

SOLUTION OF STATIC TRANSPORT IN BIG CITIES

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Abstract: The increase in the individual car transportation at the expense of the public transportation brings problems in the big cities not only in dynamic but also in the static transportation. Experience from developed countries shows that regulation of downtown parking and building of car pooling parking lots and their connection to public transportation can solve the problem. The article will define basic intentions of the city parking policy and carpooling services, as well as conditions of the coordination and tariff integration of individual car transport and public passenger transport.

Keywords: STATIC TRANSPORT, PARKING LOTS, REGULATION, PARKING POLICY

1. Introduction

Rapid increase in the individual car transportation in the last decades brought many problems into the regional dynamic and static transportation. Solving these problems depends on the different approach to this situation. Approach from the developed countries, where the increase in the car transportation leads to the unsustainable development of the roadway network and parking lot. There was an effort to make public transportation more attractive, but the result was always the increase in the individual car transportation and the decrease in walking and biking.

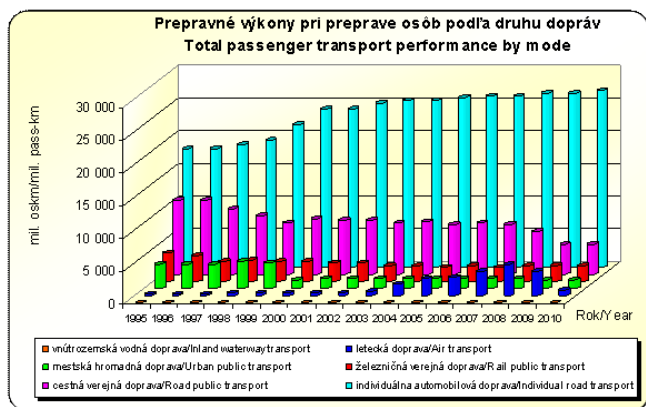


Fig. 1 Total passenger transport performance by mode in Slovakia (1995 – 2010). Source: Ministry of transport SR

It is important to adopt new regulations, which will actively support the measures to limit the individual car transportation. For example, limited offer of the static transportation in the exposed urban areas can increase attractiveness of the public transportation or biking.

This approach can improve the competition between the eco transportation and the car transportation. Improvement of the public transportation cannot be just one measurement how to limit the car transportation, but it could be a prerequisite for the regulation of the static and dynamic transportation.

2. Real status

The huge increase in the individual car transportation and the intensive development during last years brought big problems to static and dynamic transportation.

Bad parking habits decrease the flow on the roads and sidewalks, too. As a result, we have slowing the traffic flow, traffic jam and negative impact on the ecology. Complications in static and dynamic transportation have impact on the number of the car accidents, too.

Big industrial zones usually have their own employee's parking lots, but these are usually insufficient, compare to the number of cars. Opening of the new small businesses brings problems, too. These businesses are opened in reconstructed objects without sufficient parking capacities neither for the employees, nor for the

customers. Fewer restrictions from the view of static transportation are in the rural areas. There are less public buildings and a demand is satisfied with the private capacities.

3. Public parking policy intentions

Major intention of the public parking policy, is to reach a balance in the parking situation all over the cities. It can be reached through:

- equal parking conditions in all town regions,
- enable flawless parking in all residential areas,
- creation of balanced parking system, which divides between local citizens and visitors,
- united parking conditions and certifications in the entire city, including united system of fees with the different operators.

4. Partial objectives of the town parking policy

To reach the major intention of the town parking policy, it is necessary to fulfill the following partial objectives:

- obtaining again the spaces on behalf of the dynamic car transportation as a necessity for the other users of the street as pedestrians, cyclists, and parking lots,
- creation of the conditions and the regulations for the limitation of the downtown individual transportation,
- preferred short term parking to the long term parking and improvement of the residential parking situation,
- lowering the number of the all day reserved parking lots and the preferring the public transportation,
- improving conditions for the suppliers,
- lowering the impact on the environment and increasing the safety of the transportation and humanization of the street spaces,
- creation of the regulated parking zones in the other city zones,
- equalization of the parking conditions inside the city boundaries and improving the conditions for the local parking in the particular city zones,
- considering the local conditions for the parking and employment of the local municipalities and citizens,
- optimal and coordinated approach to the parking regulation in the all areas of the municipalities, with the unifying effect of the parking cards and documents,
- paid parking system,
- functioning pool parking with the connection to the public transportation,
- preferring of the public garage parking lots with the connection to the public transportation because of the limitation downtown,
- united information and guided parking system.

