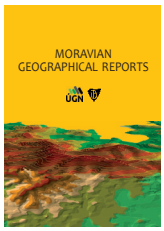

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Public transport accessibility and spatial exclusion in Roma settlements: A case study of three regions in Eastern Slovakia

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Abstract

Spatial isolation and social exclusion of some of the Roma communities have been a long-term issue in specific Slovakia regions. Along with some other factors, these may contribute to poor access to labour markets for Roma residents of such communities. As public transport acts as an important means of mobility of socially excluded residents, we consider the quality and accessibility of the public transport network as an important element that can impact on the spatially isolated Roma's ability to reach labour markets, as well as services, education, etc. Based on our empirical evidence, this paper aims to provide a better understanding and analysis of the social exclusion of segregated Roma neighbourhoods in the context of spatial exclusion and transport disadvantage related to public transportation accessibility. We tried to focus on physical accessibility of public transport points for the communities, as well as on the quality and frequency of public transport services available at these points for residents of Roma communities. Our research covered three different regions of Eastern Slovakia, where the concentration of Roma communities is high compared to the rest of the country.

Keywords: *social exclusion, transport disadvantage, public transport, Roma settlements, segregated communities, labour markets, Slovakia*

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1. Introduction: Specifics of the Roma population

All attempts to estimate the current numbers of the Roma in Slovakia result in hazy numbers, usually between 400 and 600 thousand. A more realistic picture of the Roma population size is presented by the Atlas of Roma Communities 2013 (see Mušinka, et al., 2014), with a qualified estimate, according to which there are over 400 thousand Roma in Slovakia.

Spatial segregation is one of the key issues concerning the Roma population in Slovakia. The phenomenon of segregation of Roma communities is a frequent problem in various countries (see e.g. Lancione, 2019; Magazzini & Piemontese, 2016; Rosa, 2016). According to Maestri (2019), segregation is not only produced by the intertwinement of globalisation, changes in the labour market and neoliberal policies that lead to a disinvestment in social policies for most marginalised categories, it is also shaped by the role of civil society actors, increasingly so in times of crisis and welfare restructuring. In accordance with the statement of Maestri and Vitale (2017), they are often internal actors who do not develop demands for change and direction towards the integration and empowerment of Roma.

The spatial isolation of Roma has a major impact on the eradication of poverty and social exclusion. Related to spatial isolation, poor transport accessibility may be a serious barrier in the process of social inclusion of the Roma in Slovakia. The opportunity to reach places of education, services and employment, plays a key role in the integration of the poor Roma living in socially excluded localities.

A very specific feature of the Roma population's spatial distribution in Slovakia is their residence in homogeneous ethnic settlements, named Roma communities, described by Rusnáková and Pollák (2012, 258) as follows:

> "...it is a settlement (spatially delimited), resided by Roma (or predominantly by Roma). It is part of a town (hence lacks its own self-government), but often isolated from the built-up area (by distance or a barrier, such as a river, railway, etc.) or within the built-up area (Roma street, Roma neighborhood), formed in a relatively autonomous socio-cultural structure."

According to Matlovičová et al. (2012), the concentrated communities are home to 53.5% of all Roma, while the rest of them are dispersed within the dominant Slovak ethnic population in mixed neighbourhoods. A growing share of the Roma living in concentrations within the built-up areas of towns and segregated communities has been observed. In 1988, these communities embraced only 14,988 inhabitants, but they witnessed 127,429 persons in 2000 and 190,950 residents in 2010 (Matlovičová et al. 2012). In 2013, the Roma communities mapping identified 803 Roma concentrations (in 583 municipalities) with 215,555

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Roma residents. Out of 2,890 of Slovakia's municipalities, 1,070 are occupied by the Roma. Most of Slovakia's Roma population has been concentrated in the eastern part of the country (Rochovská & Rusnáková, 2018).

Many authors have drawn attention to the fact that the Roma in Slovakia are among the poorest groups in the Slovak population and the problems associated with poverty and social disadvantage affect many of them (Radičová, 2001; Rusnáková & Rochovská, 2014, 2016; Filadelfiová & Gerbery, 2012; Filadelfiová, 2013). The Roma population, being an at-risk-of-poverty group, has been also explicitly mentioned in the political documents and action plans of the Slovak Republic focused on the suppression of poverty or social exclusion, such as the Strategy of the Slovak Republic for Integration of Roma up to 2020 (2011). In 2018, the first EU statistics survey on income and living conditions (EU-SILC) focused on marginalised Roma communities was carried out (see Grauzelová & Markovič, 2018). This survey has confirmed that poverty and material deprivation in marginalised Roma communities is more frequent and more intensive compared to the Non-Roma majority population of Slovakia. According to the above-mentioned documents, the Roma ethnic group combines several disadvantages linked to demographic conditions, poverty generated by unemployment, poverty caused by low-skilled and low-paid work, or lack of education and discrimination (Strategy... 2011).

The most miserable conditions are certainly observed in the segregated Roma communities. Lacking elementary infrastructure in the segregated settlements and spatial isolation of the Roma from the majority are exacerbated by their political, economic and cultural isolation. Households in the segregated Roma communities, have poor access to basic assets, which reinforces their poverty and social exclusion. Part of the Roma population living in segregated settlements is considered to be the most exposed to risk of poverty, social exclusion and discrimination. Džambazovič (2007) defines segregated communities as settlements located outside resident municipalities. According to this author, these are settlements formed by concentrated dwellings located far from the village or town, or even separated by a barrier. While integrated and separate neighbourhoods are typical manifestations of relative poverty, segregated settlements are indications of absolute poverty. Although there is no generally accurate definition of the term Roma settlement (Rusnáková & Rochovská, 2014, 2016), it can be stated that these are ethnically homogeneous settlements, segregated not only spatially but also socially. Among the most common characteristics of such settlements, numerous authors (Filadelfiová et al., 2006; Kráľovská, 2006; Vaňo & Mészáros, 2004; Radičová et al., 2004; Vašečka & Džambazovič, 2000, and others) mention difficult conditions for access to fundamental services – education, housing, health, employment, access to services, adequate income. Well-known problems of the residents of Roma settlements include poor housing associated with complicated land ownership, poorer health compared to the Non-Roma majority population, poor education levels and qualifications, limited access to basic infrastructure (e.g. drinking water, see Rochovská et al., 2021). There are several disadvantages associated with the inhabitants of Roma settlements, including poverty generated by unemployment, poverty caused by lack of education or linked to demographic conditions and discrimination (Mušinka et al., 2014).

