PUBLIC TRANSPORT SERVICEABILITY AS A FACTOR OF RURAL DEVELOPMENT

MAREK CIVAN\textsuperscript{1,2}, ALFRED KROGMANN\textsuperscript{2}
\textsuperscript{1}Department of Ecology and Environmental Sciences
\textsuperscript{2}Department of Geography and Regional Development
Constantine the Philosopher University in Nitra
Trieda Andreja Hlinku 1, 949 74 Nitra
SLOVAKIA
marek.civan@ukf.sk

Abstract: The paper is focused on the assessment of transport serviceability in rural municipalities in the Banská Bystrica district by public bus transport. Particular parameters of serviceability are able to reflect the level of rural development in terms of quality of life for inhabitants as well as offer of transport for visitors and tourists. Based on the categorization of municipalities into the size categories, the main differences among the groups and municipalities are highlighted. Very positive results were obtained in municipalities located at thoroughfares and municipalities with tourism potential, which creates wider range of connections with places of local, regional and national importance. The worst values were identified within the small rural settlements with less than 200 residents that are usually situated on the periphery and therefore they do not have conditions to create an increased demand for public transport. The presented results depict a municipal development in the light of public transport serviceability, which is a one of the factors affecting the migration of population.

Key Words: public bus transport, transport serviceability, rural municipalities, the Banská Bystrica district

INTRODUCTION

Serviceability in municipalities through public bus transport has significantly changed since the Velvet revolution. A successive privatization of the former branches of state-owned bus company has reflected in the qualitative and quantitative changes that have adapted to market conditions. One of the impacts has been a decrease in the proportion of public passenger transport at the expense of individual automobile transport (Horňák and Pšenka 2013). In spite of that, public transport has a relevant importance especially in the countryside. There is higher demand for this service compared to cities with wider offer of transport opportunities (Marada and Květoň 2006). The main function of transport serviceability is to ensure necessary connections for inhabitants mostly in the cases of commuting to work, school, health care facilities or public authorities (Poliak and Semanová 2013, Straková et al. 2016). This service has a large significance particularly for the non-driving category of people such as children, disabled persons or elderly population (Rahman et al. 2016). From the ecological and environmental point of view, public transport is more acceptable alternative to individual automobile transport. Just bus transport has a significant advantage in comparison with rail transport because of accessibility of network in any municipality, what makes serviceability by bus more flexible (Marada et al. 2010). From the viewpoint of quality and quantity of lines and connections, public transport depends a lot on bus transport as the prime medium of transportation (Wang and Qu 2015).

Legislatively, the process of ensuring of public transport in municipalities through bus transport up to 100 km comes under competences of self-governing regions that order this service from operators in public interest (Hejhalová 2009). Therefore, transport as a service presents a factor of rural development along with other indicators (Straka and Tuzová 2016), while transport connections affect the quality of life in rural environment (Kohutková and Baus 2012, Lee and Sener 2016). Moreover, the aspects of transport serviceability belong to social and economical characteristics of regional development (Mrázková 2004). The quality of transport infrastructure along with serviceability plays an important role in the municipal development for investors as well as for inhabitants, who make
decisions about their future place of permanent residence. Thus, transport serviceability may be the one of key attributes of quality of life in countryside (Boruta and Ivan 2010).

The aim of the paper is to present a comparative analysis of size categories of municipalities as well as particular settlements in the district of Banská Bystrica. It is the example of a heterogeneous region due to the various natural and socioeconomic conditions, which have formed a wide spectrum of rural municipalities with different functions and levels of public transport serviceability.

MATERIAL AND METHODS

Basic characteristics of the Banská Bystrica district

The target area is composed of 42 settlements, while there is only 1 city (Banská Bystrica) and 41 rural municipalities. In accordance with the methodology by Baran and Bašovský (1998), municipalities are divided into the size categories depending on the number of population (Figure 1). There are just 5 (12.2%) small municipalities with population to 199 inhabitants (abbr. S1), whereas there are 13 (31.7%) small municipalities in the group from 200 to 499 residents (abbr. S2). The district is also formed by medium-sized municipalities, while 12 (29.3%) of them have the number of population from 500 to 999 (abbr. M1) and 8 (19.5%) municipalities are characterized by the level from 1,000 to 1,999 residents (abbr. M2). The last category is formed by 3 (7.3%) large municipalities with population from 2,000 to 4,999 inhabitants (abbr. L1).

