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Factors affecting transport-related social exclusion: territorial classification of Czechia

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Abstract. Manifestations of social disparities take different forms and have various causes. In extreme cases, they lead to social exclusion. On the one hand, transport is an instrument for excluded individuals to participate in society. But on the other, where there is a lack of mobility and accessibility options, transport itself becomes a factor on which social exclusion is based. This study assesses objective and subjective factors regarding transport-related social exclusion. In the case of Czechia, a classification of the lowest territorial units of the state is elaborated in terms of the type of transport exclusion to which their inhabitants are potentially exposed. This example proves that the various characteristics of the settlement system in particular result in the potential for the emergence of different types of transport disadvantages. It is the task of the whole of society to find an adequate tool in response, to ensure transport inclusion.

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1. Introduction

Social inequalities occur in certain forms in every society. They are a manifestation of these societies' internal heterogeneity and can be considered a natural component of them, with social exclusion as their extreme state. Every society is differentiated on the basis of factors and mechanisms which cause or exacerbate the existence of inequalities and further reproduce them. One of these factors is the level of integration into the transport system. Inequalities in integration into the transport system are also a natural component of every society, but in extreme cases they can result in the exclusion (or limitation) of individuals or groups from participation in community/society activities. This form of social exclusion is transport-related, and we call this "transport exclusion" (see Kenyon et al., 2002; Hine, 2008; Jaroš, 2017; Luz & Portugal, 2021). It is a complex, selectively acting differentiating process in which an individual or group of individuals who are members of a particular society are unable to fully participate in its common activities, which they are nevertheless entitled to participate in as "fully-fledged" members of the society. The cause of this limitation is (transport) inaccessibility to particular activities. Thus, transport exclusion results in access to activities that are common in society being limited or prevented on the basis of geographical remoteness, poor transport accessibility, or poor mobility of the individual (e.g., Burchardt et al., 1999; Church et al., 2000; Levitas et al., 2007; Schwanen et al., 2015; Lucas et al., 2016; Carpentieri et al., 2019; Stanley & Stanley, 2019). Thus, the problem is not a lack of opportunities, but rather that these opportunities are inaccessible (Preston & Ráje, 2007).

This paper focuses on the options to identify areas that are at potential risk of transport exclusion and their spatial delimitation. Research undertaken by other authors concentrated on transport-related social exclusion (e.g., Hine & Mitchell, 2003; Preston & Rajé, 2007; Stanley et al., 2011; Engels & Liu, 2011; Shergold & Parkhurst, 2012; Mackett & Thoreau, 2015; Horňák in Rochovská et al., 2016) was used to identify the basic characteristics of transport-excluded areas which on the one hand can be considered as causes of exclusion, but which on the other hand can also be considered as negative manifestations of this process, further exacerbating exclusion. These findings are used in the study to create an analytical tool to classify territories according to the potential risk of transport exclusion for the regions (or their inhabitants). This tool is applied for quantitative analysis using the example of the territory of Czechia, for which the potential risk of transport inclusion is classified, including specification of the type of exclusion to which the area is exposed. This is applied at the level of municipality districts as the smallest statistical territorial units of Czechia for which relevant data are available.

2. Transport exclusion: its identification and classification

There has been a conceptual change in studying the problems of social inequality, with the issue moving away from the concept of poverty measured within a vertical stratification of society in terms of the rich vs. the poor (Ringen, 1988; Pirani, 2013) toward perceiving the issue in terms of the concept of "social exclusion" during the 1980s. The concept of social exclusion focuses in particular on horizontal connections within society, indicating the participation or non-participation in dominant structures within society, i.e., included vs. excluded (Townsend, 1979; Mareš, 2006; Levitas et al., 2007). Thus, it is not so much increasing inequalities in societies that are focused on, but rather the core problem is understood to be the separation of certain groups from mainstream society (Giddens, 1998). The same conceptual shift occurred in the geography of transport, with the core concept in the study of transport inequality – accessibility – being replaced by a somewhat more broadly defined concept of transport exclusion, which represents a socio-spatial differentiation process. This shift was made mainly as a consequence of the development of a "new mobility paradigm" (Sheller & Urry, 2006), which views places as moving in space and, as such, as dynamic features and emphasizes their connection at least within thin networks of human actors and their activities. The concept of transport exclusion thus no longer looks at the spatial differentiation of clearly measurable distances, time, frequency or price accessibility (e.g., El Geneidy & Levinson, 2006) or their more complex forms such as potential, cumulative or multidimensional accessibility (e.g., Marada et al., 2016; Rosik et al., 2017; Wiśniewski et al., 2021). Rather, it perceives the entire issue within a bigger picture, placing it within a broader context. As well as the parameters of integration into a transport system, which can be used to determine, e.g., vertical and horizontal position within the transport network (e.g., Marada, 2006), the concept emphasizes transport exclusion and personal mobility parameters. It is because of the incorporation of personal mobility that the individual nature of the whole process, which affects specific excluded individuals or groups,

needs to be emphasized. Overall, we need to stress that transport exclusion, just like social exclusion, is more a kind of heuristic concept that provides space for discussion of transport/social inequalities, rather than a clearly definable and measurable term (Růžička & Toušek, 2014; Jaroš, 2017).

