THE ANALYSIS OF SOLUTIONS OF STATIC TRANSPORT IN THE SLOVAK REPUBLIC AND ABROAD

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Abstract

This article is focused on problems related to parking in the Slovak Republic (SK) and abroad. The examples of individual solutions are mostly from spa cities or towns. Spa cities are attractive from the transport view and they attract traffic more. The most used means of transport is an automobile and in relation to this, there is a greater demand for parking in these cities. The number of visitors in spa cities has been increasing every year and therefore, the number of vehicles has been increasing too. The cities often do not have enough space to build new parking spots. Improper parking on the streets, public space and green areas is not unusual and it presents a negative impact on the city dwellers (e.g. restricted traffic). In our article, we analyse and compare individual solutions for parking in the Slovak Republic and abroad.

Keywords: static transport, vehicle, parking regulation, parking app, parking house

1 Introduction

On average, a vehicle is not used 90 % of the time – it is parked. In connection with the increasing number of vehicles and the need for parking, it is necessary to ensure an adequate number of parking spots, which are a few in present. It is difficult to find a free parking spot and the needed time to find a free parking spot has been increasing. Possibly the best way to decrease the demand for parking is to ensure that people will begin to use the public transport more, walk or cycle. There are several ways how to decrease the ratio of IAT (individual automobile transport) in favour of the public transport, cycling and walking.

One of the most significant ways is realization of driving lanes reserved for public transport, so-called bus lanes. A travel time has been reduced in several cities in the world due to that. The second way how to increase the demand for other modes of transport is to make roads dedicated just for pedestrians, cyclists, or public transport. As a result, certain areas of the city will be closed for IAT and passengers will be forced to use other modes of transport than automobile one. The best example of this solution is Groningen city, in which is one of the biggest ratios of bicycle transport of the whole modal split is.

Regulation of parking is the easiest viable way and also the most significant one. Vacant sidewalks and regulation of parking are the base of improving traffic situation according to Enrique Peñalosa – worldwide honoured expert on urban development. Regulation of parking and number of parking spots effectively decrease ratio of IAT. A good example is a building 33 Central in London, which has only 2 parking spots in total. Both parking spots are reserved for customers with disabilities.

Parking can be regulated by 2 basic ways. One way is by legal norms, which define a number of parking spots and the second way is paid parking. Slovak norms define just a minimal number of parking spots and due to this, they do not support decreasing of demand for IAT, but the other way around. For comparison, it is suitable to mention the neighbouring Czech Republic, where there are valid Prague civil engineering prescriptions, which determine minimal and maximal number of parking spots. The regulation of parking in the form of charging is in the Slovak Republic at a low level. Drivers often park their vehicles at places, which are not defined for parking – sidewalks, grassy areas, and roads. The food for thought is that they can park for free like this and in many cases, they restrain other participants of traffic or they destroy green areas. The individual examples of solutions given in the article are mainly from spa cities or towns. A spa town is a specialized resort town situated around a mineral spa. The term spa is used for towns or resorts offering hydrotherapy which can include cold water or mineral water treatments and hot thermal baths. [1,2,4]

2   Static transport in SK

Modal split in SK achieves the ratio of 74 % (IAT) to 26 % (public transport) in a numerical expression. The current situation regarding the modal split is unfavourable due to the lack of accessible parking spaces in most cities in the SR. It is necessary to solve the parking problem complexly from the beginning of requirement to its enforcement, so that it keeps the necessary city mobility. [3]

2.1 Parking houses

One of the most common problems in SK is the lack of space to build new parking spots. The most suitable solution to this problem is to build new parking spots under or above the ground, which does not take up as much place as regular terrestrial parking spots. This way will ensure a large amount of parking spots without a need for a large area. Currently, there are not many parking houses in SK. Most of them are a part of shopping centres, where underground parking on several floors is provided. The following parking houses are already in operation, however, they are not in the spa cities, because parking houses are only located in these type of cities (we do not consider shopping centres).

2.1.1 Zvolen

Parking house with a capacity of 177 parking spots is in Zvolen in a housing estate called Západ. These parking spots are not free of charge, but drivers must pay for parking. The investor of this parking house is a private company in Banská Bystrica. There is also a car wash, bowling, pizzeria and a fitness centrum apart from parking spots. This Parking house was built in this part of the town because of the cars parking on sidewalks and green areas. [5]

Figure 1   Parking house in Zvolen – housing estate Západ

2.1.2 Trenčín

Near the centre of Trenčín city a parking house with 150 parking spots, which are charged is situated. Few shops and a club are a part of this parking house too. The operation is nonstop and the whole building is supervised by a camera system and staff. Occupancy of the parking house is not too high. At night it is at a level of 10 % and during a day the occupancy is higher. The reason for a low occupancy is a fear of parking in the parking house and free regular terrestrial parking spots near the parking house. [6]

