

ANALYSIS OF REALIZATION OF PUBLIC TRANSPORT BETWEEN KATOWICE CITY AND PYSKOWICE TOWN IN THE SILESIA AGGLOMERATION USING BUSES OF THE KZK GOP COMPANY

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Abstract

The organization of public transport is an important element of a sustainable transport policy in the region. This is particularly relevant and important to the organization of transport in areas with a high degree of urbanization, for example Silesian Agglomeration. The article presents an analysis of connections organized by KZK GOP on the route allowing access from Katowice city to one of the smaller towns (Pyskowice) located in the Silesian Agglomeration.

Keywords: The Silesian Agglomeration, sustainable transport, public transport, bus transport, KZK GOP, Katowice & Pyskowice bus connections

1. INTRODUCTION

Due to numerous of factors: historical, political and technical The Silesian Province is one of the most densely populated and urbanized areas of Poland. Silesian province is an area which is rich in deposits, mainly coal, as well as an area with well-developed industrial infrastructure and transport. As a result, the Silesian province is an area in which instead of one specific center was established a few core centers. Of course there is one main center which is Katowice city, it is also capitol of the province, but there are few neighbor cities with very common infrastructure (social, industrial etc.). As a result, in the Silesian province is well-developed transport network, and the people to carry out daily trips (related to school, work, leisure, etc.) very often have to move around a large area of the region. Importantly, a significant part of the population does not live in the same big city (eg. in Katowice, or immediately adjacent to cities), but due to less noise, air pollution, etc., in the smaller neighboring towns. These people expect a well-organized and efficient transport system. This expectation is also consistent with the principles of sustainable transport by which should be strived to increase the share of public transport in the implementation of daily trips [1, 25]. One of the most important elements of transport system is timetable of available means of transport. Creating a proper timetable is very difficult and complicated task [2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 24,]. Very often it requires to use some simplified methods [11] or computer support [2, 7]. When the timetable is done and I use it is very important to analyze them in order to check whether they fulfill the expectations of travelers.

This is especially important in the implementation of travel to or from further afield from the center of the region of small towns, which include, among others, Pyskowice town.

Public transport system in the Silesian Province agglomeration (in its central part) is carried out by several operators with different legal status (company, association of municipalities, etc.) in different modes of transport. The entity implementing the majority of bus transport within the Katowice conurbation is a KZK GOP company, which according to the data provided by them supports an area of 1.7 thousand km², which is inhabited by almost 2 million people [26]. KZK GOP also organizes public transport between Katowice city and Pyskowice town.

2. PYSKOWICE TOWN

Pyskowice is one of the oldest towns of Upper Silesia [28]. The town is located in south-western Poland, in the western part of Silesia, and Upper Silesian Industrial Region (GOP), in the northern part of the district of Gliwice Katowice Upland, on the Drama river. Historically it lies in Upper Silesia and is directly adjacent to the city of Gliwice and municipalities: Rudziniec, Toszek, Wielowieś (district of Gliwice) and Zbrostawice (district tarnogórski). [27]

According to the data of the Pyskowice municipal office area of the municipality is 3 114 [ha], of which 1 693 [ha] are covered by buildings of a city. The population as of 31 December of 2015 amounts to 17205 people, including: 2722 from age 0 to 17, 11771 from age 18 to 64 and 2712 with age over 64 [28]. The town is located in the west-northern part of the KZK GOP activity.

The most important aim of the trip from Katowice to Pyskowice is necessary to use the minimum of 2 buses, between which you have to change in the center of Gliwice.

Travel from Katowice to Pyskowice is possible with the use of several different connections, but the carrier on their website, using the search engine, suggests to take bus number 6, 840 or 870 to Gliwice, then change to a bus 677 in the direction of Pyskowice;

A very important element of those connections is place to make the changes of the means of transport. When we plan to use connection with bus line 6 to bus line 677 we should change bus at Gliwice Dworzec PKP bus station, and for connections with bus lines 840 or 870 to bus line 677 we should change the bus at Gliwice Plac Piastów bus station. Both stops are located in the center of Gliwice, and the transition between them takes about 4 minutes, but on these relationships, in contrast to the relationships Pyskowice - Katowice, there is no need to change the bus stop to continue the journey.

3. RESEARCH METHODOLOGY

As part of the study were analyzed the plates of bus routes, bus trips and web applications provided by KZK GOP, whose task is the ability to search a connections. Studies presented below are an extension of the research described in [12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23] of the connections made to other popular in the region of connections relationship. The following article describes the number of connections and the transfer time for the line No. 677 from Gliwice to Pyskowice aim of switching from KZK GOP lines that allow access from Katowice to Gliwice.