5. Steps to achieve objectives

Basic measurements for achieving the goals should be counted:

- lowering the volume of the unwanted transportation:
 - o support of urban and suburban public pass. transport,

- o elimination of transit traffic and creating of zones without transit possibilities,
- o on-line information system about free parking places in city,
- o carpooling,
- humanization of the street spaces:
 - o increase of pedestrian safety and making more places without car traffic,
 - o decrease of maximal traffic speed,
 - o development of cycling traffic and facilities for bikers,
- preference given to the development of the garage parking spaces:
 - o utilization of curtilage between buildings for parking,
 - o bulk parking houses building,
 - o using of automatic parking systems,
- residents favour and better transport services in city center:
 - o favour for residents by the night and during the day,
 - o supply places with time regulation,
 - o regulation of transport service in zone for pedestrians,
- development of the widespread parking system:
 - o function changes of parking places and tax difference,
 - o integrated parking system,
 - o coordination of static transport for city full-area,
- systematic control and the effective repression:
 - o 24 hour of day,
 - o 365 days of year.

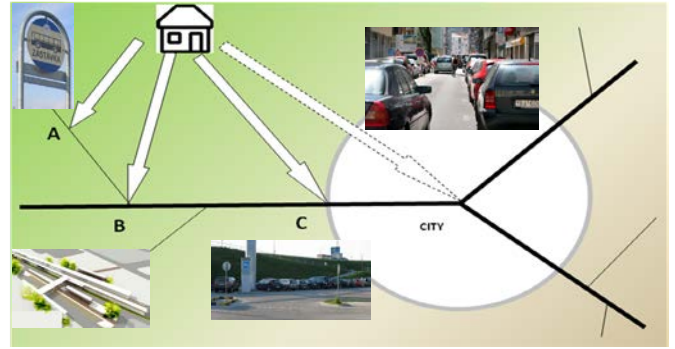


Fig. 3 Coordination of individual car transport and public passenger transport.

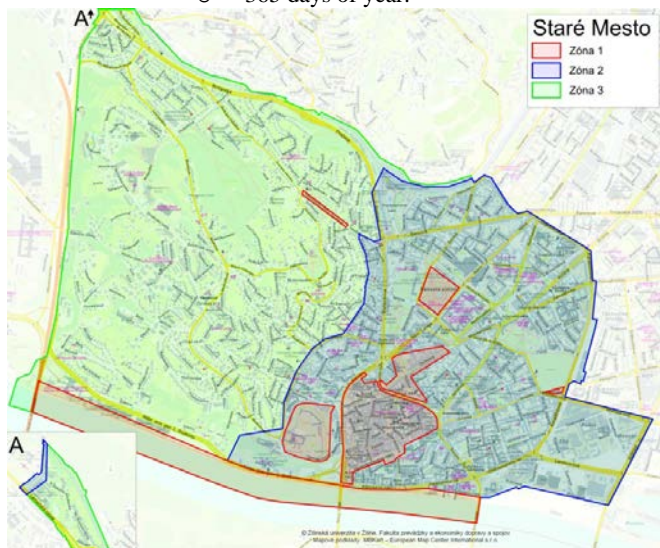


Fig. 2 Proposed parking zones in the center of the city Bratislava.

6. Integration of public passenger transport and individual car transport

New strategy of the public passenger transport development in the big cities is needed. It is necessary to integrate individual car transport and public passenger transport to make synergy effect for better inhabitants mobility.

The first condition of the integration is coordination of individual car transport and public passenger transport. It is necessary to provide easy change from the individual cars to the public passenger transport for passengers at the stops (fig. 3, point A), transfer terminals (fig. 3, point B) and park&ride parking lots (fig. 3, point C). The aim is to eliminate individual cars driving into the city centers (fig. 3, point city).

The second condition is tariff integration of individual car transport and public passenger transport. The tariff integration is possible to do between tariffs of static transport (parking fees) and tariff of public passenger transport (tickets for public transport). The tariff integration is schematically illustrated at figure 4.

