

THE IMPACT OF TRANSPORT INVESTMENT FOR THE QUALITY OF BYDGOSZCZ CITIZENS LIFE

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Abstract: Public transport in cities has a crucial function of making it possible to travel for many different purposes, so the transport demands of citizens are satisfied. Inhabitants use buses, trams and other means of transport to get to work, school, leisure centers and to visit their relatives and friends. That is why a good working public transport is so important, especially for those who lives in areas far away from the city center. In this assignment there is made an evaluation about transport investment and functionality of new tram line in Bydgoszcz, and how it improved people quality of life. New tram line in Bydgoszcz had an impact towards improving the functionality of public transport for people from Fordon district as well as from the whole town.

Key words: public transport, quality of life, transport demand

INTRODUCTION

In the field of public transport, the quality of services is given by the perception of passengers on the performance of the public transport service.

The quality of services depends to a large extent on the decisions taken in the public transport system. When we talk about the decisions taken in this field, we refer to all those decisions that refer to the establishment of public transport routes, to the frequency and period of the day in which the services are offered, to the type of services offered. The quality of services is an indicator of the success of public transport operator, and this has direct implications for passengers.

Usually the quality of public transport services is measured through the following characteristics:

- Accessibility, in which case indicators are used to assess the accessibility of a potential passenger on a public transport service, for different types of travel
- Monitoring services, indicators are used to evaluate the experiences of passengers who use public transport services daily;
- Travel time, indicators are used that measure the duration of the journey in the public transport system and compare them with the durations achieved with other modes of transport or with an ideal value;
- Safety and security - indicators are used to assess the likelihood of a passenger being involved in an accident or becoming a victim while using the public transport service;
- Reliability - indicators of the effectiveness of the operator's program and its ability to meet the commitments made through the programs made public are used;
- Economic characteristics - economic indicators of the performances of public transport services;
- Capacity - the capacity of the operators to fully satisfy the requests addressed to the public transport system in different areas and at different moments of time.

The aim of the article is to evaluate the transport investment and the functionality of the connections of the new tram network in Bydgoszcz in terms of improving the quality of life of the inhabitants.

Characteristics of transport infrastructure in Bydgoszcz

Bydgoszcz is a city that has its own individual, unique image that has been shaped over nearly seven centuries. The location near the Brda and the Vistula, at the junction of two geographic and historical lands: Pomerania and Kujawy, favored its development, thanks to which it is now characterized by a large demographic potential, significant economic and cultural achievements [14].

Bydgoszcz, being the administrative capital of the Kuyavian-Pomeranian Voivodeship, at the same time performs a number of functions of supra-regional and national importance in the field of administration, production, trade, finance, science, culture and sport. Bydgoszcz is a city that is constantly opening up to new challenges of the 21st century [13]. Location of the city on the background of the country map (Fig. 1.)



Figure 1. Bydgoszcz against the background of the country and Kujawsko-Pomeranian Voivodeship

Source: <http://www.bip.zdmikp.bydgoszcz.pl/attachments/article/151/plan.pdf> [10]

The city has a population of 348.2 thousand inhabitants (data from 2020) [10], which ranks it in the 8th position of Poland. The central location of Bydgoszcz in the Kujawsko-Pomeranian Voivodeship creates convenient conditions for residents of the region to access various services. On the other hand, the urban functional area of Bydgoszcz (Bydgoszcz agglomeration) is, depending on the final delimitation of its borders, the space where inhabits about 530 thousand people. Activities related to the delimitation of functional areas, the indication of the scope of cooperation and the definition of development priorities are currently underway. The complementary development of functionally interconnected cities and municipalities, based on coherent spatial and socio-economic planning and the joint implementation of investment projects of local and regional importance, will benefit the growth of the province in Poland and Europe.

Bydgoszcz is located in the Baltic-Adriatic road network corridor within the TEN-T (Trans-European Transport Network) and is intended to be a driving force for the economy within the single market and will allow for a virtually unlimited movement of goods and persons within the European Union. Within the current TEN-T network, the A1 motorway S5 and the planned S10 motorway run in the vicinity of Bydgoszcz. Through the area of the city of Bydgoszcz runs railway line No. 131 Chorzów Batory - Tczew qualified for the core network for freight and comprehensive in the passenger transport segment. Line 201 Nowa Wieś Wielka - Gdynia Port, on the other hand, was classified as a comprehensive network in both segments.

In Bydgoszcz, the so-called Rail Road Terminal (RRT) was located, a multimodal platform integrating road and rail transport. Also in Bydgoszcz, the existing international airport, was included in the comprehensive network of airports within the TEN-T. In terms of waterways, only the Oder section from Cedyni (Oder – Havela canal) to Szczecin was classified as part of the TEN-T network.

The external network of public roads in relation to the city of Bydgoszcz consists of national roads (including classes A and S), provincial, county and municipal - neighboring municipalities, having links to the appropriate category of city streets.

