Next Stop: Social Exclusion?

De gevolgen van OV-frequentieverlagingen op baanbereikbaarheid en potentiële vervoersarmoede in Rotterdam

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Samenvatting

Door de uitbraak van het coronavirus in Nederland in maart 2020 en de introductie van de 'anderhalvemetersamenleving' zijn vervoerders en concessiehouders gedwongen om het OV af te schalen. Tezamen met de mogelijk economisch ongunstigere tijden in het verschiet, en relatief laag autobezit in stedelijk gebied, is het van belang dat juist zij met een lagere socio-economische status (SES) een goede en volwaardige toegang tot arbeidsplaatsen hebben – en behouden - met het OV. Dit ter voorkoming van (onnodige) werkloosheid, hoge verplaatsingskosten en uiteindelijk vervoersarmoede en uitsluiting van de samenleving. Mede hierdoor is de noodzaak ontstaan om te onderzoeken wat de sociaal-maatschappelijke gevolgen zijn van: (1) De bezuinigingen op het OV die zijn doorgevoerd sinds maart 2020; (2) Eventuele verdere afschaling van het OV, mochten reisbeperkingen voor een langere periode van kracht blijven. Deze twee situaties zijn onderzocht met Rotterdam als *focus city*.

Door naast de gesimuleerde vervoerkundige afname ook in kaart te brengen welke wijken gevoelig zijn voor het fenomeen vervoersarmoede, is er ook rekening gehouden met een zogenaamde *Social Severity Index*. Hiermee zijn de sociale zwakke plekken van Rotterdam in kaart gebracht.

Uit het onderzoek is gebleken dat Rotterdam-Zuid nog steeds een hoge gevoeligheid heeft voor vervoersarmoede en dat hier bij afschaling van OV veel risico is op sociale uitsluiting. Hierdoor is het voor overheidsinstanties extra van belang om bij wijzigingen van het vervoersplan extra kritisch te zijn en extra focus te leggen op de sociaal-maatschappelijke aspecten van het openbaar vervoer. Het opheffen/reduceren van lijn x kan natuurlijk heel andere sociaal-maatschappelijke gevolgen hebben dan het opheffen/reduceren van lijn y. Dit onderzoek dient dan ook voornamelijk als voorzetje voor overheidsinstanties om zich meer bewust te worden van de combinatie van OV-verbindingen aanbod en sociaal-maatschappelijke waarde voor inwoners in de '*catchment areas'* van deze ov-verbindingen. Zeker dáár waar men beperkte andere mobiliteitsmogelijkheden ter beschikking heeft verdient het OV meer focus op één van de belangrijkste pijlers van OV: Het mitigeren van vervoersarmoede en voorkomen sociale uitsluiting in de maatschappij voor hen zonder alternatief.

1. Introduction

The novel coronavirus magnified social inequality issues on various topics related to e.g. education (Bol, 2020), ethnicity (Pilkington, 2020), gender (Fare et al., 2020), health care (bambra et al., 2020), and income (Darvas, 2020). Spatial mobility tends to be no exception. The first wave in March 2020 resulted in an 87% drop in daily ridership in public transport (PT) in the Netherlands (Translink, 2021). Despite the working-from-home mantra opposed by the government during the first wave, not everyone was able to work from home. Although trips made by PT dropped between 70% for the highest income groups, only a 30% to 40% drop was registered for the lowest income groups (Tirachini, 2020). Next to spatial mobility, job losses were also unequally distributed during the first wave, as most affected by the mass lay-offs during this wave, were individuals with temporal or flexible contracts. These types of contracts are particularly prevalent amongst youth, lower educated individuals, and individuals with a non-western migration background (SCP, 2021). As Public Transport Operators (PTOs) and concessioners are currently evaluating various cost-cutting measures e.g. reduction of staff, network restructuring, and reduced operating hours and frequencies to financially survive the pandemic (OVPro, 2021), the ones reliant on PT have a lot to fear. Consequently, the combined effect of the reduction of PT services along with increased job loss among marginalized groups endanger the spatial mobility of those relying on PT. Before the outbreak of the coronavirus, research by Environmental Assessment Agency (PBL) (2019) already identified that the Dutch public transport system is prone to transport poverty (TP). Particularly, the urban poor and lower educated have been identified as having the highest risk potential for transport poverty (Martens et al., 2011). Now that the economic forecast for the upcoming years is, according to CPB (2020), worrisome, the potential for an increase of social exclusion in the Netherlands is high. Concerning the contemporary health crisis and pessimistic economic outlook, a critical review on transport equity is needed to protect the weakest in society from falling behind even more.

