

DEVELOPMENTS IN THE PUBLIC TRANSPORT SERVICEABILITY OF RURAL SETTLEMENTS WITH EXAMPLES FROM VARIOUS TYPES OF MICRO-REGIONS

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ABSTRACT

This article seeks to explore differentiated developments in transport serviceability at the level of municipalities and their sub-divisions in Czechia from 2001 to 2009. Two different peripheral rural micro-regions – Sedlčany and Ledeč nad Sázavou – were selected for evaluation. The analysis is based on a number of statistical indicators, such as the index of change between 2001 and 2009 and the coefficient of variability. It is typical for these rural micro-regions that bus transport comprises the backbone of the service network, while railway connections directly impact the “modal split” only in a few small municipalities located along a railway line. In general, a higher degree of fragmentation of the settlement system negatively impacts the provision of transport serviceability by means of public transport.

Key words: transport serviceability, public transport, individual automobilisation, parts of municipalities, commuting

1. Introduction

The transport serviceability of rural areas has ascended dramatically to the forefront of interest both for researchers and the general public, immediately after 1989, when massive decreases took place in the number of public transport connections in Czech settlements, resulting in – at that time, unusual – pressure on municipality budgets. While numerous studies (e.g. Seidenglanz 2001; Marada and Květoň 2006, etc.) confirm that the situation has gradually stabilised, since the mid 1990s, residents have become accustomed to a new situation and, with the transfer of the organisation of regional transport serviceability from district authorities to regional authorities after 2005, a certain optimisation of transport links has occurred. At present time a slight decrease in mass transit still continues in outlying municipalities. A number of municipality centres are without public transport connections on weekends (for instance, in 2007, more than half of all municipalities with less than 3,000 residents; for more, see Marada and Květoň 2008), still more desperate is the situation in various settlements, or rather parts of municipalities, which even on weekdays have no public connections. In essence, the only means of mobility in these rural settlements is the utilisation of individual automobile transport.

The distribution of the automobilisation of households in Czechia (2001) has been repeatedly described (e.g. Marada and Květoň 2009) as something of a gradient: southwest Bohemia (and large cities) have higher rates of automobile ownership, while northeast Moravia and Silesia exhibit lower degrees of automobilisation. A gradient describing the average number of daily public transport connections, departing from

municipalities, shows a roughly opposite orientation, meaning that districts with insufficient public transport serviceability have a higher rate of automobilisation, which likely denotes a means of compensation for the lessened availability of mass transit (for more, see, e.g. Květoň 2006; Marada and Hudeček 2006). When evaluating at the municipality level, utilising LISA autocorrelation analysis (for more, see Marada and Květoň 2009), the indicated “zonality” of automobilisation from southwest to northeast is not so clearly evident. The gradient’s “smooth flow” is particularly interrupted by the less car-equipped basin area of northern Bohemia. In addition, a belt of highly automobilised municipalities, extending from the Mladá Boleslav region through the Prague agglomeration and on to České Budějovice, can be observed. It is likely that the degree of automobilisation in areas surrounding the most significant centres of settlement could be influenced by the process of suburbanisation. In contrast, in terms of the nature of rural space, this could be caused more by a need to compensate for the insufficient availability of public transport (see also the average age of automobiles in Czechia’s rural areas; e.g. Květoň 2006). LISA analysis also exhibits the high availability of public transport serviceability in the municipalities of south-eastern and central Moravia, surrounding Prague and in the Most and Karlovy Vary regions. On the other hand, the low availability of public transport is characteristic of the municipalities of central and southern Bohemia and Vysočina, especially in areas located along the administrative borders of regions (the so-called inner periphery of Czechia).

In earlier studies (Marada and Hudeček 2006; Marada and Květoň 2006 etc.), the size of a municipality’s population was designated as a significant factor in determining

the quality of transport serviceability. This is basically a key economic factor, because it is (simplistically) true that a larger number of potential customers is more likely to cover the expenses for a connection or, at least, to ensure smaller losses. Nutley (1998), for example, symptomatically summarises the influence of the number of customers on the quality of transport serviceability in the form of a so-called vicious cycle of transport serviceability. The loss of a portion of its ridership leads to decreases in a connection's profitability, for which a transport company generally compensates by eliminating infrequently used connections. By so doing, however, the company lowers the quality of its service, which leads to further decreases in customers. The size of a municipality also partly influences the degree to which households are equipped with automobiles, although the intensity of this observation is more random than in the case of public transport. The character of a settled area is certainly significant, as people in a fragmented settlement are generally more likely to have access to an automobile than people in a more compact settlement; a trend that supports the notion of compensation for insufficient public transport serviceability. The fact that supply and demand for public transport are not always in mutual agreement (see Marada et al. 2008) indicates that differences in the expressions discussed are, naturally, also influenced by factors of a subjective nature. These frequently hard to measure factors include, for instance, the individual decisions of users concerning the means of transport used, traditions in the transport behaviour of a local community and even decisions made by relevant institutions in planning transport serviceability.

Social exclusion is an aspect closely related with the issue of transport serviceability and accessibility. Toušek (2007) states that the term social exclusion has, due to its perceived urgency, become a favoured research topic in recent years and even a subject of interest among the general public. He provides a general definition for this relatively new term: "We understand it as a process, in which individuals or entire groups are forced to the fringe of society and that access to resources, which are available to other members of society, is limited or obstructed" (Toušek 2007: 2). So-called spatial exclusion is considered to be one specific case of social exclusion, which is generally connected more with poverty, minority religious convictions, national minorities or specific social groups within a society. Spatial exclusion can be defined – in the sense of the definition given above for social exclusion – as a type of social exclusion caused primarily by a remote location from primary societal activities or individual needs. Causes for social exclusion are usually both external and internal in nature. In the case of spatial social exclusion, external influences, meaning influences that are very difficult for excluded persons to influence, can include the peripheral location of a residence itself, which is related to the location of basic services, the location of employment opportunities, etc. Other

factors that cannot be altered include the age of residents, which determines their transport possibilities (children and youth cannot drive an automobile; the same is true for many of the elderly and even for some individuals in an economically active age category). In contrast, internal causes, meaning manifestations resulting from the actions of the excluded persons themselves, include, for example, a lack of motivation to overcome spatial exclusion through one's own efforts, etc. In remote settlements, we can of course point to a generally high level of determination by external causes and to weak possibilities for overcoming spatial exclusion through the mobilisation of internal potential. Using an automobile remains the only practical option. Dargay (2002) presents foreign experience and confirms that the motorization in rural areas is higher than in cities, with not only the overall level, but motorization is also higher in all age cohorts of the population. The author analyzed the different age groups productive as well as post-productive age and emphasizes higher household car ownership in all cases. Similarly Whelan (2007) confirms the relatively low rate of household goods vehicles in urban area and population centres of settlements. In context of foreign experience may be in the future in the Czech rural areas peripheral to assume increasing dependence of local people on a passenger car, which (is) the expression of the compensation process. Important conditioning factors of motorization are also household characteristics such as presence of children, the position of parents at work, household size, etc. (Nolan 2010). However, much research is devoted solely to influence of accessibility passenger cars on employment and empirically demonstrate the most positive influence (for example Gurley and Bruce 2005). Holzer et al. (1994), who empirically verified that the passenger car ownership negatively associates with the length of unemployment and a positive relationship is demonstrable on the amount of monthly wages. This is also confirmed by Ong (1996), in addition to positive effects on employment also confirmed the link with higher monthly income.

In recent years, J. Musil (e.g. 2008) has systematically examined the geographical dimension of social exclusion by focusing on issues concerning Czechia's so-called internal peripheries. He notes that these areas are characterised by their long-term, very low quality of life and that their isolated inhabitants face problems of unemployment, insufficient access to services, poor or nonexistent infrastructure, etc. Research conducted by the Faculty of Sciences at Charles University in Prague also confirms the existence of these characteristics in internal peripheries (Jančák, Chromý, Havlíček and Marada 2008).

This article, therefore, seeks to explore differentiated developments in transport serviceability at the level of municipalities and their sub-divisions, in light of their transport situation, from 2001 to 2009, in selected model, and categorically different, micro-regions. In connection with this stated objective, significant differences

can be presumed to exist in the availability of public transport connections, depending on a settlement's position as compared with the main micro-regional centre. And significant influence can be assumed also in context with transport position, meaning a municipality's, or rather its part's, location on a given type of transport route.