This brings us to the issue of the social exclusion of segregated Roma communities of Eastern Slovakia as the target group of our analysis. Džambazovič and Gerbery (2005) emphasise that social exclusion leads to a reduction in opportunities to participate in society, to social isolation and separation from society. Poverty of the Roma is strongly related to social exclusion, which stems from a combination of historical, cultural, social and spatial factors (Džambazovič & Jurásková, 2002). Within the spatial dimension of social exclusion, many studies point to mobility-related and/or transport-related factors of social exclusion (see e.g. Kenyon et al., 2002; Percy-Smith, 2000; Cass et al., 2005; Delbosc & Currie, 2011) and the transport disadvantages (Kamruzzaman & Hine, 2011) of certain communities. In contrast, we find no specific attention focused on the quality of public transport services in any of the documents dealing with Slovakia's segregated Roma population inclusion. Also, as shown below, Slovakia's regional authorities whose competences include the regional public transport network coverage, do not reflect the specifics of segregated Roma communities. There are some reports on community transportation organised by local authorities in some municipalities but these refer mostly to school kids' transportation to schools. They are not supported by any systematic tools, however, and so they depend purely on the financial capacities of the municipalities.

Our research motivations stem from the assumption that poor public transport accessibility and transport disadvantage might be one of the barriers affecting the Roma communities's poor access to labour markets, education, health care, services etc. Based on that, we attempt to answer the following three questions:

1. What is the walking distance to public transport (PT) stops or stations in Roma communities?;
2. What is the quality of public transport serviceability of the PT stops located in/close to Roma communities? What is the frequency of PT services to the nearest regional centre at peak/off-peak day-times?; and
3. Is there a relationship between the PT availability/quality and the geographical location of the Roma community settlement? Will the quality of PT be worse in the spatially most segregated (i.e. "out-of-the-village") Roma settlements?

Our research area covered the three NUTS4 (LAU1) units of Rožňava, Spišská Nová Ves and Vranov nad Topľou (see Fig. 2). These regions are located in eastern part of Slovakia and belong to regions with very high concentrations of Roma communities (see Rochovská & Rusnáková, 2018, more details in Methodology part).

Besides, our ambition is to identify the Roma communities which may be referred to as "public transport deserts". Due to limited data availability, compared to what Jiao (2017) or Aman and Smith-Colin (2020) consider as transit deserts or public-transport deserts, our approach will be a little different (see Methodology).

In the following part of the paper, the role of transport and mobility is explained in the context of social exclusion. Data sources and methods used in our approach are described in a separate section where also specific data on Roma population mapping in Slovakia are introduced. The following parts include results, interpretation, discussion and conclusions.

2. Theoretical background: Spatial exclusion and transport disadvantage

Since the beginning of the 21st century, social exclusion has become one of the key concepts sheltered by the social policies in the European Union. This has been deeply incorporated into national, regional and local social inclusion policies within the EU.

In our understanding and in accordance with the document Strategy of equality, inclusion and participation of Roma until 2030 (2021), inclusion means enabling every citizen, especially the most disadvantaged, to fully participate in society, including the possibility of employment. Inclusion is underpinned by the principles of equal opportunities, fairness, cooperation and solidarity, with diversity seen as an opportunity to enrich society as a whole. Society adapts to the diversity of all its members, which

includes policies promoting equal access to public services and full civic participation in decision-making. Integration is a process of blurring differences and creating equal opportunities, in which the inclusion of disadvantaged citizens or groups of citizens into society is a manifestation of solidarity, tolerance and acceptance of differences.

Generally, social exclusion is perceived as a systematic process of marginalisation, isolation and weakening of social ties, which is evident at the level of the individual as well as at the level of social groups. Exclusion means failure to participate in a normal way of social life (Strobel, 1996). For example, Levitas et al. (2007, 9) define exclusion 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".

Authors focusing on social exclusion describe several dimensions to which social exclusion applies. We should mention Percy-Smith (2000), who outlines seven different dimensions of social exclusion (economic, social, political, neighbourhood, individual, spatial group), as well as Mareš (2002) with very similarly named six dimensions, and also Kenyon et al. (2002), who identified nine dimensions (added extra mobility and temporal dimension). Although the identified dimensions are partially different, all the authors agree on the existence and importance of spatial exclusion as a specific dimension. The spatial dimension of social exclusion is often emphasised in the policies, as individuals and communities may be excluded in both social (vertical) as well as spatial (horizontal) ways (Mareš et al., 2008). Khan (2012, 5) emphasised the spatial dimension of social exclusion linked with a policy focus on those living in 'deprived areas', where poor housing, inadequate social services, weak political voice and lack of decent work all combine to create an experience of marginalisation. Legros and Lièvre (2019) point to the fact that although the Roma may seem fairly well integrated in housing terms, this relative spatial integration does not necessarily translate into meaningful neighbourhood interaction. Rather, neighbourhood relations are often characterised by racism, stigmatisation and intolerance of Roma cultural practices, with these sentiments equally apparent in the formal educational setting.

According Percy-Smith (2000), the spatial dimension of exclusion typically results in large numbers of disadvantaged people living together in a decaying area. Disadvantaged individuals who live there often become subject to further exclusionary process, including not only total lack of local servicies, but also being discriminated against by employers. The most significant form of exclusion, however, is involuntary spatial exclusion. Life in segregated areas is not usually chosen by its inhabitants and due to its strong link to the poverty of these places, it is not in the power of these inhabitants to change the nature of the area nor to leave it (Filčák & Stager, 2014; Berescu et al., 2012).

The role of transport, mobility and accessibility in relation to social exclusion has been clearly described by Kenyon et al. (2002), identifying poor mobility and poor ability to use transport networks to access the necessary resources (work or education, services, social networks, etc.) as one of the dimensions of social exclusion (in addition to, for example, the economic, social, political or institutional dimensions). Cass et al. (2005, 542) state that "... access (to networks, etc.) and social exclusion are interconnected through a common perception in which resources (money, car, etc.) are necessary to achieve goals." The importance of space as a barrier that generates the cost of overcoming the distance to these essential resources is pointed out in the work of Schönfelder and Axhausen (2003), but also by Levinson (1998) in the context of commuting to work. Traffic-related social exclusion is partly a result of current spatial development and spatial planning in modern society, as pointed out by Kenyon et al. (2002), who state that social exclusion is, among others, the result of limited availability of opportunities, services and social networks, due to fully or partially limited mobility in society and an environment developed on the assumption of high mobility. In this context, many works speak literally of the transport disadvantage of certain communities or individuals (see e. g. Kamruzzaman & Hine, 2011). According to Rosier and McDonald (2011), transport-related exclusion may also be defined as difficulties in accessing transport due to price, poor physical availability or availability of services.

Respecting the importance of mobility, the accessibility of high-quality transport infrastructure may not always be decisive, as empirical studies suggest that mobility requirements and the capability to use this transport infrastructure are also important (Schönfelder & Axhausen, 2003; Jaroš, 2017). For example, proximity to the motorway is not a solution for socially excluded poor communities with low car ownership or individuals without the ability to drive (e. g. the disabled, the elderly, poor families without a car).

