



ANALYSIS OF PROBLEMS OF PUBLIC TRANSPORT FUNCTIONING IN 2017 AND 2018 ON THE EXAMPLE OF CZESTOCHOWA CITY

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Abstract: The article identifies the problems of public transport in Czestochowa. The authors' main goal was to investigate whether the importance of particular problems for public transport users has changed between the years 2017-2018. Implementation of the goal was possible thanks to the authors' own research using the diagnostic survey method and data analysis method. The results of the research indicate a growing interest in public transport, in particular bus communication. Popularizing public transport in Czestochowa, however, limits access to the transport infrastructure. Due to many conditions, development of the transport network in the city is difficult, sometimes impossible to implement. Nonetheless, there is a solution that can be introduced without having to incur significant financial costs - it is to increase the frequency of rolling stock on individual lines.

Keywords: transport, passenger transport, city, problems of public transport

DOI: 10.17512/znpcz.2018.4.29

Introduction

Managing transport in cities is extremely difficult because individuals responsible for it must reconcile the often conflicting interests of different stakeholder groups. Despite these difficulties, we should strive to solve transport problems in cities as it is necessary for their proper functioning. In the authors' opinion, the most important problems in cities are the occurrence of traffic congestion on their streets. This phenomenon disrupts the delivery schedule of various types of raw materials, materials, semi-finished goods, goods and finished products necessary for the operation of manufacturing, trading and/or service enterprises. To a large extent, it also reduces the mobility of urban users. A solution to the first problem is seen, among others in consolidating goods streams. In turn, reducing individual vehicle traffic in cities may take place by increasing the frequency of using other, alternative means of transport, i.e. public transport, bicycles (including city bikes) or encouraging walking. In any case, however, it should be ensured that these alternative forms of transport are attractive to city dwellers. Then citizens will not need to be actively encouraged to use such solutions.

Management of sustainable transport in cities

In the transport policy of the European Union, much attention has been paid to developing transport in cities (Green Paper 2007; White Paper 2001; White Paper 2011; *Zrozumieć politykę...* 2014) to satisfy the current and future needs of their users (Kabus, Karolczyk 2017, p. 23). The development of transport in urban areas is to contribute to increasing the quality of life in the city, thus increasing its attractiveness as a potential place of settlement. This is to be achieved by limiting the negative impact of urban transport on the natural environment and human health (Brzustewicz 2013, p. 85). In this context, the priority objective of the implemented EU policy is to reduce emissions from transport. Due to the fact that 25% of the total transport emissions are generated in urban areas, cities are of key importance to mitigate the effects of climate change (*Zrozumieć politykę...* 2014, p. 8).

Recent changes (development of civilization, globalization, the information society, etc.) have contributed to the necessity of developing new concepts of transport systems. Cities that are places of high population concentrations in which many production, commercial and service companies operate, and face numerous transport problems that slow down or even hamper their development. Issues related to transport in Polish cities are the subject of many discussions (Krysiuk, Nowacki, Zakrzewski 2015, p. 7813). Transport management is thus one of the most important activities carried out at all levels of public administration. As a result, urban development strategies that take into account the prerequisites of the European transport policy, pay particular attention to the construction of sustainable passenger transport systems in urban areas (Grabińska 2017, p. 129). One of the priorities of the actions is to reduce the impact on the road transport environment, which as Skowron-Grabowska, Sukiennik, Szczepanik (2015) stated, enjoys unflagging popularity in both freight and passenger transport.

Transport and communication problems have been growing since the second half of the 20th century (Osyra, Nitkiewicz 2016, p. 185). In order to reduce their occurrence, city authorities implement sustainable models of cities (Kowalewski 2005; Mierzejewska 2010, as cited in: Kajdanek 2016, p. 142) taking into account the sustainable development of transport, which was stated by M. Konopka and M. Kozerska (2017, p. 1705) as "a long-lasting process of transport evolution, which results in increased transport efficiency by, for example, increasing mobility, accessibility or minimizing costs". Modern local government units are also trying to implement the basic principles of Corporate Social Responsibility (CSR) (Sukiennik, Herbuś 2017, p. 73) in transport development strategies. Including various concepts in the content of the strategy, as well as the need to reconcile the interests of many groups of stakeholders, makes the process of developing strategic documents challenging. As a rule, planned strategic activities in the area of transport focus on providing access to various types of consumer goods, as well as to resources (Nowakowska-Grunt, Chład, Sośniak 2017, p. 84). However, urban transport not only conveys goods, but also comprises a set of activities related to the movement of people, so-called passenger transport (Nowakowska-Grunt, Chład

2015, p. 133). Therefore, the planned strategic activities related to the development of transport in cities are to help augment the mobility of the society.