Given the historic research on similar topics in the city of Rotterdam (Bastiaanssen, 2012; Bruinse, 2016; van der Bijl & van der Steenhoven, 2019), and the unemployment rates in the city (CBS, 2017, Onderzoek010, 2021b), makes Rotterdam an interesting case to review the potential effects of the reduction of PT frequencies on transport poverty and social exclusion. Therefore, main research question that this paper wants to answer is**:** *How can the impact of the PT frequency reductions on transport poverty be minimized for groups without alternative transport in the city of Rotterdam?*

2. Theory

2.1 Social Exclusion

Social exclusion is a complex and broad definition, which not only evaluates personal circumstances, but also institutional availability of resources. Adopting the terminology as used by Levitas et al., (2007), the definition of social exclusion can be better conceptualized for this paper as: "…the lack, or denial of resources, rights, goods and services, and the inability to participate in the normal relationships and activities, available to the majority of people in a society, whether in economic, social, cultural or political arenas*."* (Levitas et al., 2007: 9). The concept of social exclusion overarches the sole terms of 'poverty' and 'low income', but is closely related to them (SEU, 2003). According to Lucas (2012), the definition by Levitas et al., (2007) helps to explain three important aspects of social exclusion: Firstly, it recognizes that the problem of social exclusion is multi-dimensional (e.g. cultural, economic, political, social, spatial) which covers the individual level, but also institutional level, and is carved in the societal structure. Secondly, the disadvantage is seen as a direct opposite of the normal life. Lastly, the definition identifies the dynamic nature of the concept; The concept can change over time and space. An important dimension of social exclusion is the lack of mobility resources (Wixey et al., 2003).

2.2 Transport Poverty

The term 'transport poverty' (TP) is created to identify those who are not able to participate within societal activities that are available to the majority of people in a society, because of their inability to reach these activities. transport poverty can be seen as a significant obstacle for the fulfillment of basic needs and is therefore recognized as a determining factor for social exclusion (Pawlik, 2020). Transport poverty is not just about not having an adequate bus service in the vicinity, but can also relate to the high cost of car ownership putting a hole one family expenses (Churchill & Smyth, 2019), or about personal assets (e.g. income, physical and mental health) being (in)sufficient to facilitate the use of PT, and whether PT can facilitate in the needs and desires of the individual. According to Lucas (2012), transport poverty can be the result of a mixture of the two disadvantage factors that lead the way towards inaccessibility and ultimately social exclusion: institutional-focused disadvantage factors (Illustrated as Transport Disadvantage) as well as Personal disadvantage factors (illustrated as Social Disadvantage). Lucas' (2012) illustration promptly addresses the inter-relation between the various personal and institutional factors that contribute to transport poverty. It displays that transport poverty consists of a sum of various factors, with all their own effect on ones (in)accessibility, but all combined ultimately leading to inaccessibility and social exclusion.

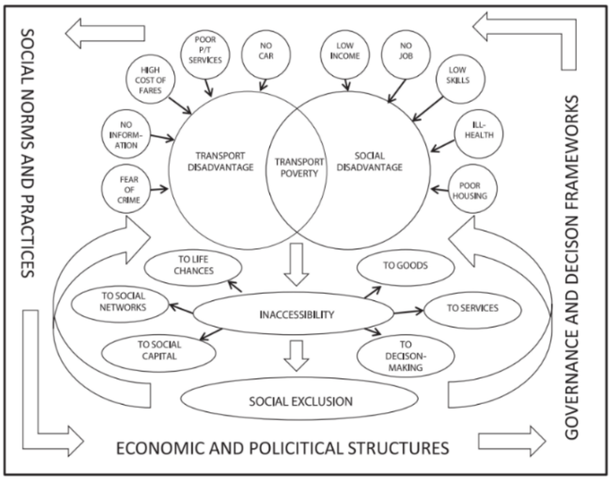

Fig. 1: Relationship between Transport Disadvantage (TD), Social Disadvantage (SD) and Social Exclusion (Lucas 2012: 3)

3. Method

The goal of this paper is to evaluate the effects of changes in PT frequencies on the accessibility of jobs of PT users. The pre-Covid PT frequencies as were run in 2016[1], will be used as the basis for comparison for two scenarios: (1) PT service frequencies as currently known during the pandemic (-10% frequency reduction). (2) Evaluate of what will happen in case of possible future cuts in government funding for PT (-30% reduction).