Figure 1 Structure of municipalities in the Banská Bystrica district based on the size categories

Geographically, the formation of settlement and transport network in the study area was affected mainly by natural conditions in the form of terrain segmentations. Three main mountainous units overlap into the district – Veľká Fatra, Low Tatras and Kremnica Mountains. They have become a major limiting factor for the development of settlement compactness, what also affects transport serviceability (Květoň et al. 2012) and characteristics of routes (Dandapat and Maitra 2014). Primarily owing to these factors, two main transport axes has shaped – the first in the north-south direction from Banská Bystrica through Donovaly to Ružomberok (road No. 59 (E77)) and the second in the west-east direction from Banská Bystrica through Brusno to Brezno (road No. 66). A localization of municipalities along the mentioned
thoroughfares creates a prediction of more favourable level of serviceability due to their higher degree of centrality. Another stimulating factor for transport serviceability may be developed tourism in some municipalities (Bačík 2016).

**Methods and data**

The basic information about municipalities was acquired from the Statistical Office of the Slovak Republic. The initial data on transport were obtained from the National information system on timetables of public bus transport valid to 6 September 2016. According to the extended methodology by Civáň, Némethová and Krogmann (2014), the indicators for evaluation were selected and further divided into the following two groups.

The first group covers basic parameters – number of population to 1 June 2016 (abbr. A1), area in km² (abbr. A2), population density in inhabitants per km² (abbr. A3), number of bus stops in municipality (abbr. A4), number of population per 1 bus stop (abbr. A5), percentage of population of the total number of population per 1 bus stop (abbr. A6), area in km² per 1 bus stop (abbr. A7), percentage of area of the total area in km² per 1 bus stop (abbr. A8).

Through the further calculations, the final indicators of transport serviceability were set – number of suburban (abbr. B1), regional (abbr. B2) and international (abbr. B3) bus lines that have at least 1 stop in the municipality (only regularly operating lines were included into the evaluation), number of bus connections in school days (abbr. B4), Saturdays (abbr. B5) and Sundays (abbr. B6), number of population per 1 bus connection in school days (abbr. B7), Saturdays (abbr. B8) and Sundays (abbr. B9), percentage of population of the total number of population per 1 bus connection in school days (abbr. B10), Saturdays (abbr. B11) and Sundays (abbr. B12).

**RESULTS AND DISCUSSION**

Within the first group of parameters, there is a directly proportional tendency based on the rising number of population in the size categories of municipalities (Table 1). The highest average value of population density (over 100 inhabitants per km²) is associated with the group of medium-sized municipalities with level from 1,000 to 1,999 inhabitants. The number of bus stops usually reflects real needs in terms of settlement structure, while there are 4 stops per municipality on average. Even 11 stops are located in Poniky, mainly because of its large area that covers more than 59 km². The above-average values were acquired also in Badín (8 stops), Tajov (7 stops), Staré Hory (7 stops) and Slovenská Lupča (7 stops). The last two municipalities are the places with developed tourism. On the other hand, just 4 municipalities (Povrazník, Oravce, Baláže, Horné Pršany) were typical for only 1 bus stop, while all of them belong to the category of small municipalities (S1 or S2).

**Table 1 Basic parameters of transport serviceability (average values)**

<table>
<thead>
<tr>
<th>Category</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>135</td>
<td>9.16</td>
<td>21.74</td>
<td>2.00</td>
<td>91</td>
<td>67.31</td>
<td>4.56</td>
<td>49.84</td>
</tr>
<tr>
<td>S2</td>
<td>330</td>
<td>12.72</td>
<td>56.86</td>
<td>3.00</td>
<td>144</td>
<td>43.72</td>
<td>4.80</td>
<td>37.71</td>
</tr>
<tr>
<td>M1</td>
<td>709</td>
<td>14.56</td>
<td>89.72</td>
<td>4.58</td>
<td>177</td>
<td>24.94</td>
<td>3.67</td>
<td>25.24</td>
</tr>
<tr>
<td>M2</td>
<td>1,395</td>
<td>28.05</td>
<td>107.01</td>
<td>5.63</td>
<td>287</td>
<td>20.56</td>
<td>4.90</td>
<td>17.46</td>
</tr>
<tr>
<td>L1</td>
<td>2,520</td>
<td>31.94</td>
<td>85.89</td>
<td>5.67</td>
<td>454</td>
<td>18.01</td>
<td>5.62</td>
<td>17.60</td>
</tr>
<tr>
<td>All municipalities</td>
<td>785</td>
<td>17.22</td>
<td>74.10</td>
<td>4.05</td>
<td>198</td>
<td>25.18</td>
<td>4.52</td>
<td>26.25</td>
</tr>
</tbody>
</table>