Taking into account the subject matter of the study, the issue of ensuring the smooth movement of people is of great importance (Nowakowska-Grunt, Chład, Sośniak 2017, p. 84). Therefore, in order to minimize the negative impact of transport on the environment in cities, while ensuring universal access to passenger transport services, it was noted that it is necessary to introduce measures to manage the transport behavior of the population (Osyra 2016, p. 221). These behaviors are studied by many foreign and Polish authors. The aim of this research is first of all to design activities that encourage city users to switch to greener means of transport, i.e. public transport, cycling and walking (Brzeziński, Rezwow 2007, p. 5; Koźlak 2009, p. 42). Therefore, planning the development of the transport system in the city in terms of technical, organizational and legal aspects should be preceded by a study of the communication behavior of the population (Sierpiński, Staniek, Celiński 2016, p. 1744). Understanding the factors that determine the choice of a means of transport is an important element in the design of transport processes in cities (Ferenc, Łamasz, Koreleska 2015, p. 497). In turn, as G. Sierpiński (2012, p. 95) stated, "proper identification of the reasons for the choice may allow shaping of these behaviors". Introducing innovative technologies makes this task much easier. One of the solutions is to conduct research aimed at understanding the transport habits of the society using smartphones or dedicated GPS devices (including Jariyasunant et al. 2011; Safi, Mesbah, Ferreira 2014; Rizzoli et al. 2014; Montini et al. 2015; Safi et al. 2015). The use of these research tools is much less costly compared to traditional tools. In addition, they allow one to conduct long term research. As a consequence, they contribute to better matching of transport services to the preferences and habits of their users. In addition, they can be an important tool to influence and induce users to change their communication behavior (Jariyasunant et al. 2011, p. 12).

Summing up, striving for sustainable development of transport in cities should become a priority. Therefore, city authorities should focus on introducing solutions that would ensure the sustainable development of urban areas with simultaneous social and economic development. Only this course of action can bring the expected results.

Study methodology

In the next part of the article the methodology of the authors' own research is presented, i.e. the aim of the research, the research problems, methods as well as techniques were specified. The research sample was also characterized here and the research schedule was presented.

Aim of research and research topics

The subject of the study presented in this article is the phenomenon of the use of public transport in passenger transport in the city of Czestochowa, while the research subject is a person (user) using this type of transport. The research was a

panel study. The selection of the research sample means that it cannot be considered as representative. The authors defined the following research problem: what are the basic problems of the functioning of public mass transport in Czestochowa and has the rank of these problems changed in the examined period? In this case, it was also necessary to propose actions to increase the attractiveness of this type of transport. Based on the main research problem, the following specific problems were raised:

1. What is the frequency of using public transport in Czestochowa?
2. What are the most important problems in the operation of this type of transport?
3. What actions should be taken for public transport in Czestochowa to become a viable alternative to individual vehicle transport?

The proposed research questions allowed the following research hypotheses to be defined:

- H₁ In 2018, compared to 2017, the share of people who very often use public transport has increased;
- H₂ In the analyzed years, users of the urban transport infrastructure were more willing to use bus and tram transport;
- H₃ In the respondents' opinion, limited access to the transport infrastructure is still an important problem restricting or preventing the use of public transport during public passenger transport;
- H₄ Increasing the quality of the rolling stock providing transport is still an issue that should be addressed in order to encourage citizens to use public transport.

Research methods and techniques

In order to obtain answers to the research questions and verify the set of hypotheses, two research methods were used. One of them was the method of a diagnostic survey, and the technique was a questionnaire. The second research method was the analysis of primary data. It allowed the authors to draw conclusions about differences in the results of their own research carried out in the individual years.