Jaroš (2017) points to social and transportation aspects affecting transport-related exclusion (see Fig. 1). This author states that accessibility affects the 'external frameworks' of transport-related exclusion. The main factors here include the distance of the location (exposed character) and transport (in)accessibility of the location. On the other hand, mobility (individual or personal capability to be mobile) predetermines the 'internal conditionality' of transport exclusion. It also depends on the specific mobility needs of every individual.

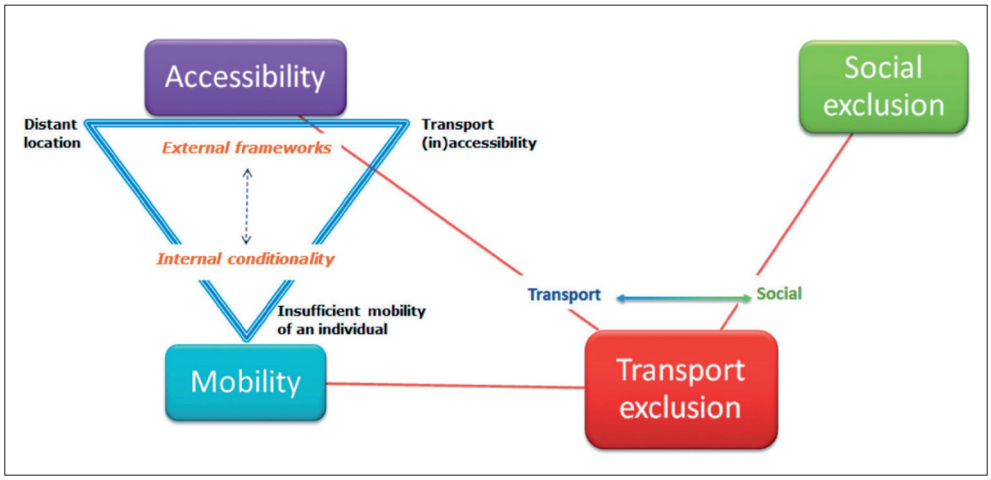

Fig. 1: Transport exclusion – transport and social aspects; internal conditionality and external frameworks
Source: Jaroš (2017, 257)

As described by many (Levinson, 1998; Kenyon et al., 2002; Horňák, 2012; Jaroš, 2017), the spatial design of landscape inhabited by humans and generally the geographical organisation of society, are among the key elements affecting the scale of transport- and mobility-related social exclusion. In a society where work (as the main source of income) is considered one of the most important assets of households or individuals (Stenning et al., 2010; Rusnáková et al., 2015; Holubová et al., 2021), access to jobs is a decisive driver to social inclusion. Therefore, accessibility of jobs within geographical space has been a research subject of numerous studies (Levinson, 1998; Ong & Blumenberg, 1998; Partridge et al., 2010; Delbosc & Currie, 2011, etc.), very often approached as a distance between places of residence and places of jobs (Michniak, 2008; Grengs, 2010; Cheng & Bertolini, 2013; Ďurček et al., 2020). In Central European conditions, we find interesting attempts to evaluate the accessibility of jobs via the transportation costs (see Horák & Šeděnková, 2005; Ivan, 2009, 2010; Horňák, 2012).

As far as commuting to work is discussed, apart from other modes of transportation, the passenger car and public transportation are frequently perceived as the most decisive transport modes in a society organised within a modern landscape (Hensher & Reyes, 2000; Kawabata & Shen, 2007; Ivan, 2010; Horňák, 2012; Trembošová & Kohutiar, 2022).

Although public transportation is rather well developed in most of the EU countries, the Central European territory shows some peculiarities stemming from either specific features of the population distribution in some regions (e. g. so-called scattered settlement in the Carpathians generating obstacles for an effective public transportation), or collapsing public transport supply as a consequence of the post-socialist public transport sectors' transition (see e. g. Pucher & Buehler, 2005; Taczanowski, 2015; Marada & Květoň; 2016, Seidenglanz et al., 2015). In most post-socialist countries, public transport has witnessed a considerable fall within the modal split of passenger transport, mirroring the modal split trends observable in Western Europe (Król et al., 2018; Horňák et al., 2013; Michniak, 2018). According to Eurostat databases, the share of public transport of the total passenger transport performances dropped to between 20–30% in Poland, the Czech Republic, Slovakia or Hungary by 2017 (Energy, Transport and Environment Statistics, 2020).

Nevertheless, in some environments public transport still plays a crucial role in everyday mobility (such as in large cities or in communities with limited affordability of the passenger car, (see e. g. Temelová et al., 2011; Horňák & Rochovská, 2014). We agree with Preston and Rajé (2007) who indicate that in communities with high mobility demands but with poor individual mobility equipment (e. g. due to poor economic conditions of households or due to urban design hampering the use of passenger cars), public transport may play a crucial role as a means of everyday mobility. There has been no specific research done on the segregated Roma communities' household motorisation rate in Slovakia so far, so we can only suppose that the rate of car ownership is probably very low in these communities due to poor economic conditions (Rochovská & Rusnáková, 2018; Kahanec et al., 2020). This brings us to a conclusion that in spite of the obvious drawbacks of public transport systems (growing fees, discomfort or trip chaining: see Nutley, 1998; Hensher & Reyes, 2000; Rietveld et al., 2001; Marada & Květoň, 2010; Horňák, 2012), for Roma communities in Eastern Slovakia public transport will be the main means of transport for commuting to work, schools, health-care centres and so on.

3. Data and research methods

As mentioned in the introduction, the research question relates to the theory of social exclusion and is mainly based on spatial social exclusion and related transport accessibility, the lack of which subsequently affects the availability of the labour market, schooling, health care and other services. Through the three research questions, we will focus on quality of public transport services in or close to Roma communities and explore the relationship between public transport availability and quality and the geographical location of the Roma community settlements.

One of the main input data resources was the comprehensive database of the Atlas of Roma Communities (2019), identifying municipalities with Roma population communities (i. e. municipalities with Roma communities with a minimum of 30 residents or municipalities with a minimum of 30% of Roma population). Besides, other information sources were used to analyse the level of transport inaccessbility of settlements in marginalised Roma communities in our research areas. Three districts (identical to three NUTS4/LAU1 units of Rožňava, Spišská Nová Ves and Vranov nad Topľou, see Fig. 2) located in the eastern part of Slovakia were selected for our research purposes. The selection of these territorial units covers areas belonging to regions with the highest detected concentrations of Roma populations in the country (see Mušinka et al., 2014; Rusnáková & Rochovská, 2018; Filčák & Škobla, 2021), but also reflects the focus of some other project research activities carried out in the same regions (Šatara et al., 2020; Havírová & Šatara, 2020; Rigová et al., 2021).

