policy Framework].
- Vervoerregio Amsterdam., 2021. Programma van Eisen: Concessieverlening Zaanstreek-Waterland 2024 [Program of Requirements: Zaanstreek-Waterland Concession 2024]. [www.vervoerregio.nl](http://www.vervoerregio.nl).
- ANP. (2018). NS: Minder zwartrijders en agressie dankzij inchecken met poortjes [NS: Fewer fare dodgers and aggression because of check-in gates]. <http://www.nu.nl/binnenland/5643689/ns-minder-zwartrijders-en-agressie-dankzij-inchecken-met-poortjes.html>.
- ANP. (2019, January 2). Nederlands openbaar vervoer het duurste van EU [Dutch public transportation the most expensive in the EU]. <https://www.parool.nl/nieuws/nederlands-openbaar-vervoer-het-duurste-van-eu~b97c9248/>.
- Audirac, I. (2008). Accessing Transit as Universal Design. <http://Dx.Doi.Org/10.1177/0885412208318558>, 23(1), 4–16. <https://doi.org/10.1177/0885412208318558>.
- Ayres, I., 1991. Fair driving: gender and race discrimination in retail car negotiations. *Harv. Law Rev.* 104 (4), 817–872. <https://doi.org/10.2307/1341506>.
- Bastiaanssen, J., Breedijk, M., 2022. Toegang voor iedereen? Een analyse van de (on) bereikbaarheid van voorzieningen en banen in Nederland [Accessible for everyone? An analysis of the (in)accessibility of facilities and jobs in the Netherlands].
- Bastiaanssen, J., 2012. Vervoersarmoede op Zuid Een verkennend onderzoek naar de mate waarin verplaatsingsmogelijkheden van invloed zijn op de arbeidsre-integratie van werklozen [Transport Poverty in South Rotterdam: An Exploratory Research on the degree to which motility influences worker integration] [Masters Thesis]. Radboud University.
- Benevenuto, R., Caulfield, B., 2019. Poverty and Transport in the Global South: an Overview. <https://doi.org/10.1016/j.tranpol.2019.04.018>.
- Brown, A.E., 2018. Fair fares? How flat and variable fares affect transit equity in Los Angeles. *Case Studies on Transport Policy* 6 (4), 765–773. <https://doi.org/10.1016/j.cstp.2018.09.011>.
- Carleton, P.R., Porter, J.D., 2018. A comparative analysis of the challenges in measuring transit equity: definitions, interpretations, and limitations. *J. Transp. Geogr.* 72, 64–75. <https://doi.org/10.1016/J.JTRANGE.2018.08.012>.
- Cass, N., Shove, E., Urry, J., 2005. Social exclusion, mobility and access. *Sociol. Rev.* 53 (3), 539–555. <https://doi.org/10.1111/J.1467-954X.2005.00565.X>.
- Chen, A.H., Youdelman, M.K., Brooks, J., 2007. The legal framework for language access in healthcare settings: title VI and beyond. *J Gen Intern Med* 22 (2), 362–369. <https://doi.org/10.1007/s11606-007-0366-2>.
- Chowdhury, S., van Wee, B., 2020. Examining women's perception of safety during waiting times at public transport terminals. *Transp. Policy* 94, 102–108. <https://doi.org/10.1016/J.TRANPOL.2020.05.009>.
- Church, A., Frost, M., Sullivan, K., 2000. Transport and social exclusion in London. *Transp. Policy* 7 (3), 195–205. [https://doi.org/10.1016/S0967-070X\(00\)00024-X](https://doi.org/10.1016/S0967-070X(00)00024-X).
- Collins, K., Der Wartanian, R., Reed, P., Chea, H., Hou, Y., Zhang, Y., 2023. Social equity and public transit in the inland empire: Introducing a transit equity analysis model. *Transportation Research Interdisciplinary Perspectives* 21, 100870. <https://doi.org/10.1016/j.trip.2023.100870>.
- Currah, P., Mulqueen, T., 2011. Securitizing Gender: identity, biometrics, and transgender bodies at the airport. *Social Research: an International Quarterly* 78 (2), 557–582. <https://doi.org/10.1353/SOR.2011.0030>.
- Cervero, R., Sandoval, O., Landis, J., 2002. Transportation as a stimulus of welfare-to-work private versus public mobility. *J. Plan. Educ. Res.* 1.
