

Analysis of the bus preference and bus stops in Košice

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Abstract Systematic growth of amount of cars and vehicle ownership incites to a growth of traffic flow in locality areas and cities, especially at the traffic peak. A slowing down of traffic, increase of density on traffic areas and advance growth of delay at the crossroads, increasing of exhaust emissions, noise and vibrations is a result of these changes, which manages to traffic accidents increasing.

Key words preference, bus lane, Košice, buses, bus stops

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1. Introduction

The preference of Public transport directly affects two defined areas of perception of its attractiveness and quality - travel speed and reliability. The passenger expects to be transported between the beginning and the destination for acceptable time and reasonable speed. [1, 3]

At the same time, it expects that the goal of its journey will be achieved in a timely manner independently of external circumstances. It seems that even on relatively low trips, in the case of travel by public transport, perceived more, because unlike passenger car travel, passengers traveling time and time arriving at the destination can easily compare with the timetable. [3]

Making urban transport more attractive will result in more passengers traveling through public transport, which means that more people would abandon the use of individual car transport in cities, which would contribute to improving the transport situation. In this article we focused on two components, which affect the travel speed – bus preference and situation of the bus stops in Košice. [2, 3]

2. Bus transport situation in Košice

The first attempts to establish a bus service in the city Košice dates back to the 1930s. However, the regular bus service began to run only in 1932. It was on the route from the railway station, via Mlynská Street, to today's Moyzes Street with the final stop at the town hall.

The bus transport in the city Kosice is nowadays an indispensable part of urban public transport. It accounts for almost 86% of the total performance. There are 29 daily lines in operation, 4 express lines, 8 "traffic peak" lines, 1 line for students, 8 "working" lines, 7 night lines.

Table 1. Bus transport performance in Košice (urban transport)

Indicator	Unit	Type	2006	2011	2016
Transport performance	thousand. vehiclekilometers	buses	11 006	10 590	11 728
		overall	15 982	15 727	14 825
			68,86%	67,34%	79,11%
Number of transported persons	a thousand persons	buses	64 246	56 080	58 222
		overall	99 354	89 332	83 144
			64,66%	62,78%	70,03%

Source: processed by the authors from annual reports from DPMK [4]

Bus lines transferred in 2016 up to 58.222 million people of the total transported people 83.144 million persons (70.03%). Bus vehicles made 11.728 million vehicle-kilometres per year out of a total of 14.825 million vehicle-kilometres per year (79.11%) in that period. The high increase caused in the share of bus transport in traffic, but also in the number of persons transported the DPMK to cease operating trolleybuses in January 2015. [4]

2.1. Bus preference in Košice

The preference of bus transport is very low in Košice. Buses must stay in many places in congestion, where their delay on the line is only increasing. So, in such dramatic ways, the travel speed is reduced.

If bus preference is built in the city Košice, only via BUS lanes, in the following places:

- **Magnezitárska street**

The section was set up in 2010 as a response to the ever-increasing length of traffic congestion at an exit from Sídliisko Ťahanovce. The length of this BUS lane is approximately 115 meters.

The section is located after the bus stop EcoPoint on the Magnezitárska Street. DPMK came up with a suggestion to divert on the morning transport peak of bus lines 18, 27, 36 through the village of Ťahanovce. The original route between bus stops Sofijská (last stop on Sídliisko Ťahanovce) and Tesco, Džungľa was 1.5 km long. The new route was extended to 4.4 km, but even with such a significant increase in mileage, time savings were higher.



Figure 1. BUS lane in Magnezitárska street [Source: Google Street View]

Currently, the same lines pass through this section, but the decision is on the drivers themselves. In many cases, there is a situation that the bus runs along the original route, and the second line on the same route will overtake it during a move across the village.

This BUS lane was the result of an unstable situation in the area and was a temporary replacement. This state persists to these days.

- **Štúrova street**

This section with BUS lane is located on the southern part of the Štúrova Street. Links from the west and south of the city to the city center go there. Lines 10, 11, 15, 16, 20L, 21, 23, 25, 32, 52, 56, 71 and 72, as well as night N2, N3, N4 and N6, pass through this section.

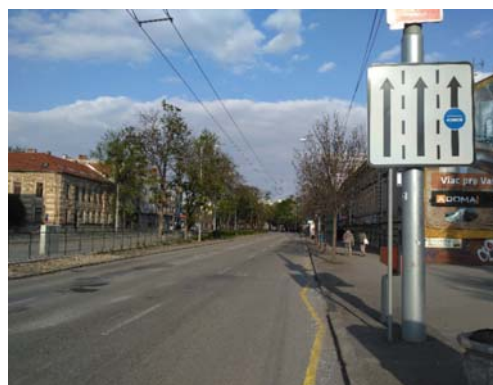


Figure 2. BUS lane in Štúrova street [Source: author]

A separate lane for buses (BUS lane) is located on the southern side of the Štúrova Street. It is located on the right side of the road and its start is before the bus stop Dom Umenia and ends at the stop of the bus stop Námestie osloboditeľov, behind the traffic lights. Its total length is approximately 670 meters. This BUS lane is an important element in a given segment, helping to moderate the already high delays in the city center.



Figure 3. BUS lane in Štúrova street [Source: author]

- **Toryská street**

In part of city Košice-Západ is also a short section reserved for buses. Every day there are (actually) bus lines 71 and 72, night N6.

It begins just before the bus stop Magistrát Mesta Košice and ends a few meters after the crossroad. Its length is approximately 100 meters. After the bus stops, the BUS lane continues, and the public transport vehicles have separate indication ("ball traffic light" - the same as that, which is used for trams).

