



## Transport-related problems of Bratislava city and its suburban region

Daniel Michniak 

Institute of Geography of the Slovak Academy of Sciences

Štefánikova 49, 814 73 Bratislava, Slovakia

[geomich@savba.sk](mailto:geomich@savba.sk)

**Abstract.** Increased daily mobility between Bratislava and its hinterland combines with mobility within the city to put demands on the transport system. The massive increase in road transport, connected inter alia with the rapid development of suburbanisation based mainly on individual automobile transport, has caused many problems. This paper introduces some of those problems as manifested in Bratislava and its hinterland – from a geographical perspective – and outlines the way in which an unfavourable situation can be improved. The future of transport in Bratislava and its hinterland requires the creation of a multimodal transport system, which can effectively serve various transport requirements and ensure the mobility of inhabitants.

**Keywords:** transport infrastructure, public transport, individual transport, suburbanisation, Bratislava.

### Introduction

The decrease in public transport and massive increase in individual automobile transport after 1989 in Slovakia (Horňák and Pšenka, 2013; Michniak, 2018) and other post-communist countries (Howkins, 2005; Pucher and Buehler, 2005) caused many problems, e.g. with insufficient transport infrastructure, traffic congestion, unregulated parking in cities and towns, missing integration of public transport, etc. Transport-related problems are visible mainly in cities and their surroundings and they are connected inter alia with the rapid development of suburbanisation (Šveda and Šuška, 2019).

Bratislava as the capital of the Slovak Republic is its country's most important social, economic and cultural centre, attracting inhabitants (migrants and commuters) from all regions in Slovakia, as is confirmed by study of interregional migration patterns there (e.g. Podolák, 1995), as well as commuting patterns (e.g. Michniak, 2016). The dominant position of Bratislava in the settlement structure of Slovak towns and cities also confirms direct public-transport connections with other regional and district centres in Slovakia (Székely, 2004; Michniak and Székely, 2019).

The geographical location and natural conditions of the region or locality determine its development potential. The location of Bratislava has much influenced on its existing transport infrastructure (see e.g. Korec and Galasová, 1994; Horňák and Bačík, 2013). The city is situated on both banks of the Danube, while the Malé Karpaty Mountains represent significant physical-geographical barriers to the development of transport infrastructure.

In comparison with other regions in Slovakia, that of Bratislava has a very good transport location vis-à-vis other regions in Europe, especially in terms of connections to the

TEN-T or Trans-European Transport Networks. A large part of the freight transport between Slovakia and the western part of Europe thus passes through the Bratislava region, increasing traffic intensity in the country. Bratislava is the crossroads of all three TEN-T core corridors (i.e. the Baltic-Adriatic, Orient/Eastern Mediterranean and Rhine-Danube Corridors) passing through Slovakia. The Danube River is part of the Inland Waterway System included in the Rhine-Danube Corridor.

Bratislava has an eccentric position as compared with the territory of Slovakia overall, given that it is located at the border with Hungary and Austria, in close (65 km) proximity to Vienna, a city that can be regarded as one of Europe's major metropolises. Bratislava is also very well connected with many cities in Europe, via direct public-transport connections (Michniak, 2008; Horňák and Bačík, 2013).

The concentration of inhabitants and their activities in Bratislava and its suburban region causes many problems with daily mobility. The aim of this paper is therefore to introduce selected problems of transport in Bratislava and its hinterland, and to point to some measures that have or can be taken to address problems associated with transport. In the first part of the article it is problems associated with transport infrastructure that are analysed. Subsequent parts point to problems relating to individual automobile transport and public transport, while the main focus is on passenger transport. The final part outlines ways in which transport-related problems may be solved, and an unfavourable situation in transport improved.