- DOVA., 2022. Uitvoeringsregels 2023 (Bijlage 1 van het LTK) [Implementation Rules 2023 (Attachment 1 of the National Fare Agreement)].
- Dunckel Graglia, A., 2015. Finding mobility: women negotiating fear and violence in Mexico City's public transit system. <http://Dx.Doi.Org/10.1080/0966369X.2015.1034240>, 23(5), 624–640. <https://doi.org/10.1080/0966369X.2015.1034240>.
- Durand, A., Zijlstra, T., van Oort, N., Hoogendoorn-Lanser, S., Hoogendoorn, S., 2022. Access denied? digital inequality in transport services. *Transp. Rev.* 42 (1), 32–57. <https://doi.org/10.1080/01441647.2021.1923584>.
- Durand, A., Zijlstra, T., Hamersma, M., van Oort, N., Hoogendoorn, S., Hoogendoorn-Lanser, S., 2023a. Fostering an inclusive public transport system in the digital era: an interdisciplinary approach. *Transportation Research Interdisciplinary Perspectives* 22, 100968. <https://doi.org/10.1016/j.trip.2023.100968>.
- Durand, A., Zijlstra, T., Hamersma, M., van Oort, N., Hoogendoorn-Lanser, S., Hoogendoorn, S., 2023b. "Who can I ask for help?": Mechanisms behind digital inequality in public transport. *Cities* 137, 104335. <https://doi.org/10.1016/j.cities.2023.104335>.
- Foundation for Reading & Writing., 2018. Feiten & Cijfers Laaggeletterdheid [Low Literacy Facts & Numbers].
- Golub, A., Brown, A., Brakewood, C., Macarthur, J., Lee, S., Ziedan, A., 2022. Equity and exclusion issues in cashless fare payment systems for public transportation. *Transportation Research Interdisciplinary Perspectives* 15, 100628. <https://doi.org/10.1016/j.trip.2022.100628>.
- Golub, A., Marcantonio, R.A., Sanchez, T.W., 2013. Race, Space, and Struggles for Mobility: Transportation Impacts on African Americans in Oakland and the East Bay. <https://doi.org/10.1080/02723638.2013.778598>, 34(5), 699–728.
- Hamers, D., Nabielek, K., Schluter, S., Van Middelkoop, M., 2007. Afgeschermd woondomein in Nederland [Separated Living Complexes in the Netherlands]. [www.woonbedrijf.com](http://www.woonbedrijf.com).
- Hashem, H., Ghani, M., Hirani, S., Bennett, A., Awad, G.H., 2022. Solo status, religious centrality, and discrimination among American Muslim women. *Int. J. Intercult. Relat.* 88, 32–41. <https://doi.org/10.1016/J.IJINTREL.2022.03.005>.
- Hine, J., Mitchell, F., 2001. Better for everyone? travel experiences and transport exclusion. *Urban Stud.* 38 (2), 319–332. <https://doi.org/10.1080/00420980020018619>.
- Ieromonachou, P., Potter, S., Enoch, M., 2004. Adapting Strategic Niche Management for evaluating radical transport policies—the case of the Durham Road Access Charging Scheme. *Int. J. Transp. Manag.* 2 (2), 75–87. <https://doi.org/10.1016/j.ijtm.2004.09.002>.
- Jones, P., Lucas, K., 2012. The social consequences of transport decision-making: clarifying concepts, synthesising knowledge and assessing implications. *J. Transp. Geogr.* 21, 4–16. <https://doi.org/10.1016/j.jtrangeo.2012.01.012>.
- Larson, S.J., 2018. Examining the efficacy of title VI social equity analysis: a comparative case study of transit access and neighborhood segregation outcomes over time. <https://doi.org/10.1080/10999922.2018.1441595>, 20(4), 344–357. <https://doi.org/10.1080/10999922.2018.1441595>.
- Law, R., 2016. Beyond 'women and transport': towards new geographies of gender and daily mobility. <http://Dx.Doi.Org/10.1191/030913299666161864>, 23(4), 567–588. <https://doi.org/10.1191/030913299666161864>.