3.1 Scoping Transport Poverty

This paper will primarily focus on frameworks of Lucas (2012) that have a link with transport poverty, and are in the eyes of the researcher, most prone to contribute to an increase in transport poverty, during the contemporary PT challenges. Also, this study is more scoped towards the impact of reduction of PT frequencies citywide; Leaving car-related-transport-poverty indicators out of scope. Indicators linked to both areas of transport poverty: social disadvantage and transport disadvantage that have haven been included in this research have been made visible in Figure 2.

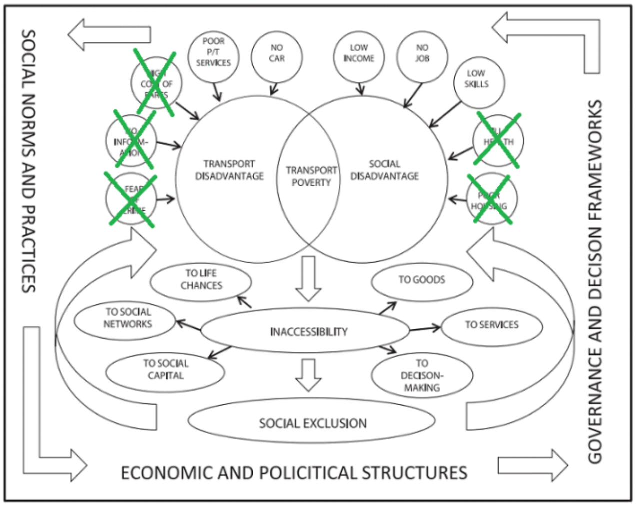

Fig. 2: Researched parameters of TD and SD for this paper. Based on the scheme of Lucas (2012: 3)

3.2 Transport Disadvantage – PT frequency reduction and car ownership

According to recent documentation from concessioners such as the Zuid-Holland province (Provincie Zuid-Holland, 2021), Metropolitan Region Rotterdam-The Hague (MRDH) (MRDH, 2021), and Utrecht province (Provincie Utrecht, 2021), it is very likely that PTOs must significantly reduce frequencies to avoid financial challenges in the near future. Therefore, poor PT service, in the form of poorer frequencies, is the main area of interest on the subject of transport disadvantage (TD). Those who already had a historically marginalized social position in our pre-Covid-19 society, are also less likely to own a car (CPB, 2009; Brown, 2017). Next to that Bastiaanssen (2012) already displayed the low level of car and bicycle ownership of inhabitants of low-SES neighborhoods. However, as there was no specific data available to the researcher, the assumption has been made that diverting to a car is not an desirable option for the focus population.

3.3 Social Disadvantage – social housing and joblessness in the neighborhoods

On the side of social disadvantage, 'Poor housing' and 'Ill-health' are out of scope for this research, as testing these factors requires personal contact with individuals, which is undesirable during the pandemic. The remaining frameworks of social disadvantage 'Low

[1] 2016 was the most recent year of public transport timetables made available in the MRDH model for the researcher.

income', 'No job' and 'Low skills' are of interest for this research. As the inhabitants of low-SES neighborhoods tend to be at the highest risk of transport poverty within urban areas (Martens & Bastiaanssen, 2019), these neighborhoods are of interest for this study. To define low-SES neighborhoods in Rotterdam, Two types of data has been used. Firstly, data on public housing is used. The level of public housing in a neighborhood can act as an indicator for lower-income levels within a neighborhood, as there are strict rules on who can apply for such housing. A high level of public housing can therefore be seen as an indicator of lower economic power within a neighborhood. Based on data published by the Land Registry and Mapping Agency (*Kadaster*), the level of public housing within neighborhoods in the Rotterdam area has been determined.

Another factor used in determining SES levels of neighborhoods is the level of joblessness in the neighborhood. As income is closely related to having a job; Income is mostly generated out of paid work (CBS, 2020). The lack of having a job has been used as another indicator for the determination of income levels among neighborhoods in Rotterdam. Data of the percentage of jobless inhabitants per neighborhood is publicly available via Onderzoek010 (Onderzoek010, 2021b).

3.4 Combining Social Disadvantages: Social Severity Index (SSI)

The SSI is an estimation of the severity that PT frequency reductions will have on the neighborhoods' inhabitants. The SSI is based on the average joblessness levels in the neighborhood combined with the level of public housing in the neighborhood. The city's average is used as a mean. Neighborhoods with both parameters lower than city's average, score the lowest SSI level of 1 (Low TP potential), which are most transparent on the map in Figure 3. Neighborhoods that show one of the two parameters being higher than average score SSE level 2 (light blue). Neighborhoods scoring higher than average on both parameters score the highest level of SSI, which is SSI level 3 (High TP potential) (dark blue).