2. Methodology and databases

From a methodological standpoint, the territorial units evaluated should be emphasised and explained. The selected micro-regions were defined as part of a socio-geographical regionalisation in Czechia on the basis of the prevailing direction of work commutes (see Hampl 2005). The actual selection of the micro-regions is based on a typology of micro-regions in Czechia, which Marada and Květoň (2009) created with a cluster analysis of size-significant and structural characteristics of the availability of transport possibilities in all of the micro-regions in Czechia. Additional details, concerning both the characteristics of the created typology and justification of the micro-regions selected as model areas for this article, shall be included in the following section. The essential factor for the selection of micro-regions, in addition to the typology, was also the character of settlement and in such sense the fragmented settlement structure with a high number of municipality parts. Both regions have similar physical-geographical conditions, regions are peripheral in the Czech Republic, but Sedlčany has better position to Prague as macroregional centre, which could be reflected in the quality of transport services.

Two categorically different micro-regions – Sedlčany and Ledec nad Sázavou – were selected for evaluation of transport serviceability. These are peripheral, rural regions, exhibiting differing characteristics of transport serviceability. The Sedlčany micro-region was selected as an example of a rural micro-region that was classified into cluster 2 in cluster analysis (see Fig. 1) while Ledec nad Sázavou is part of cluster 1. However, in addition to defining micro-regions, it is also necessary to define the geographical level of the units observed, indicators for evaluation and the overall approach of the evaluation, itself. The various parts of municipalities in the defined micro-regions comprise the level for observation. Up to the present time, the majority of transport geography analyses have focused on the evaluation of transport possibilities at the municipality level. Nonetheless, Květoň (2006), for example, points out significant differences in transport serviceability within individual municipalities and their parts. For this reason, we proceeded with our analysis at this lowest scale level. According to the Czech Statistical Office (CZSO), there were 6,249 municipalities, divided into 11,498 parts, in Czechia as of 1. 1. 2008 (CZSO Lexicon of Municipalities 2008). This means that there are, on average, 1.8 parts for every municipality.

Naturally, in light of the differentiated structure of settlement in Czechia, significant differences exist, wherein, for example, large villages in southeast Moravia are also municipalities, while municipalities in Bohemia's internal peripheries can include as many as ten settlements. As the correlation relationship indicates (Marada and Květoň 2009), municipalities with a higher elevation, meaning a less-favourable geographical conditions, include a higher number of parts.

Data on the availability of transport connections was acquired from the company CHAPS Brno, s.r.o., which administers electronic timetables in Czechia. It should be emphasised here that we succeeded in acquiring data, expressing the availability of public transport services in each of the reference years (2001, 2003, 2005, 2007 and 2009), which makes it possible to evaluate changes in the development of transport serviceability at the level of municipality parts. For these settlement units, data indicating the overall number of departing public transport bus¹ and railway² connections was available. Public transit connection departures were ascertained, for each year, for a selected working day,³ but also for a selected Saturdays and Sundays.

An index of change, between 2001 and 2009 in terms of available public transport services (bus + "un-weighted"⁴ railway transport), was calculated from the data acquired. The calculated indices are expressed graphically in cartograms, which also portray the transport network. This makes it possible to evaluate the availability of transport services in the context of a settlement's transport situation. The structure of public transport is expressed in the cartograms with localised diagrams, which indicate the volume of available public transport and, as the case may be, the division of bus and railway services.

The next step involved the creation of a coefficient of variability, relating to the transport serviceability in each of the various municipality parts. This coefficient was calculated as the difference between the maximum and minimum value of serviceability within a municipality divided by the average number of connections for all parts of the municipality. The resultant values of the calculated coefficient were again expressed graphically in a map, making it possible to identify primary differences among municipalities.

¹ Bus connections were divided into two categories. The first category includes all local bus connections, while the second totals the number of departures of long-distance bus transport.

² Railway connections were also divided into two main categories – local railway connections and the number of express train departures from every part of each municipality.

³ The data is always related to a standard working day (a Wednesday in April/May), which is not affected by any exceptions in the timetables (summer vacation, state holidays, etc.).

⁴ Some articles in transport geography (e.g. Marada et al. 2008) attribute extra weight to railway connections. The reason for this is the lower frequency and greater carrying capacity of trains, when compared with bus connections. However, because the number of express trains in the observed micro-regions is minimal, no weighted coefficient has been applied to train connections.

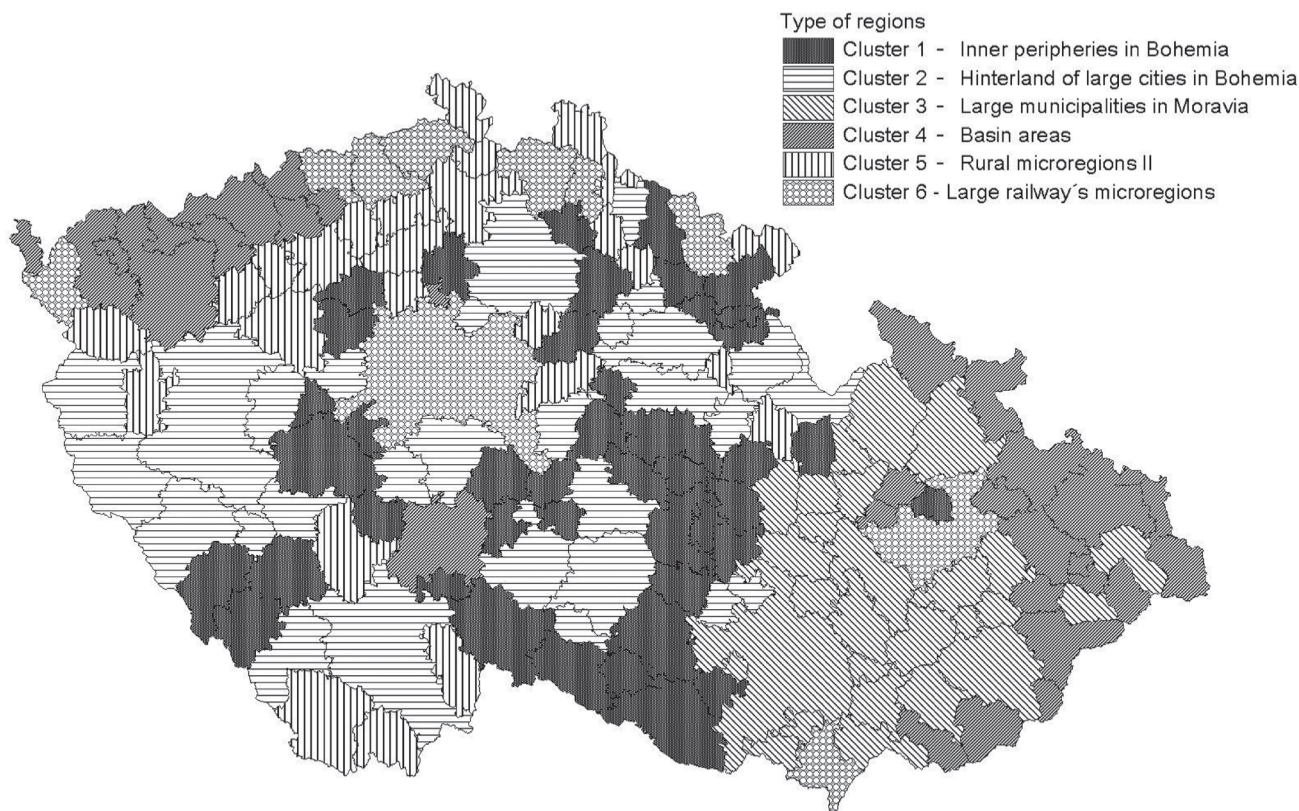


Fig. 1 Typology of regions in terms of the availability of transport opportunities. Source: results of a cluster analysis using SPSS 12.0, Population and Housing Census 2001 (CZSO), electronic IDOS timetable (CHAPS Brno)

The final part of the evaluation focused on changes in the availability of public transport at the level of the two micro-regions. In particular, developments in central municipalities were distinguished for comparison with developments in parts of municipalities (in all of the evaluated years). An average value of public transport availability was also calculated for “core” municipalities along with an average value of availability in corresponding parts of municipalities. Both indicators were calculated for a working and a weekend day (Wednesday and Saturday). The development graphs, therefore, present a mid-range comparison of central municipalities and their sub-parts, in terms of the availability of public transport.

