

## URBAN TRANSPORT QUALITY IN TERMS OF THE SUSTAINABLE DEVELOPMENT

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**Abstract.** Transport is one of the most significant factors determining the economic development of a city or a region. Ensuring suitable infrastructure and efficient transportation system constitutes a guarantee of economic growth. Public transport has long been the most inexpensive way of travel. The development of automotive industry increase of the society's affluence, and thereby an improved quality of life are conducive to people expecting an improvement in the quality of the provided transportation services. Transport companies face a challenge of continuous improvement of their services, upgrading their quality and paying particular attention to how passengers perceive them, as well as satisfying passengers' requirements and needs. The article presents an analysis of the results of Bydgoszcz public transport quality surveys conducted in 2014 and 2018. The aim of the article is a comparative analysis of the results of quality and satisfaction surveys of public transport customers in Bydgoszcz over the last four years. The conducted surveys demonstrated an increase in the mobility of the analysed agglomeration residents and a resultant more frequent use of urban public transport.

**Key words:** mobility, sustainable development, urban transport, quality.

**JEL code:** R11, R58.

### Introduction

Road investments, particularly of regional or supra-regional character, constitute one of the most important factors having an impact on shaping the opportunities for regional and local development and on its quality (Mickiewicz P., Nowak M.J., 2018). Adequately developed transport infrastructure (roads, railways) as well as dynamic advance of an agglomeration influences the choice of a suitable strategy for solving problems related to transportation serves provided to residents. Moving around in urban areas is, according to research, one of the 10 most significant factors determining the quality of life (Witkowski J., Kiba-Janiak M., 2012). Mobility contributes to both growth and decrease of unemployment (Niebuhr A., 2003). It has a substantial impact on the sustainable development of the European Union. Solving transport problems is a complex challenge, since big-city centres its concerns are dominated by individual vehicle transport (Janecki R., 2011). It results in a chain of negative phenomena. First of all, it entails an insufficient capacity of infrastructure used for that form of transport and environment pollution. Transport is one of the most difficult sectors in terms of controlling CO<sub>2</sub> emissions. Technological advancements, greater traffic intensity and the manner of driving in built-up areas (lack of smooth driving), constitute an ever-increasing source of CO<sub>2</sub> and nitrogen oxide emissions. Thanks to the legal measures provided by the EU, we have been lowering the limits of harmful substances emissions for new vehicles over the course of the last 15 years. Overall, we have managed to reduce nitrogen oxides and particulates emission by 30-40 %. It occurred despite an increase in the traffic volume (Green Paper - Towards ..., 2017). Within the scope of further elimination of undesirable consequences, alternatives to private passenger vehicle transport are promoted and made more appealing, including above all the use of mass transport (Plan Zrownowazonego Rozwoju ..., 2016).

Such steps favour the improvement in the quality of living and increasing the wealth of residents, and they further impact on the growth of the competitiveness of the entire agglomeration. The

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concept of sustainable development is strongly linked with an implemented spatial planning policy (Nowak M.J, Mickiewicz P., 2012).

Urban transport is perceived as an efficient tool in the fight with congestion and environment pollution problems. The quality of transport services offered by transport operators is a highly important element. The concept may be defined as a function of its characteristic properties assuming specific values, which determine an overall value of a functional service (Drob-Zaba E., Zaba K., 2008). In Poland, the application of quality control of urban mass transport is at its initial stage of development. Legal regulations related to the issue can be found in the Public Transport Act of 16 December 2010. The act assumes that the plan for the sustainable development of public mass transport is devised by, inter alia, a district of at least 80 000 residents – in terms of a transportation service or a transportation network in district passenger transport (Ustawa z dnia ..., 2010). The nature of public transport in the territory of Bydgoszcz District is based on the operation and development of modern and environmentally-friendly mass transport, meeting passengers' expectations. Reliable urban transport is a crucial element in the existence of every city, one of the most important factors regulating its operation (Szymczak M., 2008).