Just as high quality and high capacity of integration within a transport system does not necessarily lead to the development of a region and the participation of all its individuals in dominant structures and processes within the particular society, (*Note* 1) so too for the converse case – transport disadvantage in the form of poor integration within a transport system need not result in transport exclusion. This is because transport exclusion depends to a large degree on the vulnerability of each individual and their personal attributes in dealing with their disadvantaged position. Transport exclusion is thus more an autonomous feeling of an individual who, due to transport disadvantage, cannot fully satisfy their own needs as they would like. This is not an exactly identifiable or precisely measurable phenomenon/process. As such, it is onerous to find ways to classify, quantify or directly measure the level of transport exclusion. In this regard, there are no factors that are sufficient, or even essential, for transport exclusion to occur. These factors that can potentially influence transport exclusion may be diverse in character (see, e.g., Alexis, 2020). In this regard, transport exclusion expresses a whole range of factors influencing social exclusion in general, i.e., economic, social, cultural, political, technological, physical geographical, and others whose negative impacts are mainly expressed in an inability to fulfil one's needs due to spatial remoteness, insufficient accessibility or poor mobility, related subjectively to a specific individual (Kenyon et al., 2002; Jaroš, 2017).

The object of transport exclusion is not a particular location or region, but rather specific individuals/groups, i.e., the inhabitants of a particular location, or people who move within the territory or who have another relationship with it. The characteristics of a specific location comprise the "transport exclusion external framework" (see Jaroš, 2017), which is the same for all the inhabitants of a territory, and these characteristics are, largely, describable quantitative indicators. Where these indicators have unfavourable values, we can speak of transport disadvantaged, or transport indifferent, areas (Kraft, 2012). However, as has already been mentioned, transport exclusion is a subjectively perceived selective process that relates to specific individuals who have different opportunities for dealing with and confronting the specific conditions of the particular "external framework". This differing vulnerability of individuals determines the "transport exclusion internal conditionality", which can be described as the ability of an individual to meet their transport needs under particular conditions, which, in turn, is termed "personal mobility" or "transport affordability" (Preston & Rajé, 2007; Lucas et al., 2016). This is naturally different for all the people living or moving within a particular area, and it often differs even within a single household, e.g. as a result of household members having different access to a personal car (Porter & Turner, 2019). Different opportunities for fulfilling one's transport needs may result in the existence of transport-disadvantaged areas, whose inhabitants do not necessarily feel social exclusion, or at least not all of them, and vice-versa.

Factors that can potentially influence the establishment of exclusion can be divided into objective and subjective factors. Objective factors potentially influencing traffic exclusion define the external framework, e.g. factors of transport accessibility or position and significance within the settlement system. In contrast, subjective factors define the internal framework, i.e., factors determined by the need and ability of each individual to use transport. In the perception of individual factors such as demand for or supply of transport opportunities, one can describe transport-excluded locations as "transport deserts" (Jiao & Dillivan, 2013; Jiao, 2017).

The phenomenon of transport exclusion itself is onerous to measure or classify, and this is in particular due to its being a matter of the perception of the individual (subjective factors), which has the character of a feeling. One can, however, define the external framework and internal conditionality by identifying specific subjective and objective factors that result in this phenomenon. Thus, it is not transport exclusion itself that is monitored, but rather conditions defining the potential that it can occur. This research is thus focused on defining the potential for transport exclusion in Czechia.

3. Methodology

The research focuses on examining three phenomena that define the potential for exclusion: geographic potential (a), accessibility (b), and personal mobility (c). This is based on research by Preston and Rajé (2007), who used these three parameters in their study to create a three-dimensional social-spatial schema of social inclusion and exclusion (see Fig. 1). Each of these parameters is given dichotomous values of "high vs. low" in a specific location, and this corresponds to participation or non-participation

in the society-wide system in accordance with its common standards. In this regard, the objective is to differentiate the level of participation in society, which can be considered as a standard or close to a standard, compared to individuals/locations that fall well-short of this standard. There are logically many fewer locations or persons who do not reach society-wide standards in access to common activities, and so are classified as "low" compared to those who do achieve these standards. The result of the specific combination of individual monitored parameters in specific locations is eight types of transport-related social exclusion. Horňák (in Rochovská et al., 2016) perceives the described types of transport exclusion as a certain level of transport disadvantage (indicated in Fig. 1), with each of the eight levels having specific conditions and so requiring a specific approach to resolve.

The classification of territory according to these levels/types of potential transport exclusion is implemented in the research. Individual levels are not structured hierarchically. They are not even stages through which regions go in their development. Neither do they indicate the level of risk that inhabitants in a particular area become excluded. The individual parameters instead refer to the number of options for participation in society-wide processes. The availability of at least a single option suffices for an individual to be included (meaning their mobility needs being met), if that option provides the opportunity for the individual to fully and effectively participate in society, i.e., as long as it secures their accessibility to the common activities in society as their needs. The research scheme summarised in Fig. 2 shows the classification typology workflow consisting of a combination of three parameters and specific indicators that represent them.

The first of the parameters investigated is (a) geographic potential of the area (in Fig. 1 described as "area mobility"). This is the essential aspect determining the spatial conditions of a particular location, and it can be perceived as a horizontal transport position (Marada, 2006). To a large extent, it defines the need/necessity of an inhabitant to secure their mobility needs. Low geographic potential of an area indicates a high dependence on transport (individual and public) to meet the needs of each individual. High geographical potential characterises core areas, while low potential is typical of rural or peripheral areas (see e.g., Hampl et al., 1987).

The characteristic of each location defined by the potential of its geographic position is given, or even fixed, and relatively stable in the short term. Other characteristics (i.e., accessibility and personal mobility) determine the vulnerability of an inhabitant and his or her opportunities to deal with unfavourable conditions as defined by the geographic potential factor.

To determine levels of geographic potential, core areas of settlement in Czechia were defined for this research. All towns and cities which are considered centres of at least sub-regional hierarchical size level according to socio-economic regionalisation (Hampl & Marada, 2015) on the basis of inter-municipality commuter interactions are considered core areas. This results in 153 towns and cities, the smallest of which has just over 4,000 inhabitants. "Maximum population density areas" were created around these towns and cities (for method, see Korčák, 1966). This is a method that models an area around core areas whose population density is of at least a pre-determined value (in this case 750 inhabitants/km^2 – five times the country average) (*Notes* 2 and 3). The calculation algorithm is modelled such that the most suitable option for the maximum size of the described area is calculated while maintaining its integrity (no enclaves or exclaves) (*Note* 4). If a specific location is within defined maximum population density areas, its geographic potential is considered to be high. In contrast, if it does not fall within defined core areas, it is a rural, peripheral, or otherwise unfavourably situated area with a geographic potential level defined as low.