- Lee, J., Vojnovic, I., Grady, S.C., 2018. The 'transportation disadvantaged': Urban form, gender and automobile versus non-automobile travel in the Detroit region. *Urban Stud.* 55 (11), 2470–2498. [https://doi.org/10.1177/0042098017730521/ASSET/IMAGES/LARGE/10.1177\\_0042098017730521-FIG3.JPEG](https://doi.org/10.1177/0042098017730521/ASSET/IMAGES/LARGE/10.1177_0042098017730521-FIG3.JPEG).
- Lewis, E.O., MacKenzie, D., Kaminsky, J., 2021. Exploring equity: How equity norms have been applied implicitly and explicitly in transportation research and practice. *Transportation Research Interdisciplinary Perspectives* 9, 100332. <https://doi.org/10.1016/j.trip.2021.100332>.
- Long, H.H., 1954. Racial desegregation in railroad and bus transportation. *J. Negro Educ.* 23 (3), 214. <https://doi.org/10.2307/2293218>.
- Lucas, K., 2012. Transport and social exclusion: where are we now? *Transp. Policy* 20, 105–113. <https://doi.org/10.1016/J.TRANPOL.2012.01.013>.
- Lucas, K., 2019. A new evolution for transport-related social exclusion research? *J. Transp. Geogr.* 81, 102529. <https://doi.org/10.1016/J.JTRANGE.2019.102529>.
- Lucas, K., Bates, J., Moore, J., Carrasco, J.A., 2016a. Modelling the relationship between travel behaviours and social disadvantage. *Transp. Res. A Policy Pract.* 85, 157–173. <https://doi.org/10.1016/J.TRA.2016.01.008>.
- Lucas, K., van Wee, B., Maat, K., 2016b. A method to evaluate equitable accessibility: combining ethical theories and accessibility-based approaches. *Transportation* 43 (3), 473–490. <https://doi.org/10.1007/S11116-015-9585-2/TABLES/1>.
- Luz, G., Portugal, L., 2021. Understanding transport-related social exclusion through the lens of capabilities approach. *Transp. Rev.* <https://doi.org/10.1080/01441647.2021.2005183>.

- Manauagh, K., Badami, M.G., El-Geneidy, A.M., 2015. Integrating social equity into urban transportation planning: a critical evaluation of equity objectives and measures in transportation plans in North America. *Transp. Policy* 37, 167–176. <https://doi.org/10.1016/j.tranpol.2014.09.013>.
- Martens, K., Bastiaanssen, J., Lucas, K., 2019. Measuring transport equity: key components, framings and metrics. *Measuring Transport Equity* 13–36. <https://doi.org/10.1016/B978-0-12-814818-1.00002-0>.
- Murillo-Munar, J., Gómez-Varo, I., Marquet, O., 2023. Caregivers on the move: Gender and socioeconomic status in the care mobility in Bogotá. *Transportation Research Interdisciplinary Perspectives* 21. <https://doi.org/10.1016/j.trip.2023.100884>.
- Najib, K., Teeple Hopkins, C., 2019. Geographies of Islamophobia. <https://doi.org/10.1080/14649365.2019.1705993>.
- Namgung, M., Akar, G., 2014. Role of gender and attitudes on public transportation use | enhanced reader. *Transportation Research Record: Journal of the Transportation Research Board* 136–144.
- NOS., 2015, November 26. Boete zwartrijden in het ov wordt 50 euro. <https://nos.nl/artikel/2071500-boete-zwartrijden-in-het-ov-wordt-50-euro>.
- Ouali, L.A.B., Graham, D.J., Barron, A., Trompet, M., 2020. Gender differences in the perception of safety in public transport. *Journal of the Royal Statistical Society Series A: Statistics in Society* 183 (3), 737–769. <https://doi.org/10.1111/RSSA.12558>.
- Owusu-Agyemang, S., Simons, R.A., Henning, M., Marshall, M., 2024a. Transit made easy: examining the adoption and impact of mobile fare payment technology among bus riders. *Transportation Research Interdisciplinary Perspectives* 25. <https://doi.org/10.1016/J.TRIP.2024.101086>.
- Owusu-Agyemang, S., Simons, R.A., Henning, M., Marshall, M., 2024b. Transit made easy: examining the adoption and impact of mobile fare payment technology among bus riders. *Transportation Research Interdisciplinary Perspectives* 25, 101086. <https://doi.org/10.1016/j.trip.2024.101086>.