Figure 2   Trenčín - parking house

2.2 Parking apps

Increasing number of vehicles every year and a lack of parking spots wreak a problem to find a free parking spot. Parking applications can truncate a time of searching for a free parking spot by 43 % and travelled distance by 30 %, according to the results of realized measurements. Few applications can be used in several cities in SK – e.g. ParkDots, Parkio, Zaparkuj. to, EasyParking, parking4disabled, CVAK. [7]

2.2.1 ParkDots

It is possible to use ParkDots application in the several cities in SK – Bratislava, Piešťany, Trenčín, Trnava, Dolný Kubín, etc. The application offers data about the occupancy of a parking lot and a parking fee. It is using IoT (internet of things) sensors. It will send a notification to the user 15 minutes before the end of the validity time. In the case of a need, it is possible to prolong the time of parking from anywhere. Apart from that, the application offers detailed parking statistics – monitoring of payment discipline, actual occupancy of parking spots. ParkDots Enforcement application serves policemen and other delegated persons for control of payment for parking and time of parking for which was paid (it is carrying out with the help of a license plate number). They carried out a research on a sample of 696 questioned persons:

- 82 % of questioned persons would use a parking application to find a parking spot and pay for parking,
- 74 % of questioned persons were willing to offer their parking spot for other drivers to park when they are not using it,
- 75 % of drivers regularly use the navigation application while driving,
- 80 % of drivers said they would like to pay for parking by mobile payment. [8,9]

2.3 Parking cards

Parking cards are one of the solutions of parking regulation. These cards are given to residents and also for visitors of the city. A validity of these cards is for a certain period. The owner of a parking card does not have to pay for parking on paid parking lots at the area of the city.

2.3.1 Piešťany

The town of Piešťany is regulating parking in the form of paid parking on the streets Rázusova, Nálepkova and in the central area of the town. Parking in paid parts of the town is possible ~~just~~ only with non-transferable parking card or by buying a parking ticket. Non-transferable parking card is valid only when it is located in the vehicle, which license plate number is listed on the particular card. Three kinds of non-transferable parking cards can be procured in Piešťany - weeklong parking card – 6 €, yearlong parking card – 35 € and yearlong parking card for resident – 25 €. [10]

3 Static transport in abroad

In most western countries, several options have been introduced to solve problems with parking. In these countries, they are trying to change a human´s mind and persuade them that ownership of an automobile is a burden. They have been trying to restrict the movement of automobiles through various regulations (no entry into a certain area, prolongation of travelling time – red wave on crossroads with traffic lights, traffic calming) and continually improving the quality of public transport. San Francisco is an interesting city concerning the charging of parking. If demand is high, the parking fee is increasing, if demand is low, the parking fee is decreasing.

3.1 Parking house

In developed European countries (e.g. Germany, Austria, etc.), parking houses are not exceptional, but the common way of ensuring a sufficient number of parking spots on the minimal area. They are trying to ban parking in the streets and as a result ensure larger space for other kinds of transport (public transport, bicycle transport and walking).

3.1.1 Mariánské Lázně

Mariánské Lázně is a spa town in the Czech Republic. A spa area is marked with traffic signs with restrictions. Entry to this area with motor vehicle is possible just with a permission.

Figure 3   Parking house – Mariánské Lázně

In a side part of the town, it is possible to park a vehicle (up to 3,5t) in a parking house with 360 covered parking spots. Occupancy of the parking house is 100 % during holidays and weekends. During other days, the occupancy is approximately at a level of 60 %. Yearly costs including repairs and debentures present approximately 1 million CZK. Minimal parking fee is 20 CZK for an hour and maximal parking fee is 140 CZK for a day. [11]

3.1.2 Bad Hersfeld

Bad Hersfeld is a spa town in Germany, where four parking houses were built by private companies. The construction of the Schilde-Parkhaus is made of steel and unprocessed spruce wood. Due to the open wood construction, natural lighting and ventilation is ensured. The architects considered various aspects when designing to minimize interference with the surrounding landscape. [12]

Table 1   Price list and information about parking houses

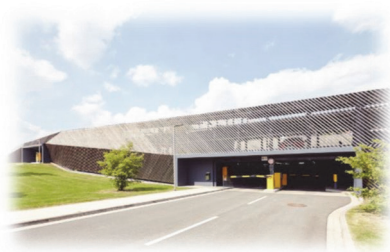| | Capacity | Operation | Price list | |
			min.	max.
Schilde-Parkhaus	180 spots	nonstop	1 € / hour	4 € / day
City-Parkhaus	285 spots	Mon – Sat (7:00 - 21:00)	0,50 € / 30 minutes	15 € / day
City-Tiefgarage	230 spots	Mon - Sat (7:00 - 19:00)	0,50 € / hour	10 € / day
Parkhaus Altstadt Bad Hersfeld	162 spots	nonstop	0,50 € / 30 minutes	10 € / day

Figure 4   Schilde-Parkhaus

3.2 Automated parking systems

Currently, automated parking systems (APS) have been progressing and are able to park a vehicle without the driver´s assistance. Many variants of these systems exist (for example - car tower, puzzle parking system, etc). This system of parking helps drivers eliminate the needed time of finding a free parking spot. The vehicle is parked without the assistance of the driver. APS are in operation in the Czech Republic (Prague, Liberec, Slaný), China, Germany and other countries.