The second component investigated is (b) accessibility of an area. This refers to how reachable core areas are from the particular location using the transport system (Preston & Rajé, 2007). The accessibility of an area can be understood as the range of transport opportunities, or more specifically the level of the location's integration into the transport system. Transport is a means which allows one to participate in society-wide structures and undertake common activities in society. This opportunity to participate in the system is determined by the transport accessibility of the location itself and also its vertical transport position (Jaroš, 2017; Marada, 2006).

On the one hand, the accessibility of an area represents a means to overcome social exclusion, since high accessibility means that even an area in an unfavourable position can be well connected to the system. On the other hand, however, poor accessibility can further entrench social exclusion. The accessibility of an area is a characteristic relating to the inhabitants of a specific location that defines external conditions or objective factors that are relatively stable, if not entirely fixed.

In the research, accessibility is defined as the degree of opportunity to undertake a journey by public transport (of inter-urban character). The total

number of transport connections leaving a particular municipality district during a standard weekday was calculated using data from timetables. The criterion of 12 connections per day was taken as the critical value determining sufficient connections to dominant structures in society. This is equivalent to six pairs of two-way (return) connections. The critical value was determined based on the distribution of values as two thirds of the median (18 connections). Therefore, locations with 11 or fewer connections departing per day have below-standard, poor accessibility, and as such their inhabitants may have limited opportunities for participating in society through the use of transport.

The third parameter monitored is (c) personal mobility. This represents an individual's mobility not just in terms of opportunities or ability to make a journey, but also in terms of their personal transport requirements. All these aspects – ability/opportunity and the need to transport – are entirely individual and are influenced by many factors, with location being just one. It varies significantly over each individual's lifetime. For instance, it is considered generally true that both the need and the ability/opportunity to travel vary significantly between different members of the same household. Therefore, this parameter represents the opportunity/ability for each individual to meet their own requirements (i.e., needs) for transport.

While the previous two parameters (geographic potential of area and accessibility of area) are fixed for a specific place and generally apply to the whole location, personal mobility is individual in its character and relates to specific persons. It is a transport exclusion internal conditionality, as it defines the vulnerability of every individual towards manifestations of exclusion. We can state that personal mobility responds to conditions set within external frameworks (i.e., geographic potential and accessibility of area).

Concerning location, personal mobility is represented through those characteristics of its inhabitants that indicate a higher risk of social exclusion occurring. This approach is applied in this study as well. The parameter of personal mobility is defined by an aggregated index that takes account of the proportion of citizens who are most at risk of transport exclusion (children up to 15 years old, students, persons over 65 years old, persons caring full-time for pre-school-age children, unemployed persons). The aggregated index also comprises private car ownership i.e., the proportion of citizens who own a car (*Note* 5); this represents the ability to make an individual journey and resolve any issues of inaccessibility of activities within a particular location. Both these parameters (the most vulnerable group of people and the ability to move) are represented equally and reversibly in the index. It takes into account inhabitants' vulnerability as well as their ability to cope with these unfavourable conditions.

The resulting index has a relatively symmetrical distribution of values, and so the critical value was determined through the standard deviation from the average value. In accordance with the definition of transport exclusion, it was ensured that territorial units with index values of around the average are considered to be locations that correspond with society-wide standards, and thus demonstrate high personal mobility. Choosing the critical value in this manner ensures that mean and median values are above the determined threshold, i.e., above the minimum standard. In contrast, low personal mobility can be identified for territorial units where the population structure is significantly different (they contain a greater proportion of vulnerable groups) from the conditions which are the standard in the country, and, as such, fewer inhabitants have access to a private car than is standard.

As has been noted, we can use a combination of the three stated parameters to define a total of eight types/levels of transport exclusion, or more specifically the prevailing potential for it arising in a particular location (Fig. 1). It is evident that the type labelled "1" in the above scheme represents the ideal conditions (high geographic potential of area, high accessibility of area, and high mobility of inhabitants), and it should be the objective of all locations we investigate to achieve this status. In this type of area, the causes leading to transport exclusion are minimised, and there are effective tools for dealing with transport exclusion for the inhabitants of these areas. We can expect that large towns and cities and their immediate suburbs will fall within this type, with a large number of transport opportunities for inhabitants with high personal mobility. This does not mean, however, that there is no transport exclusion in such locations at all, as it can manifest for specific individuals (based on their individual conditions). The type labelled "7" in the scheme represents the opposite of this situation. Inhabitants in these locations have values in all the parameters looked at which are generally insufficient to enable them to participate in society. This is a characteristic mainly seen in rural locations with a low level of transport opportunities and a population with individual transport needs that cannot be met through personal mobility. Even in this case, the exclusion does not generally apply to all the citizens of the particular location. Transport exclusion acts on the inhabitants of specific locations selectively,

