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Department of Built Environment Studies & Technology (JABT), Faculty of Architecture, Planning & Surveying (FSPU)

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Not Just a Spatial Context: Understanding the Extent of Transport-Related Social Exclusion

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Abstract
Mobility and accessibility limitations because of transport-related issues influence the ability of individuals to participate in activities. People affected by this circumstance are referred to as "transport disadvantaged," which might eventually lead to their social exclusion. Various scholars have investigated transport-related social exclusion (TRSE) issues and revealed the common transport difficulties encountered, affecting individuals from multiple backgrounds. Extensive studies have been done by looking at specific measures, such as issues related to time and spatial aspects when analysing the accessibility level in a particular locality. These studies focused on public transport performance to justify the accessibility level and the individuals' accessibility level in a local area. Despite numerous attempts to tackle the TRSE issues, any study investigating individuals' ability to participate in activities would not be compelling unless the TRSE issues were examined from a broader perspective. This paper discusses reliable evidence from previous research on the TRSE categories. These researchers use these categories correspondingly to explain the causes of transport difficulties. Furthermore, over 50 peer-reviewed papers supporting these categories tying the discourse to transport mobility and accessibility restrictions were critically analysed. The findings provide insights to expand the understanding of the broad TRSE dimensions that would benefit future research investigating TRSE issues. The findings will also benefit the policymakers, designers, and users to understand more the importance of TRSE for better sustainable future development.

Keywords: *Transport-related social exclusion, mobility, accessibility, transport disadvantage, social exclusion*

1.0 Introduction

A good connection between transit (TDA) and social marginalisation has been revealed during decades of discussion (Pyrialakou et al., 2016; Walks, 2018). This relationship affects the capacity of individuals to reach their destinations. Researchers report that the condition is worsened by limited mobility and accessible conditions, limiting involvement in activities (Levine 1998, Farrington and Farrington 2005; Preston and Rajé, 2007; Kamruzzaman and Hine, 2011, 2012; Duvarci & Yigitcanlar, 2015). Transport is a way to connect people and places to meet the requirements of people. If there are insufficient resources to meet these needs, it will lead to socioeconomic disadvantages. In the long term, this decreases an individual's ability to access networks and opportunities. Inaccessibility is a phase that leads to social exclusion. Therefore, mobility and accessibility are seen as essential aspects influencing the connectivity of individuals to their surroundings and others.

Previous TRSE studies examined the barriers to transport access using only one or a few categories of TRSE, depending on the research aims. Numerous academics have examined time and space-related criteria, such as availability, trip frequency, and travel time distribution, to evaluate accessibility levels (Yigitcanlar, Rashid, & Dur, 2010). In order to assess access to activities, physical and economic constraints, such as handicap and vehicle ownership, were being used. Research that collectively

investigates the TRSE is insufficient to justify populations affected. Present methods for studying have achieved positive results with TRSE-related studies focusing largely on time and distance trip temporal and spatial challenges.

Many scholars also focus on physical obstacles, like the elderly and people with disabilities (Dodson et al., 2006; Lucas, 2011; Bascom et al., 2017). Studies show that these associated concerns are considerable and interact with other factors and make a significant contribution to travel obstacles leading to social exclusion or vice versa. The results were equivalently explained by the recent research of the key features and correlations of TSD (physical, economic, temporal, geographical, psychological and data). The paper unpacks the categories of TRSE discussed in six previous studies, followed by a recent study confirming a subset of TRSE indicators through a series of Delphi studies. The purpose of this study is to discuss the scope of TRSE and its extent to identify its multiple dimensions. The findings contribute to our theoretical knowledge of TRSE by delving deeper into the idea and addressing the common barriers to activity participation. The findings expand future research capability by gaining a better understanding of TRSE. Additionally, the findings are expected to influence future quantification methodologies for TRSE issues collectively, assisting local governments and planners in developing appropriate future strategies and approaches.