3. Typology of micro-regions in Czechia in terms of public transport availability

As stated in the previous section, case studies were implemented for two categorically different micro-regions in Czechia. Marada and Květoň (2009) carried out a cluster analysis, from which a typology or a classification of micro-regions, in terms of transport availability and its differentiation throughout Czechia, was created. The typology pinpoints both structural characteristics,⁵ as well as indicators of volume,⁶ to express the actual availability of transport opportunities. The result is a transport-geographical classification of micro-regions, which defines six different types. The resultant clusters generally form connected areas and can be characterised, in terms of transport availability, by certain unique traits. The first cluster can be simple labelled as Bohemia’s internal periphery. The second cluster is comprised primarily of micro-regions in the hinterland of large cities in Bohemia. The third is typical for micro-regions in southern and central Moravia. The fourth cluster is no less significant and includes basin areas in Bohemia and Silesia. The fifth cluster is again apparent in rural areas in Bohemia and a unique cluster is comprised of micro-regions, which are typical large railway centres (see Fig. 1). More detailed characteristics of the various clusters are described in Marada and Květoň (2009).

⁵ The authors’ structural transport characteristics include the portion of households equipped with one or more automobiles, the portion of train and bus connections from the total number of available public transport connections.

⁶ Indicators of volume express the significance of available transport and were calculated here as the aggregate of railway transport (the sum of the number of local connections and three times the number of express connections) along with the number of bus connections (the sum of local and un-weighted, long-distance connections). Also, an aggregate of individual automobile transport, expressed as the sum of the number of households with one automobile and two times the number of households with two or more automobiles, was calculated (Marada and Květoň 2009).

The Sedlčany micro-region was selected as an example of a rural micro-region that was classified into cluster 2 (see Fig. 1) while Ledec nad Sázavou is part of cluster 1. The rate of automobilisation in both areas is similar (approx. 63%); however, significant differences should be evident in the public transport services available. The share of bus transport dominates within cluster 1, while railway transport is also characteristic for cluster 2. Because our aim is to pinpoint differentiated developments at the level of municipalities and their parts, in light of their transport situation during the period from 2001 to 2009, it was necessary to adapt the selection of both micro-regions to this objective.

4. Changes in transport serviceability in the Sedlčany micro-region

The Sedlčany micro-region is made up of 20 municipalities, two of which have city status – Sedlčany (7,700 inhabitants) and Sedlec-Prčice (2900 inhabitants). It is a typical area of the internal periphery along the border of the Central Bohemia and Southern Bohemia Regions, characterised by a high degree of fragmentation of municipalities – e.g. Sedlec-Prčice is comprised

of 36 municipal parts. The micro-region's territory is transected by roadway I/18 Příbram – Sedlčany – Votice in a west-east direction, and in a north-south direction, by roadways II/119 Dobříš – Sedlčany, II/120 Sedlčany – Sedlec-Prčice and II/105 Jílové u Prahy – Sedlčany – Milevsko. The Sedlčany – Kosova Hora segment continuing on to Olbramovice is serviced by a regional railway, which connects at the Olbramovice station with the Prague – Benešov – Tábor – České Budějovice rail line.

A significant indicator, which was not specifically quantified and which can, nonetheless, be derived from the cartographic representations, is the situational attractiveness of each municipal part. It can be expressed, for instance, as the distance in kilometres from Sedlčany, but, simultaneously, as the situation in respect to roadways, specifically the distance to the nearest class I roadway. Rölc (2004), for example, highlighted situational attractiveness in his analysis of transport-settlement issues in two model territories from the Jablonec nad Nisou and Kutná Hora districts, respectively. Such evaluation can be carried out in this article on the basis of the cartogram depicting the availability of public transport services (see Fig. 2).

In terms of the transport serviceability of municipalities and their parts in the Sedlčany micro-region, changes

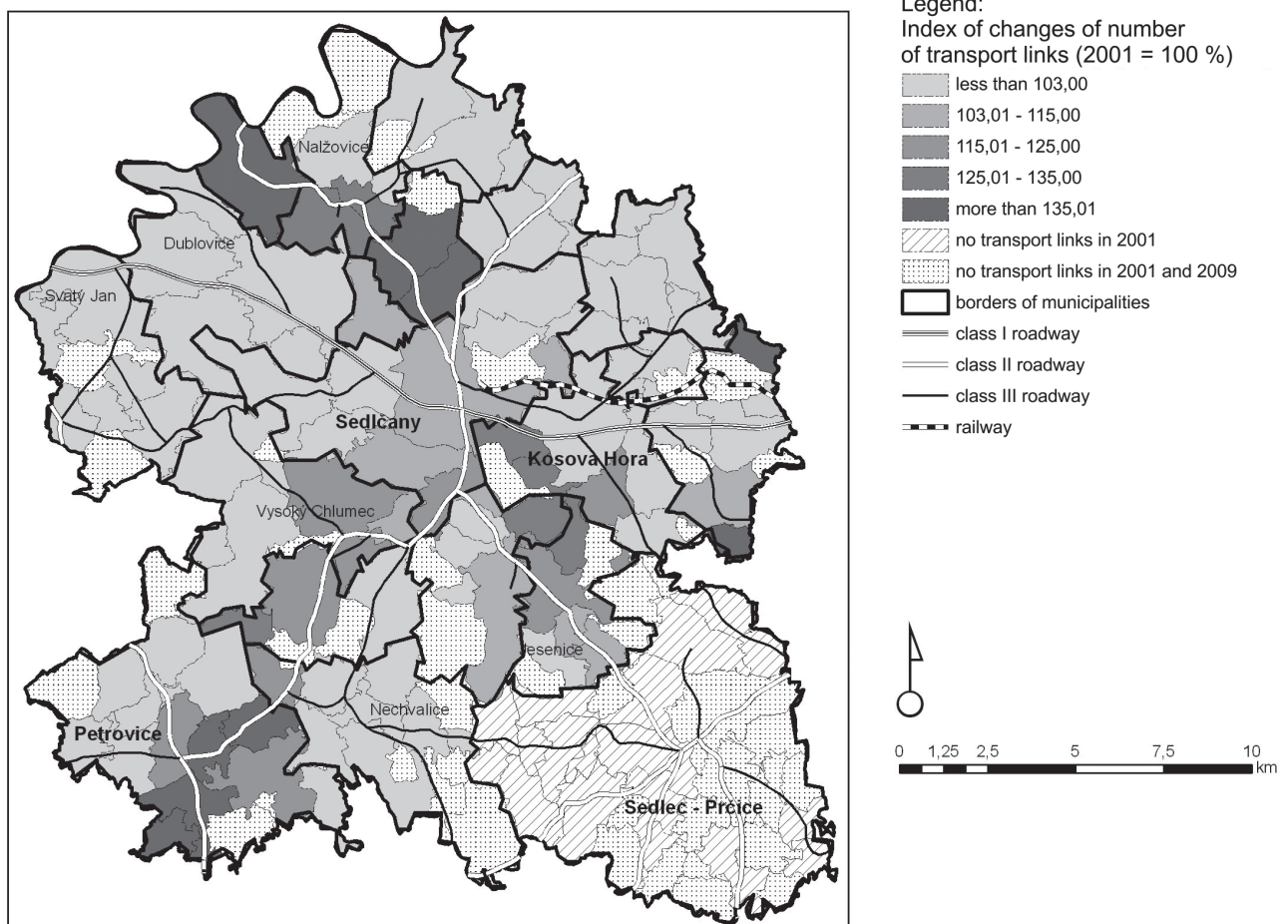


Fig. 2 Index of change in public transport availability in the Sedlčany micro-region Source: data provided by CHAPS Brno, s.r.o., own calculations

occurred during the observed period (2001–2009) in the volume of connections available, especially in the parts of municipalities transected by class II roadways 119 and 105 in the Dobříš – Sedlčany – Milevsko and the Sedlčany – Jesenice directions, respectively. In the case of the increase in the north-south direction, this result is influenced by the incremental discontinuation of the Prague – Sedlčany – Petrovice – Milevsko bus line, the volume of which had been increased.