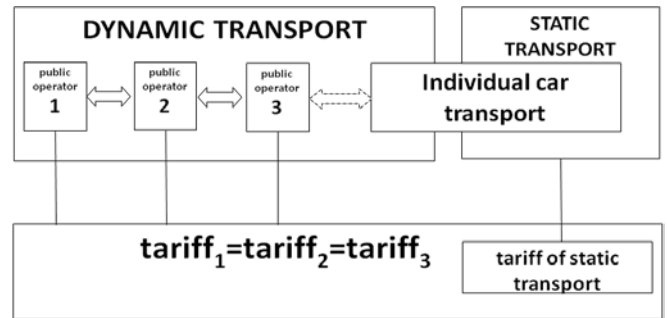


Fig. 4 Tariff integration of individual car transport and public passenger transport.

7. Parking lots and parking systems

Parking lot attraction and willingness of the drivers to park their cars at the parking lot can be influenced by the nearby services.

There can be objects directly at the parking lots, or in their vicinities, where these services can be offered.

Services: parking, shopping center, fast food, restaurants, hotels, motels, rest areas, getaway and info services, transfer to another public transportation, bicycle rentals, car washing, toilets, Wi-Fi, auto services, wheelchair access, gas station, division of parking lots and signs for better orientation at the parking lot.

Elimination of the individual car traffic at downtown can be one of the possibilities how to overcome the problems in static transportation. To reach this status, the drivers must be allowed to park their cars in outer parts of the city and continue commuting to the inner city by public transportation. In many towns of the world, there are functioning parking systems with only one intention – to alleviate downtown from the individual transportation. They offer the functioning and premium public transportation as an alternative to the individual car transportation.

P&R (PARK AND RIDE)

This parking system can be used in the combination of car-pooling parking lots at the suburban areas with the public transportation. The system is based on the principle of stopping the car at suburban car-pooling lot and continuing by the public transportation.

B&R (BIKE AND RIDE)

Just as P&R is designed for the cars, so B&R are used by cyclists who can continue to the center by the public transportation. They can leave their bikes at the parking lot, which is under the video surveillance.

K&R (KISS AND RIDE)

Is based on the dropping off the commuting person at the bus or train station. The person continues on by transferring to the public transportation. This system assumes good access to the bus/train

stops and requires certain time for the parking over and dropping off passenger. The access should be safe and accessible by wheelchair.

P&G (PARK AND GO)

The system can be used in situation, where car-pooling lot is situated at area close enough to the center. A passenger can park the car and walk on.

P&B (PARK AND BORROW)

P&B parking system can be used in the combination of car-pooling parking lots at the suburban areas with the electric cars or bicycles. The system is based on the principle of stopping the car at suburban car-pooling lot and continuing by the rent electric car or bicycle to a city center. The advantage of this parking system is that the drivers have not any problems to find parking place in the city center. Parking lots in city center are reserved for electric cars and bicycles.

8. Requirements for the parking lots

The services play major role in selection process by the driver. Complex services can increase the quality of the parking lot and at the same time the willingness of the driver to stop the car at the further place from the trip destination.

In the table 1 there are services, which should be offered at the parking lots and also ability to collect fees for the service.

Table 1: Overview of the services requested for each type of the parking lots and the possibility of their charging.

Type of the parking lot	Requested services																			
	surveillance	camera system	shopping and entertainment center	fast food	restaurant	accommodation	rest room	information office	sale of the travel tickets, newspapers, magazines	follow-on public passenger transport	exchange	bike rental	car wash	toilets	Wi-Fi	auto service	wheelchair access for disabled people	gas station	division of the parking lots and signs for better orientation at the parking lot	charging
A	2	2	1	2	1	1	1	2	2	2	1	1	1	2	1	1	2	1	2	2
B	1	2	1	1	1			1	2	2	1	1	2	1		2			2	2
C	1	2		1	1	1		2	2	2	1	1	2	1		2			2	2
D								2	2	2						2				1
E								2	2		1					2				2
F								2	2							2			1	1
G		1		1				2	2				1			2			2	1
H		1	2	1				2	2							2			2	1
I		1		1				2	2				1			2			2	2

- 1 – requested service 2 – required service
- A - Park & Ride facilities on the outskirts of town
- B - Multiple garages in the urban areas outside the center
- C - Multiple Garage in the city center
- D - Assigned parking spaces in the urban areas outside the center
- E - Assigned parking spaces in the city center
- F - Parking spaces in residential areas
- G - Parking in front of the hospital
- H - Parking in front of the shopping center
- I - Parking in front of cultural and sporting facilities

In the table 2 there are different types of the vehicles assigned to the various types of the parking lots and types of the inhabitants they are most used. The parking systems are also assigned to the various types of the parking lots that would apply to them.