Research sample characteristics

The criterion to select the respondents was use of the services provided by the public transport operator in Czestochowa during the course of the study. In 2017, 51 respondents took part in the study, including 33 women (65%) and 18 men (35%). A year later, the questionnaire was completed by 47 respondents. 62% of the total number of respondents was women (29 respondents), 38% - men (18 respondents). As in the case of the previous year's survey, the largest group of people who answered the questions included in the research questionnaire were people aged 18 to 29 (*Figure 1* and *Figure 2*). Inference based on the chi-square test indicated that both during the research in 2017 and 2018, the age of respondents did not have a normal distribution.

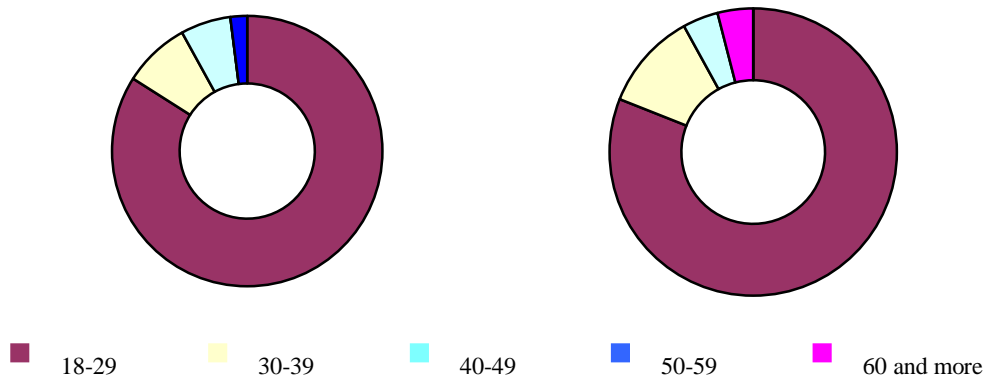


Figure 1. Age distribution of respondents (survey 2017) **Figure 2. Age distribution of respondents (survey 2018)**

Source: Authors' own compilation based on conducted studies

In the survey conducted in 2017, 68.6% of respondents were student pupils/students, 51% were professionally active people, while 2% were unemployed. A year later, 71% of the respondents were pupils/students, 29% professionally active people. It should be noted that 30 respondents admitted that they are only study learning or studying, while another 11 people stated that in addition to studying, they were also professionally active. 6 respondents indicated one answer - professionally active.

The survey questionnaire also included a question aimed at obtaining an answer to the question whether the participants in the survey possess category B driving licenses. The obtained research results revealed that a significant group of the respondents (83%) has a driver's license.

Organization and course of research

The study was preceded by a profound analysis of the research problem. Next, the research hypotheses were formulated by the authors. These hypotheses allowed us to develop the questionnaire (*Figure 3*).