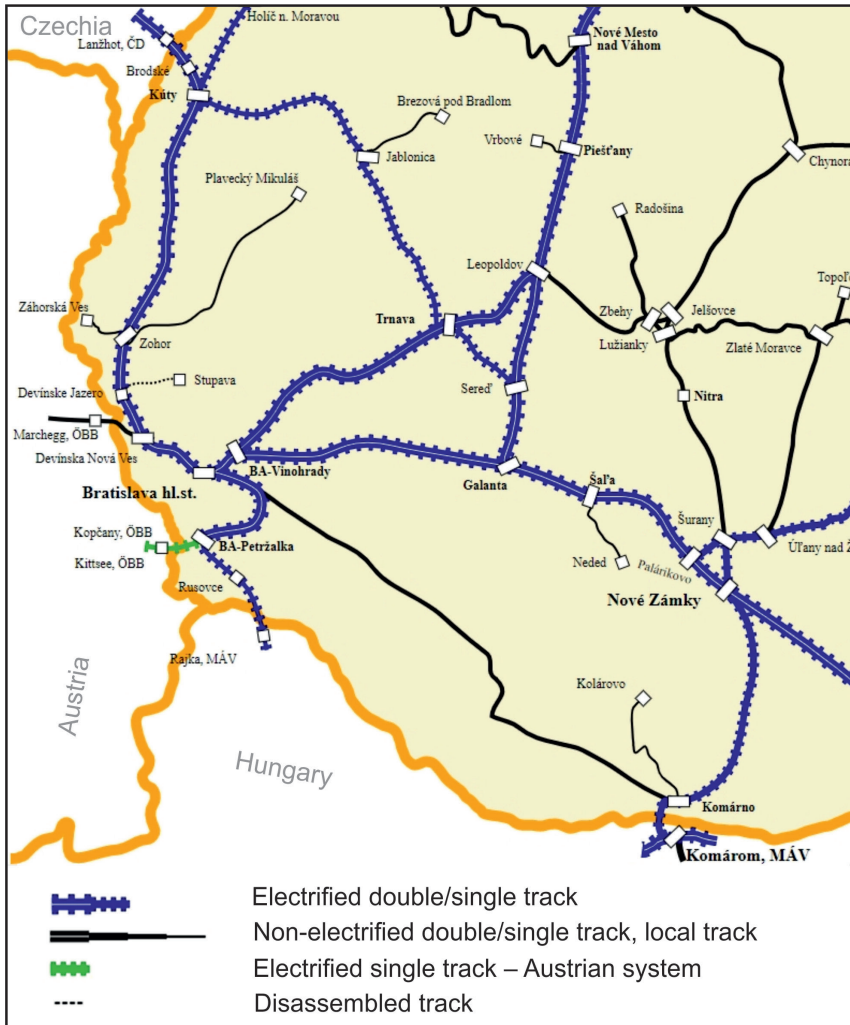
### **Problems associated with transport infrastructure**

Several authors (e.g. Baum-Snow, 2007; Garcia-López, 2012) point to the fact that improvements in transport infrastructure (construction of motorways and the rail network) lead to the development of suburbanisation, and to population growth in the hinterlands of cities.

Before automobile transport developed, the development of the hinterlands of cities and towns concentrated in settlements close to the railway lines. The location of a railway station often decided upon individual settlements' development or stagnation. In comparison with the road network, the rail network is more stable, and needs considerably less space, while the road network is more flexible and easier to adapt to new developments. A further advantage of rail transport is high transport capacity and relative ecological advantages over certain other modes.

Railway infrastructure in Slovakia was built mostly during the 19th and first half of the 20th centuries. However, at present, railway lines are only being modernised, with the construction of new sections not a matter of more major interest to *Železnice Slovenskej Republiky* (Railways of the Slovak Republic – which manages railway infrastructure). Nevertheless, railways are the most efficient means of transport from a hinterland to a city, as can be seen in the case of Gdansk, Poland (Połom et al., 2018), as well as Vienna (Giffinger et al., 2001) or Prague (Urbánková and Ouředníček, 2006).

Bratislava is an important railway junction of several international and regional railway lines (Fig. 1). The most important of these is Slovakia's main one, along the Bratislava – Žilina – Košice route, as well as an important international one leading from the Czech Republic, along the Kúty – Bratislava route. That is then followed by the Bratislava – Nové



**Fig. 1.** The rail network in the hinterland of Bratislava  
 Source: [https://upload.wikimedia.org/wikipedia/commons/3/3a/Railways\\_Slovakia\\_SK.svg](https://upload.wikimedia.org/wikipedia/commons/3/3a/Railways_Slovakia_SK.svg) (Author's modifications)

Zámky – Štúrovo line. The IC and EC category trains run on both international lines, allowing for daily commutes to Bratislava from a greater distance – indeed even from areas far beyond the boundaries of a typical hinterland.