The studies were obtained times of departures of line KZK GOP 677 from the bus stop Gliwice Dworzec PKP (for relations with KZK GOP buses line number 840 & 870), departures times of line KZK GOP 677 from the bus stop Gliwice Plac Piastów (for relations with KZK GOP buses line number 6) and arrival times on bus stops buses coming from Katowice to Gliwice (KZK GOP bus lines 6, 840 & 870).

The following **Tables 1 to 3** presents a comparison of the departure time of the bus line KZK GOP 677 with arrival times of buses KZK GOP lines 870, 840 and 6. In **Tables 1 to 3**, blue color indicated waiting time between connections amounting to more than 30 minutes, while red indicated time expectation equal to 5 minutes or less - it is a short waiting time, for which there is a high risk of being late for buses going in Pyskowice direction due to the delay in the timetable of the first bus (for interchange on the line 677). Purple color indicated a situation in which a bus in the direction of Pyskowice departs just before the arrival of the bus from Katowice.

Table 1 Analysis of the waiting time between KZK GOP 6 & KZK GOP 677

Arrival of KZK GOP 6 on bus stop Gliwice Dworzec PKP	Departure of KZK GOP 677 from bus stop Gliwice Dworzec PKP	Waiting time [min]	Arrival of KZK GOP 6 on bus stop Gliwice Dworzec PKP	Departure of KZK GOP 677 from bus stop Gliwice Dworzec PKP	Waiting time [min]	Arrival of KZK GOP 6 on bus stop Gliwice Dworzec PKP	Departure of KZK GOP 677 from bus stop Gliwice Dworzec PKP	Waiting time [min]
	03:41		08:51	09:13	00:22	15:53	16:13	00:20
	04:14		09:21	09:43	00:22	16:23	16:43	00:20
04:22	04:45	00:23	09:52	10:43	00:51	16:53	17:13	00:20
04:43	05:11	00:28	10:22	11:43	00:21	17:23	17:58	00:35
04:53		00:18	10:53		00:50	17:52	18:58	00:06
05:31	05:43	00:12	11:23	12:43	00:20	18:22		18:58
05:41		00:02	11:53		00:50	18:51	00:07	
05:51	06:13	00:22	12:53	13:13	00:20	19:38	19:56	00:18
06:05		00:08	13:08		00:05	20:35	20:56	00:21
06:21	06:28	00:07	13:33	13:43	00:10	21:35	21:46	00:11
	06:43	00:22	13:53	14:13	00:20		22:21	00:46
06:50	07:13	00:23	14:23	14:43	00:20	22:35	22:56	00:21
07:21	07:43	00:22	14:53	15:06	00:13	23:29		
07:51	08:13	00:22		15:13	00:20			
08:21	08:43	00:22	15:23	15:43	00:20			

Table 2 Analysis of the waiting time between KZK GOP 840 & KZK GOP 677

Arrival of KZK GOP 840 on bus stop Gliwice Plac Piastów	Departure of KZK GOP 677 from bus stop Gliwice Plac Piastów	Waiting time [min]	Arrival of KZK GOP 840 on bus stop Gliwice Plac Piastów	Departure of KZK GOP 677 from bus stop Gliwice Plac Piastów	Waiting time [min]	Arrival of KZK GOP 840 on bus stop Gliwice Plac Piastów	Departure of KZK GOP 677 from bus stop Gliwice Plac Piastów	Waiting time [min]	
	03:40		09:34	09:41	00:07	12:45	16:41	03:56	
04:11	04:13	00:02	10:14	10:41	00:27	17:00	17:11	00:11	
04:34	04:44	00:10	10:59	11:41	00:42	17:59	17:56	-00:03	
05:04	05:10	00:06	11:44	12:41	00:57	18:29	18:56	00:27	
05:24	05:42	00:18	12:25		00:16	19:03	19:55	00:52	
05:46	06:12	00:26	12:45	13:11	00:26	19:48	20:55	00:07	
06:08	06:27	00:19		13:41	00:56	20:46		20:55	00:09
07:54	06:42	00:34		14:11	01:26	21:46	21:45	-00:01	
	07:11	01:03		14:41	01:56		22:20	00:34	
	07:41	01:33		15:04	02:19		22:46	22:55	00:09
	08:11	00:17		15:11	02:26		23:29		
08:14	08:41	00:27		15:41	02:56				
09:04	09:11	00:07		16:11	03:26				