The reason for the implementation of this index is the assumption that reduction of PT services has a smaller social impact in higher SES areas. It can be assumed that other resources can be used to mobilizes higher SES individuals. However, it is most likely that areas scoring high on the TP-related indicators, do house the individuals who are less likely to have (a variety of) other mobility resources at their disposal.

The SSI, along with the simulation of decreased PT frequencies and the corresponding accessibility of jobs, creates a more focused view on where the highest potential for transport poverty in the city might be found. The data on job accessibility per

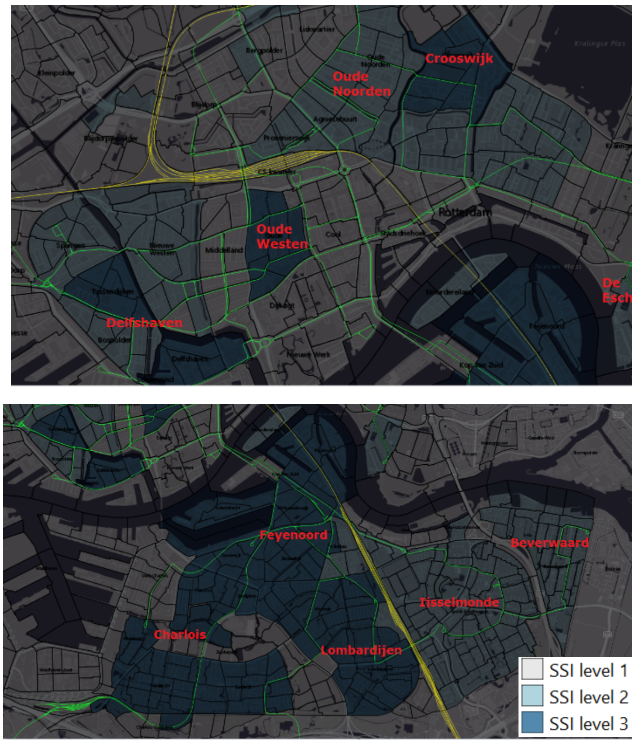

Fig. 3: SSI levels in North (up) South (down)

neighborhood will finally be combined with the SSI data of the neighborhoods.

3.5 Travel Time Constraint

A Travel time constraint is implemented to research two social disadvantage factors linked to transport poverty: 'Low skill' and 'Low income'. van Roon et al., (2011) showed that lower level education (*Basisonderwijs, Vmbo, mbo 1, Havo, vwo, mbo 2-4*) are largely represented in travel distances to work of up to 10km. Therefore, and also based on the study of De Koning et al., (2017), a time constraint of 45 minutes has been set. As in normal situations, an individual would be able to travel up to 15 kilometers by PT within 45 minutes in an urban environment.

3.6 Job Concertation Throughout Rotterdam

Figure 4 gives an overview of where most job opportunities in the Rotterdam area can be found. In the model, the Rotterdam region is divided into postal code areas (PC4), indicated as black lines dividing areas. Fig. 4 shows that the highest number of job opportunities per km^2 can be found in the city center. South sees lower job opportunities then North. Areas located in the South with the highest level of jobs per km^2 are shopping centers or hospitals.

Fig. 4: Number of jobs per km^2 for the Rotterdam region as programmed in the MRDH model (MRDH, 2018)

3.7 Bivariate Mapping

Bivariate mapping is a technique where two datasets can be combined to form one map. This technique is used to show the results of the two simulation. This has resulted in a map with the percentual decrease of job accessibility (compared to pre-covid), which is then overlayed with the SSI level of every neighborhood. To navigate the map, a bivariate legend is added to the map.