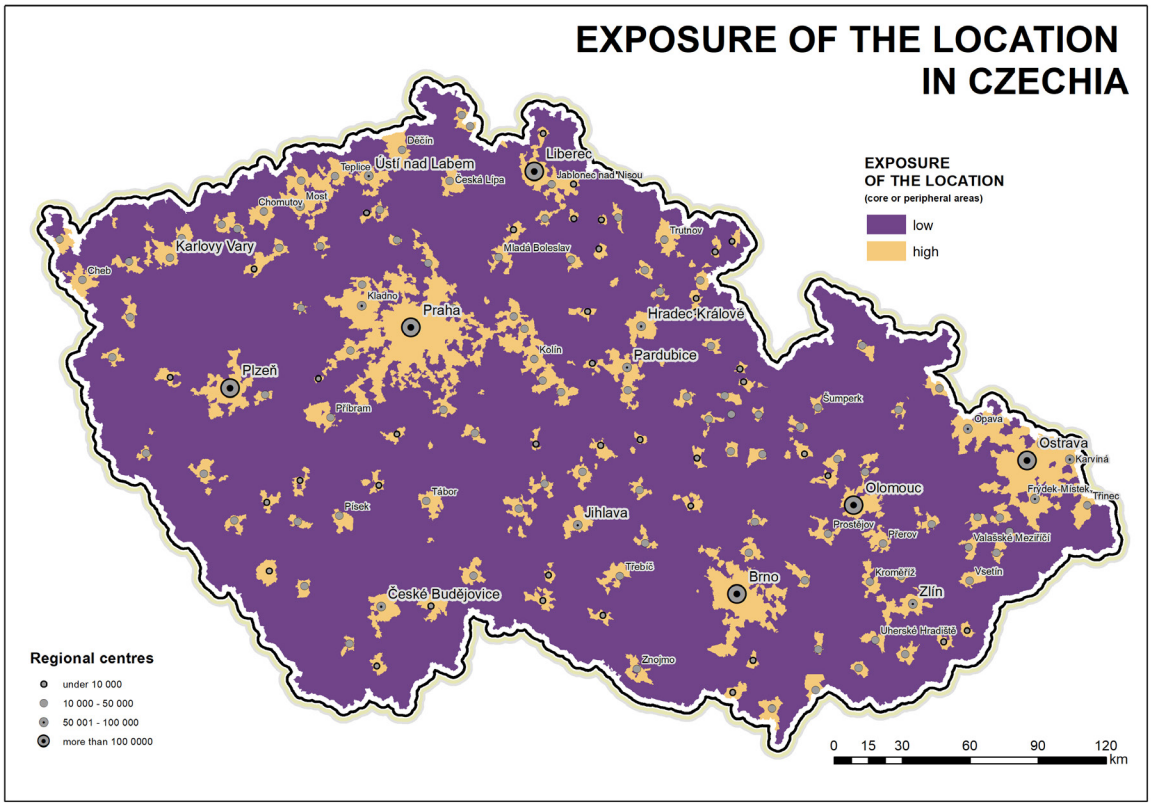


Fig. 3. Geographic potential of areas
Source: author's processing

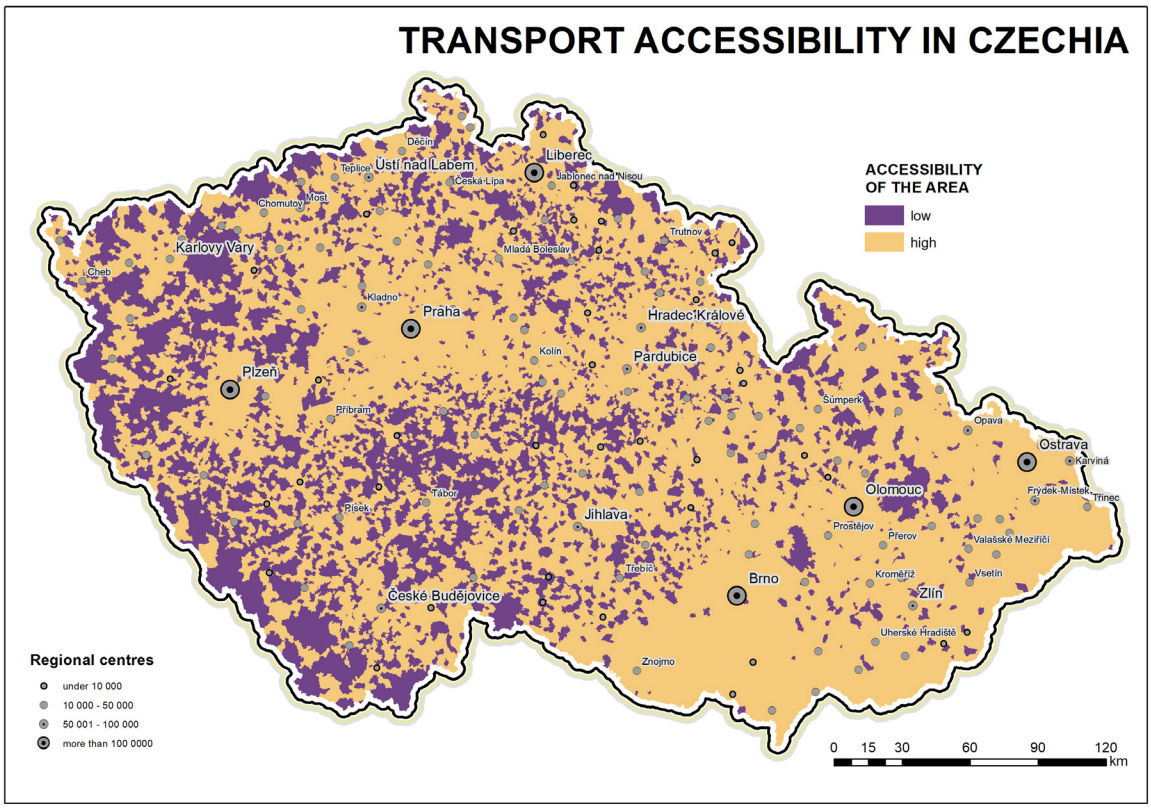


Fig. 4. Accessibility of areas
Source: author's processing

and their manifestations are perceived at an entirely individual level (Kenyon et al., 2002; Lucas, 2012; Mackett & Thoreau, 2015).