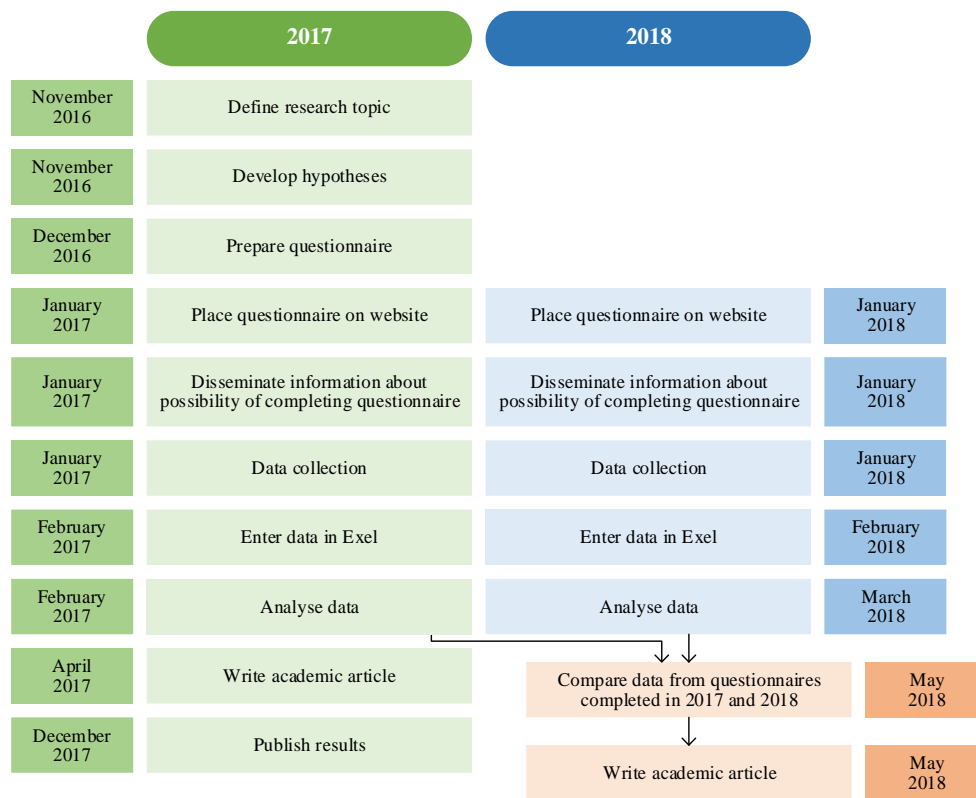


Figure 3. Research schedule

Source: Authors' own elaboration

In both studies, the same questionnaire was used. Each of the respondents answered four closed and one semi-open question. In addition, a legal notice was attached to the questionnaire. The survey could be completed by all persons who opened an appropriate link during the study. This link was distributed by e-mail and was made available on one of the social networks. The results of the research carried out in 2017 were collected, analyzed and then published in the Scientific Publications of the Faculty of Management at Czestochowa University of Technology (Strzelczyk, Chład, Kott 2017, pp. 147-160).

In January 2018, the survey link was sent to the respondents who participated in the survey the previous year. This allowed the authors to collect new original data on the subject of interest. Next, these data were analyzed so that later they could be compared with the results of the research collected a year earlier. Public transport use in Czestochowa – research results.

The survey questionnaire could only be completed by people using Czestochowa public transport. In both of the analyzed years, the majority of respondents travelled by public transport frequently (37.25% in 2017 and 42.55% in 2018). It should be noted that the number of indications of the answer "rarely"

decreased in 2018 compared to 2017 by 13.06%. In turn, 5.75% and 5.3% more users answered "very often" and "often". There was also a 2% increase in the number of persons selecting the "very rarely" response (*Figure 4*).

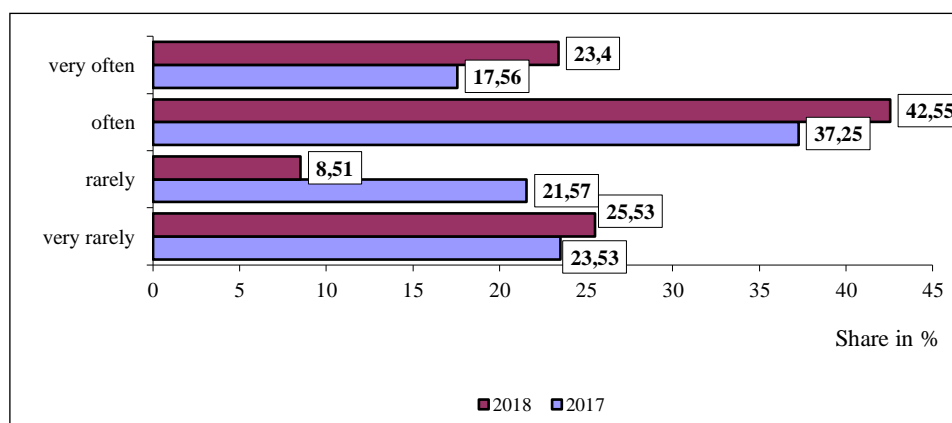


Figure 4. Frequency of using public transport by respondents in 2017 and 2018

Source: Authors' own compilation based on conducted studies

Therefore, it can be concluded that the respondents use the services provided by the public transport operator in Czestochowa much more willingly than they did a year earlier. It should be stressed that both in 2017 and 2018, more women than men used public transport services (*Table 1*).