According to the Atlas of Roma Communties (2019), the locations of individual Roma population concentrations in Slovakia were divided into the following three categories:

1. I – settlement within the municipality;
2. II – settlement at the margin of the municipality; and
3. III –settlement outside the municipality (segregated).

In the resource database, the above-mentioned categories of Roma population concentrations reflect geographical location variability and levels of spatial integration of particular Roma communities into respective settlement structures. The Atlas of Roma Communities (2019) represents the 3rd generation of Roma population mapping in Slovakia, with well-developed and detailed methodology of Roma communities' location typology. Therefore, we can fully accept the typology of Roma communities delivered by this resource document. Basically, the Roma settlements located within the municipality (category I) are well integrated into a municipality's organism and its built-up territory. Conversely, the settlements located outside (category III) are remote from the main municipality structure, dispersed far (often more than 1,000 m) from the built-up area, thus presumably disconnected from the infrastructure, often without a paved road or pathway, with poor or no access to pipelines (see Atlas of Roma Communities, 2019; Rochovská et al., 2021). According to the methodology of the source database of the Atlas but also to other studies (e.g. Rochovská & Rusnáková, 2018 or Rusnáková & Rochovská, 2014), the Roma communities listed in category III can be considered as segregated Roma communities. This categorisation in the Atlas of Roma Communities (2019) assisted us to design our research questions (see Introduction, above). We can assume that general living conditions (including access to infrastructure and public transport) are the worst in category III (segregated Roma communities), representing spatially isolated and segregated communities from the main municipality structures. On the other hand, category I of the Roma communities is supposed to be well integrated within the urbanised environment, with relatively comfortable access to public transport networks.

In our research areas, 116 Roma concentrations were identified by the Atlas of Roma Communities (2019). The location typology of these communities within the settlement environment shows a slight prevalence of category II of Roma communities located on the outskirts of the municipality structures (see Tab. 1).

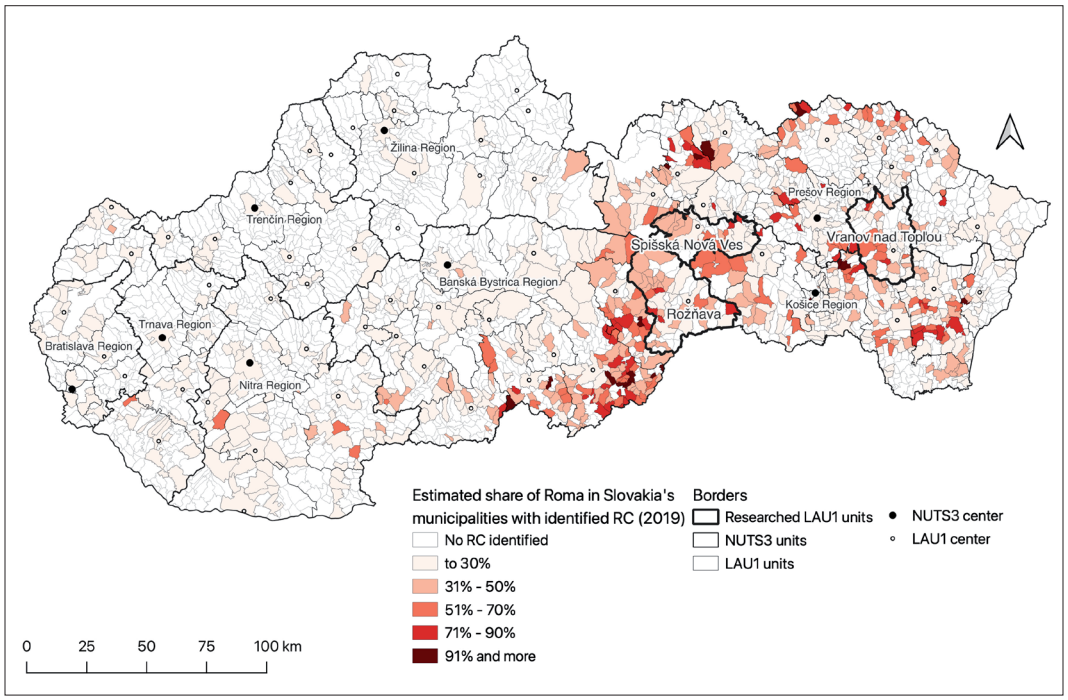

Fig. 2: Spatial distribution of Roma in Slovakia with geographical position of researched areas
Notes: RC = Roma communities. Data on Roma population only cover municipalities identified by the Atlas of Roma Communities (2019), i.e. municipalities with Roma communities with a minimum of 30 residents or municipalities with a minimum 30% of Roma population.
Source: authors' elaboration based on data from Atlas of Roma Communities (2019), zbgis.skgeodesy.sk

LAU1 Region	Inside the municipality (category I)	On the outskirts of the municipality (category II)	Outside the municipality (segregated, category III)
Vranov nad Topľou	8	24	9
Spišská Nová Ves	3	21	9
Rožňava	8	24	10
TOTAL	19	69	28

Tab. 1: Location categories of the Roma communities in the research areas
Source: Atlas of Roma Communities (2019)

In our analysis, we tried to identify the level of public transport accessibility. Firstly, walking distance (in metres) from the centre of a particular Roma settlement to the nearest public bus stop was mapped. This parameter reflects spatial variability of public transport infrastructure accessibility within municipalities at a micro-level. As shown below, this affects especially Roma communities living apart from the main municipality urban structures. Accessibility of public transport points (stops, stations) is an important element of public transport use probability (see Kraft, 2016 or Ivan et al., 2019). In our case, this indicator was measured for each individual Roma community manually through www.google.com/maps, with walking set as the transport mode for searching the optimum shortest walking pathways to the nearest bus station. In disputable cases, map databases of zbgis.skgeodesy.sk and mapa.zoznam.sk as well as the Street View service of Google Maps database, were applied to clarify pathway routing where Google satellite layers were not clear. Estimation of walking distance was based on Google Maps online tracking tool used to track the distance between the respective Roma community settlement's geometric centre and the nearest regional bus stop or station. Within this step, quality of the walking infrastructure (paved and unpaved pathways and access roads) was mapped, too.

