


The Szczecin Metropolitan Railway and its expectations on urban transport in the Szczecin agglomeration

Agnieszka Barczak

 <https://orcid.org/0000-0001-7584-7183>

West Pomeranian University of Technology in Szczecin
31 Janickiego St., 71-270 Szczecin, Poland
e-mail: agnieszka-barczak@zut.edu.pl

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Abstract

Transport is integral to every city, having a crucial impact on its functioning and development. As road infrastructure does not up to keep up to speed with the constantly growing numbers of vehicles on roads, new solutions are required. Fast urban railway systems are a solution that can reduce transport congestion, with environmental protection issues also taken into account. Following these reasons, the decision was made to build the Szczecin Metropolitan Railway (Szczecińska Kolej Metropolitalna, or SKM), consisting of four lines constructed using existing railway infrastructure, within the Szczecin Metropolitan Area (SMA). The construction works on the linear and point assets of the SKM are ongoing and will be concluded in 2022. Therefore, given the large impact of this project on the affected communities, the purpose of the present study was to analyze the expectations of the SMA population concerning the launch of the SKM via a large-scale questionnaire. For the purposes of the study, the following research hypothesis was defined: from the assessment of the affected residents, the introduction of the SKM will considerably improve the travel experience and greatly facilitate transit within the fast railway system's area of impact. From the analysis of the questionnaire, it could be concluded that the introduction of the SKM will have a positive impact on the improvement of transport within the Szczecin area and shorten travel times significantly.

Introduction

Many modern cities are overcrowded, and almost half of the world's population currently live in them today. Demographers predict that the number of city dwellers will continue to grow in the coming decades (Dembińska-Cyran, 2005). Furthermore, public transport in urban areas will need to meet the increasing transport needs of its residents. When functioning properly, these transport solutions ensure general access to health services, education, culture, jobs, as well as service providers and traders, and more. Therefore, local authorities are required to

make the necessary transport connections available to all residents.

An urban transport system is considered to be an organized entity of all modes of transport operating within an agglomeration of geographical areas. It includes current transportations assets, human accessible areas and intermodal links. It also accounts for transport infrastructure for all modes of transport operated by the different types of transport operators, and organizational and legal regulations (Piórkowska & Szpilko, 2019). The essence of urban transport can be defined as the process of planning, implementing and controlling all activities related to

meeting the urban agglomerations' needs in terms of management quality, quality of life, and development (Ballou, 2004). Since "urban transport enables cheap, safe and relatively fast journeys over long distances, mainly for those who do not have their own vehicles or driving licenses" (Zielińska, 2018), the topic of urban transport and its expansion and modernization are very important and must be kept up-to-date.

When analyzing urban transport issues, it is impossible to pass over important issues such as transport congestion and environmental protection. The greater the attractiveness of public transport, the higher the demand for such aspects should be, thus also leading to a significantly reduced burden on urban road infrastructure. The fewer vehicles on the road, the lower the exhaust fume emissions would be in the area, and thus the environmental burden. The creation of the Szczecin Metropolitan Railway (SKM) for the Szczecin Metropolitan Area (SMA) is therefore an investment that can bring multi-faceted benefits to the community. It should be pointed out here that urban transport is not restricted to the city but also serves suburban areas as well. This project is therefore intended to meet the city's needs with regards to both urban and suburban resident transport (Piórkowska & Szpilko, 2019).

Since Szczecin is a specific, extensive urban center, ensuring its proper development of passenger transport systems requires an appropriate approach. One of the most suitable solutions for the increasing transport needs of residents and users may be to use rail transport for urban and suburban commuting (Pietrzak, 2012).

The aim of this paper was to analyze the expectations of SMA residents in regards to the launch of the SKM. To achieve this aim, the following research hypothesis was defined: in the residents' assessment, the introduction of the SKM will considerably improve the travel experience and facilitate cleaner and more efficient transit within the fast railway system's area of impact.

In order to verify this hypothesis, a standardized interview was carried out on a sample group of residents living within the SKM's affected area. Since the survey was also intended to reach the elderly, who often do not use the Internet, personal interviews were planned. However, due to the restrictions of the COVID-19 pandemic, completed questionnaires from a representative group of 384 respondents could not be obtained. Therefore, this analysis was carried out on group of 150 respondents.

Public transport in the Szczecin Metropolitan Area

The Szczecin Metropolitan Area (SMA) is a functional urban area of 2,795 km² with a population of 686,582 (on September 1, 2020). It is a spatially continuous settlement area consisting of separate administrative entities and comprised of a compact urban area, together with its associated functional urbanized zone and the nearby settlements. The area is comprised of a core unit, the province capital city of Szczecin, and its functionally linked surrounding areas (BIP, 2020).

The SMA was established on April 15, 2005, and now brings together 15 members, including the Zachodniopomorskie Voivodeship, the City of Szczecin, the Police county, the City of Stargard, the City of Świnoujście, and the municipalities of Dobra Szczecińska, Goleniów, Gryfino, Kobyłanka, Kołbaskowo, Nowe Warpno, Stepnica, Police, Stare Czarnowo and Stargard (Figure 1).