Table 1. Cross tables for variables: sex of respondents and frequency of using public transport in 2017 and 2018

	2017			2018		
	women	men	total	women	men	total
very often	5	4	9	7	4	11
often	13	6	19	14	6	20
rarely	8	3	11	3	1	4
very rarely	7	5	12	5	7	12
total	33	18	51	29	18	47

Source: Authors' own compilation based on conducted studies

On the other hand, it is difficult to determine whether age has an influence on the frequency of using public transport. It is caused by the fact that mainly young persons took part in the study (i.e. at the age from 18 to 29). This means that the results of panel studies cannot be considered as representative.

As in the previous year, the respondents used the trams much more often than buses. It should be noted, however, that in 2018 the share of the "bus" response

increased by 11% compared to 2017. This proves the continuous interest in the tramway lines, but also an increase in the use of bus routes for journeys.

The respondents were also asked to indicate the time of the day they usually travel by public transport. In 2018, approximately 65.96% of all surveyed persons traveled by bus and/or tram in the morning, i.e. from 6⁰⁰-10⁰⁰, 63.83% afternoon (14⁰⁰-18⁰⁰). 40.43% of the total number of respondents most often used public transport from 18⁰⁰ to 22⁰⁰, 31.91% - in the hours 10⁰⁰-12⁰⁰, 29.97% - at noon, the least - 14.89% - at night (Figure 5).

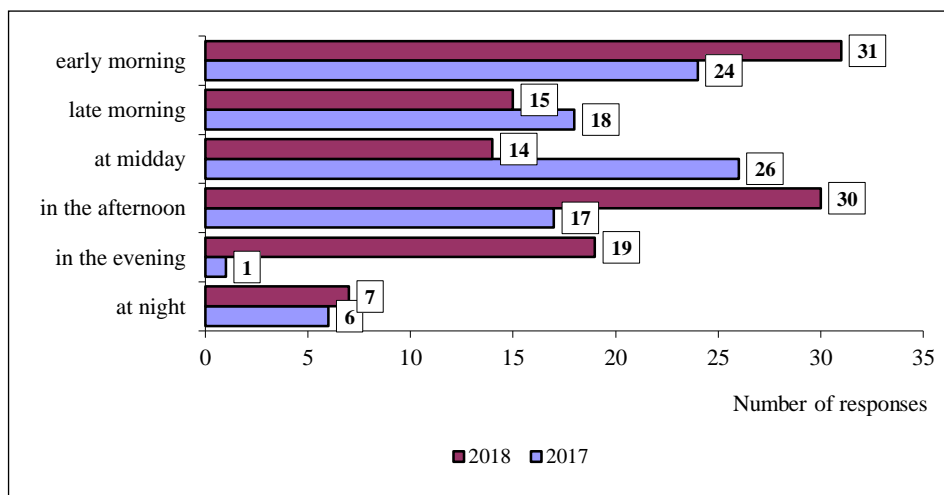


Figure 5. Time of day respondents most often take journeys by public transport in 2017 and 2018

Source: Authors' own compilation based on conducted studies

Comparing the collected data with those obtained in 2017, it can be concluded that the respondents in 2018 travelled much more frequently by public transport in the evening, afternoon and early morning hours, and at night. However, they were much less likely to travel at noon and before noon.

Directions of changes in public transport in Czestochowa - research results

The completed study carried out using the diagnostic survey method also allowed the authors to define the directions of priority changes in public transport in Czestochowa. To make this possible, it was necessary to identify the main problems in this area. For this purpose, the surveyed persons received a list of 11 factors, which to a lesser or greater extent determine the frequency of using public passenger transport. The task of the respondents was to rank these factors according to their opinions. The first items were supposed to present problems that, according to the respondents, were crucial, considering the operation of public transport in Czestochowa. The results of the research are presented in Table 2.