2.0 Methodology

This study examines TRSE in a broader perspective, using data from previous studies to determine the chronology of TRSE evidence without regard for a specific time period. The authors conducted a search of the Science Direct, Google Scholar, and Scopus databases for relevant phrases such as "transport disadvantage," "transport-related social exclusion," "transport mobility," and "accessibility." This study gathered 150 of the most relevant papers by filtering journal articles and book chapters using keywords. The process begins with reviewing the abstracts, introductions, and conclusions of articles to identify relevant content. The study deconstructs the categories of TRSE discussed in numerous studies and links them while examining TRSE.

3.0 Transport-Related Social Exclusion

The TDA debate demonstrates the problems of people's transit problems as a result of many barriers to participation. Currie & Delbosc, 2010; Lucas, 2012; Preston&Rajé, 2007) are related with a cause-effect social isolation. Many studies were conducted to clarify the broader phenomena of TDA and to recognise the key interdependent roles of mobility and accessibility and viable solutions to difficulties (Duvarci & Yigitcanlar, 2015). Kamruzzaman et al. (2016) analyse TDA and TRSE separated and note that the two concepts have been identical for prior travel research and the ability to be involved in transport operations. The existence of TDA contributes to social exclusion, referred to as TRSE, which can develop in any locality. The variables and causes of TDA and TRSE are used to identify mobility and accessibility difficulties in the literature.

Three processes influence transport-exclusion relationships (Church et al., 2000; Hine & Mitchell, 2001). First, travel choices and relationships with others, such as friends and family, affect the ability to travel. This process affects people's mobility and accessibility based on their age, gender, physical ability, beliefs, ethnicity, sexual orientation, and financial status. "Nature of the transport system" relates to the meaning that transport services and networks, as well as price, are available for participation in the transit sector. These include the availability of public transit and links, individual mobility options, travel capability, and safety sentiments when you go alone, depending on the financial and physical situations. "Time-space activities organisation" refers to the features that enable people to access their travel activities.

Social disadvantage and lack of transport increase travel problems, which prevents impacted people from having access to services and networks. Furthermore, the situation offers impediments to participation and impedes their socio-economic progress. A negative environment does not consist of lack of social activities but of a lack of access, which works against the desired process of social

integration (Preston and Raje, 2007). Disputes over time lead to social problems (e.g. crime and unemployment) with separation and social instability (Buser & Koch, 2014).

While not everybody is affected by social exclusion, many factors affect the participation of persons in activities relating to transport – elements that affect the ability of an individual to travel. The danger of social exclusion was identified by Spoor (2013) as individual variables such as sex, ethnic origin, language spoken, religion, age, sexual guidance, beliefs and handicap. However, these characteristics are governed by local policy (i.e., public/private institutions and norms, cultures, attitudes and practises, structures and values). Investigation suggests that the socially excluded individuals or groups are most likely to suffer from transport disadvantages (e.g. single families, elderly, migrants, working poor people, unemployed, children, or people with disabilities) (Blair et al., 2013; Church et al., 2000; Engels & Liu, 2011; Hine & Mitchell, 2001; Ricciardi et al., 2015; Fransen et al., 2019).

4.0 The Significance of Mobility and Accessibility

Researchers emphasised the TRSE's relevance to accessibility and mobility in the transport discourse. Restriction of mobility has a significant impact on access to activities, whereas restriction of accessibility might have an adverse effect on opportunities. The distribution of jobs, health care facilities, educational and recreational opportunities can all be affected by accessibility. Enhancing accessibility is viewed as a means of enhancing transport options. Naturally, this brings us back to the subject of mobility, concerning individuals' alternatives of public and private transport. Individuals may be forced to use private transport if their local area lacks an adequate public transport system. Despite the fact that persons who own a mode of transport have a higher level of accessibility, this is contingent on the financial and physical circumstances of the individual (Rose et al., 2009; Mattioli et al., 2016). Lack of public transport is cited as a hindrance to alternate modes of transport by Sanchez (2002).