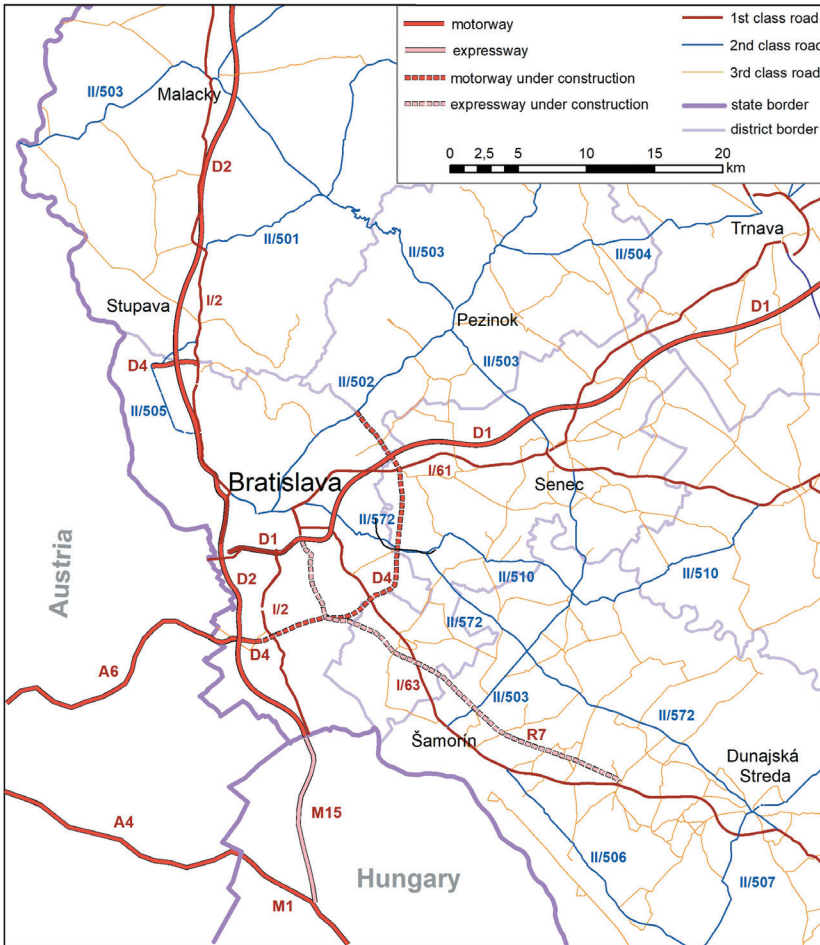
From Bratislava-Petržalka, international rail lines lead to Hungary (Rajka) and Austria (Kittsee – Vienna) – as they have since 1996. The second line connecting Vienna and Bratislava passes through Devínska Nová Ves – Margchegg and was built in 1848.

The regional railway lines from Bratislava: Nové Mesto – Dunajská Streda – Komárno, Bratislava, Nové Mesto – Bratislava, Petržalka, Zohor – Záhorská Ves and Zohor – Plavecký Mikuláš supplement the railway infrastructure in Bratislava and its suburban region. The system also includes a 42 km tram line network in Bratislava of 1000 mm narrow gauge.

For the development of suburbanisation in the hinterland of Bratislava a matter of key significance is the development of the network of motorways (Fig. 2). The building of a motorway junction or exit in the hinterland of the city in many cases serves as the impulse for the development of the suburban region in its vicinity.

Construction of the motorway network in Slovakia started from Bratislava in the direction to the Czech Republic with the D2 Malacky – Bratislava section built between 1969 and 1973. In 1972, the construction of the most important motorway in Slovakia (the D1 running Bratislava – Košice) started with the Bratislava – Senec section completed in 1975.

The construction of the D2 motorway section Lamačská cesta – Bratislava, Staré Grunty with the Sitina tunnel (in 2007) meant the completion of a continuous motorway passing through Bratislava. This helped solve the unfavourable transport situation in the western part of Bratislava, as the traffic through the tunnel relieved the Patrónka intersection, through which transit traffic had also passed.



**Fig. 2.** The road network in the hinterland of Bratislava  
Source: Author's own elaboration.

Currently, the motorway passing through Bratislava leads via the *Prístavný most* bridge, i.e. the route by road experiencing the most intensive transport anywhere in Slovakia (93,344 vehicles per day in 2015 – SSC, 2015), this being the place where transit and intra-city transport meets. Problems (road accidents and congestion) along this route influence transport across the whole city.