Table 1: Assignment of the various types of the vehicles, inhabitants and parking systems to the various types of the parking lots.

Type of the parking lot	Intended for vehicles					Intended for inhabitants										Parking systems						
	bicycles	motorcycles	cars	buses	trucks up to 3,5 t	trucks over 3,5 t	Inhabitants of the other cities															
							inhabitants of the city	daily commuters (employees, students)	weekly commuters (employees, students)	service duties	health care	shopping	culture, sports	visit		tourists						
														for one day	for more days		for one day	for more days				
A	1	2	2	2	2	1	2	2	2	1	1	1	1	2	1	1	2	1	2	1	2	
B	1	2	2	1	1		2	2	2	1		1	1	2	2	2	2	2	2	1	1	1
C	2	2	2	1	1		2		2		1	1	1	1	1	1	2	1	2	1	2	
D	1	2	2	2	2		2	1	2	1		1	1	1	1	1	2	2	1	2	1	
E	2	1	2	2	1		1		1		1	1					2		1	1	2	
F	1	2	2		1		2		1					1	1		2					
G	2	2	2				2				2						2				1	
H	2	2	2	1	1		2					2					2				2	
I	2	2	2	2			1							2			2				2	

- 1 – requested 2 – required
- A - Park & Ride facilities on the outskirts of town
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- H - Parking in front of the shopping center
- I - Parking in front of cultural and sporting facilities

9. CONCLUSION

The regulation of the static transport is essential to maintain a sustainable urban transport and the areas function, including historic centers of the big cities.

It is necessary to systematically solve the static transport throughout the city. The uniformity must be achieved in the parking policy, the gradual unification of the payment of dues, the organization of the vehicle parking and shut-off in all urban areas of the cities. It is necessary to build the new parking area as to meet the requirements for the humanization of the space (plant the trees, shrubs, grass, flowers or the other greenery).

Sustainable mobility of the population in urban areas is possible only by integration of all transport modes, provided support for public transport and regulation of individual car transport.