Table 2. Key problems of public transport in Czestochowa in 2017 and 2018

Problems Importance of the problem	2017	2018
limited accessibility to transport infrastructure	4.5	7.8
low level of comfort (crowded, no air conditioning, presence of homeless people, noise of the vehicles, etc.)	4.2	7.1
too long travel time (caused by e.g. traffic congestion)	3.7	7.1
low level of frequency of transport	3.3	7.0
unpunctual transport	3.0	7.1
poor technical condition of fleet	2.5	5.0
poor technical condition of stops and shelters	2.2	6.0
failure of fleet to meet the needs of people with mobility problems and mothers travelling with children in prams	1.8	4.8
excessively high ticket prices	1.3	4.4
low level of passenger safety inside bus/tram	1.3	4.5
low level of passenger safety during boarding and disembarking from bus/tram	1.0	4.9

Source: Authors' own compilation based on conducted studies

Limited access to the infrastructure is still a key problem of public transport in Czestochowa. The respondents in this case ranked this factor 1st or 3rd in the hierarchy. It should be noted that in 2018 the significance of this issue among the respondents increased. The respondents also indicated the importance of such problems as: too low level of travel comfort, too long travel time and unpunctual transport. On the other hand, the importance of the first problem for the respondents from the last year did not change (2nd position in the ranking), "too long travel time" and "unpunctual transport" changed the position in the ranking. "Too long travel time" changed from the 3rd to the 2nd position, while "unpunctuality of transport" - from the 5th position also to 2nd.

The four previously mentioned groups of problems were indicated by the respondents on a higher position than even the problems: low level of frequency of transport (3rd position), poor technical condition of bus stops and shelters (4th position), poor technical condition of the fleet (5th position), and low level of passenger safety when getting on and off the bus/tram (6th position). By analyzing the collected primary data, not adapting the rolling stock to the needs of people with mobility problems and mothers travelling with children in trolleys (7th position), low level of passenger safety inside the bus / tram (8th position) and too high ticket prices (9th position) can be considered issues of the least concern.

In addition, by comparing the data collected in 2018 to those obtained in 2017, it can be concluded that the problem related to ensuring passenger safety during boarding and disembarking from the bus/tram has taken on importance. The same applies to the next two problems which are the poor technical condition of the bus stops and shelters and unpunctuality of connections (a 3-place jump).

The last question in the questionnaire was created in order to find out the answer to the authors' question: what factors would encourage respondents to increase their use of public transport? (*Table 3*).

Table 3. Incentives to use public transport (survey results from 2017 and 2018)

Incentives to use public transport	Share of answers [%]	
	2017	2018
increase availability of public transport	37.3	46.8
increase frequency of transport times	37.3	59.6
ensure transport punctuality	43.1	42.6
reduce travel time	35.3	40.4
improve condition of stops and shelters	21.6	17.0
increase quality of rolling stock of public transport companies	52.9	31.9
improve passenger safety	33.3	23.4
adjust rolling stock to needs of people with mobility problems and mothers travelling with children in prams	23.5	27.7
lower price of public transport tickets	51.0	53.2
other, what?	3.9	2.1

Source: Authors' own compilation based on conducted studies

In the opinion of the respondents, the factor that could increase the use of public transport is primarily an increase in the frequency of transport (a year earlier - an increase in the quality of rolling stock carrying out transport). This proves that in the opinion of those surveyed, the quality of the public transport fleet is satisfactory. Economic considerations remain invariable to the respondents. In 2017 and 2018, the participants claimed that the ticket price is not a key issue of the operation of public transport in Czeszochowa. Despite this, in the opinion of every second respondent, a reduction in the price of a ticket would increase the frequency of travelling by public transport. An increase in the availability of public transport is another factor that would encourage travelers to use the services of the Czeszochowa operator. This answer was indicated by 46.81% of respondents. Ensuring transport punctuality and shortening the travel time is a priority factor successively for 42.6% and 40.4% of all the respondents. Increasing the quality of

the fleet performing transport is important for 31.9% of participants of the survey. The answers to adaptation of the rolling stock to the needs of people with mobility problems and mothers traveling with children in prams, improving passenger safety and improving the technical condition of bus stops and bus shelters were indicated successively by 27.7%, 23.4% and 17% of the respondents. One of the respondents also defined another factor that would increase interest in traveling by public transport. It was: raising the standard of the bus fleet. Due to the fact that one of the options was to choose the answer "increase the quality of the fleet carrying out transport", the respondent certainly wanted to emphasize the need to modernize the means of transport.