It has been reported by UN Habitat (2013) that the lack of public transport reduces mobility alternatives, which in turn impacts socioeconomic outcomes. Transportation disadvantage was more significant in suburban and rural locations (McDonagh, 2006; Larasati et al. 2018; Abe et al. 2020). It has been suggested that increasing mobility, especially in a remote area, could reverse the social exclusion process (Farrington et al., 2005). Therefore, mobility is viewed as a broader subject of accessibility. UK-based investigations on a matrix of 'area mobility, personal mobility, and area accessibility' in Bristol, Nottingham, and Oxfordshire were done with significant findings (see Preston and Rajé 2007). Individuals with high personal mobility had a scattered type of inclusion throughout seven sample areas, regardless of the level of area mobility and accessibility.

4.1 Mobility

A person's ability to use accessible transport modes is constantly related to mobility from point to point in the subject of transport studies. Mobility is described as 'moving ease' by Preston & Raje (2007). According to Stanley & Stanley (2007), mobility choices for individuals are divided into three classes: walking, individual travel modes (vehicles, bicycles, motorcycles) and public transport (train, bus and taxi) (Litman, 2003a). According to Delbosc and Currie's (2011b) survey questions, self-reported mobility metrics include the ability to travel when desired, get around reliably, get to places quickly, and find time to travel. The multi-dimensional nature of transport mobility is attributable to a few factors: location and the availability of transport (Vella-Brodrick & Stanley, 2013). When examining mobility, it is necessary to consider various factors, including the quality of transport and the ideal modes of transport for an individual's health and psychological well-being (Kashfi et al., 2016). Restriction of access to goods, services, and social interactions will limit individuals' participation leading to dissatisfaction and a lack of consistency in one's values (Bocarejo & Oviedo, 2012; Peel et al., 2002).

4.2 Accessibility

The word "accessibility" means a person's capacity to access goods, services, activities and places (Geurs & Van Wee, 2004). It reveals how easy your intended work is to accomplish. Transport individuals had a greater accessibility level (Kamruzzaman & Hine, 2011, 2012). The accessibility of transport and land use planning is a crucial aspect (Xia et al., 2016; Bantis et al., 2020).Halden et al. (2005) evaluate past research to identify six accessibility limitations. Their research divided six accessibility factors into two categories. The first category concerns the needs and circumstances of individuals while the second concerns land use, the supply of services and transport issues. Their research illustrates how these different characteristics can hinder access to opportunities for disadvantaged persons. Many constraints that limit access include 'people's time budgets, home commitments, physical skills and opportunities for engagement' (Dempsey et al., 2011). Individuals should be able to access goods, services, employment, and social connections using public transport that is close by and takes a fair amount of time (Hine and Mitchell, 2003; Haque et al., 2013). According to Lucas et al. (2015), accessibility is inversely associated with social exclusion. However, the lack of the appropriate subset of indicators resulted in an imprecise attempt to connect individuals to activities.

5.0 Findings and Discussions of Qualitative Review

The synthesis of findings was discussed into two (2) topics:

5.1 The Extend of Transport-Related Social Exclusion

There are no identical transit problems around the world, or even in certain places, within that region due to different backgrounds and features of people. It is critical to ascertain the types of disadvantage that individuals encounter, which necessitates the establishment of major TRSE categories. A number of TRES categorising methodologies have been suitably described in the preceding work (see Table 1)

Seven characteristics were identified by Church et al. (2000) as limitations of transport activity. Physical exclusions explained the physical and psychological challenges, followed by economic exclusions, such as the increasing cost of longer journeys. Requirements and activities relate to exclusion in terms of time, which takes into account the geographical environment and the provision of public transport. A lack of access to social or economic activities owing to transport deprivation was the result of geographical exclusion linked to spatial isolation and insufficient provision and exclusions of transport facilities. Another two exclusions are fear-based related to crime, or negative local characteristics and space-based reflect the poor security and space management problem.

Hine and Mitchell (2001) continue to study seven categories of the Church et al. (2000) and suggest a similar collection of five categories: physical, economic and temporal. The spatial dimension is in line with the geographical and spatial category of Church et al., (2000) 's but the psychological dimension is in line with the aspect of fear. In addition, they were classified in four areas, physically, economically, time-related and organizationally (2005). They were identical to Church et al. (2000) and Hine and Mitchell in the initial three categories (2001).