In addition to municipalities with increasing (roughly 30% of the municipal parts) or stagnating (40%) public transport availability, a number of municipal parts (30%) exist, in which no basic public transport services were observed during the specified period. These are primarily municipal parts of Sedlec-Prčice, but there are also a number of other municipal parts (see Fig. 2), in which no public transport connections were observed in 2001 or 2009.

Territorial differences in the availability of public transport connections in 2009 are determined by the horizontal transport situation and the significance of the population core settlements. The greatest volume of public transport is evident in the central part of Sedlčany (127 connections, 9 of which are train), Sedlec, Svatý Ján and other locations surrounding significant

transport flows – consider the arterial road connections Prague – Nalžovice – Sedlčany – Petroviče – Milevsko and Sedlčany – Dublovice – Příbram as well as the railway connection Sedlčany – Kosova Hora – Vrchotovy Janovice – Olbramovice. In terms of the division of transport services by type, buses form the backbone of transport serviceability in the region, with the exception of municipalities along railway line 223, where in certain cases only train connections are available. An increased transport serviceability is typical in the hinterland of more significant municipalities, where transport lines from various directions often accumulate. Therefore, even settlements with small populations in the hinterland of Sedlčany are better served by public transport than similar-sized settlements near the borders of the micro-region.

Relatively high variability in the number of connections was measured in municipalities with greater numbers of inhabitants which were, simultaneously, highly fragmented, wherein the part of the municipality that contained its municipal authority proved to be best served. The greatest variability was, consequently, recorded in Sedlec-Prčice (36 municipal parts), and then in Petrovice (18 parts), Sedlčany (10 parts), Vojkov (9 parts) and Svatý Ján (8 parts).

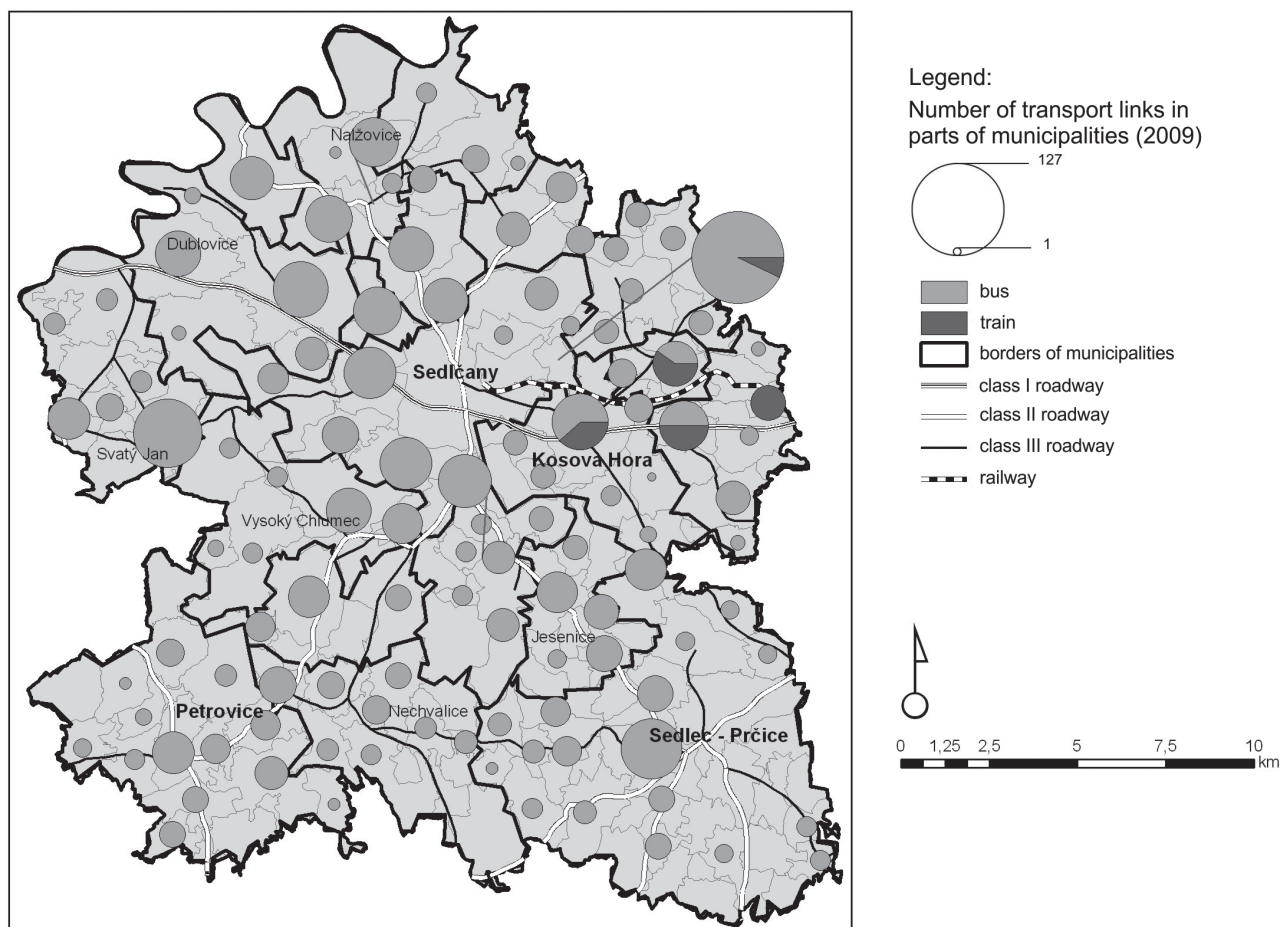


Fig. 3 Available public transport services in the Sedlčany micro-region in 2009. Source: data provided by CHAPS Brno, s.r.o., own calculations