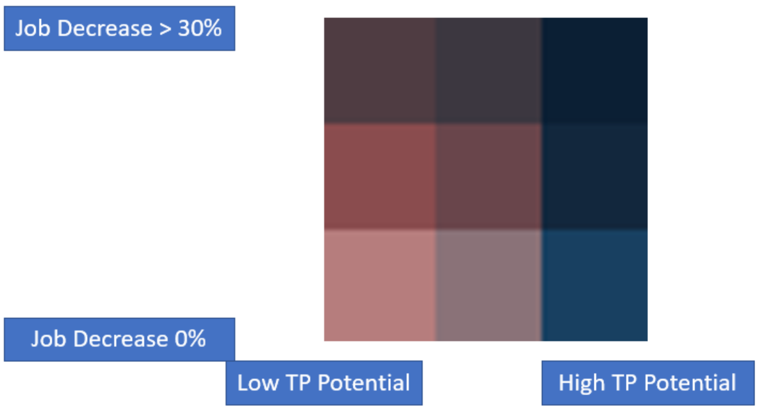

Fig. 5: Bivariate legend

The legend shows two primary colors: red and blue the red color indicates the percentual decrease of accessible jobs from a PC4 area. The darker the red color, the less jobs are accessible from that area. The blue color indicates the SSI level (see Fig.3). The darker the blue, the higher the SSI level. As the red and blue colors are overlayed on every PC4 area, the color of an area can range from a light brown, to dark blue On the x-axis of the bivariate the color is determined by the transport poverty (TP) potential which relates to the SSI level. On the y-axis the color is determined by the percentual decrease of accessible jobs from the pc4 area. Together the inserted color of the x-axis and y-axis form the final color showed on the map. The rule of thumb here is that the darker blue the area is, the higher the potential risk of transport poverty for that area.

4. Simulation Setup

The simulation model to simulate the accessibility of jobs by PT in Rotterdam has been found in the MRDH traffic model (hereafter MRDH model), which is a forecasting model for freight, traffic, and PT throughput in the MRDH-region. The model's base year used in the current case is 2016. The number of accessible jobs in Rotterdam was already pre-programmed in the MRDH model. The MRDH model is given the task to calculate the reachable jobs by public transport from any postal code PC4 location within the scoped area, with a travel time constraint of 45 minutes. Firstly this has been done for a pre-covid situation, the basis-model.

4.1 Basis-Model

The basis-model, which represents the pre-Covid situation gives an overview of the accessibility of jobs before the pandemic. Figure 6 shows the basis-model for job accessibility for 45 minutes travel time bt PT. The number of jobs reaches a maximum of 812.000 in the city center. The accessibility north of the river Maas sees an East-to-West pattern with a relatively high number of accessible jobs near metro lines. In this 45 minutes basis-model, Rotterdam South sees a relatively lower level of accessible jobs compared to the North. In general, as the distance from the city center grows, the number of accessible jobs decreases.

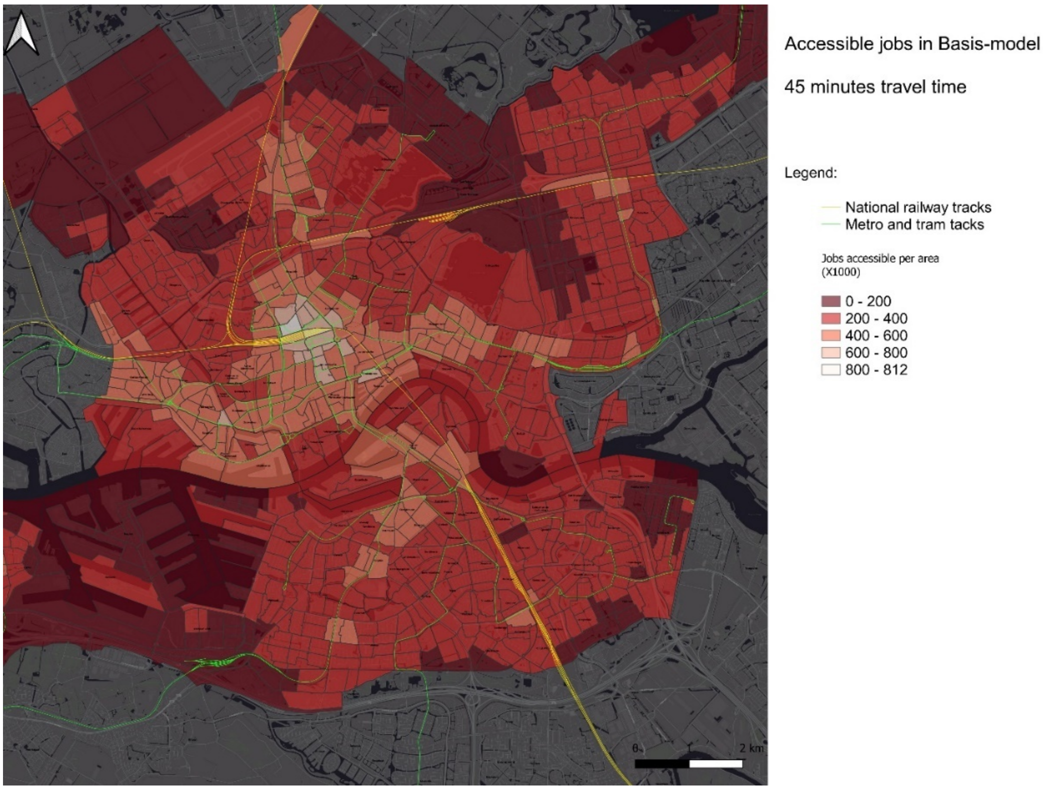

Fig. 6: Pre-Covid number of jobs accessible per area in 45 minutes by PT

4.2 Simulated Scenarios

The (hypothetical) influence of frequency reduction on job accessibility has been simulated by two scenarios: A moderately optimistic scenario (-10%) and a pessimistic scenario (-30%).