Concerning the mentioned types of area, we can recognise a phenomenon described as a "transport inaccessibility paradox" (Nutley, 1998). The core areas of a country, which as well as their residential function also provide significant job opportunities and service functions, also have the greatest range of transport opportunities. In contrast, in peripheral areas with limited job opportunities and a limited range of services, transport opportunities are also limited. The paradox is that, where the transport supply is high, the relative need for transport is low, since inhabitants have many opportunities to undertake the activities they need to within their neighbourhood. In contrast, in locations with a high dependence on transport (peripheral areas), the transport supply is, paradoxically, the lowest. This paradox is reflected in car ownership (a component of personal mobility), which responds reciprocally to this paradox of (in)accessibility. Car ownership is often higher in peripheral areas with a high need for transport than it is in core areas (Marada & Květoň, 2010).

In this research, the territory of Czechia is divided into 15,070 municipality districts, which are classified into eight type-differentiated categories with specific transport and mobility characteristics determining the potential/risk that inhabitants are subject to specific types of transport exclusion (Jaroš, 2017).

4. Results

Three parameters defining the potential for transport exclusion in particular locations were assessed using the above-specified methods. The results were subsequently visualised cartographically, and these are shown in Figs. 3, 4, 5 and 6.

In terms of geographic potential of areas, the suburban zones around large cities (Prague, Brno, Ostrava) are shown to be core areas of Czechia's settlement. Other important core areas (centres of the mesoregional level) always incorporate just the actual centre and immediate surroundings, generally forming a compact urban unit with the core. The requirement for a population density of 750 inhabitants/km^2, which is almost six times Czechia's average population density, meant that the large industrial areas in the north and north-west of the country were partially fragmented into smaller territories focused around the region's main centres

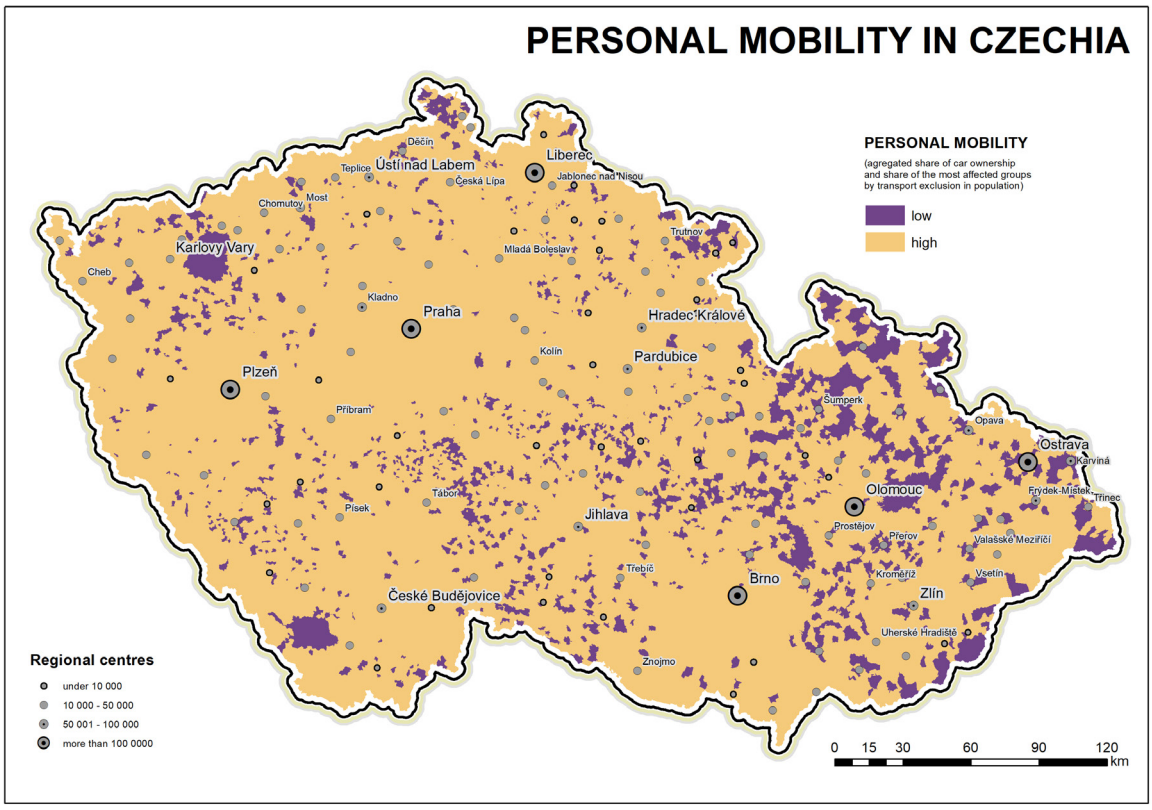
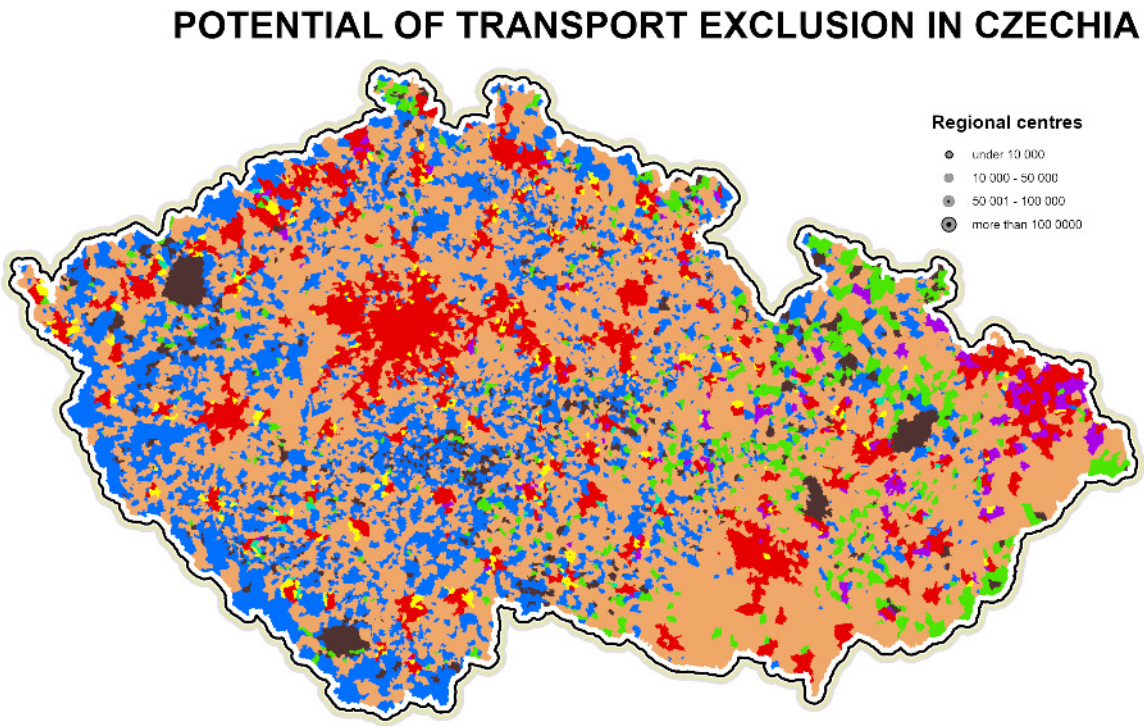