The D4 motorway should form Bratislava's outer motorway bypass. Its first section from Jarovce to the state border with Austria was completed in 1999. Another section of the D4 motorway in the northern part of Bratislava between Záhorská Bystrica and Devínská Nová Ves was completed in 2011. The connection of the D4 motorway to the motorway network in Austria (A6 motorway) was put in place in 2007. The connection between the D2 and the motorway network in Hungary has been provided since 1998 by the M15 expressway, which connects the M1 motorway with the state border with Slovakia in the municipality of Rajka.

The implementation of a PPP project for D4/R7 is currently the most significant investment made in road infrastructure. The project includes the construction of the southern and eastern parts of the Bratislava motorway bypass highway D4, and sections of the R7 expressway, in a direction east of Bratislava; and this should to some extent improve transport in Bratislava and the eastern and south-eastern parts of its hinterland. The project was to be completed in 2020, though construction will end later, as with many other Slovakian projects for the construction of motorways and expressways.

New transport infrastructure rectifies a transport situation for a certain period. However, better possibilities for individual automobile transport to be used often lead to its more intensive use, with this phenomenon being known as induced demand for transport (Hills, 1996).

Local transport infrastructure plays an important role in the process by which new residential projects in the city and its suburban zone are planned. However, transport needs in terms of sufficient infrastructural capacity are often not considered – roads and streets are often narrow, and pavements may be missing from streets in many cases.

Investment in public transport infrastructure has not been sufficient, and has lagged behind the development of individual automobile transport. There have been efforts to improve railway transport via the modernisation of railway infrastructure (with an increase in the speed limit to 160 km/h) along the main railway line from Bratislava-Rača in the direction of Trnava. In 2016, the tram line to Petržalka was completed (along the 2.4 km Šafárikovo námestie – Jungmannova section). Bratislava also has a system of trolleybus lines, also developed after 1989 along small sections<sup>1</sup>. New vehicles for city transport (trams, buses and trolleybuses) and some regional trains were purchased using EU Funds in the period 2007–2013. Regional bus-transport operators also invested in new buses that improved the quality of travel.

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<sup>1</sup> In 1999 lines to the National Institute of Heart Diseases (NÚSCH) and the National Cancer Institute were opened. In 2006 the line from the Molecova stop to the final Kuklovská stop in the district of Dlhé diely was opened. Interestingly, this line is not connected to the rest of the trolleybus network, ensuring that it is mainly trolleybuses with an auxiliary diesel aggregate that run there. 2011 saw work finish on the Pražská–Hroboňova trolleybus line, while the Vojenská nemocnica – Patrónka followed in 2013.

### **Problems associated with individual automobile transport**

The massive development of suburbanisation in the second half of the 20th century in many countries (the USA, Canada and Australia to name but three) was based on individual automobile transport (Newman and Kenworthy, 1999; Kopecky and Suen, 2010). In Slovakia and other post-communist countries, significant changes in the use of different means of transport in passenger transport occurred after 1989. The automobile became financially accessible, and an even more important symbol of success, social position, or the better quality of life now being enjoyed. Investments from the private sector into automobile services (car repair shops, service centres, petrol stations, car rental, insurance and leasing companies) all contributed to the development of individual automobile transport.

Motorisation in Slovakia increased from 165 cars per 1000 inhabitants in 1990 to 236 in 2000 and 307 in 2010. In 2015, it reached 375 and in 2018 even 414 cars per 1000 inhabitants. In Bratislava the number of cars is even higher – with 695 registered vehicles in 2018 per 1000 inhabitants (MV SR, 2018). High values for motorisation are also to be noted in districts in the hinterland of Bratislava – Dunajská Streda (509), Pezinok (506), Malacky (490) and Senec (449). Roads there are not adapted to current traffic intensity.