Secondly, the frequency of direct bus services connecting the identified nearest available stops with the nearest regional urban centre (i. e. regional nodal centre) per working day was detected. This parameter reflects the quality of regional labour-market accessibility by public transport from the respective municipalities. It is important to emphasise that the regional sustainable mobility plans (mentioned elsewhere in the text) cover only the municipality level of the public transportation capacities. As mentioned above, however, the accessibility of public transport at municipality level may vary a lot, hence the two levels of parameters. According to numerous studies (see Levinson, 1998; Hine, 2009; Kamruzzaman & Hine, 2011, etc.), despite the growing importance of individual automobility (due to passenger car availability improvement) in welfare societies, the role of public transportation for everyday mobility purposes is still crucial for lower-class communities. This is specifically true in postsocialist countries such as Slovakia or the Czech Republic (Seidenglanz, 2007; Temelová et al., 2011; Horňák et al., 2016; Květoň et al., 2017), where some communities are largely dependent on public transportation due to their insufficient household incomes or other obstacles causing an unaffordability of family car ownership. Public railway transport was not taken into account here, as the railway network density in the research areas is quite low compared to public bus-transport network, and railway stations are typically too far from any Roma community identified in these areas.

In our approach, the towns of Rožňava, Spišská Nová Ves and Vranov nad Topľou were considered the regional urban centres of the respective districts in focus. To analyse the frequency of bus services operated between the Roma communities and these commuting centres (bi-directionally), we identified the total number of bus connections departing from specific bus stops, and specifically the number of connections to the nearest commuting urban centre. In general, we included all direct bus services during rush hours

(between 7–9 a.m. and also between 2–5 p.m.) and outside rush hours (i.e. excluding the times mentioned above). The number of bus connections was counted manually using the database of www.cp.sk. The counting of bus connections was referred to October 7th, 2020 (Wednesday, a common working day).

The final step included a typology of the Roma communities in focus by public-transport accessibility level. To assess the public-transport accessibility in a more complex way, a scoring method assigning value-points to each of the Roma communities was applied. Seindenglanz (2007) uses a similar method in his work, dividing the position of rural municipalities according to the quality of transport accessibility, based on the transport position indicator. He defined this indicator as the value that was assigned to a municipality on the basis of the equipment of the transport infrastructure. A similar method was used by Aman and Smith-Collin (2020), who determined a comprehensive public transit accessibility (CPTA) score, on the basis of which they could identify areas with low transport supply. In both studies, the authors determined the conditions under which the monitored areas could be divided into different types. The conditions within our typology are listed in Table 2. Based on the weighted arithmetic average score of individual indicators, we were able to determine 5 types of transport inaccessbility levels. The weights of the weighted arithmetic average are listed also in Table 2.

It is necessary to mention that the official database of the Atlas of Roma Communities (2019) available online does not cover accurate information on population size of individual Roma communities, since numbers of residents is considered as sensitive information. Therefore, only numbers of dwellings were applied to indicate the size of respective communities.

Indicator	Condition	Score	Weight
Distance of settlement and bus stop	0–400 m	1	25%
	400–600 m	2	
	600–800 m	3	
	800–1,000 m	4	
	more than 1,000 m	5	
Number of bus services (to centre of district) between 7–9 a.m. and also between 2–5 p.m.	more than 12 services	1	50%
	7–12 services	2	
	4–6 services	3	
	1–3 services	4	
	0 services	5	
Number of bus services (to centre of district) excluding the time from 7–9 a.m. and also between 2–5 p.m.	more than 12 services	1	25%
	7–12 services	2	
	4–6 services	3	
	1–3 services	4	
	0 services	5	

Tab. 2: An overview of input indicators and their weights in the synthetic evaluation of public transport accessibility
Source: authors' elaboration

4. Public-transport accessibility in Roma communities – evidence from data

A detailed analysis on existing walking infrastructure within Slovakia's Roma communities has never been published, although the Atlas of Roma communities (2019) indicates some improvements in paved walking and driving infrastructure. Our own mapping shows that out of the total of 116 Roma communities in focus, 97% are equipped with paved access road and 77% with paved side-walk or a path along the paved access road.

Generally, the accessibility of public transport infrastructure (the nearest bus stop) is acceptable in most of the surveyed communities (see Tab. 3). Only in 7 communities the distance to the bus stop reaches over 1 km.

Figure 3 shows that the walking distance to the nearest bus stop corresponds with the location type of the Roma community. Almost 90% of all analysed Roma settlements located inside the built-up area of the municipality (17/19 settlements), are situated up to 600 m from the nearest bus stop. On the other hand, the worst walking accessibility of public transport is generally detected in Roma communities located outside of the built-up areas. Although the accessibility indicator varies throughout the districts in focus (see Fig. 4), we may conclude that the location of a Roma community within the municipality's urban structure affects the public transport infrastructure walking accessibility significantly.

We also tried to analyse the relationships between location of the Roma community within municipalities and the number of bus services to/from the nearest regional centre per day. Figure 5 shows some differences between these three types of settlements.

Distance to the nearest BUS stop	Number of Roma communities
up to 400 m	52
401–1,000 m	57
over 1,000 m (max. 1,450 m)	7
TOTAL	116

Tab. 3: Roma communities in Rožňava, Spišská Nová Ves and Vranov nad Topľou regions by walking distance to the nearest bus stop
Source: authors' research based on Atlas of Roma Communities (2019), www.google.com/maps, zbgis.skgeodesy.sk, mapa.zoznam.sk

As expected, the highest frequencies of direct bus services (12 or more public bus services/24 hours) were detected in the case of Roma communities integrated inside the municipalities. In more than 70% of Roma communities well-integrated inside the municipalities, we detected more than 6 public bus connections to the regional centre per day. This value (6 services/24 hours in each direction) is generally recommended as the lowest acceptable scale of public-transport serviceability set for inhabited municipalities by the regional transportation policy documents called sustainable mobility plans (see Košický samosprávny kraj 2020 and Prešovský samosprávny kraj 2020). The most striking was the absence of public transport services linking some of the Roma communities with regional centres. Although not seen in relative numbers (see Fig. 5), the highest absolute number of zero bus connections was found in communities lying on the outskirts of municipalities. We can also state that the worse the Roma community position within the municipality, the poorer the public bus services' quality. The above-mentioned regional sustainable mobility plans do not specifically consider the segregated Roma population communities with apparently lower individual mobility levels. Also, these

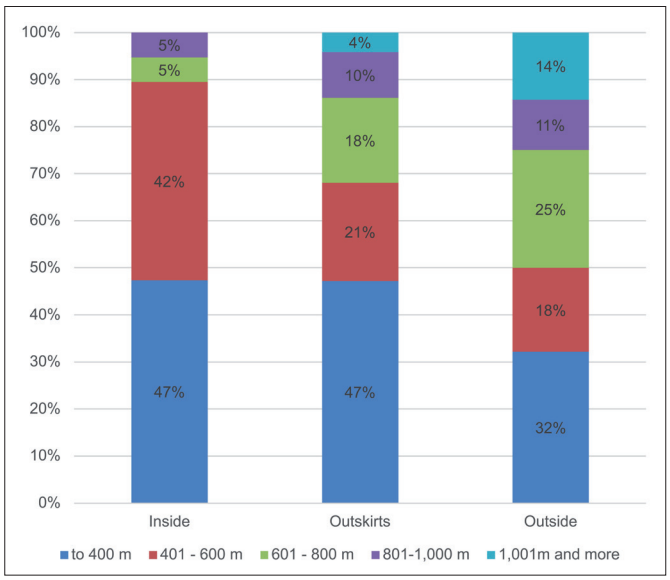

Fig. 3: Walking distance to the nearest bus stop from Roma communities by location type (inside, outskirts or outside the built-up areas of communities, summation of Roma communities in Rožňava, Spišská Nová Ves and Vranov nad Topľou regions)
Source: authors' research based on Atlas of Roma Communities (2019), www.google.com/maps, zbgis.skgeodesy.sk, mapa.zoznam.sk