Fig. 5. Personal mobility
Source: author's processing

(e.g., in the Northwest Ore Mountain conurbation belt or in the Liberec conurbation). There was even more visible fragmentation of core areas, however, in East Bohemia, where the Regional Capitals of Hradec Králové and Pardubice form two separate regions, while the cities of Olomouc, Přerov and Prostějov similarly form separate regions in Central Moravia. For smaller centres of regional and sub-regional levels, core areas are mostly only the actual centres, possibly alongside a few of the closest surrounding settlements. There were 2,523 municipality district units identified as core areas, in which 65% of the country's population is concentrated. In contrast, the remaining 12,547 municipality districts can be considered rural and peripheral areas with a spread settlement. Although they cover more than 80% of the area of Czechia, only a third of the country's population resides here.

The noted paradox of transport (in)accessibility is clearly seen in regard to accessibility of areas, with



Typology of areas

TYPE OF AREA
1
2
3
4
5
6
7
8

Type of area	Number of units	Number of inhabitants (millions)	G. potential	Accessibility	Pers. Moility
Type 1	1 844	6,010	high	high	high
Type 2	203	0,720	high	high	low
Type 3	590	0,290	low	high	low
Type 4	6 703	2,879	low	high	high
Type 5	398	0,187	high	low	high
Type 6	78	0,020	high	low	low
Type 7	762	0,045	low	low	low
Type 8	4 492	0,350	low	low	high
∑	15 070	10,501			

high
low

Fig. 6. Classification of territorial units of Czechia according to the potential of transport exclusion
Source: author's processing

the greatest range of transport opportunities in the core areas. In contrast, in the peripheries, whose inhabitants are reliant on transport to core areas, integration into the transport system is generally the lowest.

The accessibility of areas reflects the characteristics of Czechia's settlement system. It is understandably core areas that have high-quality connections to the transport system, and these are also the main transport destinations. Additionally, however, there is a very evident west-to-east gradient, in which the western part of Czechia (i.e., the historical territory of Bohemia) is significantly more poorly connected to the transport system (i.e., quality transport services) compared to the eastern part (the historical territories of Moravia and Silesia). This is a result of the settlement structure, with western Czechia generally having a lower density of settlements, with their size and activities concentrated in centres of a higher level. These centres then form relatively large surrounding areas in which transport links are mainly heading that particular centre. In contrast, the eastern part of the country has a higher population density, and rural settlements are also generally larger. Centres are more concentrated, and their surrounding areas overlap each other. As a result, the eastern part of the country has sufficient transport connections, even in mountain regions. This does not apply to the western part of the country, where extensive areas with poor transport services can be clearly identified in mountain regions (the "external periphery") and in the area between the City of Prague and Regional Capitals (the "inner periphery") (Musil & Müller, 2008). In general, the range of transport opportunities in the eastern part of Czechia is thus higher.

Of the total 15,070 units investigated, the determining criterion of 12 public transport