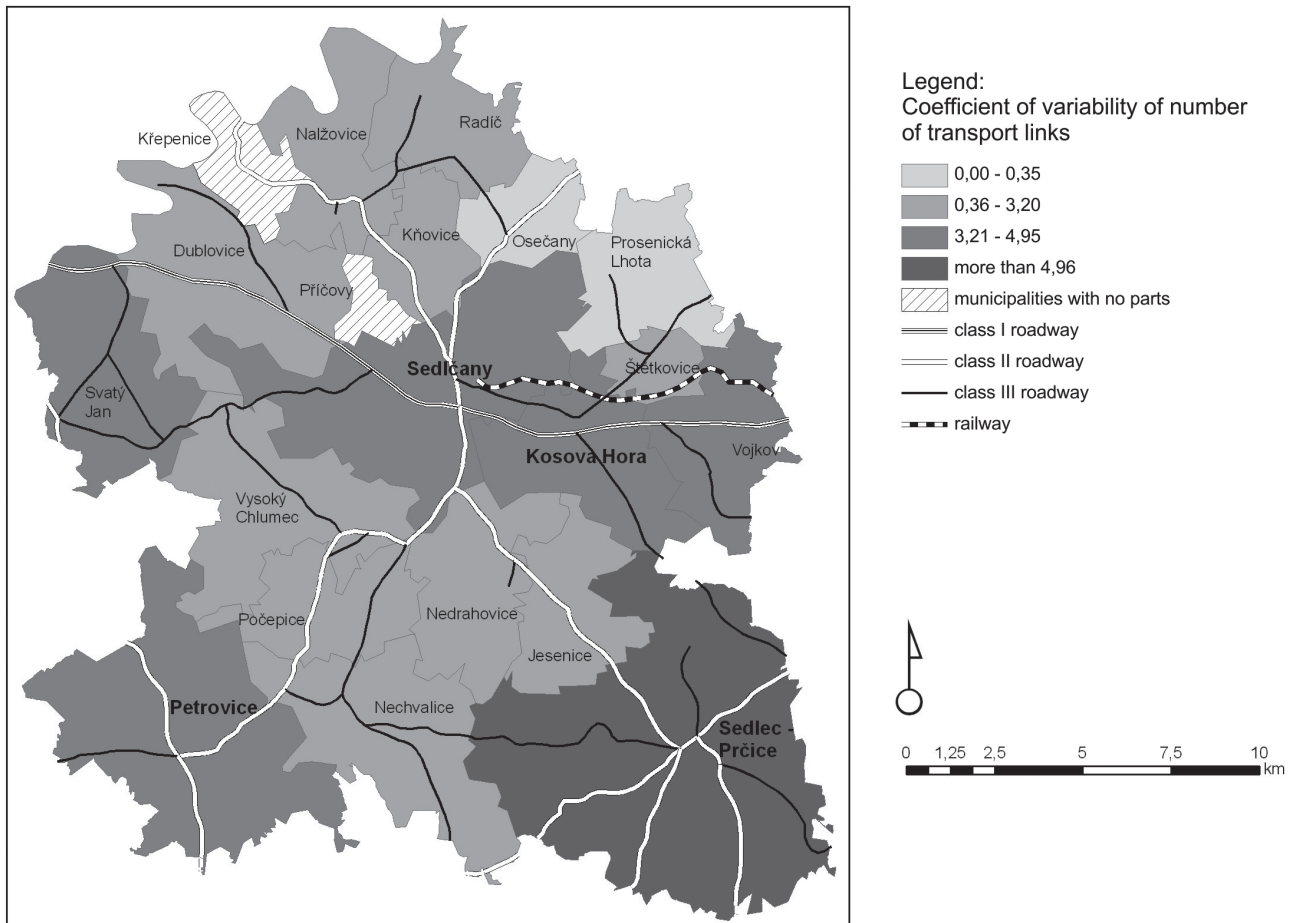
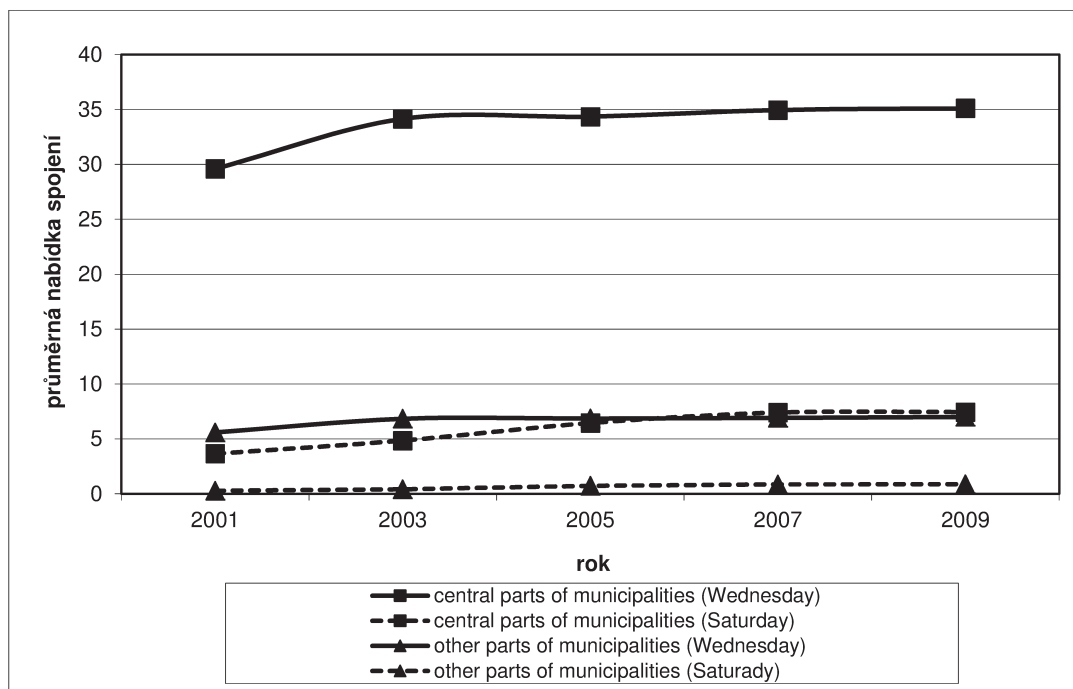


Fig. 4 Coefficient of variability in public transport availability in 2009
 Note: The coefficient was calculate as the maximum "minus" the minimum value of serviceability within a municipality "divided by" the average number of connections for all parts of the municipality. Source: data provided by CHAPS Brno, s.r.o., own calculations



Graph 1 A comparison of developments in transport serviceability in municipalities and their parts in the Sedlčany micro-region from 2001 to 2009. Source: data provided by CHAPS Brno, s.r.o., own calculations

A significant difference between central and other parts of a municipality is also evident in Graph 1, which indicates, moreover, that the transport serviceability of a municipal part on a working day is similar in volume to the amount of connections in central parts of the municipality on Saturday. The development trends depicted are in line with earlier results, i.e. showing a slight increase in the availability of connections over the entire observed period. It is clear, therefore, that the past eight years have seen improvement (or at least maintenance) of the transport serviceability; nonetheless, spatially outlying parts of municipalities are generally served at a minimum if at all. The residents of such settlements are primarily dependent on individual automobile transport. Developments in the availability of public transport in municipal parts on the weekend only confirm the already stated realities (see e.g. Marada and Květoň 2008), i.e. that a significant portion of municipalities with less than 3,000 inhabitants are left without any connections on weekends. The Sedlčany case study confirms this observation, even in light of long-term developments.

In the context with the above-mentioned analysis of transport services we should give some demographic indicators for selected microregion. Transport supply and its differentiation plays an important role especially for students and retirees. Share of both groups is even, and it is at about 17–18%. It is important to note that the share of people living in parts of municipalities with less

than 100 inhabitants is almost 20%. The previous analysis showed that it is very low supply of public transport in these parts of the municipalities. Therefore people are dependent mainly on the private car.

Tab. 1 Basic demographic and settlement indicators

average size of central part of municipality	736
share of inhabitants living in municipality parts with less than 100 inh.	19.87%
average population size of other municipality parts	55
share of inhabitants 0–14 years old	17.23%
share of inhabitants 60+ years old	18.02%

Source: own calculation based on data from Czech statistical office

5. Changes in transport serviceability in the Ledec nad Sázavou micro-region

In the Ledec nad Sázavou region, most municipalities, along with their parts, saw increases in the number of public transport connections, during the observed period (2001–2009). The increases occurred primarily in the western part of the territory, which contains municipalities with larger populations (three of the region's five municipalities with more than 500 inhabitants; namely Dolní Kralovice, Loket and Hněvkovice) that are situated