The objective of the article is to find out and analyse individual needs of mass transport passengers in Bydgoszcz with regard to selected aspects of transport quality and their satisfaction with transportation services over the course of the last 4 years. The study was undertaken since the clients' evaluation of quality is becoming an overriding method that describes their feelings, the degree of their satisfaction, but also their acceptance of the charges incurred on account of the services (Bakowski W., 2008). From the point of view of the entities responsible for urban transport organization the aim of analysing the quality of transport as well as the evaluation of residents' transportation routines is to develop the strategy that will enable them to shape a market focused on keeping the existing passengers and to solicit new service users in the long term (Wyszomirski O., 2008). It must be stressed that the quality of transportation services is always multi-dimensional. It encompasses a multitude of quality properties that reflect transportation suggestions made by passengers. A benchmark of quality ought to feature a comparison of suitably selected attributes so that the considered quality of transport entails users' impressions (Starowicz W., 2007).

On 18 May 1888 the first horse-drawn tram line in Bydgoszcz was put into operation. In 1896, the first electrical trams appeared, serving two tram lines. In 1897, Bydgoszcz trams carried 1 278 801 passengers covering 346 thou. Km; and in 1906, the number of transported passengers already reached 2 880 791. The first buses took to the streets in 1943 and one year later they were joined by trolleybuses. In 1954, 42 million passengers used mass transport in Bydgoszcz, in 1971 – 144 million, and in 1975 – 170 million passengers, which was linked, in particular, to a growing number of city residents (323 thou.). Currently 26 bus services running during the day and 6 night services as well as 10 tram services operate in Bydgoszcz, which involves: 175 buses and 76 trams. In 2016 26.04 million passengers were carried by trams. Two transportation companies operate in the city: Public Transportation Company Sp. z o.o., Irex - Trans Sp. z o.o. Tickets in Bydgoszcz include single (reduced-fare and full-fare) tickets, short-term tickets, long-term bearer tickets as well as tickets registered in a passenger's name (<http://www.zdmikp.bydgoszcz.pl>).

In 2007, an A+T interchange system was implemented in Bydgoszcz allowing passengers changing from a bus to a tram (or the other way around) to travel using one ticket. „BiT-City” agglomeration ticket was in operation until 2008. Thanks to this solution, when travelling on a tram on a single agglomeration ticket in Bydgoszcz-Torun relation (or the other way around), one may

use any transportation service in Bydgoszcz or Torun for 60 minutes. The access to public transport for the disabled has also become easier thanks to the adaptations introduced in the rolling stock to suit their needs (introduction of a greater number of low-deck vehicles). Since 2011 passengers are also able to buy public transport tickets via a mobile phone app. In 2016 a tram service to Fordon was put in operation. ZDMiKP also implemented a Smart Urban Transport System for public transport. At present, electronic LCD and LED displays have been installed at the main transport interchanges and terminuses, showing bus and tram service departures in real time. LCD displays also inform of any traffic obstructions and they display messages of any changes in public transport (<http://www.zdmikp.bydgoszcz.pl>). In 2018, under a resolution of Bydgoszcz City Council, new long-term tickets were introduced for the youngest passengers, which have made the offer of urban transport significantly more attractive (Uchwała Rady Miasta ..., 2018). Urban transport is under constant supervision of ZDMiKP in terms of its punctuality and quality of provided services (marking, information displayed on the means of urban transport, ticket availability, operationability of validating machines, vehicle cleanliness, etc.). More than 23 thou. individual inspections of the rolling stock are conducted per year by all three operators (<http://www.zdmikp.bydgoszcz.pl>).

### **Research results and discussion**

The survey research was conducted in the period from 4 to 24 September 2014 and from 10 to 28 December 2018. The choice of the second date for the survey was selected for a purpose and it was linked to the fact that the authors wanted to learn the opinion of survey respondents regarding an extension of a tram service by a section running to Fordon, which was started in 2016. The study was conducted on the basis of a CAWI method. CAWI research methodology involves an interview conducted online. A respondent receives and fills in a survey online. Currently it is without a doubt one of the most popular techniques, and at the same time, one of the most dynamically developing methods of marketing studies and not only – it is also used in academic, market, business research, etc. Microsoft Excel software was used for survey results processing and their presentation. Due to the lack of data regarding the number of people using urban transport in Bydgoszcz, the study was conducted on approx. 250 individuals. With such a number of respondents and with the level of confidence of 95 %, the error rate is approx. 6.5 %.