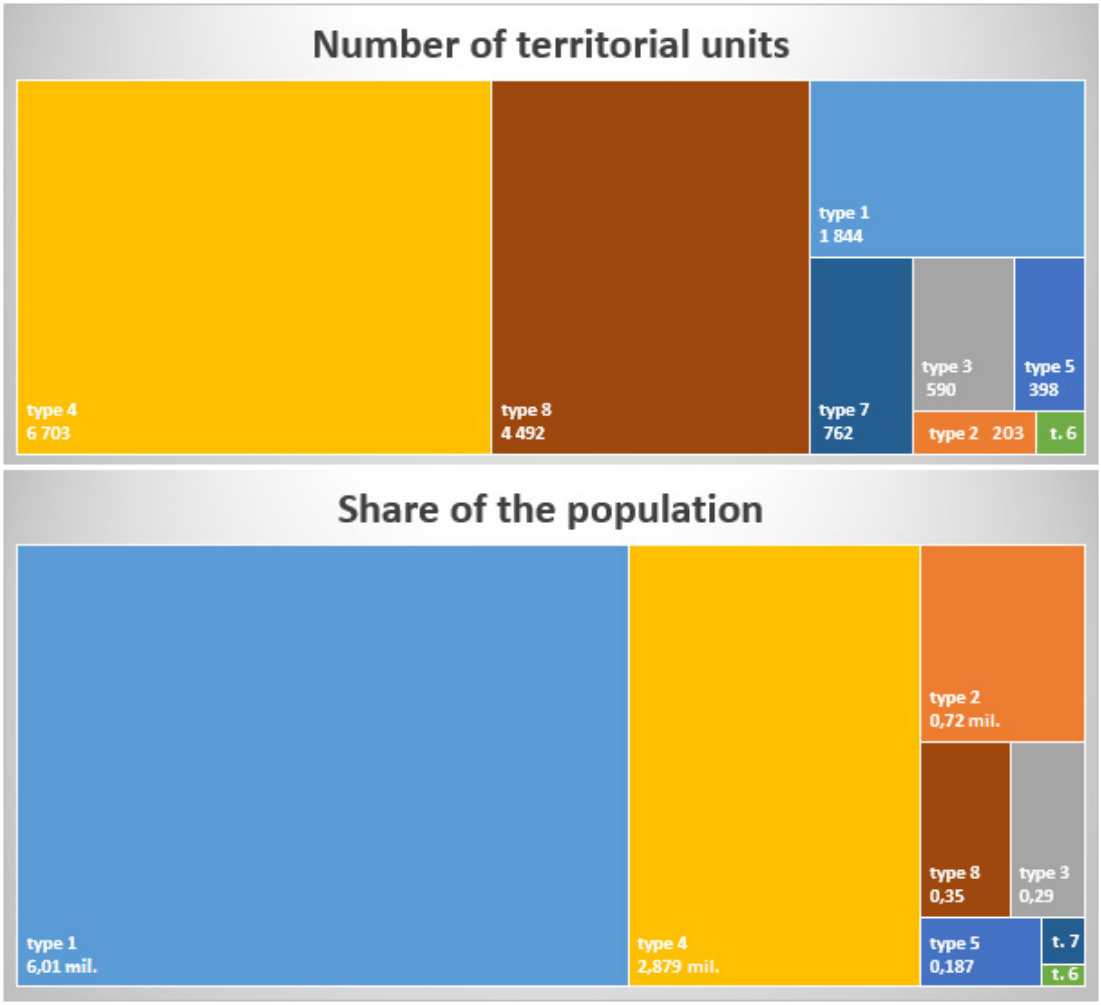


Fig. 7. Number of territorial units and share of population considering different types of transport exclusion risk
Source: author's processing

connections was met by 9,340 municipality districts, and these are considered locations with high accessibility. In contrast, locations with 11 or fewer connections per day (5,730) have poor accessibility and limited opportunities to be connected to society through transport.

Regarding personal mobility, there is also a clear difference between eastern and western Czechia. It is proven that some components of personal mobility respond greatly to the unfavourable nature of external (objective) conditions defined by area location and accessibility. Although there was relatively low variation in the territorial distribution of the monitored aggregated indicator of the most at-risk groups of inhabitants, it was the second indicator taken into account, i.e., car ownership, that showed the most difference among the units investigated. In peripherial areas with poor accessibility in western Czechia, there is markedly higher car ownership, a phenomenon that has already been identified (e.g., Nutley, 1998; Marada & Květoň, 2010). For inhabitants, individual transport often represents the only way to avoid the risk of transport exclusion. In contrast, in the east of the country, a wider range of public transport means that there is less necessity to use private transport. People in these areas have enough opportunity to ensure their everyday needs using public transport, and thus dependence on private cars is naturally lower.

The investigated territorial units are divided up in a significantly asymmetrical way in terms of the personal mobility indicator. There are six times more units with high personal mobility (13,437) than with mobility identified as insufficient (1,633). However, this division is fully in line with the definition of transport exclusion relating to individuals and groups that are located outside society's system and its standard, and not those who demonstrate average or near-average values within the system. This means there is a differentiation between inside vs. outside society, not between being at the top or bottom of society (Giddens, 1998).

In terms of classification according to the potential for transport exclusion within the territory of Czechia, all eight types of risk of transport-related social exclusion are found. A heterogeneity of differentiation between territorial units is clearly demonstrated according to the monitored indicators. Different types of transport exclusion are represented very unevenly (see Figs. 6 and 7).

Figure 6 shows clearly circumscribed core areas of the state (Types 1, 2, 5 and 6). More than three quarters of the core areas display high accessibility and personal mobility (Type 1) in addition to high geographic potential. These areas thus have the highest potential for meeting the population's transport needs. Although this type is characteristic for only about 13% of all the units investigated, more than 60% of the population of the entire country live in these areas. Other types of areas incorporating core areas are not so common and represent just a fraction of the population. Meanwhile, Type 2 is found mainly in large towns and cities with good public transport provision. Types 5 and 6 occur on the outskirts of centres, and in particular in their nearby surroundings. We can also see that Type 2 occurs more commonly in core areas in the east of Czechia, whereas, in contrast, Type 6 occurs more often in core areas in the west of the country. While all these areas cover only around a sixth of the territory of the country, two thirds of the population are concentrated here.

More than 80% of the country's territory falls within rural/periphery types (low geographic potential). These include the two most commonly classified types of area, which are there altogether 11,195 of the total of 15,070 units assessed. The most common – Type 4 – is specific for peripheral areas of high personal mobility, and in particular high-quality connection to the transport system. These areas occur mainly in the wider surroundings of core areas, often linked to Type-1 areas. This type occurs across the whole territory of the country. The second most common area is Type 8, which is very similar in character. In contrast to Type 4, however, it has an insufficient range of transport opportunities (low accessibility of area). This area type occurs in extremely peripheral areas and links to Type-4 areas. This area type is found almost exclusively in western parts of Czechia, roughly corresponding to areas of the "inner-" and "outer periphery". It is revealed that areas in the east of the country do not achieve this level of peripherality typical of the west, with the category almost entirely absent and occurring just sporadically. Categories 3 and 7 are less frequent and occur in different types of territory, although there is an evident east–west gradient here too, with Type 3 occurring more in the east of Czechia and Type 7 in the west.