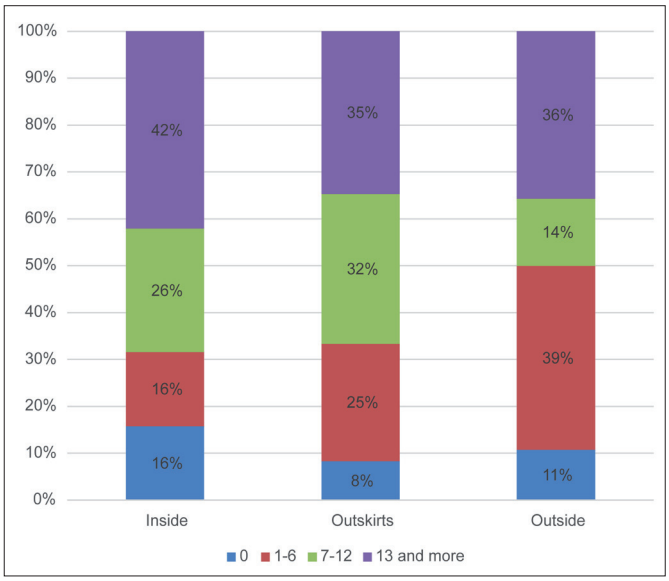

Fig. 5: Frequency of bus services between Roma communities and the nearest regional centre/24 hours (by Roma communities' location type, cummulative data on Rožňava, Spišská Nová Ves and Vranov nad Topľou districts)
Source: authors' calculations and elaboration based on data from Atlas of Roma Communities (2019) and www.cp.hnonline.sk

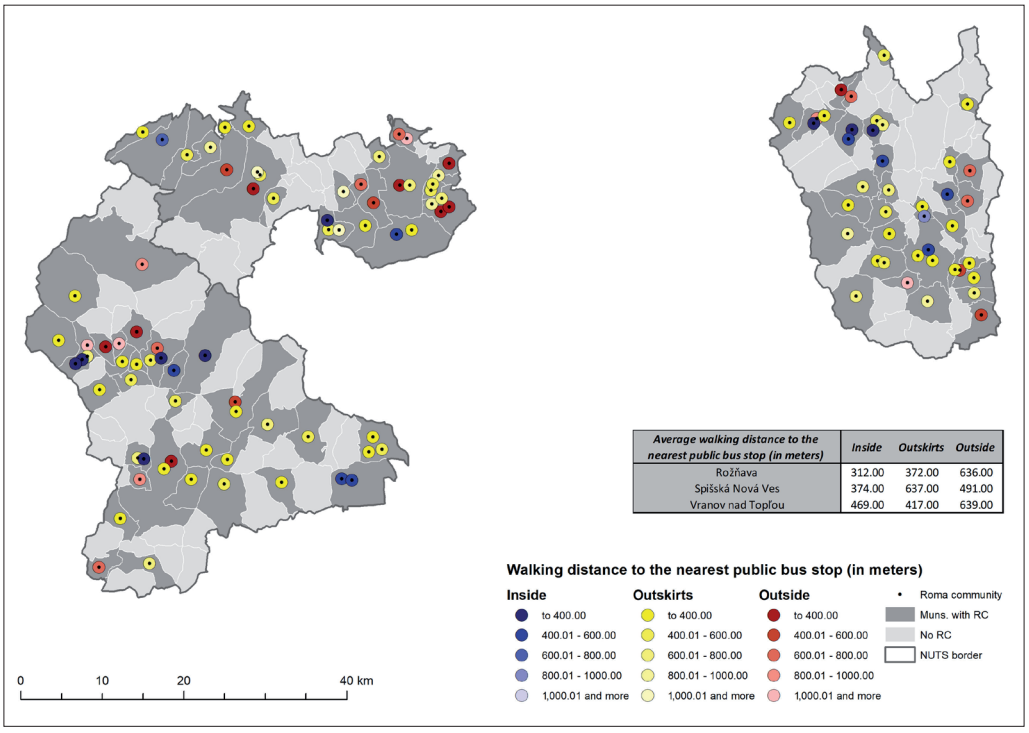

Fig. 4: Walking distance to the nearest public bus stop from Roma communities in districts of Rožňava, Spišská Nová Ves and Vranov nad Topľou
Source: authors' calculations and elaboration based on data from Atlas of Roma Communities (2019), www.google.com/maps, zbgis.skgeodesy.sk, mapa.zoznam.sk

documents' recommendations on public-transport frequency and capacity generally meet needs of municipalities as the lowest territorial units. Therefore, they can hardly respect individual micro-location specifics and comunities residing apart from core parts of municipalities.

Figure 6 shows that there are numerous large (in terms of number of dwellings) Roma communities with low daily frequencies of bus services to/from the nearest regional centre. In each district, however, we find several Roma communities (of various location types) with no direct bus service to the nearest regional centre, which indicates a very poor public transport accessibility. These were generally rather small communities (usually up to 50 dwellings) located in municipalities in most of the cases on the periphery of the district and therefore far away from the nearest regional commuting centre. Six of such communities (out of 12 communities) are situated on the outskirts of municipalities.