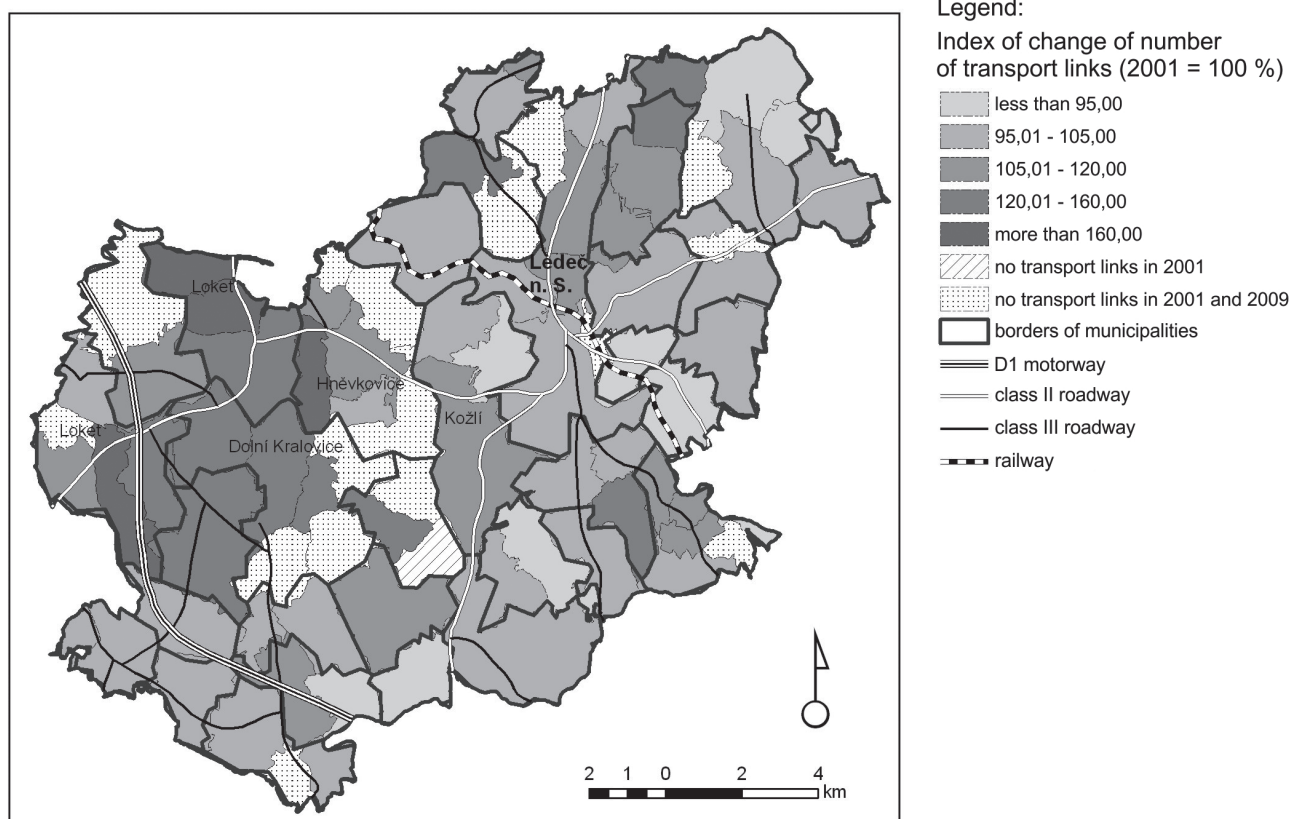


Fig. 5 Index of change in public transport availability in the Ledec nad Sázavou micro-region. Source: data provided by CHAPS Brno, s.r.o., own calculations

near the D1 motorway. These two factors in particular, municipal population and advantageous transport situation, play a role in the number of public transport connections in a municipality, or in its parts. The population of a municipality, which also expresses the volume of demand for public transport, is considered the more significant of the two factors. The increase in the number of public transport connections was also evaluated in light of the localisation of larger employers and the resultant increased level of commuting into the municipalities, or parts of municipalities, in question. This relationship, however, was not verified through our observations. Within the more populated municipalities of the region mentioned above, central parts of these municipalities experienced growth in the number of public transport connections, on the one hand, as did municipal parts with minimal amounts of inhabitants, on the other. Increases in these municipal parts are often caused by the allocation of one connection, which when considered in relative values has a very high weight. Such is the case of municipal part Leština, within Kozlov Municipality, which is located north of Ledec nad Sázavou.

A fifth of the parts of municipalities in the micro-region (i.e. 17 parts) were not served by public transport in 2001 or in 2009. The largest municipal part with this problem, in terms of population, is Horní Ledec in Ledec nad Sázavou with 585 inhabitants. As is very evident from Figure 5, however, Horní Ledec is a very small territory, which borders on the central part of the

municipality – Ledec nad Sázavou. Public transport serviceability is, therefore, available from the centre of the city, which is within walking distance for the inhabitants of Horní Ledec. Other municipal parts in the region, which are not equipped with basic transport serviceability, are parts with very low numbers of inhabitants: 25 people on average. The only municipal part which saw an increase in the number of public transport connections, and which had no connections in 2001, is Dolní Rapotice in Šetějovice Municipality, a settlement with 32 permanent inhabitants. These particular municipal parts, however, are inhabited by residents, who are forced to use their own automobiles to achieve transport mobility.

In terms of the number of public transport connections in 2009, no significant disparity is evident. The central part of Ledec nad Sázavou has the largest public transport serviceability (96 connections, 21 of which are train connections), followed by Dolní Kralovice, Loket and Hněvkovice, as municipalities with significant local populations. Bus connections form the backbone of basic public transport serviceability, due to the fact that a railway line is only accessible to the inhabitants of five municipalities in the region. Figure 6 confirms that most public transport connections are tied to the most populated municipalities, or their parts, and to those municipal parts, which are located on or near a class II or higher roadway, or near a railway line. The transport situation of a municipality or its part, therefore, plays

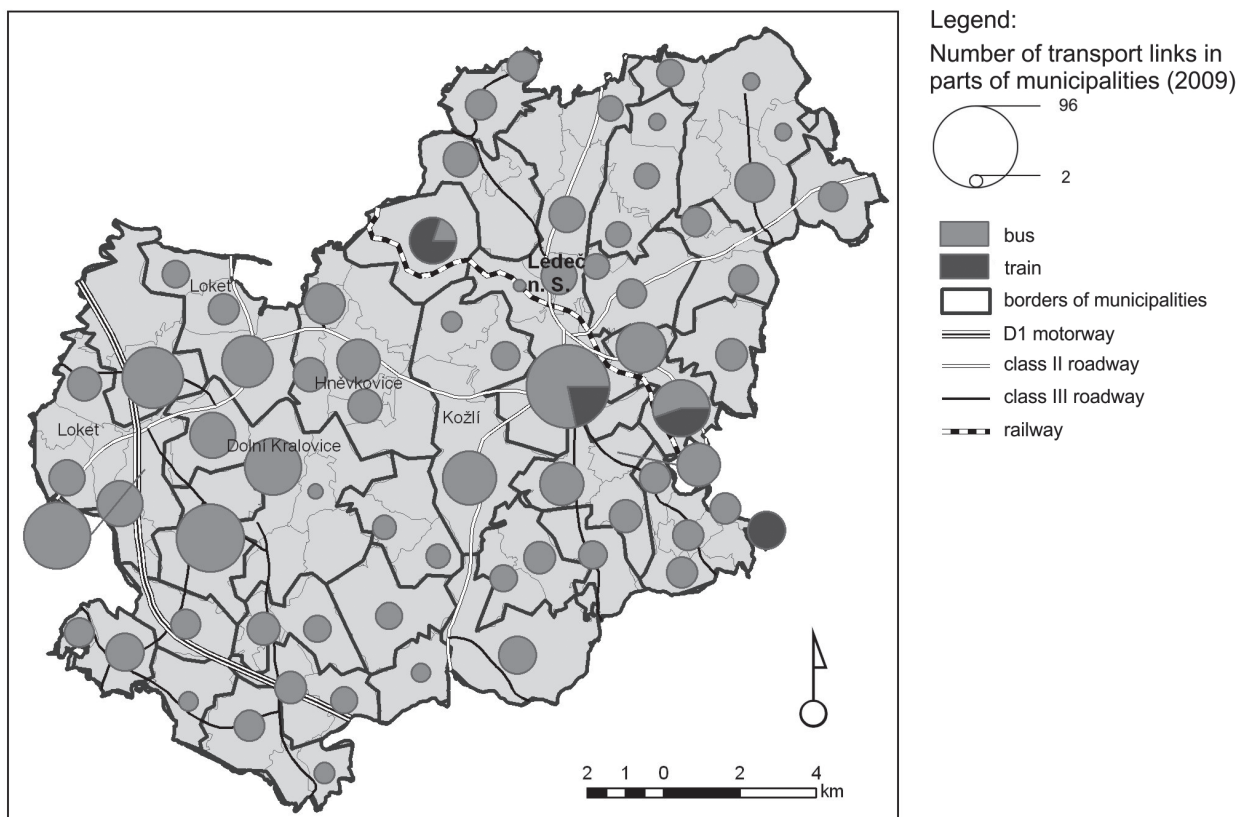


Fig. 6 Available public transport services in the Ledec nad Sázavou micro-region in 2009. Source: data provided by CHAPS Brno, s.r.o., own calculations