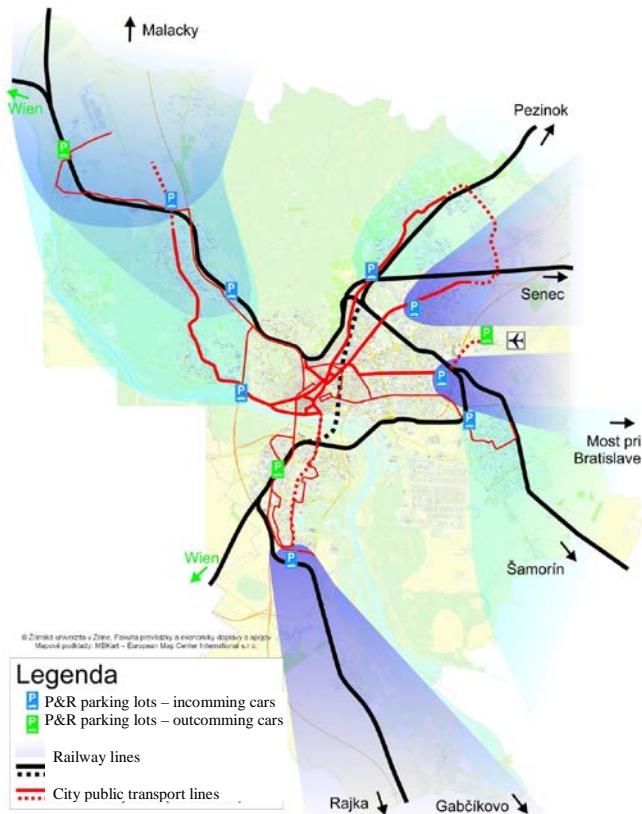


Fig. 5 Proposed P&R parking lots in the city Bratislava

Table 3: Proposed tariff for static transport in the city Bratislava

		Weekdays 8:00 a.m. – 4:00 p.m.		Weekdays 4:00 p.m. – 8:00 a.m., Saturday, Sunday, holidays	
		Resident	Not resident	Resident	Not resident
Parking places at the street	Center	RK1 C=1xMP RK2 C=1xPCR	JP C=1xTCL/h PPK C=4xPCR	RK1 C=1xMP RK2 C=1xPCR	0,- €
	Wider center	RK1 C=1xMP RK2 C=0,5xPCR	JP C=0,5xTCL/h PPK C=2xPCR	RK1 C=1xMP RK2 C=0,5xPCR	
	Center-side	RK1 C=1xMP RK2 C=0,2xPCR	JP C=0,2xTCL/h PPK C=0,8xPCR	RK1 C=1xMP RK2 C=0,2xPCR	
	Without tax	RK1 C=1xMP	0,- €	RK1 C=1xMP	
Bulk parking houses	Center	RK1 C=1xMP RK2 C=0,7xPCR	JP C=0,7xTCL/h PPK C=2,8xPCR	RK1 C=1xMP RK2 C=0,7xPCR	JP* C=0,30 €/h
	Wider center	RK1 C=1xMP RK2 C=0,3xPCR	JP C=0,3TCL/h PPK C=1,2xPCR	RK1 C=1xMP RK2 C=0,3xPCR	
	Center-side	RK1 C=1xMP RK2 C=0,1xPCR	JP C=0,1xTCL/h PPK C=0,4xPCR	RK1 C=1xMP RK2 C=0,1xPCR	
	Without tax	RK1 C=1xMP RK2 C=0,05xPCR	JP C=0,30 €/h PPK C=0,1xPCR	RK1 C=1xMP RK2 C=0,05xPCR	
P+R	0,30 €/h. 2 x 60 min. CLIC for public transport entitles to free parking for 12 hours 24 hours (and more) tourist ticket for public transport entitles to free parking for 24 hours (or more)				
Zone for pedestrians	Parking is not allowed				

- C = fee
- JP = one time fee
- MP = service charge
- RK1 = resident card for 1st car
- RK2 = resident card for 2nd and other car
- PPK = prepaid parking card
- TCL = tourist ticket for public transport valid for 24 hours
- PCR = prepaid ticket for public transport valid for 1 year
- CLIC = single ticket
- * - it is possible to use PPK for concrete parking zone

REFERENCES

- Barta, D. – Mruzek, M.: *Using of braking in real driving urban cycle* In: Logi : scientific journal on transport and logistics. - ISSN 1804-3216. - Vol. 3, No. 1 (2012), p. 14-22.
- Dolinayová A.: *Possible economic instruments of internalization external costs of transport*, In: TRANSCOM 2007 : 7-th European conference of young research and science workers, Žilina, June 25-27, 2007, Slovak Republic, Section 2: Economics and management - part 1 (A-K), University of Žilina, p. 93-96, Žilina, 2007, ISBN 978-80-8070-706-4
- Fazekaš, M. – Babin, M.: *The concept of mobile technical basis for City logistics in Žilina and Košice = Koncept mobilnej technickej základne pre City logistiku v meste Žilina a Košice* In: LOGI 2012 : 13th international scientific conference, November 22th, 2012 in Pardubice, Czech Republic : conference proceedings. - Brno: Tribun EU, 2012. - ISBN 978-80-263-0336-7. - p. 85-97.
- Nedeliaková, E. - Dolinayová, A. - Gašparík, J.: *Methodology of transport regulation in the Slovak Republic* In: Periodica Polytechnica : Transportation Engineering. - ISSN 0303-7800. - Vol. 38, No. 1(2010), p. 37-43.
- Nedeliaková, E. – Nedeliak, I.: *Aspekty regulácie železničnej dopravy*. In: Železničná doprava a logistika. - ISSN 1336-7943. - 2009. - Vol. 5, No. 3 (2009) p. 96-99.
- Pečený, L. – Meško, P. - Halás, M.: *Koordinácia spojov verejnej osobnej dopravy ako prvok zvýšenia kvality pre cestujúcich*. In: Horizonty železničnej dopravy 2012 = Horizons of railway transport 2012: Strečno, Slovak Republic, September 13th and 14th, 2012. - Žilina: Žilinská univerzita, 2012. - ISBN 978-80-554-0571-1. - p. 265-268.

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