- <u>10% PT service reduction - Moderately optimistic scenario</u>

As of January 3th, 2021, Rotterdam's PTO RET runs approximately 90% of its pre-Covid 2019 schedule (MRDH, 2020). To generate insight in what this decrease has done to the accessibility of jobs, the MRDH model comes into place. This scenario simulates the accessibility of jobs with a decrease of services levels as of timetable 2021. The moderate scenario represents the assumption that the current covid-related availability fee (BVOV) (*beschikbaarheidsvergoeding*) issued by the Dutch government will be extended for a longer period. Therefore, the further reduction of services can be minimized to a minimum. However, it is not unlikely that, especially for the short term, there will be no frequency increase on PT lines if, compared to 2019, the passenger numbers remain low.

- <u>30% PT service reduction - Moderately optimistic scenario</u>

This second simulated scenario is created based on the condition wherein the Dutch government will significantly reduce or fully suspend the BVOV. The effects of lack of government aid to cover for the gaps in income, created by the pandemic, has been already calculated by PTOs and concessioners. In this scenario, a timetable reduction of 30% has to be realized by them in order to operate financially sound without BVOV aid.

4.3 Calculation Number of Accessible Jobs

After the scenarios have been simulated. The outcome of the number of accessible jobs per area, for both scenarios and travel times, will be subtracted from the pre-Covid job accessibility using the following formula:

$$\text{j\_change} = \frac{a\_Jobs\ accessible\ in\ area\ X\ in\ simulation\ y - A\_jobs\ accessible\ in\ area\ 2019}{A\_Jobs\ accessible\ in\ 2019} \cdot 100\%$$

Wherein *j* is the percentual decrease of accessible jobs per area, *x* the area code, the number of jobs accessible for the area, *y* the simulation scenario (10% or 30%).
The outcomes of the simulations have been made visual by using QGIS software.

5. Results

5.1 10% Reduction and 45 Minutes Travel Time

The Basis-model already showed that Rotterdam-South has, compared to North, worse accessibility of jobs, along with a simulated decrease of PT frequencies that job accessibility even worsened. When looking back at the job accessibility in the pre-Covid basis-model, jobs were not already equally spread throughout the city. As the suburbs and areas farthest away from the city center seem to suffer first from a decrease in accessible jobs.
The largest spots of potential TP and social exclusion are visible in South. In North, Crooswijk also shows high potential. The areas with inhabitants at greatest risk for transport poverty are mostly seen in Rotterdam South. In North, Crooswijk can be identified as an area with a higher than average risk. In the Northwest, some areas within Delfshaven are at risk.

Fig. 7: TP and Social exclusion risks at 45 minutes travel time and 10% freq. reduction[2]

[2] A larger Bivariate legend is visible in 3.7.

5.2 30% Reduction and 45 Minutes Travel Time

When evaluating the Bivariate map of the 30% PT service reduction scenario, a fairly similar pattern is visible as in the 10% service reduction scenario. Except that more areas are darker red of color, indicating an overall less accessibility of high levels of jobs throughout the city. However, it is visible that Rotterdam-South's transport poverty potential tends to be higher in this scenario. As the percentual decrease for the districts, Feyenoord and Charlois are higher than in the 10% scenario while the SSI levels of the districts remained unchanged. The outcome of both input variables (no. of jobs reachable from area x SSI level) equals out a higher transport poverty potential for this pessimistic scenario.