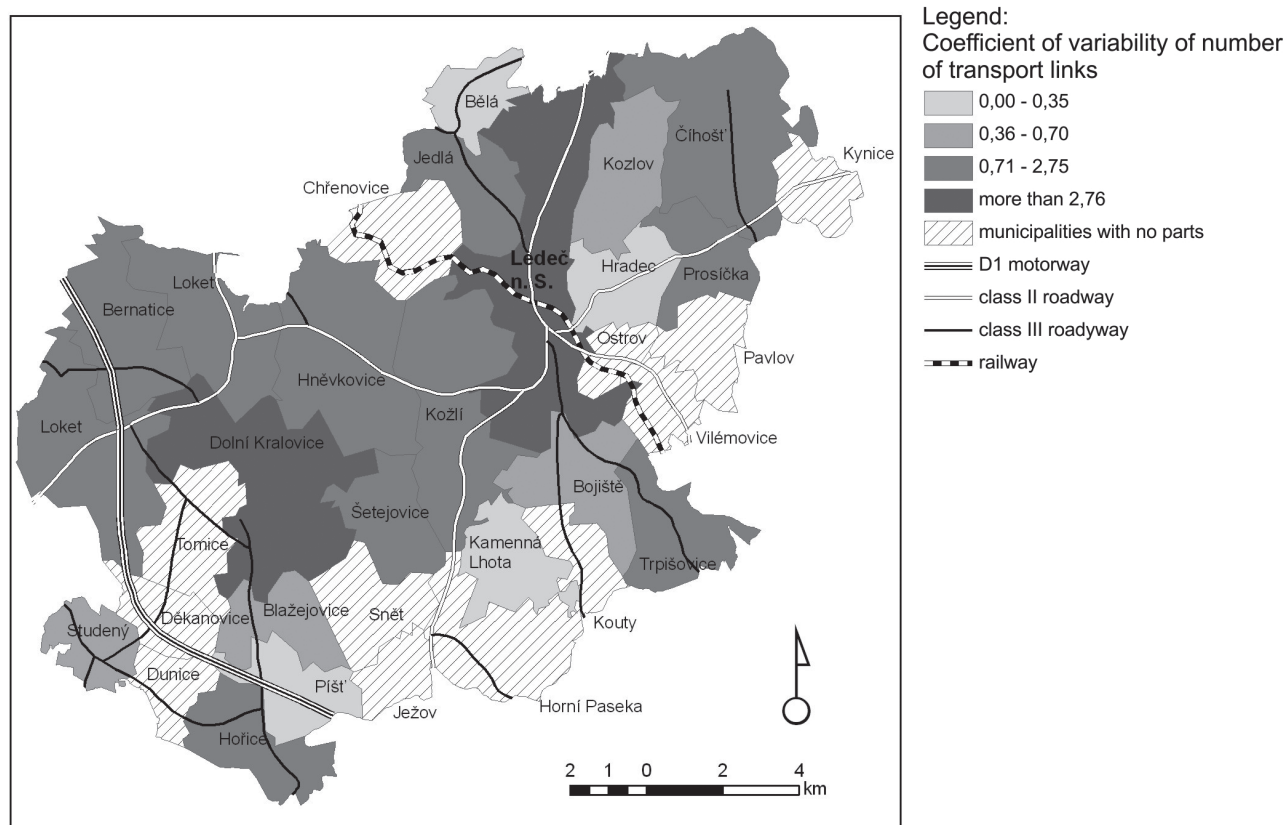
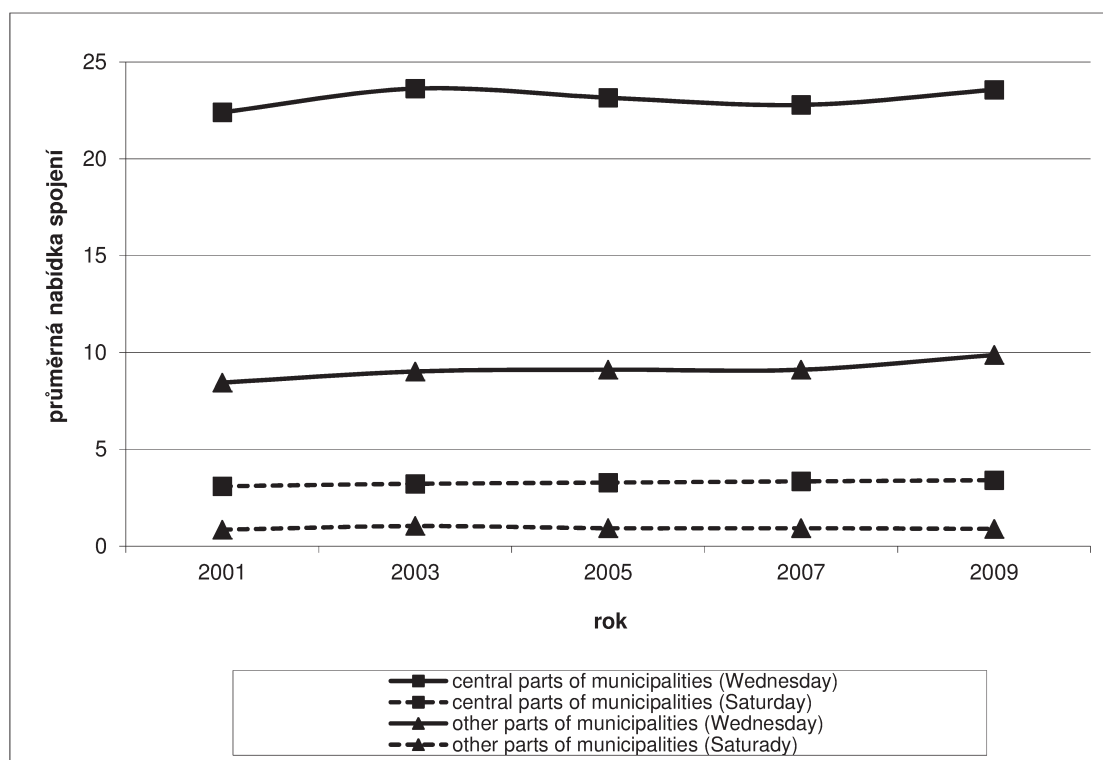


Fig. 7 Coefficient of variability in public transport availability in 2009

Note: The coefficient was calculate as the maximum "minus" the minimum value of serviceability within a municipality "divided by" the average number of connections for all parts of the municipality. Source: data provided by CHAPS Brno, s.r.o., own calculations



Graph 2 A comparison of developments in transport serviceability in municipalities and their parts in the Ledec nad Sázavou micro-region from 2001 to 2009

Source: data provided by CHAPS Brno, s.r.o., own calculations

a significant role in securing the transport serviceability of the area.

When observing variability in the number of connections within the various municipalities, a trend similar to observations from the Sedlčany micro-region became evident. The coefficient of variability increases along with the population of a municipality and with its division into multiple parts. The greatest variability, therefore, was recorded in the case of Ledeč nad Sázavou (6,127 inhabitants live in 7 municipal parts) and Dolní Kralovice (905 permanent inhabitants in 6 municipal parts).

The lower average availability of connections in parts of municipalities, in contrast with municipalities that house a municipal authority, is also evident from Graph 2, which portrays this difference over time (2001–2009). A significant difference in transport serviceability can also be observed between working days and weekends, when the availability of connections is minimal. In spite of the slight decrease in the average availability of transport connections in 2007, the overall stability of transport serviceability in the model territory can be confirmed. A key question for the future, however, remains the provision of access to spatially remote parts of municipalities, whose inhabitants are, at present, solely dependent on personal automobile transport. It is clear that such areas are characterised by very irregular demand for public transport, which complicates the potential intensity and temporal distribution of connections, not to mention their profitability or utilisation. The question of financing additional transport serviceability, meaning beyond the extent of basic transport serviceability, falls under the competencies of the municipality, in which the settlement in question is located. In the extremely sparsely populated areas of certain states in Western Europe (Great Britain, Germany), this problem is resolved by utilising alternative methods for ensuring transport serviceability.

It is necessary to add basic demographic and settlement indicators, as in previous microregions. Share of population 60+ years old (19.82%) and the students (15.61%) shows the main groups of the population for whom public transport has especially social significance. Just such people are not often able to drive a car and they are dependent on supply of public transport. It is important to note that in municipalities and their parts up to 100 inhabitants live 15% of the population in micro-region. The lowest supply of public transport was identified just in these parts of the municipalities.

Tab. 2 Basic demographic and settlement indicators

average size of central part of municipality	426
share of inhabitants living in municipality parts with less than 100 inh.	15.23%
average population size of other municipality parts	61
share of inhabitants 0–14 years old	15.61%
share of inhabitants 60+ years old	19.82%

Source: own calculation based on data from Czech statistical office

6. Conclusions

The purpose of this article was to evaluate differentiated developments in the availability of public transport at the level of municipalities and their parts and to analyse the transport possibilities of residents in the selected micro-regions of Sedlčany and Ledeč nad Sázavou. The basic spatial distribution and differences in transport circumstances, viewed at the municipality level, brought interesting results, which should be subject to further research.