Table 1. TRSE categories and previous research link

Church et al., 2000	Hine & Mitchell, 2001	Cass et al., 2005	Halden et al., 2005	Suhl & Carreno, 2011	Paez et al., 2012	Yigitcanlar et al., 2019	Butler et al., 2020
Physical	Physical	Physical	Physical	Physical	Physical	Physical	Physical
Economic	Economic	Financial	Financial	Economic	Economic	Economic	Economic
Time-related	Temporal	Temporal	Temporal	Temporal	Temporal	Temporal	Temporal
Geographical	Spatial	Organisational	Spatial	Spatial	Spatial	Spatial	Spatial
Facility-related	Psychological		Environmental	Psychological		Psychological	Psychological
Fear-related			Information	Information		Information	Information
Space-related							Institutional

The fourth organisation, the organisational dimension, includes the ability of the individual to determine when to arrive at the destination, taking into account other considerations, including public transport, the distance from the next public transport stop, travel costs, frequency of service and timing. Because this is designed as support for categories of time, space and others requiring information in the management of a travel activity of an individual (Ibraeva and Sousa, 2014), the ability of an individual to act in an appropriate way can be considered as a 'action' factor rather than as a measurable dimension of access. Similar to Schwanen et al. (2015), who defines mobility as the capacity to access space, time, economic and non-economic travel possibilities. Mobility also involves the capacity to understand access which is exerted in response to their particular possibilities through an individual's decision and behaviour.

Provision of information has been included as a new category affecting TRSE (Halden et al., 2005). Other factors include the physical design of public spaces, their operation hours, land use patterns, transport service, crime rates, quality, safety, comfort, and cleanliness. Although they have utilised most of the features interchangeably (e.g., financial or economic, environmental or psychological), the aspects of their research have been the same as those of Church and al. (2000), Hine and Mitchell (2001) or Cass et al. (2004).

Another TRSE category was addressed by Suhl and Carreno, (2011), which divides TRSE in 6 main components: physical, economic, temporal, geography, psychology and information. In the physical category, it refers to personal difficulties preventing a person from physically participating in everyday travelling. For example, difficulties such as disability. Individuals who are unable to participate in existing public transport because of financial constraints, such as poverty, are considered to be in the economic dimension of public transportation participation.

The frequency of transport services is an aspect that may be included in the time category, i.e. the domain that addresses the limited time constraint for transport services. The space element concerns access to existing transport facilities, for example the distance between the place and the nearest transport facility. This dimension encompasses the level of trust in the use of numerous modes of transport, such as their sense of security and their level of trust in public transit This dimension describes the types, times, and locations of transportation information that are made available to individuals in order to help them plan their travel, such as the availability of public transport timetable information.

The approach put up by Suhl and Carreno (2011) appears to be more inclusive. As a result, it appears to have a greater potential for accurately identifying the many sorts of disadvantages that individuals are experiencing. Paez et al. (2012), used variables in the physical, economic, temporal, and spatial to quantify accessibility's normative and positive characteristics. Butler et al. (2020) used seven categories including 6 categories from Yigitcanlar et al. (2019). The study provided a comprehensive knowledge of how smart mobility innovations might help decrease transport disadvantaged. The additional category of "institutional" dimension encompasses legislation, regulation, and institutional restrictions that may limit an individual's ability to utilise a transport mode or service.

5.2 Not Just a Spatial Context

Yigitcanlar et al. (2018) established a framework incorporating a subset of TRSE indicators to assess both potential TRSE populations and the common causes to transport barriers. The indicators used to construct the six TRSE dimensions were culled from previously published materials (i.e., papers, journals). The framework established through experts' verifications in Delphi surveys demonstrates that individuals' difficulty is not limited to spatial-temporal issues or transport provision in the local area but is also influenced by other factors involving both quantitative and qualitative measures. Apart from the spatial and temporal dimensions, which were extensively addressed in the current research, additional dimensions such as the physical, economic, psychological, and information dimensions also had signs that garnered widespread agreement from experts in the field. Participating in transportation activities might be challenging due to a variety of difficulties, including physical ability, financial situation, geographic isolation, accessibility to public transportation, safety measures,

and the availability of information needed to organise the trip (Halden et al., 2005; Suhl & Carreno, 2011; Paez et al., 2012; Hernandez & Titheridge, 2016; Perez-Barbosa et al., 2017; Yigitcanlar et al., 2018).