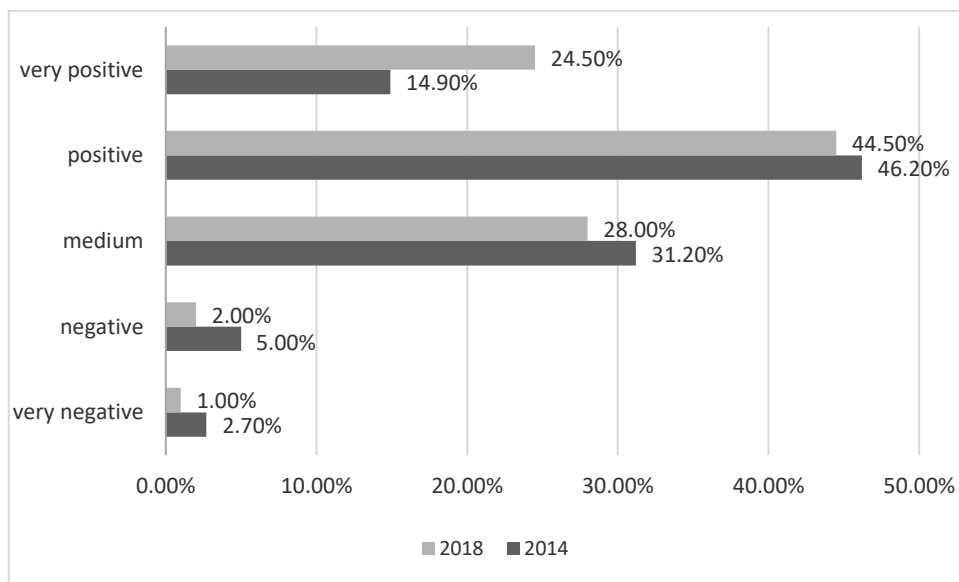
The survey was addressed to the individuals using mass urban transport in Bydgoszcz and it contained 22 questions of closed and semi-open-ended nature, as well as questions devised according to demographic category. Semi-open-ended questions enabled the respondents to add their own answers through which they wanted to express their own impressions. The questions concerned various aspects of travelling by mass transport and the respondents' opinion on the operation of the urban transport. In 2014, women constituted 49.5 % and men constituted 50.5 % of all 257 respondents. However, only 221 of those individuals declared that they used public transport in Bydgoszcz and the subsequent survey results refer to that number. 230 individuals participated in a survey conducted in 2018, among whom 58 % were women and 42 % were men.

The first survey question concerned the frequency of using mass transport in Bydgoszcz. The results demonstrated increased interest in this mode of transportation. There was a rise in the number of individuals using the services of mass urban transport daily (from 57.5 % in 2014 to 61.5 % in 2018). As far as the individuals using mass transport several times a week are concerned, similar Figures were obtained – 18 % in 2014 and 18.2 % in 2018. Nearly 19 % of respondents used mass transport several times a month in 2014 and 20.3 % in 2018. Average trip time, according to

the respondents, was as follows: in 2014 the most frequently indicated trip duration was between 16-30 minutes (48.5 %), whereas in 2018 the respondents most often specified the duration of 30 minutes (47.6 %) – which is linked to an extension of a tram line to Loskon tram stop, which increased the competitiveness of this mode of transport in comparison to a car trip, especially in the rush hours. In 2014, only 15.8 % of the survey respondents did not need to change their means of transport, currently that Figure grew to 21 %. At present, a majority of passengers use one transport service, while in 2014 62 % used 2 or 3 bus lines or tram lines, in order to get to their destination. Along with an increase in the number of people taking advantage of public transport, the percentage of people using A+T combined system grew slightly from 77.40 % to 78 %. This may indicate a greater appeal of public transport use, owing to a shortened trip length and a better trip synchronisation, and hence greater mobility of Bydgoszcz residents.

An important question concerned the form of paying for public transport fare. The most numerous group of passengers was made up of people using a monthly ticket both in 2014 and in 2018 (2014 – 65.6 %, 2018 - 66 %). Another group of passengers are those using single tickets (a rise from 20.8 % in 2014 to 22 %). Both in 2014 and in 2018 there were individuals admitting to not paying public transport fares. In 2014 paying with a mobile phone app was highly popular – as many as 72.9 % of the respondents declared its use, and at present the survey responds equally frequently buy tickets on-board a public means of transport with a proximity card – as many as 43 % of respondents.

In 2014, the majority of passengers were of the opinion that ticket prices were adequate to the quality of services rendered by transport carriers – 76 %. Currently as many as 86 % of those surveyed believe so, and this trend may be related to the prices for young passengers that were introduced in March of that year. The answers to a question regarding evaluation of bus or tram ride comfort indicate it has improved over the course of the last 4 years (Figure 1.).