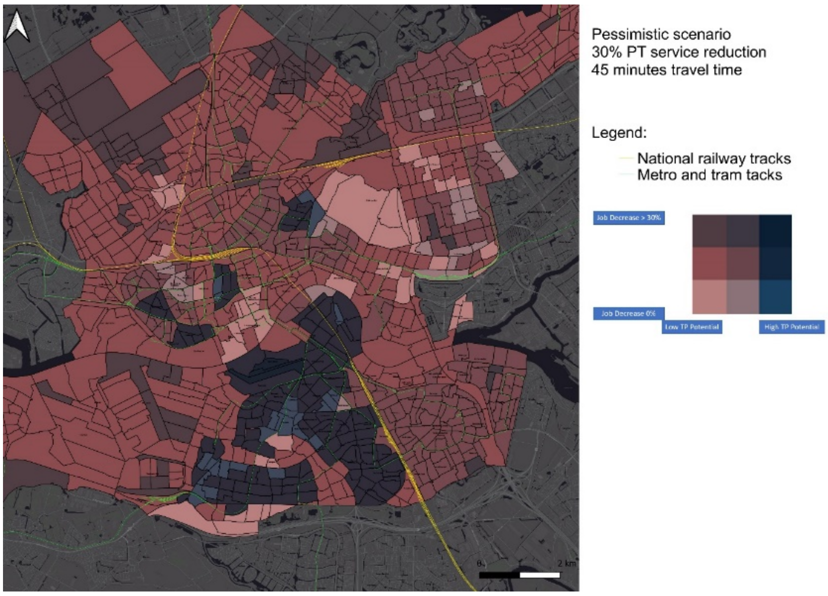

Fig. 8: TP and social exclusion risks at 45 minutes travel time and 30% freq. reduction

6. Conclusion

When taking note of the instructions by the Dutch Minister of Finance the yield realization seems to be one of the prominent Key Performance Indicators (KPIs) of evaluation for PT services in The Netherlands (van Ammelrooy, 2021). However, what PT needs in these uncertain times, when economics are not in favor of PTOs and their concessioners, is guidance and a better focus on what one of the core businesses of PT is: Preventing individuals in society from becoming transport poor and getting excluded from society.

The Social Severity Index has helped to regain that focus when evaluating PT frequency reductions in PT. However, as this study is just a minor example of a serious but very complex problem, more political awareness is needed. Revised transport plans created by PTOs and concessioners, to minimize losses during the pandemic, focus on minimizing the termination of lines, and focus more on finding the right spot between frequency and serving the city. The Social Severity Index (SSI) can help to create a better overview of the areas where, based on sociological and socio-demographical standpoints, a decrease in PT services would be most unwelcome and therefore, from a social standpoint would be undesirable.

The two simulated scenarios show a negative story for inhabitants of low-SES neighborhoods in Rotterdam. Especially for low-skilled workers and job seekers, it is essential to have good PT connections to job opportunities in the vicinity, as long-distance travel is economically undesirable. Knowing this, it is worrisome that in the 30% decrease and 45 minutes travel time, a decrease of accessible jobs of 20% appears in low-SES neighborhoods. A percentage that equals to more than 10k jobs. A number comparable to the entire workforce of the Rotterdam municipality (11.000). As results have shown, a decrease in PT frequencies has a varying impact in various neighborhoods in the city. Neighborhoods with an already low-level of SES and already a relatively bad connection to PT services, fall behind, even more, when frequency reductions have been applied. Hence, the focus should lay on minimizing PT service level reductions in low-SES neighborhoods within the city, as alternative transport can, for lower incomes, be very costly or non-existent at all.

The outcomes of the simulations should function as awareness towards governmental organizations. Preventing under-serving, in terms of a decreased accessibility of those neighborhoods with high transport poverty potential. Those areas should not be overlooked when evaluating future transport plans. The reduction of the level of accessible jobs must be a very concerning one for the governmental institutions. The loss of a job, next to the lack of private transport and insufficient PT, are the biggest predictive factors for social exclusion. With a decreased accessibility of jobs by PT, the potential for transport-related social exclusion increases for those not able to switch to other forms of transport. They end up in the vicious cycle of joblessness, heading towards social exclusion. They become transport poor.

This research shows the complexity of transport poverty. As this research was just able to research a portion of the factors linked to transport poverty, it shows how difficult it is to understand the phenomenon and act upon it. As the definition of 'Poor PT services' by Lucas (2012) is very broad, this even had to be downscaled to PT frequency characteristics to execute the research. By using a scale to gather social disadvantage characteristics, a part of the complexity is removed to simplify the usability of the theory. However, more in-depth focus in simplifying the theory of transport poverty is needed to improve the usability of these theories by scholars and actual governmental bodies who

are responsible for PT service provision in their governing areas.
Governmental institutions can be built upon this thesis to implement a prioritization tool for evaluating severeness of future service cuts. Whereas the services with the least social impact can be reduced first in favor of services running to and from low-SES neighborhoods and high potential job areas for low-SES individuals. The SSI scale is the first step towards this procedure. By adding more information regarding PT services in these neighborhoods along with more neighborhood-specific socio-economic data on where the inhabitants of those areas want and need to go, PT can offer that custom service (*maatwerk*) that is much needed in these neighborhoods.