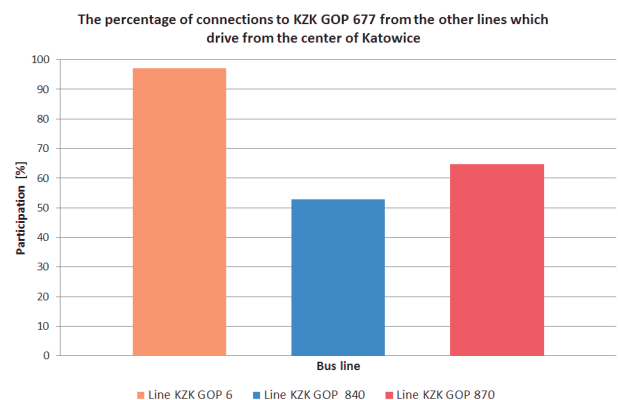
Table 3 Analysis of the waiting time between KZK GOP 870 & KZK GOP 677

Arrival of KZK GOP 870 on bus stop Gliwice Plac Piastów	Departure of KZK GOP 677 from bus stop Gliwice Plac Piastów	Waiting time [min]	Arrival of KZK GOP 870 on bus stop Gliwice Plac Piastów	Departure of KZK GOP 677 from bus stop Gliwice Plac Piastów	Waiting time [min]	Arrival of KZK GOP 870 on bus stop Gliwice Plac Piastów	Departure of KZK GOP 677 from bus stop Gliwice Plac Piastów	Waiting time [min]
	03:40		09:18	09:41	00:23	15:45	16:11	00:26
	04:13		09:45	10:41	00:56	16:06	16:41	00:35
	04:44		10:15		00:26	16:26		00:15
	05:10		10:45	11:41	00:56	16:46	17:11	00:25
	05:42		11:25		00:16	17:06		00:50
	06:12		12:05	12:41	00:36	17:24	17:56	00:32
06:19	06:27	00:08	12:35		00:06	17:47		00:09
06:44	06:42	-00:02	13:05	13:11	00:06	18:01	18:56	00:55
07:09	07:11	00:02	13:35	13:41	00:06	18:31		00:25
07:25	07:41	00:16	14:05	14:11	00:06	19:16	19:55	00:39
07:42		00:29	14:35	14:41	00:06		20:55	00:41
08:07	08:11	00:04		15:04	-00:01		21:45	01:31
08:27	08:41	00:14	15:05	15:11	00:06	20:14	22:20	02:06
08:47	09:11	00:24	15:25	15:41	00:16		22:55	02:41

The above data on the possible number of transfers apply to all possible connections, but how it is presented in **Tables 1 to 3**, buses going from Katowice to Gliwice run more frequently than buses from Gliwice to Pyskowice, which means, that passengers do not benefit a large number of connections, because they choose earlier connection to continue their journey.

The information contained in **Tables 1 to 3** relating to waiting times and the number of connections, together with their percentage share in relation to the timetable of the bus line KZK GOP 677 is shown in **Figure 1**, these data also include connections that require long waiting time, which probably would not be used by the passengers to continue a journey on this relationship.

	KZK GOP Bus line			
	677	6	840	870
Number of connections:	34	40	35	36
Percentage of connections which allows the bus change [%]:		118	103	106
Percentage of connections (without long waiting) which allows the bus change [%]:		97	53	65
The average waiting time [min]:		21	51	30
The average waiting time (without long waiting) [min]:		17	15	14


Figure 1 The percentage of connections, waiting times and the number of connections to KZK GOP 677 from the other lines which drive from the center of Katowice.

 Source: Own calculations based on **Tables 1-3**

Also very important is difference during a trip undertaken using public transport and individual transport (car). Travel by public transport takes about 1 hour 30 minutes to almost 2 hours, by individual transport the same route is carried in a period of about 50 minutes.

Figure 2 shows number of connections and the waiting times to change buses between the line KZK GOP No. 677, and line KZK GOP No. 6 which drive from the center of Katowice and change is made on Gliwice Dworzec PKP bus stop, and between the line KZK GOP 677, and lines KZK GOP No. 840 or 870 (change is made on Gliwice Plac Piastów bus stop).