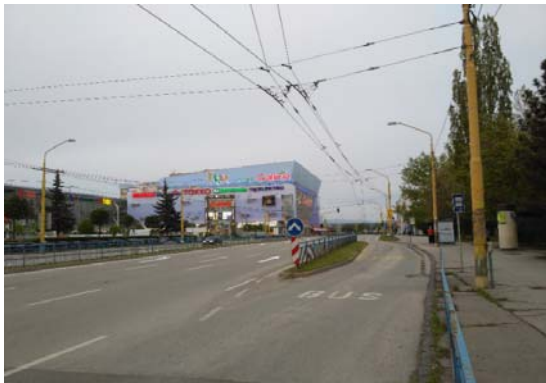


Figure 4. BUS lane in Toryská street [Source: author]

• Trieda KVP – bus stop Miestný úrad, KVP

The BUS lane is also located at Sídliisko KVP. Its length is only about 60 meters. This section passes bus lines 19, 34, 36, 71, 72 and night line N6.

A separate BUS lane starts just for the bus stop Miestný úrad KVP and ends before the crossroad. At the end of the BUS lane is placed, on the traffic light, a separate signal for buses („balls lights“).



Figure 5. BUS lane in Trieda KVP [Source: Google Street View]

There are also other sections in the city Košice, where the bus has easy leaving the bus stop or is preferred at the crossroad. These are:

- exit from Levočská stop, direction city center,
- earlier "free" signal ahead of ICT at the bus stop Námestie osloboditeľov (end of the bus lane),
- earlier "free" signal before of ICT at the bus stop Magistrát mesta Košice (end of the bus lane).

Vehicles are preferred to ICT and the "free" signal lights up about 5 seconds earlier. However, it has to be said that this is not an absolute preference, because there are no detectors on those places, and the signal "free" for public transport will run, however they are not present at the area.

On other places in the city Košice, buses have to travel at the same time with other vehicles in common lanes. There is no a plan for building some new BUS lanes in the near future and therefore this status remains. [5, 7]

2.2. Situation of the bus stops in Košice

The length of the vehicle at the stop influences also the travel speed. This means, that the state of bus stops is important. In this section we are focusing on the current state of bus stops in the city Košice.

There are 517 bus stops in the city nowadays (58 of them are also compatible with trolleybus stops). The condition many of them is not suitable. A few dozen of bus stops in the city center have been reconstructed, or a reconstruction was realized together with a repairs of communication in the blocks of flat area (the last one was a reconstruction of the bus stops at Sídliisko Ťahanovce realized together with the reconstruction of the road in summer 2016).

The big disadvantage is that in the city Košice there is practically no combined stop for tram and bus transport, although the possibility of a realization of such a stop was here at that time. Shared stops in the city center would certainly help to increase the attractiveness of public transport. The only one effort to build a shared stop was the "Spoločenský pavilón" on Bardejovska Street. However, this stop is mostly used for bus transport. Trams use this stop only they are returning to the tram depot. Bound with the MET stage 2 project, however, there is a reconstruction of the track in this area and the stop Spoločenský pavilón should be already built as a combined stop at the Trieda SNP. [9]



Figure 6. Wrong placed bus stop Jakabov palác [Source: author]

Partial solution could be the new project of Modernization of public transport stops and information systems. The project is based on the conclusions of the study of the transport constructions, approved by the local council in 2016, and with the reconstruction of thirty new platforms in 16 stops in six city districts. There are actually stops: Staničné námestie, Námestie osloboditeľov, SOŠ automobilová, Námestie maratónu mieru, Dom umenia, Krajský súd, Mier, Amfiteáter, Stará nemocnica, Nová nemocnica, Spoločenský pavilón, Zupkova, Železníky. [10]

The surface of the platforms and stops should to be renovated, fitted with new devices and information displays with online line tracking. From the point of view of the technical solution, should be observed the upgraded trend of the previous modernization projects, especially the solution of the surface with the drainage channel, the installation of the Kassel type curbs and the barrier-free access. There is a plan to install two 20 rows displays with online line departures both of lines at the Railway Station between

tramway stops and the passenger building of the Railway Station Košice. [10]

This project has been included, in the past, into a project storage for drawing funds from the European Union and the City of Košice, as the project holder, intends to participate in the call for applications for non-repayable financial contribution from the Integrated Regional Operational Program (IROP 2014-2020). [9]

3. Conclusion

Increasing of the system effectiveness of public transport and increasing of the effectiveness of financial resources from public budgets get to be more important in the present time of "tight" public budgets. [6]

The introduction of preferential measures will result in a smoother driving of public transport vehicles, which result is saving of fuel for public transport vehicles (without unnecessary stops and stays), but it will also result in savings for vehicles and staff. As a result of the increase in travel speed, it will be an increase in the circulating speed of a given line, which will decrease the number of vehicles dispatched to the line. The same transport performance can be realized with a lower number of vehicles and staff. [3, 6]

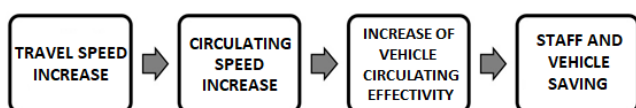


Figure 7. Increasing of travel speed [3]

Although vehicle depreciation and staff salary represents a significant amount of the cost of the line's transport performance, reducing of the necessary vehicles quantity can be a cause of a significant increase in line efficiency. For that reason, it is necessary to address this issue in city of Košice, because the current level of these travel speed components is very low. [6, 8]

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