Within the A5 parameter, values are typical for increasing trend according to the number of population. The mentioned tendency is much more noticeable here than in the case of an areal indicator (A7). The average area per 1 bus stop oscillates from 3.67 to 5.62 km². Proportional indicators (A6, A8) point out differences more precisely, because they show the increasing level of transport serviceability in accordance with the growing number of population. The municipalities in the S1 category are characterized by more than the two thirds of population per 1 bus stop. The situation in the L1 group is opposite, because less than the one fifth of population falls on the stop. The designed trend is registered within the areal indicator (A8), too. Small municipalities with no more than 199 inhabitants are typical for the fact that almost the half of their area falls on 1 bus stop. Conversely, the best values were acquired...
in the M1 (17.46%) and the L1 category (17.60%). Averagely, approximately the one fourth of population as well as area falls on 1 bus stop. The results at the municipal level were affected mostly by the number of bus stops, thanks to that Poníky reached the best value (9.09%) along with the other municipalities with above-average number of stops.

Closer differences among the size groups as well as particular municipalities are visible through the final indicators combining transport and geographical aspects (Table 2). Within the total number of bus lines servicing municipalities (B1 + B2 + B3), there is an increasing trend depending on the rising categorization of municipalities. On average, three bus lines service each municipality, while two of them are suburban and just one regional. In the whole district, there is just one international bus line (routed from Praha to Brezno) that has a stop in the municipality of Slovenská Lupča. Significantly above-average values were identified in Staré Hory (11 lines; M1), Donovaly (12 lines; S2), Slovenská Lupča (15 lines; L1) and Brusno (16 lines; L1). Despite the fact that these municipalities belong to the various size categories, their common denominator is called tourism. Donovaly is a year-long tourism centre for sport and recreational activities, while Staré Hory represents the destination of religious tourism. They both have a favourable geographical position on the axis from Banská Bystrica to Ružomberok. Brusno is a municipality focused on spa tourism and Slovenská Lupča is the municipality with the highest number of population (3,244) in the district. Thus, the high number of bus lines is understandable. Both municipalities have also a suitable location within the district, since they are situated on the axis linking Banská Bystrica with the neighbouring district city Brezno.

In terms of number of bus connections servicing the size groups of municipalities during school days (B4), Saturdays (B5) and Sundays (B6), the proportional increase is registered according to the rising category. The municipality of Donovaly reached the best results in the S2 category, because it is serviced by 42 connections in school days, 22 connections on Saturdays and even 30 connections on Sundays. This municipality with only 225 residents emphasizes its own position among neighbouring municipalities, what is the one of tourism impacts. Within the M1 category, the best values were identified in Lučatín (116 connections in school days, 45 connections on Saturdays and 41 connections on Sundays). This municipality is serviced by 7 suburban bus lines, especially due to its location at the axis connecting Banská Bystrica and Brezno. Generally, suburban lines are typical for higher density of connections, thanks to that Lučatín cumulatively reached so positive results. Conversely, municipalities of Baláže and Podkonice are placed at the endpoints of road network and due to that they reached the worst results. They are serviced by less than 10 connections during Saturdays or Sundays. Within the M2 category, the most positive values were identified in the municipality of Medzibrod (71 connections in school days, 33 connections on Saturdays and 32 connections on Sundays). It has a common border with Lučatín and it is also located along the road No. 66 connecting Banská Bystrica with Brezno. Within the scope of transport serviceability, the factor of geographical location plays an important role. Among all municipalities, the best results reached Slovenská Lupča as a largest municipality in the district. It is serviced by 197 connections during school days, 76 connections on Saturdays and 70 connections on Sundays, what creates a wide range of connections to various directions at different time.

Table 2 Final parameters of transport serviceability (average values)

<table>
<thead>
<tr>
<th>Category</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>B5</th>
<th>B6</th>
<th>B7</th>
<th>B8</th>
<th>B9</th>
<th>B10</th>
<th>B11</th>
<th>B12</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>1.60</td>
<td>0.40</td>
<td>0.00</td>
<td>19</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>16</td>
<td>16</td>
<td>5.93</td>
<td>11.85</td>
<td>11.85</td>
</tr>
<tr>
<td>S2</td>
<td>1.69</td>
<td>0.69</td>
<td>0.00</td>
<td>29</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>34</td>
<td>34</td>
<td>4.24</td>
<td>10.30</td>
<td>10.30</td>
</tr>
<tr>
<td>M1</td>
<td>2.00</td>
<td>0.75</td>
<td>0.00</td>
<td>40</td>
<td>17</td>
<td>17</td>
<td>22</td>
<td>51</td>
<td>53</td>
<td>3.10</td>
<td>7.19</td>
<td>7.48</td>
</tr>
<tr>
<td>M2</td>
<td>2.00</td>
<td>0.00</td>
<td>0.00</td>
<td>44</td>
<td>16</td>
<td>17</td>
<td>35</td>
<td>103</td>
<td>102</td>
<td>2.51</td>
<td>7.38</td>
<td>7.31</td>
</tr>
<tr>
<td>L1</td>
<td>5.00</td>
<td>5.33</td>
<td>0.33</td>
<td>118</td>
<td>48</td>
<td>46</td>
<td>31</td>
<td>79</td>
<td>80</td>
<td>1.23</td>
<td>3.13</td>
<td>3.17</td>
</tr>
<tr>
<td>All municipalities</td>
<td>2.07</td>
<td>0.88</td>
<td>0.02</td>
<td>41</td>
<td>17</td>
<td>17</td>
<td>21</td>
<td>54</td>
<td>54</td>
<td>2.68</td>
<td>6.88</td>
<td>6.88</td>
</tr>
</tbody>
</table>