The planned target network of the highest category of roads forms a triangle in the Kuyavia-Pomeranian region providing good access to these roads and connected with the other largest centers in the country. For the links between the city and Warsaw, as the central center, a section of the S-10 Bydgoszcz – Toruń expressway is crucial.

The proper link between the urban network and the national motorway and expressway system is crucial for the functioning and economic development of the city. The implementation of the S5 expressway on the entire planned route is not currently under threat, but it is necessary to aim for the implementation of a section of the S10 expressway between Bydgoszcz and Torun, ensuring proper connection between the city and the A1 motorway in the south and east, in particular with Warsaw and Silesia.

Bydgoszcz is an important junction of national roads, lying at the intersection of the corridors of expressways 5 and 10. Currently, national roads 5, 10, 25 and 80 and provincial and county roads pass through the city, through the streets of the basic system. The public road network in Bydgoszcz has a length of 761.4 km, of which 546.1 km are paved roads, which represents 71.7% of the total public roads (a detailed list of roads located in the city of Bydgoszcz by category is given in Table 1).

Table 1.

Administrative classification of roads, as at 30.10.2020

Category	Length Roads (km)	Share (%)	Length Roads two and multi-carriageway (km)	Share (%)	Length of roads with hard surface (km)	Share (%)	Length of roads with ground surface (km)	Share (%)	Area (km)
National	40.2	4.8	22.7	56.6	40.2	100	0	0	1801576
Provincial	9.0	1.3	4.6	41.9	10.9	100	0	0	302096
District	132.5	15.8	18.4	13.9	130.2	98.2	2.3	1.8	4298822
Municipal	577.7	68.8	2.2	0.4	364.8	63.1	213.2	36.9	7232016
Internal on the Board of ZDMiKP	64.6	7.7	0.0	0	20.9	32.4	42.6	67.6	752 972
Internal other boards	13.6	1.6	0.0	0	13.1	96.0	0.3	2.4	205483
Total- public	761.4	90.7	47.9	6.3	546.1	71.7	215.6	28.3	13634510
Total – public and internal on the board of ZDMiKP	826.0	98.4	47.9	5.8	567.1	68.7	259.2	31.4	14387482
Total- all	839.6	100	47.9	5.8	580.1	69.1	259.5	30.9	14592965

Source: own study based on data from the municipal road and public transport management in Bydgoszcz [11, 12]

The development of urban space as well as the layout of the road network in Bydgoszcz are band-concentric in nature. The system is characterized by a significant stretch in the east-west direction and a relatively short distance between the north and south ends of the city. Urban areas extend east-west to about 20.0 km, while north-south to about 6.0 km (medium). The spatial conditions described determined the shape of the street network, the course of the most important road lines, and thus the possibility of movement between the different districts of the city. Urban roads constituting the basic road system (GP, G and Z) account for 35.9% of the length of the network in Bydgoszcz. The road

network density index of the basic system is 0.758 km/1000 inhabitants and 0.022 km/ha. In total, the road density of all classes in urban areas of the city is 0.061 km/ha [17].

Public transport in Bydgoszcz carries out 28.9% of all journeys and 41.7% of non-pedestrian travel (public transport, passenger car, bicycle etc.) Currently, public transport services are carried out by rail (tram) and bus services. As part of the ITS (Intelligent Transport Systems) project, priorities for public transport have been introduced in Bydgoszcz, in practice for trams, as buses tend to move in general traffic. The priorities are to favor the tram in traffic lights at the intersection (preference for the tram in order to maintain a scheduled transport speed). Network for five was a new network of public transport connections in Bydgoszcz after the launch of the tram route to Fordon. It was a project developed by Department of transport organization, Municipal Roads and Public Transport Administration from Bydgoszcz in 2015.

MATERIALS AND METHODS

In order to examine the impact of the new tram line to Fordon on the quality of life of residents were used as research methods:

- survey, a total of 45 respondents living on the Bydgoszcz estate - Fordon, who use Public Transport in Bydgoszcz, were surveyed. The study involved 3 people under the age of 18, representing 7% of the total, 29 people were surveyed in the 18-30 age range, which is 64% of the total, 9 people were examined in the 31-50 age range, which is 22%, while over 50 years of age 4 people were studied, which is 9%.

- a detailed analysis of the state of road infrastructure in Bydgoszcz was carried out.

RESEARCH RESULTS

Within the borders of Bydgoszcz, the total length of the routes in operation is about 39.0 km. The technical condition of 46.4% of tram tracks is determined to be at least good, the others need to be renovated. The average age of the track in the city is 8 years (16 years in 2013), with still about 23% of the tracks being aged 18 years and over. The poor technical condition of the tram tracks translates, among other things, into the need to limit the speed of movement of rail vehicles [9]. This has a very detrimental effect on the quality of public transport due to the increase in the speed of transport and the journey time of travelers [3].

The tram network system is mainly located in the central and southern districts of the city. In recent years, new sections of the network have been built [4].