In terms of the potential occurrence of transport exclusion, Type 7 exhibits the most complicated cases. In these areas, which cover around 6% of all the units investigated, it may be difficult for a large proportion of the population to overcome these unfavourable conditions. There are minimum opportunities for full participation in society. These areas are again mainly mountain areas of the "outer-" and "inner periphery", and they mainly occur in isolation. They do not form coherent clusters but, rather, are more specific manifestations of an accu-

mulation of negative processes within a specific location. This category also includes the territory of four military training areas (specific types of territory), which are evident on the map (Boletice, Březina, Libavá, and Hradiště military training areas). Although these territories are not permanently settled, and so they form spatial gaps in the territory (Xia et al., 2016), they have nevertheless been included in our research in order to ensure the integrity of the territory. These areas are also indifferent regarding transport (Kraft, 2012), and they act as major spatial barriers in the transport system and also in the settlement system.

5. Conclusion

Regarding the concept of social exclusion, the disparity in society is no longer primarily viewed as a problem in the distribution of tangible and non-tangible assets within society. Instead, the main problem is considered to be participation in dominant society-wide structures and the fulfilment of values that society to some extent expects and appreciates. The objective for the whole of society is not to even out societal disparities and create a level playing field. Instead, the objective is to create a society in which every individual shall have a fair opportunity to participate and achieve self-fulfilment within its structures.

A similar approach is taken in regard to transport-related social exclusion, or transport exclusion. Thus, is it not necessary to create a transport system in which all inhabitants at all levels have the same or standardised transport conditions. Instead, we need to create an environment that gives all individuals a fair and accessible opportunity to meet their individual transport needs. In this sense, transport is a means that helps to overcome the negative manifestations of social exclusion. Where there is a lack of transport opportunities, however, the negative manifestations of exclusion can become further exacerbated.

Czechia's settlement system was used to investigate the core indicators describing the external framework and internal conditionality of transport exclusion (i.e., factors acting objectively and subjectively) in order to create a classification of territorial units according to potential exposure to the negative manifestations of transport exclusion. A total of eight different types of area were defined, and these are found with a highly uneven distribution within the country. This research clearly demonstrated the specificity of Czechia's settlement system, some examples including differences in the settlement betwen the western and eastern parts of the country, and the accumulation of negative manifestations in the areas of the "inner-" and "outer periphery".

The core differentiating factor in classifying the territory according to the type of transport exclusion that they are potentially subject to was seen to be distance from major settlement centres. This indicates the main positional characteristics of the location, while other factors represent mechanisms for dealing with positional disadvantage. Connection to the transport system through public transport had a significant impact on classification. There was an evident higher range of transport opportunities in the east of the country compared to the west. In contrast, the situation is the opposite way around in terms of private car ownership, with markedly higher automobilisation in the western half of Czechia. This is a response to poor access to public transport, with inhabitants very or completely reliant on private transport. These differences are clear in the resulting classification. We can say that marginal areas in the eastern half of Czechia do not reach the same level of peripherality as the peripheral areas in the west. With a higher population density, greater concentration of population in relatively larger settlements, better public transport services and settlements of a polycentric nature, the east of Czechia is almost lacking in areas characterised as peripheral with low accessibility and high mobility, which represent the most common type of area in the west of Czechia.

The classification mapped out territorial differentiation and took account of different factors influencing and potentially causing transport exclusion. Even so, transport exclusion is an entirely autonomous feeling for each individual, who can either satisfy his or her transport needs or not on the basis of their individual conditions. In this sense, the classification represents an objective assessment of the conditions for meeting these needs. The potential is not the same for all the inhabitants of a location. Even in regions with poor conditions, there are people who can be well integrated within the society-wide system, and, in contrast, there are specific individuals even in core areas with ideal conditions who do face transport exclusion. Thus, the typology created defines the prevailing conditions in a particular location which may result in transport exclusion. For specific individuals, the risk of transport exclusion is an entirely individual matter that changes during one's life and that can even vary within a single household. It always depends on the abilities and opportunities of each individual to deal with the defined conditions.

It is ultimately the task of society to respond adequately to cues from different areas and use,

for example, tools of regional or transport policy to either prevent transport exclusion or ensure the inclusion of excluded individuals. In this regard, however, we need to analyse local conditions in detail and identify the character/type of exclusion people are faced with. Efforts to secure transport inclusion in Czechia have most commonly (almost exclusively) focused on reorganising public transport links. Nevertheless, we need to see the transport system as holistic with a wide range of tools incorporating also individual transport, communal or shared transport services, mobility of services, and other alternatives of transport policy, including various economic or social transport support programmes for securing population mobility. Different types of transport exclusion require their own specific methods of resolution.

Notes

1. In this sense, high quality and high capacity of integration within a transport system in its broadest concept is perceived as a necessary, but not sufficient, condition for the development of a particular location or for full participation of individuals within society.
2. Analysed municipality units that achieve a population density of greater than 750 inhabitants/km^2 despite not being centres of sub-regional significance are also considered to be core areas in the research.
3. The critical value was determined based on sensitivity analysis as approximately five times the average population density of the entire state. This value is reached only by the largest residential agglomerations. Therefore, the value determined in this way will ensure that only those territories that are closely urbanistically connected to the 153 settlement centres are included in the core areas.
4. Despite these rules, exclaves and enclaves did occasionally emerge within the resulting core regions. Nevertheless, the presence of these exclaves and enclaves arises from the fact that the municipality administrative units analysed are not cohesive (integral) and contain such geographic features (exclaves or enclaves).
5. Data on car ownership by individual citizens of municipalities were obtained for this research from the annual statistics of the central vehicle register maintained by the Ministry of Transport of the Czech Republic.

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