7. Discussion

Currently, due to the pandemic, the researcher couldn't gather personal data of random individuals living in the SSI Level 3 areas of Rotterdam. Therefore this research is missing rather interesting qualitative data. More knowledge on where the individuals in these SSI level 3 areas need to travel to could be a valuable addition to the research.
The accessibility of jobs is now weighted in the heart of the city of Rotterdam, as that is where, statistically, the most jobs can be found. Based on former studies by Bastiaanssen (2012) and de Koning et al., (2017) lower educated individuals are most likely to work closest to home. Respectively within the Metropolitan region of Rotterdam and the Hague. However, the researcher assumes that the most relevant areas to find lower educated work lay outside the city center of Rotterdam and should more be sought in the more peripheral areas, such as the Port and industrial district in the far West and Southeast (*Drechtsteden*). Unfortunately, those places are known for having bad accessibility by PT. And even if connected, the PT network does not take into account shift work, which might start in the early morning and could end just before midnight. To strengthen the outcomes of this thesis, more qualitative research on workers of Rotterdam South is needed, next to a more detailed overview of where the most suitable jobs can be found for those individuals, and whether these jobs are accessible by PT, for example by using 'Origin-Destination' data. Which holds data of where people come from and want to go.
Another missing link, which can be built upon the previous point is the link between place of residence and work. A job location generally differs from a residential location. However, these two can influence each other. E.g. when someone moves to live closer to work. However, when the job is lost, the job searcher is limited in his search by the accessibility of jobs reachable from his 'new' residential area. As lower-skilled jobs have seen shifts towards more peripheral locations in the last 20 years, the accessibility of suitable jobs can be significantly reduced compared with the number of jobs accessible when the individual moved to a certain area, especially for lower-educated workers. Hereby the residential location of the jobless individual can harm next job searches. Especially as individuals are stuck in their place due to the financial unfavorable position someone enters when losing a job.
Moreover, this thesis only evaluated the number of accessible jobs, it was not able to take a step further and also take into account the number of prospective applicants for those jobs. As not every individual can apply for every job, a missing link is the 'spread' of jobs in the Metropolitan region based on educational level, to evaluate whether

individuals in the high SSI level areas do have proper access to areas that hold suitable jobs for them.
Apart from that, the SSI has been controlled by using the city average of joblessness and social housing, however, this slightly limits the replicability of the research, as the average will differ from city to city. For future research, a national standardized average should be used.

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Appendix

Appendix 1:
Socio-economic characteristics and SSI score per selected neighborhood of Rotterdam. Full list not publish here due to length of the list. All neighborhoods available upon request.

Neighborhood name (District name)	Percentage jobless inhabitants of work force	Percentage of public housing in the area	Social Severity Index (SSI) level
Afrikaanderwijk (Feyenoord)	19%	82%	**3**
Agniesebuurt (Noord)	14%	63%	**2**
Beverwaard (IJ'monde)	12%	54%	**2**
Bloemhof (Feyenoord)	16%	59%	**3**
Bospolder (Delfshaven)	17%	62%	**3**
Oud-Crooswijk (Kralingen-Crooswijk)	19%	81%	**3**
Delfshaven (Delfshaven)	15%	61%	**3**
De Esch (Kralingen-Crooswijk)	10%	50%	**2**
Dijkzigt[1] (Centrum)	4%	74%	**2**
Greater-Ijsselmonde	12%	52%	**2**
Hillesluis (feyenoord)	14%	47%	**2**
Kralingen-West (Kralingen-Crooswijk)	11%	48%	**2**
Lombardijen (Ijsselmonde)	15%	51%	**3**
Nieuwe Westen (delfshaven)	13%	47%	**2**
Oude Noorden (Noord)	14%	58%	**2**
Oude Westen (Centrum)	15%	61%	**3**
Pendrecht (Charlois)	15%	55%	**3**
Rubroek (Crooswijk)	12%	52%	**2**
Spangen (Delfshaven)	13%	61%	**2**
Tussendijken (Delfshaven)	18%	60%	**3**
Vreewijk (Feyenoord)	16%	73%	**3**
Wielewaal (Charlois)	17%	96%	**3**
Zuidwijk (Charlois)	17%	66%	**3**
City average	**11%**	**44%**	-

1 *Dijkzigt is a small area that is almost completely covered by the Erasmus University Hospital, which potentially holds accommodation facilities for its personnel and is therefore excluded from the research.*
Note: Socio-economic data derived from Onderzoek010, 2021a; Onderzoek010, 2021b