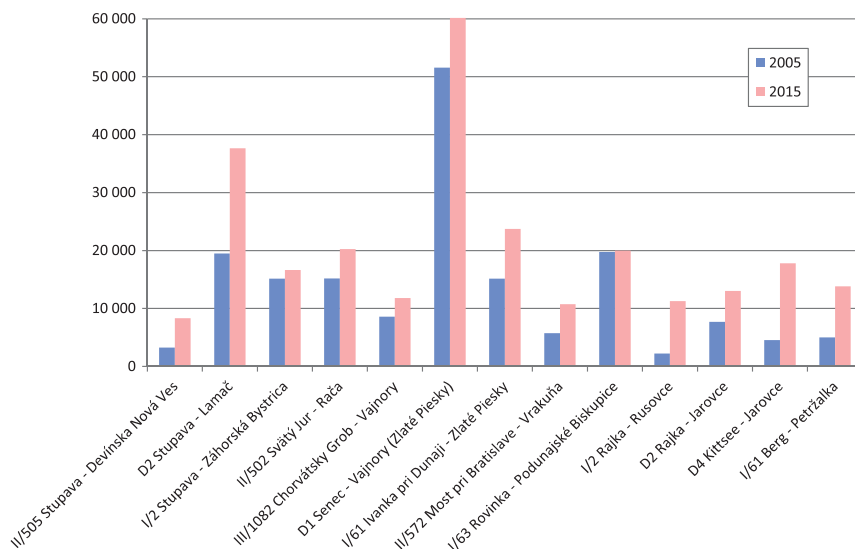
New housing construction, as well as that associated with the development of services, and production or storage facilities, is developing more and more often in areas solely accessible by car, and not served by public transport (Degórska, 2012). Life in the suburbs where public transport does not suffice necessitates regular commutes to the city by car. Ownership of at least one car, but more often more than one, looks essential if household members are to be rendered more flexible in their pursuit of their work and other activities. A preference for individual automobile transport over public transport results in an increased intensity of road transport, even as existing road infrastructure is unable to handle that.

An increase in the intensity of individual automobile transport is also visible at city limits. The highest densities of traffic in 2015, along the various routes into Bratislava, were on the D1 Senec – Vajnory highway, as followed by the D2 Stupava – Lamač motorway, and roads I/61 (Ivanka pri Dunaji – Zlaté Piesky), II/502 (Svätý Jur – Rača) and I/63 (Rovinka – Podunajské Biskupice) (Fig. 3).

Intensive automobile transport has a negative impact on the quality of life of residents living near major roads. The negative consequences include repeat congestion and associated losses of time and money, increased air pollution by exhaust gases, higher levels of noise, increased accident rates, damage to health and property, and restrictions on pedestrians and cyclists. Other negatives of automobile transport include requirements as regards space for the construction of new transport infrastructure and parking facilities.

### **Problems associated with public transport**

Before 1989, public passenger transport had a dominant role in the modal split of passenger transport in the former Czechoslovakia and other communist countries of Central and Eastern Europe. After 1989, there was an evident decrease in the importance of public transport, and a development of individual automobile transport (see e.g. Pucher,



**Fig. 3.** The intensity of transport on selected roads into and out of Bratislava in 2005 and 2015  
Source: Authors' own elaboration based on data from: SSC (2005); SSC (2015).

1999; Michniak, 2018). The reduced importance of public transport in Slovakia, especially by road, is to be observed in relation to both numbers of passengers and performance. In 2017, the share of public passenger transport in Slovakia in the number of passengers was only 26.4% (MDV SR, 2019). The role of individual automobile transport had thus increased at the expense of public transport.

Public transport is one of the basic services provided to the population, with the main aim of ensuring good accessibility to inhabitants and effective functioning of transport within the city. This is also true of Bratislava and its hinterland. In most cases, it is not possible to operate public transport without subsidy from the state, or regional and local authorities. The resulting regional public transport system depends on the cooperation and coordination of several carriers whose operation is influenced by various entities of state administration and local or regional government. In Slovakia, the self-governing regions are responsible for the provision of their bus transport services. Suburban bus transport in the Bratislava region, as a service of general interest, is operated by Slovak Lines. In the Trnava region the operators are the companies *SAD Trnava*, *SAD Dunajská Streda* and *SKAND Skalica*. City transport in Bratislava is operated by the *Dopravný podnik Bratislava*. In Slovakia, suburban bus transport plays still very important role in passenger transport and decrease of its importance after was smaller in comparison to Poland.

Passenger railway transport is commissioned and organised by the state through the Ministry of Transport and Construction of the Slovak Republic, while being run – along most lines in the country – by *Železničná spoločnosť Slovensko* (ZSSK, Railway Company Slovakia). An exception is provided by the Bratislava-Dunajská Streda-Komárno line, whose operator is the private carrier *RegioJet*. Urban transport in Bratislava is operated by the aforesaid *Dopravný podnik Bratislava* (DPB, Transport Company Bratislava) and in addition to the transport of residents, it serves in carrying commuters and visitors to the city.