To express a general level of public transport accessibility in Roma communities in the research areas, we carried out a typology of all analysed communities. This typology is based on a synthesis of three input indicators described in the methodology part of this paper. This approach allows us to present a few conclusions (see Fig. 7). First, the closer to the regional centre, the

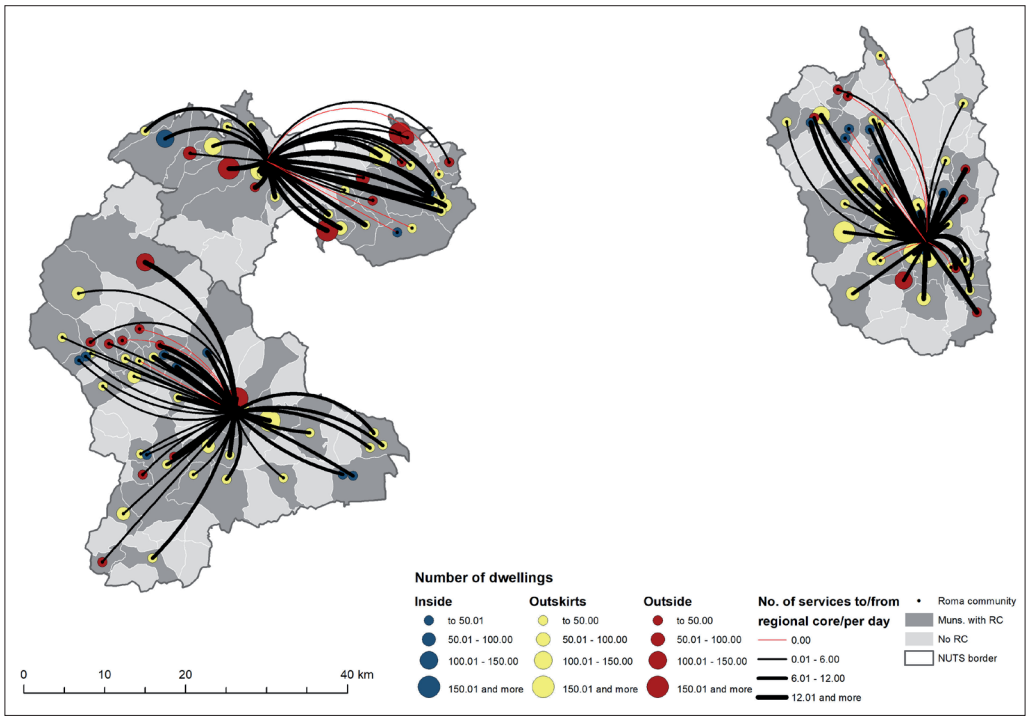

Fig. 6: Frequency of bus services between Roma communities and the nearest regional centre/per 24 hours (by Roma communities' location type and size based on number of dwellings, data on Rožňava, Spišská Nová Ves and Vranov nad Topľou districts)
Source: authors' calculations and elaboration based on data from Atlas of Roma Communities (2019) and www.cp.hnonline.sk, www.google.com/maps, zbgis.skgeodesy.sk, mapa.zoznam.sk

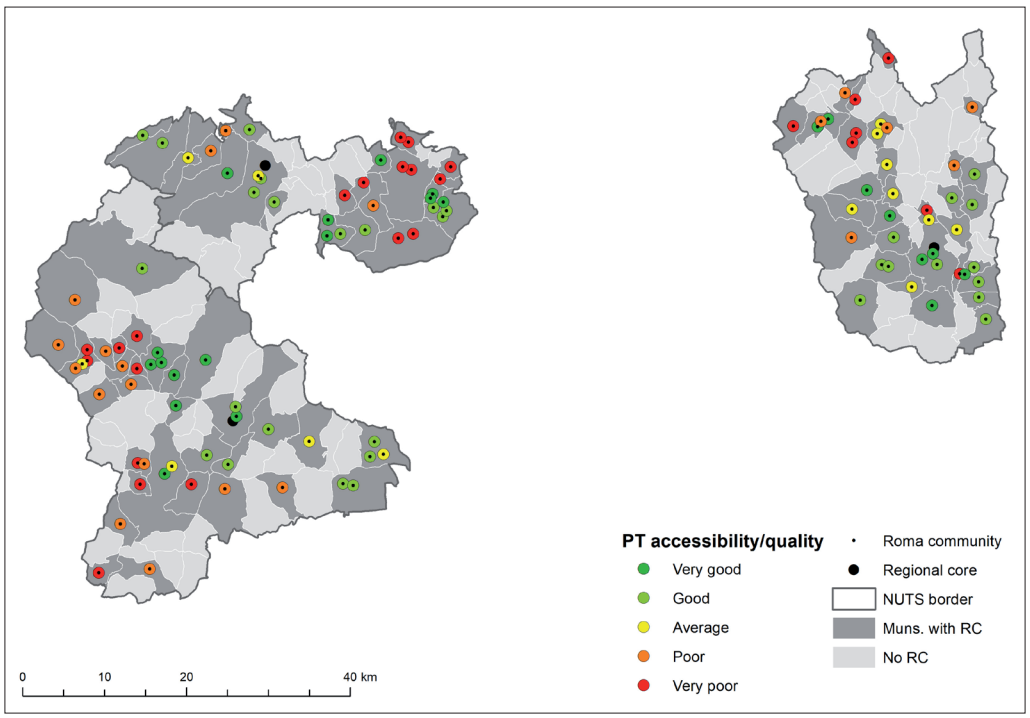

Fig. 7: Typology of Roma communities by accessibility and quality of public transport (in Rožňava, Spišská Nová Ves and Vranov nad Topľou districts)
Source: authors' calculations and elaboration based on data from Atlas of Roma Communities (2019) and www.cp.hnonline.sk, www.google.com/maps, zbgis.skgeodesy.sk, mapa.zoznam.sk

higher the general level of public transport accessibility in Roma communities. Second, a spatial clustering of Roma communities with very poor general public transport accessiblity is rarely to be seen in our research areas. For instance, we find a higher concentration of communities with poor level of public transport in the western part of Rožňava district or the eastern part of Spišská Nová Ves district. We can assume that poor public transport quality and accessibility are based mainly on local conditions (distant public transport stops, poor services to regional centres). Third, the categories of Roma settlement with "poor" and "very poor" public transport accessibility can be described as excluded or even heavily excluded from the public transport networks. We should emphasise, however, that most of such Roma communities are not too large in size (maximum of 50 dwellings). Figure 8 offers a more general picture summarising the data covering the three research areas (districts) into a clearly illustrative chart.

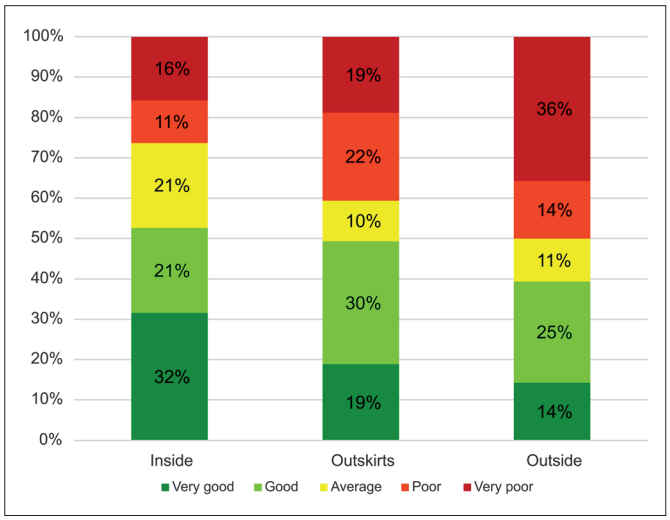

Fig. 8: Public transport accessibility in Roma communities by location type (relative share of individual types of Roma communities, cumulative data on Rožňava, Spišská Nová Ves and Vranov nad Topľou districts) Source: authors' calculations and elaboration based on data from Atlas of Roma Communities (2019) and www.cp.hnonline.sk

Thus, respecting the regional peculiarities described above, it is clear that the worse the location of a Roma community within the municipality, the worse the public transport accessibility. In other words, the Roma communities being segregated (i. e. outskirts type of location, category III of Roma communities) from the main urban structure of the municipality suffer from poor or even very poor accessibility of public transport networks, with all consequences on their social exclusion.