- Ozbilen, B., Slagle, K.M., Akar, G., 2021. Perceived risk of infection while traveling during the COVID-19 pandemic: insights from Columbus. *OHTransportation Research Interdisciplinary Perspectives* 10, 100326. <https://doi.org/10.1016/j.trip.2021.100326>.
- Priya Uteng, T., Singh, Y.J., Lam, T., 2019. Safety and daily mobilities of urban women - Methodologies to confront the policy of “invisibility”. In: *Measuring Transport Equity*. Elsevier, pp. 187–202. <https://doi.org/10.1016/B978-0-12-814818-1.00012-3>.
- Reynolds, L., 2010. Aging and disability awareness training for drivers of a metropolitan taxi company. <http://Dx.Doi.Org/10.1080/01924780903552279>, 34(1), 17–29. <https://doi.org/10.1080/01924780903552279>.
- Rotmans, J., Kemp, R., van Asselt, M., 2001. More evolution than revolution: transition management in public policy. *The Journal of Futures Studies, Strategic Thinking and Policy* 03 (01), 015–031. <https://doi.org/10.1108/14636680110803003>.
- Hans Schmeets, Leonie Cornips., 2021, July 16. Talen en dialecten in Nederland [Languages and Dialects in the Netherlands]. <https://www.cbs.nl/nl-nl/longread/statistische-trends/2021/talen-en-dialecten-in-nederland?onepage=true>.
- Sanchez, T.W., Shen, Q., Peng, Z.R., 2004. Transit mobility, jobs access and low-income labour participation in US metropolitan areas. *Urban Stud* 41 (7).
- Schuilenburg, M., Van Steden, R., 2015. Afgeschermd wonen in Nederland: een studie naar waarom mensen hiervoor kiezen en hoe zij omgaan met interne regelgeving [Separated living in the Netherlands: a study of why people choose it and how they deal with internal regulations]. *Tijdschrift Voor Veiligheid* 14, 3–18. <https://doi.org/10.5553/TvV/1872794820150140304001>.
- Schwanen, T., Lucas, K., Akyelken, N., Cisternas Solsona, D., Carrasco, J.A., Neutens, T., 2015. Rethinking the links between social exclusion and transport disadvantage through the lens of social capital. *Transportation Research Part A: Policy and Practice* 74, 123–135. <https://doi.org/10.1016/J.TRA.2015.02.012>.
- Spoor, M., 2013. Multidimensional social exclusion and the ‘rural-urban divide’ in Eastern Europe and Central Asia. *Rural SOCIOLOGY* 53 (2), 139–157. <https://doi.org/10.1111/SORU.12008>.
- Swistara, M., 2021. A fare share: a proposed solution to address the racial disparity in access to public transportation funding in America. *Michigan Journal of Race and Law* 26 (2), 521–566. <https://doi.org/10.36643/mjrl.26.2.fare>.
- Sze, N.N., Christensen, K.M., 2017. Access to urban transportation system for individuals with disabilities. *IATSS Research* 41 (2), 66–73. <https://doi.org/10.1016/J.IATSSR.2017.05.002>.
- U.S. Department of Transportation., 2016, January 5. DOT’s LEP Guidance. <https://www.transportation.gov/civil-rights/civil-rights-awareness-enforcement/dots-lep-guidance>.
- Van Holstein, E., Wiesel, I., Bigby, C., Gleeson, B., 2021. People with Intellectual Disability and the Digitization of Services. <https://doi.org/10.1016/j.geoforum.2020.12.022>.
- Venkataram, P.S., Flynn, J.A., Bhuiya, M.M.R., Barajas, J.M., Handy, S., 2023. Framing availability and usability of transportation for people with disabilities. *Transportation Research Interdisciplinary Perspectives* 22, 100961. <https://doi.org/10.1016/j.trip.2023.100961>.
- Yigitcanlar, T., Mohamed, A., Kamruzzaman, M., Piracha, A., 2018. Understanding transport-related social exclusion: a multidimensional approach. <https://doi.org/10.1080/08111146.2018.1533461>, 37(1), 97–110. <https://doi.org/10.1080/08111146.2018.1533461>.
- Zajac, A.P., 2016. City accessible for everyone – improving accessibility of public transport using the universal design concept. *Transp. Res. Procedia* 14, 1270–1276. <https://doi.org/10.1016/J.TRPRO.2016.05.199>.