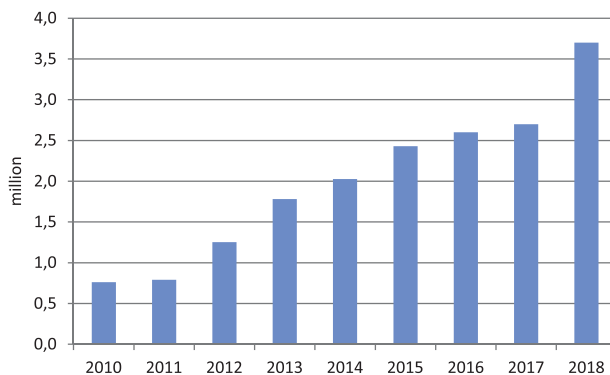


The reliable functioning of urban transport (adequate frequency of connections, reliability of departures, and sufficiency of coverage of the city by urban transport lines) is important if this is ever to become an advantageous alternative to individual transport in urban mobility. Transport pricing policy and the comfort and safety of passengers are also important aspects where the quality of urban transport is concerned. According to CDV (2015), public transport (bus, trolleybus, tram, regional bus and train) is used by only 36.1% of Bratislava citizens, while within that group 65.3% make regular use of it.

Localities in the hinterland of Bratislava, located near the railway line with a railway station or a railway stop, have a favourable position in terms of daily mobility to the city. Their residents can use the train as an alternative to road transport by bus or car, which leads along with the in-many-cases congested road network.

A marked increase in the number of commuters (more than a tripling since 2012) was recorded on the Bratislava-Dunajská Streda – Komárno rail line (Fig. 4), in relation to a change of carrier. The national carrier (ZSSK) provided transport along this line until 3 March 2012. The aforementioned private carrier *RegioJet* then took on the operation of this route on 4 March 2012, under a contract with the state signed in 2010 and valid through to 2020. Prior to *RegioJet*'s commencement of operations, the ŽSR reconstructed the railway line, while *RegioJet* itself invested in railway stations themselves, and in their car parks. The new carrier was able to offer improved services for passengers (refreshments, Wi-Fi internet) and introduced a tact timetable. However, the growing number of passengers has ensured "victim of success" problems related to the overcrowding of trains. Delays are also frequent. Nevertheless, numbers of passengers on this line do have the potential to grow further.

Location of Bratislava on the state border with Austria and Hungary, and the attendant development of cross-border suburbanisation (e.g. Hardi, 2012; Bálizs and Bajmócy, 2019) also brings challenges in the field of transport. Commutes to Bratislava from places located in Austria and Hungary are based mainly on individual transport, given that there are certain legal limitations where the development of cross-border public transport is concerned. There are bus lines of city transport running to Hainburg (in Austria) and Rajka (in Hungary). The numerous trains between Bratislava and Vienna serve mainly for commuters between the capital cities, though they do also enable commutes from municipa-



**Fig. 4.** Number of passengers using the Bratislava-Komárno route  
Source: Authors' own elaboration based on data from RegioJet (2019).



lities in Austria to Bratislava to take place. There are also a few trains between Bratislava, Petržalka and Rajka, though their frequency does not suffice to make regular commutes to Bratislava an option.

### **Measures to address transport-related problems**

The improvement of the transport situation in cities and their hinterlands denotes complementary measures of two types. On the one hand, there are restrictive measures mitigating against individual automobile transport, while on the other there are steps taken to enhance public transport (Steg, 2003; Eriksson et al., 2008; Wang et al., 2014). Restrictive measures include e.g. restriction or charging of entry to certain parts of cities (mainly their centres), parking policies (that restrict parking for commuters and increase parking charges), the founding of dedicated bus lanes and the favouring of public transport at traffic lights. Measures leading to the improvement of public transport above all entail the development of integrated transport systems (including urban and suburban transport). Such a measure is augmented by changes leading to improved comfort and reliability of transport links between the city and the hinterland, and the building of car parks at transport terminals on city limits and railway stations in suburban regions, in order to allow for a combination of individual transport (passenger car, motorcycle or bicycle) and public transport.

The development of individual automobile transport in Bratislava over the last thirty years has gone unregulated. To date, Bratislava has no city-wide parking policy. Currently, parking in Bratislava is restricted mainly in the city centre, with paid parking during workdays between 8:00 and 16:00. Many parking places in the centre and other city boroughs (marked with a white cross on the ground and a blue "Reserve" road sign) are private or reserved. Conditions under which reservations can be secured vary from borough to borough. A city-wide parking policy with the aim of reducing numbers of cars in the city and protecting and securing parking places for Bratislava (permanent) residents was to be introduced in 2020. Only permanent residents would be allowed to buy a parking card (costing €39, 150 or even 500 for the first, second and third cars respectively in a given household). Other inhabitants and visitors of Bratislava will pay commercial parking fees (Magistrát Bratislavy, 2019).