5. Discussion

Our approach to the public transportation accessibility for Roma community residents is based on a combination of indicators assessing both the accessibility of the public transport network for communities and the quality of public transport services within the network. The utilisation of methods and tools conventional for recent transport geography research is to reveal transport disadvantages and inequalities in access to public transport (a similar approach was applied, e.g. by Križan & Tolmáči, 2008; Bocarejo & Oviedo, 2012; Kraft, 2016; Květoň et al., 2017; Šťastná & Vaishar, 2017; Ivan et al., 2019; Stępniak et al., 2019; Curtis et al., 2019), and allows us to identify accurate levels of public transport networks inaccessibility from the view of the geographical environment and regional and/or local conditions. We do understand, however, that the assessment of public transport accessibility and quality is only a part of the very complex issues of social exclusion faced by Roma communities.

We also understand that public transportation is only one of the segments of mobility means, along with walking, use of a bicycle or a motocycle, passenger car use, etc. As indicated by some of the previous studies, public transport may not necessarily be a key means of mobility in Roma communities. Hluško (2020) claims that in some Roma communities the importance of individual mobility (including the car and walking mobility) may be much higher compared to utilisation of public transport in commuting to work. It is difficult, however, to judge whether this is a result of geographical inaccessibility to the public transport network or fares being too expensive for local Roma residents, as no specific research on Roma communities' mobility preferences has been carried out in Slovakia so far. It is also very difficult to estimate the car ownership rate in these communities, since no statistics on passenger car stock at local (or even micro-local) level are available in the country. There are numerous studies (e. g. Michálek & Veselovská, 2015; Rusnáková, 2015 or Rochovská & Rusnáková, 2018) indicating a low car-ownership rate in households in segregated Roma communities. This seems to be slightly in contrast with findings of Hluško (2020). The latter author, for example, argues that high preferences of Roma communities' residents for passenger car utilisation in every-day mobility only refers to carpooling, while individually driven cars seems to be less frequent than public transportation use.

Links between public transport accessibility and the social exclusion of Roma communities may also be a subject of dispute, unless we reveal real preferences of households and individuals for transportation modes. Transport mode preferences are hard to predict as they depend on numerous factors, such as economic conditions and income, subjective preferences, purpose of journey, weather and many other circumstances (see Dolinayová, 2011). No similar research has been done in Roma communities in Slovakia at present.

Nevertheless, based on the literature cited above, we can claim that due to the affordability of fares in regional public transport in Slovakia, the willingness to use public transport means for regular mobility should be rather high among Roma communities. We must emphasise, however, that in many cases an inaccessibility or poor quality of regional public transport may not be the key in access to a regional labour market. As described by many (e.g. Michálek & Veselovská, 2015; Rochovská & Rusnáková, 2018; Šatara et al., 2020), economic conditions and regional labour markets in Slovakia's regions with high Roma population concentrations are in most cases rather poor and too underdeveloped to offer enough opportunities for low-skilled and low-educated Roma residents from segregated communities. Therefore, many Roma residents probably prefer car-driving or carpooling to reach more distant labour markets (in other Slovak regions or even abroad), being inaccessible by regional public transport networks. Along with Kenyon et al. (2002) or Šťastná and Vaishar (2017), we understand that regional public transport still plays a crucial role in access to education, health-care services, food or social life.

Our findings suggest that some of the Roma communities in our research area may resemble of what Jiao and Dillivan (2013), Jiao (2017), Jiao and Cai (2020), Aman and Smith-Colin (2020) or Jiao (2017) identified as public transit deserts. The identification of Roma communities with poor or very poor accessibility of public transport networks presented above could be an effective argument justifying any attempt to define some of the Roma communities as public transport deserts. To identify public transport deserts in any geographical environment, Aman and Smith-Colin (2020) suggest to recognise not only public transport accessibility but also mobility demands and specifically public transport demands, which could help reveal how much the lack of an efficient public transportation is an issue for the respective community. From what has been published, however, so far we know very little about the mobility demands of the people of Roma communities in Slovakia.

6. Conclusions

Many residents of Roma communities in Slovakia reportedly face several disadvantages in access to labour markets or basic services (Vašečka & Džambazovič, 2000; Rochovská & Rusnáková, 2018). Transport disadvantage is surely only one of the elements of the Roma population's social exclusion within the Slovak society. Lacking any profound recent study on mobility behaviour, transport opportunities and preferences or motorisation of Roma households and communities, we focused on public transport accessibility in Roma communities in three regions of Eastern Slovakia. Emphasising that this situation might be specific in various regions of the country, based on our research we can conclude the following:

- Walking distance accessibility of public (bus) transport infrastructure points differs from place to place but it is generally worse in spatially segregated Roma communities (of category III) located often in secluded locations (often in rural environment with sparsely distributed paved-road infrastructure);
- The quality and frequency of public transport services at the bus stops accessible from Roma population communities do sometimes not meet basic standards set for regional public transport serviceability, especially if we consider access to the nearest regional centre (nodal centre); again, this parameter is generally worse for Roma communities located outside the built-up structures of municipalities (category III); and
- Roma communities with poor or very poor accessibility to public transport networks (caused by both poor access to public transport points or poor serviceability) can be found in each of the three regions in focus; but we should emphasise that such communities are mostly smaller or middle-sized, while larger Roma communities usually witness better public-transport accessibility conditions.

A better coordination between all relevant actors (public transport operators, self-governing regions, municipalities, as well as authorities responsible for segregated Roma communities' social inclusion in the country) might help improve the issue. Here, we must emhpasise that so far there is a lack of specific attention focused on Roma communities (especially those segregated) in the public transportation policy documents (the so-called Sustainable Mobility Plans) approved by regional authorities. For many living in these communities, public transportation represents the only means of mobility and the only way how to reach regional labour markets.

Future research should cover mobility needs in segregated Roma communities to better understand the transport preferences and role of mobility means in communities being at transport disadvantage. Such research might enable one to optimise the policies coping with barriers lying between poor segregated communities and the Non-Roma majority society in Slovakia. According to research results by Claps and Vitale (2011), long-term policies, not merely repressive ones, but also allowing different options, may contribute to the possibility for these communities to escape from marginalisation and segregation.

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