On the basis of the resultant evaluation of the state and development of transport serviceability in both of the correlated micro-regions, it is possible to characterise certain common, or divergent, characteristics. At a general level, it can be stated that the availability of connections in municipalities and municipal parts increased slightly or remained stable, from 2001 to 2009. This availability is influenced primarily by the population of a municipality and its position in the transport network. It is typical for these rural micro-regions that, in terms of the division of transport by mode, bus transport comprises the backbone of the service network, while railway connections directly impact the “modal split” only in a few small municipalities located along a railway line. In addition, bus connections are often more demand driven in nature (they adapt to accommodate rush hour cycles – commute to school at 8:00, to work at 6:00, from work after 14:00, etc.). In contrast, the development of regional railway transport is oriented at accommodating the interval system of long-distance transport, i.e. regularly repeating departures throughout the civic day, wherein the various slow trains “connect” with express trains, which are operated at regular intervals.

The most significant differences in the availability of connections within the respective micro-regions are most clearly evident in municipalities with important central parts (Sedlec, Sedlčany and Ledeč nad Sázavou), which concentrate service activities and which are also comprised of a high number of subordinate municipal parts. However, a noticeable difference exists between the average number of connections in central parts of municipalities and in other municipal parts. On a working day, this difference is more significant in the case of the Sedlčany micro-region (35 connections : 7 connections) than it is in the case of the hinterland of the Ledeč nad Sázavou area (24 : 10). This situation is influenced primarily by the much greater fragmentation of municipalities in the Sedlčany area as opposed to the Ledeč region, where the settlement structure is more favourable, in terms of transport serviceability.

In general, the claim can be made that a higher degree of fragmentation of the settlement system negatively impacts the provision of transport serviceability by means of public transport. It is, therefore, clear that, at the level of municipal parts, the exclusion of residents, caused by a lack of access to public transport, can be

observed. The high degree of fragmentation in the settlement system (especially in Bohemia) is a result of historical factors and no significant changes can be expected in the near future. Reductions to bus and railway connections were unavoidable, in light of general decreases in economically non-profitable transport routes; however, the consequences of such measures lead to serious social problems in rural municipalities, including the possible "social exclusion" of residents. Possible solutions for the transport of residents in problematic settlements include alternative methods of securing transport serviceability ("on-call buses", mini-buses, etc.). Institutional aid from a supra-municipality level in securing, at least, minimal operations of transport serviceability are a necessity in such cases.

The transport serviceability and its development over time was evaluated in this article with examples from the selected case studies. Analyses have provided interesting results, which raise a number of research questions. In terms of possible generalizations it is of course more inspiration than answers on how selecting types are internally homogeneous. The significant differentiation of transport supply in central parts of municipalities and other parts may be accepted as a generally valid. In future research, the application of a similar methodology to additional types of micro-regions would be beneficial, as would the expansion of such evaluation to include demographic indicators for municipal parts and analysis of actual transport flows in a micro-region. In terms of the provision of high-quality connections, a qualitative approach can also be suggested as a means of exploring relationships and determining factors concerning the transport serviceability of model regions.

Acknowledgements

This contribution was prepared thanks to research project number KJB301110801 Public and individual transport use for commuting to work and its geographical conditionality granted by Grant Agency of the Academy of Sciences of the Czech Republic, project number P404/12/1035 Spatial Dynamics of Transport Relationship in Settlement System of Czechia (granted by Grant Agency of the Czech Republic) and research project Regional differentiation of rural municipalities in Czechia: disparities and developmental opportunities (WD-01-07-1) granted by Ministry of Regional Development of the Czech Republic. The authors are much obliged for this kind support.

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RÉSUMÉ

Vývoj dopravní obslužnosti veřejnou dopravou na příkladu typově odlišných mikroregionů

Článek se na modelových případech dvou vybraných mikroregionů zabývá problematikou prostorové (dopravní) exkluze. Jeho cílem bylo zachytit diferencovaný vývoj nabídky dopravní obslužnosti na úrovni obcí a jejich částí s ohledem na jejich dopravní polohu v letech 2001–2009 ve vybraných modelových mikroregionech. V souvislosti se stanoveným cílem byly předpokládány významné rozdíly v nabídce spojů veřejné dopravy v závislosti na poloze vůči hlavnímu mikroregionálnímu středisku a současně byla očekávána značná variabilita nabídky v souvislosti s dopravní polohou, tedy lokalizace obce resp. její části na příslušném typu komunikace.

Vybrané mikroregiony byly vymezeny v rámci sociálněgeografické regionalizace v Česku na základě převažujícího směru pracovní vyjíždky (viz Hampl 2005). Konkrétní výběr mikroregionů je založen na vytvořené typologii mikroregionů v Česku, kterou zpracovali Marada a Květoň (2009) na základě clusterové analýzy velikostně významových a strukturálních charakteristik vyjadřujících nabídku dopravních možností ve všech mikroregionech v Česku.

Pro hodnocení dopravní obslužnosti byly vybrány dva typově odlišné mikroregiony – Sedlčany a Ledec nad Sázavou. Jedná se o periferní venkovské regiony vykazující rozdílné charakteristiky dopravní obslužnosti. Sledovanou úroveň se staly jednotlivé části

obcí ve vymezených mikroregionech. Doposud se většina dopravněgeografických analýz zaměřujících se na hodnocení dopravní nabídky soustředila na úroveň obcí. Nicméně např. Květoň (2006) poukázal na významné diferenciaci dopravní obslužnosti uvnitř jednotlivých obcí a jejich částí. Z toho důvodu bylo přistoupeno k analýze na této nejnižší měřítkové úrovni.

Data o nabídce dopravních spojení byla získána ze společnosti CHAPS Brno, s.r.o., která spravuje elektronické jízdní řády v Česku. Na tomto místě je nezbytné zdůraznit, že se podařilo získat data vyjadřující nabídku veřejné dopravy v jednotlivých referenčních letech (2001, 2003, 2005, 2007 a 2009), která umožnila hodnotit změny ve vývoji dopravní obslužnosti na úrovni částí obcí.

Ze získaných dat byl vypočítán index změny mezi lety 2001 až 2009 z hlediska nabídky veřejné dopravy. V dalším kroku byl vytvořen koeficient variability vztahující se k dopravní obslužnosti v jednotlivých částech obcí. Výsledné hodnoty vypočítaných koeficientů byly graficky vyjádřeny v mapě a umožňují identifikovat hlavní diferenciaci mezi obcemi. V poslední části hodnocení byly sledovány změny nabídky dopravy na úrovni obou mikroregionů, ale zvláště byl rozlišen vývoj v centrálních obcích a komparován s vývojem v částech obcí (ve všech hodnocených letech).

V obecné rovině lze uvést, že nabídka spojení v obcích i obecních částech zpravidla mírně rostla či stagnovala. Její rozsah byl přitom ovlivněn především populační velikostí obce a jejím postavením v dopravní síti. Pro tyto venkovské mikroregiony je typické, že páteřní systém obsluhy vykonává v rámci dělbý přepravní práce autobusová doprava, kdežto železniční spojení bezprostředně ovlivňuje „modal split“ pouze v několika málo obcích lokalizovaných na železniční trati. K tomu má často autobusové spojení více poptávkový charakter (přízpusobuje se přepravním špičkám – dojíždka do školy na 8:00, do práce na 6:00, z práce po 14:00 atd.), naopak vývoj regionální železniční dopravy směřuje vzhledem k vzájemnému propojení s dálkovou dopravou k intervalovému systému, tj. pravidelně se opakující odjezdy po dobu občanského dne, kdy jednotlivé osobní vlaky „napájí“ rychlíkové vlaky již v současnosti vedené v pravidelných intervalech.

Celkově je možné konstatovat, že vyšší fragmentace sídelního systému negativně ovlivňuje zajištění dopravní obslužnosti veřejnou dopravou. Je tedy zřejmé, že na úrovni částí obcí dochází k exkluzi obyvatel, která je způsobena nedostupností veřejné dopravy. Vysoká roztržitost sídelního systému (zejména v Čechách) je dána historickým vývojem a nelze očekávat podstatnou změnu v nejbližší budoucnosti. Omezení autobusových i železničních spojů v kontextu celkové redukce ekonomicky nerentabilních linek bylo z pohledu dopravce nezbytné, nicméně dopady takového opatření s sebou přináší vážné sociální problémy venkovských obcí včetně případné „sociální exkluze“ obyvatel. Možné řešení přepravy obyvatel v problémových sídlech mohou přinést alternativní způsoby zajištění dopravní obslužnosti („autobusy na zavolání“, mini-busy aj.).

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