Conclusions

The results of our own research allowed the authors to solve the following research problem: what are the basic problems of the functioning of public transport in Czestochowa and has the rank of these problems changed in the examined period? It was also necessary for the authors to propose directions of activities, the implementation of which would make it possible to increase the attractiveness of this type of transport. Based on the main research topic and detailed issues, research hypotheses were developed. One of them was as follows: in 2018, compared to 2017, the share of people who very often use public transport has increased. In 2018, compared to the previous year, the percentage of responses of "very often" increased by 5.84%, "often" by 5.3% and "very rarely" by 2%, while the percentage of those choosing the "rare" option dropped. This decrease amounted to 13.06%. This may indicate an increase in interest in travelling by public transport in Czestochowa. The presented research results indicate that there are no grounds to reject the previously indicated research hypotheses.

Similar to 2017, the tram remains the means of transport that is most often used by passengers for their journeys. It should be noted, however, that the respondents are increasingly more willing to use the means of bus transport. Perhaps in the next year they will dominate in public transport. Nevertheless, there was no confirmation of another of the defined research hypotheses: in the analyzed years, the users of the urban transport infrastructure were more eager to use bus transport.

Another research hypothesis was defined by the Authors in the following way: in the respondents' opinion, limited access to the transport infrastructure is still an important problem limiting or preventing the use of public transport during public passenger transport. The results of our own research show that in both 2017 and 2018 this issue was a priority. Thus, the proposed research hypothesis has been confirmed. Therefore, increasing the quality of Czestochowa public transport should start by solving this problem. In the near future, introducing changes in other areas of bus and tram transport in the city should also be considered. We are talking about ensuring the punctuality of connections, limiting the occurrence of traffic congestion resulting in too long travel times and finally ensuring travel comfort. The respondents were also asked to answer the following question: what would encourage them to abandon individual means of transport in favour of

means of public transport? Analysis of the obtained responses allowed us to verify the research hypothesis: increasing the quality of the rolling stock providing transport is still a problem that should be eliminated in order to encourage citizens to use public mass transport. In the opinion of the respondents, such a factor is to increase the frequency of transport on routes. Therefore, the fourth research hypothesis did not find confirmation in the research results.

Comparing the data collected in year 2017 and 2018, it can be concluded that with such a small research sample it is difficult to determine whether the changes that were observed result from the noise or the error in collecting the samples. Because of that, the authors has carried out the Mann-Whitney U test allowing them to determine whether the obtained study results are real or random. It turned out that they are random. It means that the observed changes concerning the key issues of public transport and the factors whose aim are to encourage people to use public transport, cannot be regarded as relevant. From this, it follows that the presented study results should not constitute a final recommendation for changes introduced by local self-government units. The aim of these studies is only to draw attention to the main problems of the public transport in Czestochowa and/or constitute a starting point for further research.

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ANALIZA PROBLEMÓW FUNKCJONOWANIA PUBLICZNEGO TRANSPORTU ZBIOROWEGO W LATACH 2017 i 2018 NA PRZYKŁADZIE MIASTA CZĘSTOCHOWY

Streszczenie: W artykule wskazane zostały problemy funkcjonowania publicznego transportu zbiorowego w Częstochowie. Głównym celem autorki było zbadanie, czy znaczenie poszczególnych problemów dla użytkowników komunikacji miejskiej zmieniło się na przestrzeni lat 2017-2018. Realizacja celu była możliwa dzięki przeprowadzeniu badań własnych metodą sondażu diagnostycznego i metodą analizy danych. Wyniki badań wskazują na rosnące zainteresowanie komunikacją miejską, a w szczególności komunikacją autobusową. Popularyzację publicznego transportu zbiorowego w Częstochowie ogranicza jednak dostęp do infrastruktury transportowej. Ze względu na wiele uwarunkowań rozbudowa sieci transportowej w mieście jest trudna, czasem wręcz niemożliwa do zrealizowania. Istnieje jednak rozwiązanie, którego wprowadzenie jest możliwe bez konieczności poniesienia znacznych kosztów finansowych. Jest nim zwiększenie częstotliwości przejazdów taboru na poszczególnych liniach.

Słowa kluczowe: transport, transport pasażerski, miasto, problemy publicznego transportu zbiorowego