Source: author's construction

Fig. 1. Evaluation of the comfort of transport for city inhabitants

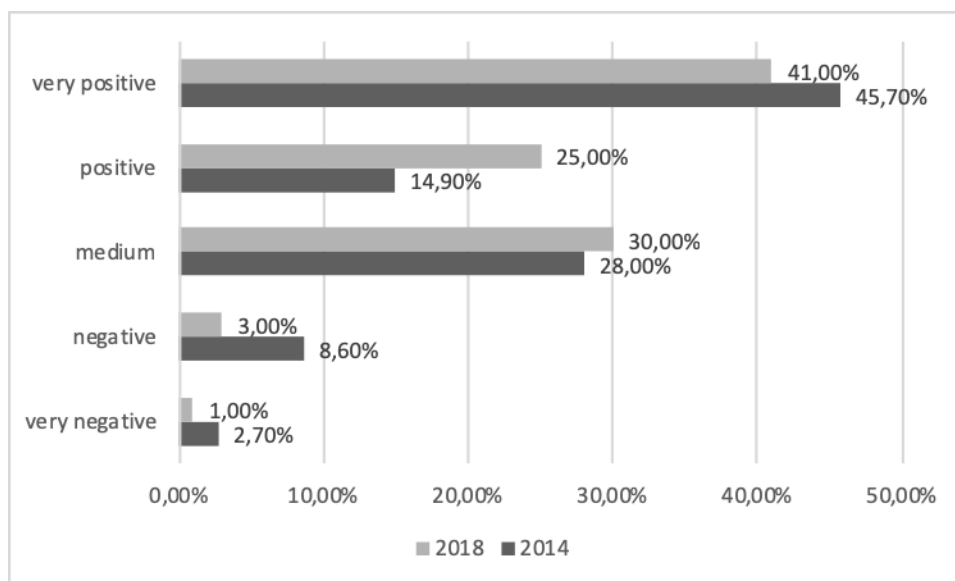
The transport operators' actions aimed at improving travel conditions undertaken over the course of several years prior to both surveys have important results. Better synchronisation of transportation links, a possibility of buying tickets on-board a vehicle with a proximity card or displays showing bus and tram departures in real time have all had a positive impact on passengers' experience. In 2014,

60.2 % of those surveyed found the comfort of travelling by public transport to have improved significantly in the recent years. At presents 75.2 % of respondents declare that, whereas only 4.9 % of respondents do not observe any positive changes.

As far as the punctuality of bus and tram arrivals are concerned, the greatest number of respondents (19.9 %) was forced to wait at a stop owing to a delay several times a week 4 years ago – at present 16.9 % of respondents gave such an answer. Waiting several times a month concerned respectively 48.9 % and 32 % of respondents. In turn, 22.1 % of them in 2014 and 15 % at present claim that they rarely or never experienced any delays in the timetable. Currently, fewer individuals indicated any unsuitable location of stops (a drop from 13.1 % to 10.1 %).

Both in 2014 and in 2018 passengers were mostly bothered by overcrowding (respectively 21.7 % and 26.7 % people), unpleasant smells (respectively 19 % and 17 %), or the behaviour of other passengers (27.2 % in 2014 and 20.2 % in 2018). However, in 2014 many other factors were named, such as lack of seating places, inadequate cleanliness, the manner of vehicle driving by a driver, inadequate temperature in vehicles or poor synchronisation of bus and tram timetables, which in 2018 was virtually unnoticeable.

Trip duration times in urban means of transport presented a completely different picture, which 41 % of respondents evaluated as being highly positive and 25 % judged to be positive. In 2014, nearly 46 % indicated 'very positive' as an answer (Figure 2).