Further recalculated indicators (B7, B8, B9) show an upward trend in the number of inhabitants per 1 connection during selected days. The best results are typical for the M2 category and the worst values were acquired within the S1 category. These findings are affected mostly by the number of population and number of bus lines servicing municipalities. Brusno is the typical example, because it has 2,166 inhabitants and therefore belongs to the L1 category, but just 18 residents fall on 1 connection.
in school days, 40 on Saturdays and 39 on Sundays. This presents better results than any in the case of municipalities in the M2 category. Within the S2 group, the most favourable values were registered in Donovaly (5 residents per 1 connection in school days, 10 on Saturdays and 8 on Sundays). There is a wide range of bus connections despite of dominance of tourists using cars. In terms of the M1 category, the most positive results were identified in Lučatin (6 inhabitants per 1 connection in school days, 15 on Saturdays and 16 on Sundays) that benefits from its location. Favourable findings were acquired also in Staré Hory (12 residents per 1 connection in school days, 22 on Saturdays and 19 on Sundays) not only due to its location, but tourism potential as well.

Proportional parameters (B10, B11, B12) reflect an increasing quality of transport serviceability based on the rising size category of municipalities. While almost 6% of inhabitants per 1 connection are registered within the S1 group, the results in the largest category (L1) are much more positive, because there were identified just 1.23% of residents per 1 connection. This designed tendency is obvious also during Saturdays and Sundays. More noticeable differences were identified in transitions between the S2 and the M1 as well as between the M2 and the L1 categories. There are not registered any negative changes between Sundays and Saturdays. This fact presents a very positive finding, because transport serviceability in municipalities is ensured during the whole week. The negative results in school days were identified in the municipality of Špania dolina. Although it has only 208 inhabitants (S2 category), it is serviced only by 10 connections, what is the lowest number among the all municipalities in the district. In Saturdays and Sundays, an inappropriate level of serviceability is registered in the municipality of Horné Pršany. It is serviced just by 4 connections per a day and the one fourth of the population falls on each connection. These values come out from its peripheral position, road network and absence of other stimulating factors. On the other hand, the best results were typical for the largest municipality (Slovenská Lupča), as only 0.51% inhabitants were identified per 1 connection in school days, 1.32% on Saturdays and 1.43% on Sundays. Other municipalities with suitable geographical location (Lučatin, Medzibrod, Brusno) reached very positive findings, too. Favourable values were identified also in Donovaly and Staré Hory, since no more than 5% of residents fall on 1 connection in any day.

CONCLUSION

Transport serviceability of rural municipalities in the district of Banská Bystrica by public bus transport depends mainly on the two dominant factors. Firstly, the position of municipality within the transport and settlement network, what is a determinant for quantity of suburban bus lines that create a cornerstone of transport serviceability. The second important parameter is the development of tourism that is able to ensure direct connections with other parts of Slovakia through regional lines that complete the transport mosaic.

Generally, the level of transport serviceability rises with the increasing size category of municipalities. Settlements typical for the higher concentration of population have qualitatively and quantitatively wider spectrum of lines and connections. On the other side, mainly natural barriers has disabled further development of settlement and transport network, what had negative impacts to the level of serviceability in many peripheral municipalities. Therefore, their inhabitants have at disposal an insufficient offer of lines as well as connections. There may be predicted higher dependence of population on individual automobile transport, mostly because of time flexibility in the necessity of travel.

The support of public transport at the expense of individual transport due to ecological and environmental purposes may be expected in the future. The level of transport serviceability in municipalities may become one of the key factors in the process of selection of future place of residence. Altogether, it may reflect the level of municipal development in terms of transport. Sufficient serviceability by public transport in direction from the municipality to city or main central settlement is necessary for various classes of population with different possibilities of mobility.

ACKNOWLEDGEMENT

The research was financially supported by the university project No. UGA VIII/2/2016 “Perception of tourism effects on the rural landscape on the example of the Donovaly municipality”.
REFERENCES