In 2013, a line to the Main Railway Station was completed with a length of about 1.6 km with a tram-bus loop and a tram bridge. At the beginning of 2016, the line to the Fordon district was put into operation from a length of 9.35 km with intermediate tram and bus loops. The share of tram transport in total public transport varies by around 25-27% (2015-2016). The estimated tram service directly serves the area, which has a population of about 112,000 registered residents. This represents about 34.1% of the total population of the city.

In January 2016, a new tram route to Fordon was launched, resulting in many changes in the functioning of public transport. The new communication system has increased the importance of passenger service using trams. As a result, the bus system has also been adjusted.

11 tram lines (including one tourist line) provide transportation in the tram subsystem. For the operation of transport tasks during peak hours is directed to the movement of 60 tram trains. The total length of the tram lines is about 120.0 km.

The spatial area of the city depends on the possibilities offered in creating transport accessibility by a given means of transport. There is a specific limit within which the time of movement limits the distance travelled by the means of transport concerned. The spatial

development of the city continues until the means of transport reach the limit of coverage. Thus, urban space is limited by transport opportunities, which are perceived by the image of time lost to travel.

In the case of agglomerations, the extent of the impact of the central centre is comparable to that of the centre and the efficiency of the means of transport. The area of the city that can be effectively served by selected forms of transport are: for pedestrian traffic about 12km², for trams, buses and trolleybuses about 76 km², for high-speed light rail and metro about 450 km², for individual means of transport about 700 km².

The development of the public transport system not only has the effect of reducing travel time, but also it is important to be able to reach the outskirts of the city. The direction of spatial development of the city is determined by the direction of development of the communication system.

Today, cities are looking for quality solutions in transport, as the possibilities of public transport, especially in combination with their excessive congestion for traffic efficiency, have become an important part of their development [1]. The rate of increase in urban transport involvement is faster than the growth rate of the size of the city, which is measured by the growth of the area and the number of inhabitants [5].

The spatial and population development of the city increases the number of potential passengers and extends the journey, which depends on the shape of the city and its spatial and functional structure. The elongated shape of the city extends the journey.

The transport needs related to the number of journeys made and the distance covered depend on factors such as:

- spatial shape of the city;
- the size of the city - the measure is the population and spatial area;
- the demographic and social structure of the population and the associated level of human activity and income;
- the size of your free time;
- spatial and functional structure of the city.

In a spatial-functional structure, the separation of residences and places that are associated with other functions affects the number of potential trips and their length [2]. For the size of the communication needs, it is important to have a degree of spatial separation of places of residence and places of work and study, where transport is compulsory. It is also worth considering the fact that larger cities attract passengers from outside the city, which increase the demand for transport in the city [6].

Of those surveyed, 96% use public transport services and 4% do not. Research indicates that 52% of respondents are satisfied, while 32% disagree and 16% do not. Respondents who use public transport on a daily basis account for the largest group of 56%, while several times a week use 16%, while as many as 20% indicated a response several times a month

When asked which mode of transport you use most often, it turned out that as many as 67% travel by tram, while the bus prefers only 33% of those surveyed.

The quality of life is linked, among other things, to the satisfaction of the bus and tram lines. Thus, 47% of respondents are satisfied with bus connections, while 36% are dissatisfied and 18% do not. On the other hand, more than half are satisfied with the creation of new tram connections, as many as 58% of passengers. Only 27% are dissatisfied and 15% have no opinion on this. This may mean that the new tram lines have a positive impact on the quality of life of the people of Fordon.

Another important aspect affecting quality of life is the frequency of public transport [8]. Thus, another question of the study concerned opinions on the cyclical nature of courses. Only 33% of bus passengers say that the number of bus routes is sufficient, the

opposite opinion is as much as 47% and 20% do not have an opinion. As far as tram passengers are concerned, so many are equally satisfied and dissatisfied with 47% respectively, and only 6% of respondents have no opinion on the subject.

CONCLUSIONS

Today, the pace of life of modern people, especially the inhabitants of big cities, is constantly accelerating. The life of active citizens is programmed in hours or even minutes. Work, study, childcare, meetings with friends, travel, sports, shopping - these are just a few tasks and daily activities that force us to be in the right place at the right time. Public transport is one of the options when we have to travel, and what everyone wants is to get to their destination as quickly and comfortably as possible.

Quality public transport services can make life easier for passengers, thus reducing traffic, which entails a number of other benefits.

Therefore, modern public transport is one of the factors that can improve the quality of life.

The work attempted to confirm the impact of the new tram line on the quality of life of the residents of Fordon. Using the questionnaire, the survey surveyed Fordon residents who assessed public transport in various aspects. 47% of those surveyed are satisfied with the quality of services offered, 56% of people use public transport every day. The journey most often takes from 30 to 60 minutes. 58% of passengers are satisfied with the new structure of the tram line to Fordon and only 27% are dissatisfied. As for the new structure of bus lines in Fordon, 47% of residents are satisfied, while as many as 36% disagree.

The tram network is a significant element of public transport and, with its development, i.e. the opening of new connections according to the needs of travelers, can be even more attractive to the inhabitants of the city and encourage the use of its services and to encourage the abandonment of travel by car. This makes the city greener and urban transport more environmentally friendly.

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