Table 5.1 summarises the previous research findings on the prevalent limits to mobility and accessibility, which are supported by the validation and findings by Yigitcanlar et al. (2018). This highlights the necessity to investigate the most appropriate approach for analysing TRSE populations by taking a multidimensional approach that includes a combination of both quantitative and qualitative measures. TRSE problems are not the same locally and vary depending on the individuals' characteristics and location. Thus, it is crucial to look at the backgrounds, geographical conditions and demands of individuals (Currie & Delbosc, 2010, Hernandez & Titheridge, 2016) while examining strategies to minimise social exclusion. This means that transport measures are necessary.

The quantitative metrics of TRSE from earlier studies are discussed by Kamaruzzaman et al. (2016). In order to assess TDA and subsequently the capacity of the measures to identify TRSE, the researchers examined process-based measures and outcome-based measures. Process-specific measures relate with an evaluation of the transport deficiency, regional mobility and accessibility features, to identifying transport problems and land use arrangements. The results-based measures, on the other hand, analyse the results of actual travel and participation by assessing the activities and spaces for persons. They proposed combining multiple dimensions when assessing the differential abilities of individuals' mobility and accessibility. The combination of quantitative and qualitative measures was suggested in the TRSE analysis rather than just the quantitative method alone in identifying the disadvantaged groups (Preston & Raje, 2007; Kamaruzzaman et al., 2016). The absence of key indicators to measure TRSE will only result in the assessment of limited findings in justifying the ability of individuals to access activities. Area accessibility measures and the deprivation-based measure, for example, are insufficient to justify the spatio-temporal aspect of individuals' access to transport. Mobility-based measures inadequately provide the spatio-temporal aspects of access to opportunity. The approach towards result-based measures might therefore be a suitable way to evaluate the TRSE of the persons, through the analysis of individual accessibility, mobility and engagement in their activities (Kamaruzzaman et al., 2016). One of the main factors for well-being is to acknowledge people's capacity to attain their destinations to meet specific needs (Vella-Brodrick & Stanley, 2013). Inaccessibility decreases access to goods and services, leading to social isolation (Lucas, 2012).

This study contributes to the finding of chronological TRSE evidence as a subset of TRSE indicators, allowing future research to use the same structure to precisely examine transport barriers affecting specific populations. The evidence will be helpful to undertake more research into the actual limitations that individuals encounter. Future studies may look into individuals' needs and their ability to participate in activities versus their mobility and accessibility situations in determining inaccessibility or the TRSE level of individuals. The findings may influence appropriate strategies to assist disadvantaged groups in meeting their needs for equity of access and social change. Additional validation at the local level may be required to provide comprehensive indications that would result in precise findings. The discovery will aid local governments and planners in developing future strategies and approaches.

6.0 Conclusion

The degree to which individuals have trouble accessing activities is influenced by both quantitative and qualitative indicators of TRSE. Apart from spatial and temporal dimensions, experts concurred on physical, economic, psychological, and information dimensions. Participating in activities may be challenging due to limitations reflecting as indicators in these dimensions. Transport connects people and places to meet individuals' needs, such as workplaces, leisure, shopping, and healthcare. Individuals may place varying degrees of preference on their activities based on their needs. Thus, the approach toward outcome-based measures may be an appropriate technique to assess individuals' TRSE by analysing their level of accessibility, mobility, and their ability to access required activities. Additionally, TRSE issues do not manifest in the same way everywhere and vary based on individuals' characteristics, backgrounds, and geographical context. This research reviews the broad perspective of

TRSE by analysing its categorical or dimensions that portray the extent of TRSE, limiting individuals' participation in activities. However, the question remains as to whether we have concluded sufficient indicators demonstrating the extent of TRSE. Perhaps, the verification in future research investigating multiple case studies would help justify the effectiveness of the sub-set of indicators in the broad dimensions of TRSE.

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