3.2.1 Slaný
This town has a population of 15 800 habitants and a parking house with APS (149 parking spots) is located here. Although it is not a spa town, it can be an example for small spa cities, which do not have enough place for parking.

Figure 5   Parking house with APS in Slaný

The total price of this parking house with APS was 89 million CZK. Yearly costs are more than 1,5 million CZK (information of 2018). Parking house with APS has 6 overground floors and 1 underground. Parking house with APS is utilised on 60 % according to the information from the previous year (2018). The operation is nonstop. Parking fee is 10 CZK per hour. Between 17:00 and 8:00 on weekdays, the maximum fee is 50 CZK. During holidays and weekends, the maximum fee is also 50 CZK. [13]

3.3 Parking applications

3.3.1 Parkopedia
In Great Britain, Germany and the USA a survey with the following result was conducted – a driver spends 44 hours yearly finding a free parking spot. Parkopedia can be used in 75 countries and 8 000 cities. It incorporates approximately 60 million parking spots. The application allows drivers to find the nearest parking lot near their destination, informs how much it will cost to park in the parking lot and whether there is a free parking spot. Real-time parking monitoring is available in over 2 000 cities (using special sensors). For example, it is possible to park a vehicle using this application in spa towns - Bad Hersfeld (Germany), Karlovy Vary (Czech Republic), Piešťany (Slovak Republic), etc. [14]

3.4 Parking cards

The regulation of parking in the form of parking cards and charging of parking is a usual way abroad. Parking for residents and abonents is the most frequent differentiate. Residents are inhabitants with residence in the area of a certain city. Abonents are regular visitors to the city.

3.4.1 Karlovy Vary
In the spa town of Karlovy Vary, there are 4 types of parking cards – a one-off, resident, abonent and discounted abonent parking card (100 CZK/year). In the case of the loss or theft of a parking card, it is requisite to pay a fee of 100 Kč. [15]

Table 2   Price list of parking cards – Karlovy Vary

Number of vehicles	Fee	
Parking card for residents		
1. vehicle	480 CZK / year	240 CZK / half-year
2. vehicle	3 500 CZK / year	1 750 CZK / half-year
3. vehicle	7 000 CZK / year	3 500 CZK / half-year
Parking card for abonents		
1. vehicle	2 400 CZK / year	1 200 CZK / half-year
2. vehicle	9 000 CZK / year	4 500 CZK / half-year
3. vehicle	18 000 CZK / year	9 000 CZK / half-year
One-off parking card		
1. vehicle	3 000 CZK / month	100 CZK / day

4 Conclusion

Parking problems occur all over the world. Solutions are often costly, but it is still necessary to apply them. It is important to change people's mind to increase the demand for public passenger transport or other alternatives (bicycle transport and walking).

The analysis of the current situation in Slovakia shows that parking is a big problem and solutions have been arising slowly. The regulation of parking is not developed sufficiently and is not expensive. The situation is already very problematic, so it is not possible to constantly wait. In the introduction, it was mentioned that when analysing the current situation in the Slovak Republic and abroad, we will try to give examples of solutions from spa towns/cities. Only two solutions are mentioned from the spa towns in SK - parking cards and the parking app, which can be used in Piešťany. Other cities have more solutions for parking - for example, parking houses, parking apps, SMS payment, etc. In comparison to spa cities/towns, they attract less traffic (visitors) and do not have such problems with parking. Spa towns in Slovakia have problems with parking and have been implementing solutions to improve the current situation slowly. It is necessary to solve parking problems also in terms of air pollution (reduce emissions from traffic). It is possible to say that spa towns in Slovakia which attract traffic do not have sufficient solutions in place to deal with the current situation of parking. That is the reason why we focused on spa towns/cities. Unless they introduce the necessary measures and solutions soon, this will be a major problem for these towns. It is better to avoid these problems than to wait for them to occur. Of course, some solutions require a change in people's mind, as we have already mentioned.

Several solutions from abroad spa towns/cities are mentioned in the article. It is necessary to introduce a system of public transport decreasing demand for IAT. There are several solutions and successful examples how is possible to solve the parking and set up a better direction for the future, which will help change the modal split in favour of public transport.

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