Problems with congestion are in some cases solved through the introduction of dedicated bus lanes. However, if these lanes are not present universally within a city, then problems with congestion tend merely to be moved to other districts. There are also a few examples of public tram transport being favoured at traffic lights.

The most important measure by which to improve the transport situation entails the creation of an integrated transport system (ITS). An ITS is a transport service system for a particular area involving public transport, including several modes as well as several carriers, in which passengers are transported under common transport and tariff conditions. ITSs in other countries have been the subject of transport research for many years (see e.g. Pucher and Kurth, 1995; Hull, 2005; Givoni and Banister, 2010; Štastná et al., 2015).

The process of integration of transport in Slovakia (e.g. the Bratislava region) has progressed only slowly. First ideas relating to the possibility of an ITS being introduced in Bratislava appeared in 1992. In November 1999, experimental integrated transport was first

applied in the city. Users of city transport (with a monthly coupon) could also use regional trains within the city limits of Bratislava if an additional coupon (for 50 Sk per month) was purchased. In February 2001, the first stage of integrated transport began operating under the name Bratislava Integrated Transport (BID). Passengers with a “BID coupon” could travel by public city transport, by regional trains, and by regional buses of SAD Bratislava (today *Slovak Lines*) along the routes to Záhorská Bystrica.

The real launch of the Integrated Transport System in the Bratislava region (IDS BK) started in November 2015 and included the territory of that region and adjacent municipalities in the Trnava region, as well as three carriers of the Transport Company Bratislava (public city transport), *Slovak Lines* (suburban buses) and Railway Company Slovakia (suburban trains). On the basis of uniform transport and tariff conditions, it is possible to travel by all three carriers. Since April 2018, the IDS BK has included another railway carrier – *RegioJet* a.s., which operates along the Bratislava – Komárno line (while line S70 Bratislava – Kvetoslavov was also included in the ITS).

## Conclusions

A large increase in the intensity of road transport in Bratislava and its hinterland during the last thirty years has caused many problems related to transport infrastructure, individual and public transport. The needs in terms of sufficient-capacity transport infrastructure are often not taken into account as new suburbs are constructed. However, the building of new transport infrastructure is known to be a solution for transport problems for a certain period only; since an effect is the further development of suburbanisation and consequent new growth of transport (cf. Hills, 1996). The building of road infrastructure is not therefore a sufficient measure to ensure that transport problems are tackled. It is also necessary to change the organisation of transport so that a preference for public (especially railway) transport is shown (cf. Rosik, 2016; Dronova, 2020).

Railways in Bratislava do not copy the main transport flows inside the city, and thus cannot constitute the main transport system in the city of Bratislava. That main transport system should be a tram line system needing to be developed and completed. City authorities and other subjects have prepared plans for the development of the tram lines (extension of the existing lines and connection of radials) and building the terminals of integrated passenger transport (that should enable transfer between trains and city transport (mainly trams).

Railway transport represents a suitable system of transport in the case of the Bratislava hinterland, and should provide as much daily mobility between Bratislava and its hinterland as possible. The research by Dröes and Rietveld (2015) confirmed that the locations of railway stations affect the degree of urbanisation positively. The analysis of this phenomenon represents one possible direction to future research. Bus transport should serve territories without railway lines, while bus lines should be oriented to railway stations.

Trends in transport in the large metropolises also include a decline in individual automobile transport and car ownership, the building of car parks (P+R), the use of car sharing, car-pooling, and the use of environmentally-friendly hybrid and electric cars. Ho-

wever, where these trends are concerned, Slovakia and Bratislava lag behind the most developed countries and cities.

The future of transport in Bratislava and its hinterlands requires the creation of a multimodal transport system, which can serve various transport requirements effectively, and ensure mobility of inhabitants to places to which various activities are dispersed. In such an integrated transport system, it is necessary to ensure the coexistence of public and individual transport, which includes e.g. cycling and walking (see Pucher and Kurth, 1995; Hull, 2005; Givoni and Banister, 2010; Štastná et al., 2015).

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