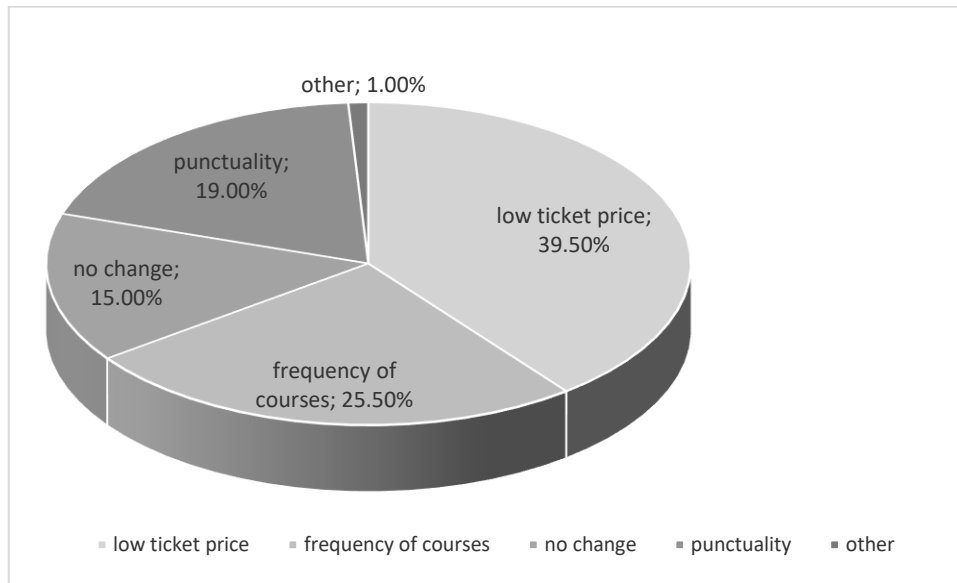
Source: author's construction

Fig. 2. Evaluation of trip duration on urban means of transport

The research also indicates that the sense of safety in mass transport vehicles in Bydgoszcz has improved. It results from the assumptions of the Plan of Mass Public Transport Sustainable Development for Bydgoszcz District, which guarantee additional equipment of vehicles that would ensure travel comfort and safety: air conditioning of passenger space, surveillance of passenger space with image recording, wireless Internet access (WiFi). That is why this element received good and very good opinions from 84.6 % of passengers in 2014 and from 92 % in 2018.

Marking of public transport stops and transport services gained better ranking as well, which was due to LCD displays that inform additionally of traffic obstacles and show communications of any changes in a public transport schedule. More than half of those surveyed (65.4 %) deemed them to be very good – that is far more than in 2014 (48.4 %).

The respondents found low fare prices to be the most important aspect in traveling by public transport in contradistinction to the status of 4 years prior in terms of the quality of service and similarly to 2014 a high frequency of trips (Figure 3).



Source: author's construction

Fig. 3. The most important aspects of passengers traveling by public transport in 2018

The respondents appreciate shortened trip time owing to a better synchronisation of connections, notification of delays and obstructions. We observe that passengers tend to use the innovations implemented in subsequent years: in 2014 it entailed paying for tickets via an app, and in 2018 paying for tickets with a proximity card. The use of A+T combined system enjoys similar popularity. According to passengers, low ticket price adequate to services rendered is becoming the most important aspect. The safety fact is turning into a very important aspect, which has decidedly improved after the implementation of vehicle surveillance. The respondents still find the following factors discomfoting: overcrowding of vehicles, behaviour of other passengers, unpleasant smells, insufficient cleanliness, or inadequate manner of bus or tram driving. However, it needs to be added that the development of public city transport in increasing the mobility of residents does not only refer to one parameter, but it is a long-term process. These dynamics is affected by all the elements to which passengers pay attention and which they find important.

## Conclusions

- 1) Public transport is a catalyst of processes leading to economic growth – in the territory in which it operates. The conducted research demonstrates that people using city transport have a better opinion of it more often than other respondents.
- 2) When analysing the surveys conducted in 2014 and 2018, an improvement of the opinions on city transport becomes noticeable with respect to a majority of considered factors. Owing to a series improvement and the development of tram infrastructure, passengers use public transport more often, thanks to which their opinions are much higher than they were 4 years before. Increasing the attractiveness and accessibility of public transport correlates with the city's sustainable development policy.
- 3) The conducted analysis allows the authors to conclude that public transport companies are successful in introducing improvements, raising the quality and appeal of public transport vehicles for passengers. Respondents have noted the improvement in the quality of services provided by

public transport operators and appreciate in particular the innovations they introduce. Passengers are treated as clients who deserve the highest quality of service at a relatively low price. Unfortunately, the factors that depend on road infrastructure, the number of passengers as well as the manners and hygiene of passengers themselves constitute a barrier that cannot be overcome.

- 4) The improvement in the quality of city transport in Bydgoszcz has had a definite impact on the greater mobility of its residents. Development of public city transport is also a long-term process. These dynamics is affected by all the elements to which passengers pay attention and which they find important.

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