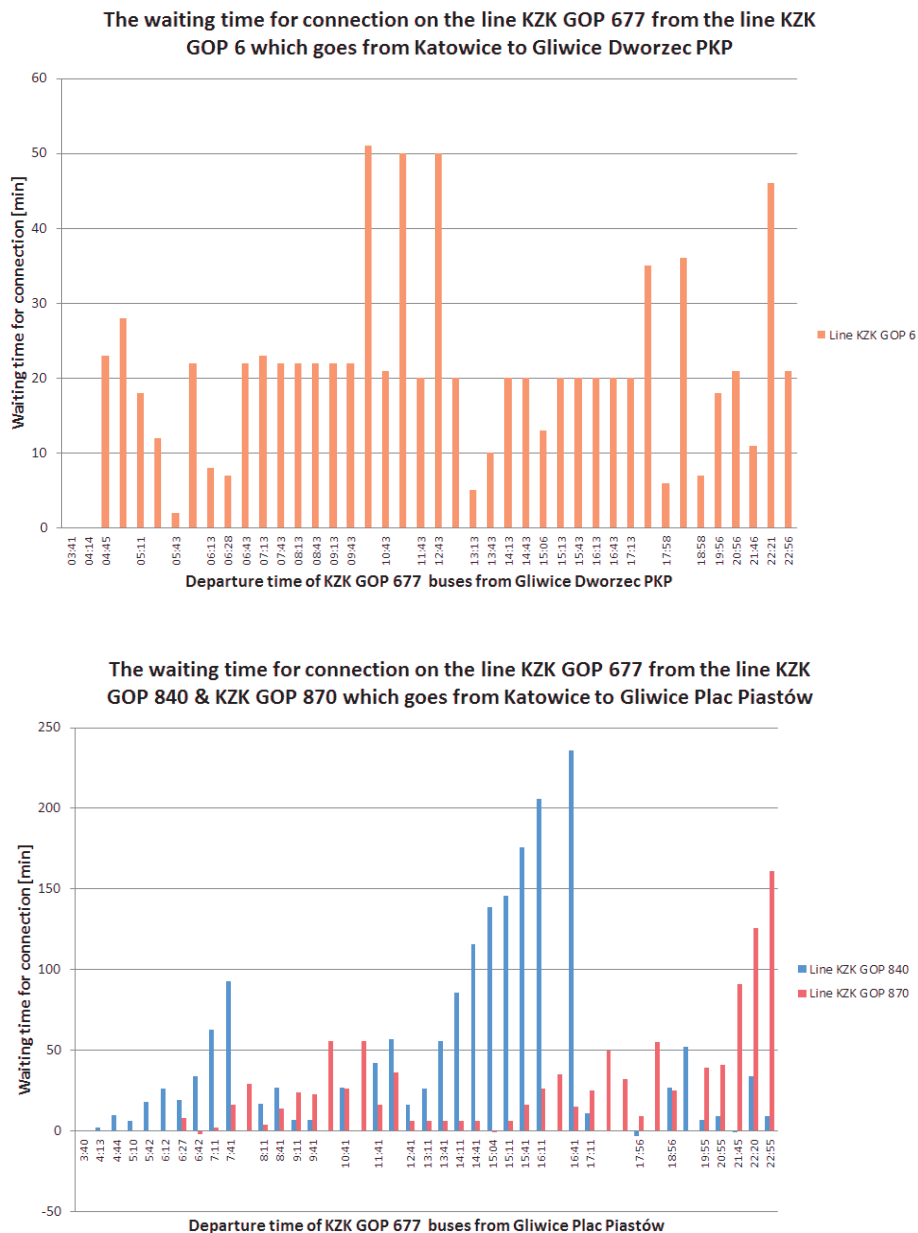


Figure 2 Number of connections and the waiting times to change buses between the line KZK GOP 677, and line KZK GOP No. 6 (change is made on Gliwice Dworzec PKP bus stop), and between the line KZK GOP 677, and lines KZK GOP No. 840 and 870 (change is made on Gliwice Plac Piastów bus stop).

Source: Own calculations based on **Tables 1÷3**.

4. CONCLUSION

Implementation of connections from Katowice city to Pyskowice town using the line KZK GOP 677 and proposed by the KZK GOP lines No. 6, 840 and 870 is realized in a pretty good manner. Noteworthy is the fact that there are quite a large number of possible connections and the average waiting time is not too long. Importantly, there are only few connections for which, buses from Gliwice depart in Pyskowice direction before the arrival of the bus from Katowice (in total 4 connection proposal for bus lines No. 840 and 870).

Unfortunately, the proposed connections have also some elements require further elaboration. A large number of connections are with waiting time of more than 30 minutes, in the extreme case it is even 3 hours 56 minutes (connection with bus line No. 840). Like was shown before, buses going from Katowice to Gliwice run more frequently than buses from Gliwice to Pyskowice, which means, that passengers do not benefit a large number of connections - they choose earlier connection to continue their journey

The main problem observed by the author is - like in other analyzed connections between other cities, eg. [12, 13] - a travel time by public bus transport which is almost two times longer than in the case of individual transport.

Therefore, according to the author, KZK GOP should consider a slight modification of the proposed timetables and what is important, increase the traveling speed of buses (mainly on the route Katowice - Gliwice), so that the travel time was comparable to the driving using individual transport.

Those actions should contribute to the gradual ever greater interest in the use of public transport instead of individual transport.

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