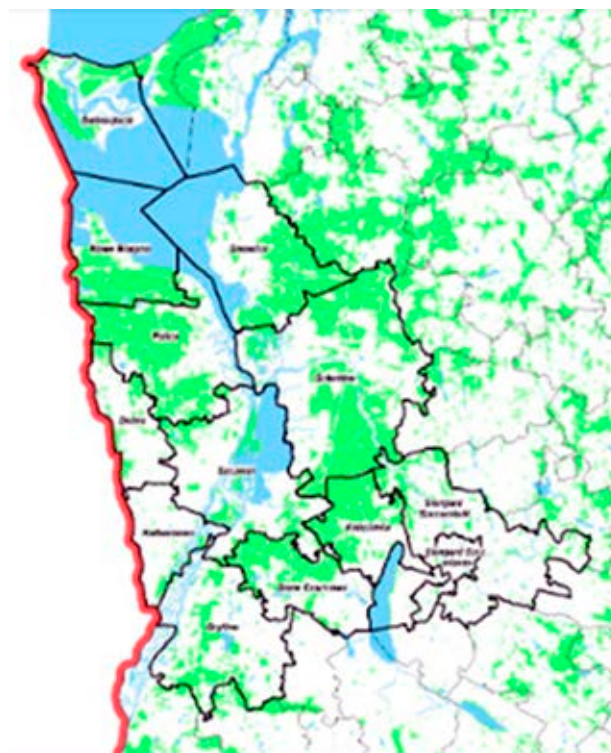


Figure 1. Szczecin Metropolitan Area (BIP, 2020)

The Szczecin Metropolitan Area boasts a frontier location that is unique on a national scale. In the absence of other large urban centers with a metropolitan potential on the eastern border of Germany, there is a realistic chance for the formation of a regional city area, expanding beyond national borders into the German side, thus extending the

influence of the metropolitan area of Szczecin into neighboring municipalities. The development of the Szczecin Metropolitan Area determines the importance of this functional center in the development of the Euroregion Pomerania, as well as cross-border and transnational cooperation in the Baltic Sea region (BIP, 2020).

Szczecin's transport network is largely determined by the city's division on the right- and left-sides of the Odra river. This has led to the need for public transport to be provided by many operators. These services are contracted by the primary transport organizer, namely Zarząd Dróg i Transportu Miejskiego w Szczecinie (Szczecin Road and Urban Transport Administration), or ZDiTM (Resolution, 2001a). The aim of the organization is, *inter alia*, "to organize and manage traffic on roads within the administrative boundaries of the city of Szczecin" (Resolution, 2001b). In addition, they also provide services to the neighboring municipalities. There are therefore five operators in Szczecin providing transport services to the residents of Szczecin and the neighboring municipalities:

- Tramwaje Szczecińskie Sp. z o.o.,
- Szczecińskie Przedsiębiorstwo Autobusowe Dąbie Sp. z o.o.,
- Szczecińskie Przedsiębiorstwo Autobusowe Kłownik Sp. z o.o.,
- Szczecińsko-Polickie Przedsiębiorstwo Komunikacyjne Sp. z o.o.,
- Przedsiębiorstwo Komunikacji Samochodowej (PKS) Szczecin Sp. z o.o.

Under the management of ZDiTM, there are 56 regular bus lines, 6 fast bus lines, 14 night bus lines, and 12 day tram lines operated in the city. There are 4 daily day bus lines connecting Szczecin and Police (a transit map is available at (ZDiTM, 2021)). There are bus services and a small number of rail services to Gryfino, Stargard and Goleniów (no rail service to Police), and private minibus services to selected destinations.

The current state of the public transport network does not guarantee fast and convenient transit between the various SMA municipalities. As a result of this, the Szczecin Metropolitan Rail project was developed aiming to significantly change the current transport system in selected areas.

The Szczecin Metropolitan Railway

General considerations for commuter rail lines have been, for example, presented by Koźlak, who notes that "demand for commuter rail has been

growing for several years despite reservations about the quality of the service provided. An appropriate policy ensuring its correct development could make it the basis for improving the competitiveness of public transport in metropolitan areas" (Koźlak, 2013). Rail transport in urban agglomerations is also mentioned in the book "Transport miejski. Ekonomia i organizacja", which points out that such railways "do not make full use of their transport capacity, due to a lack of coordination with other modes of urban transport" (Wyszomirski, 2007). Commuter rail systems in Poland have also been discussed by Raczyńska-Buława, who describes them on the basis of the agglomerations of Warsaw, Tri-City, Łódź and Kraków (Raczyńska-Buława, 2015). Some of the first scientific considerations concerning the SKM in Szczecin appeared, for example, in the work of Pietrzak (Pietrzak, 2012b; 2014), who focused on analyzing the feasibility of launching the SKM and on the very concept of its establishment as part of the Szczecin transport network. In turn, Drewnowski and Małachowski (Drewnowski & Małachowski, 2018) analyzed the efficiency of the services using the Szczecin Metropolitan Railway.

Urban and suburban rail transport solutions are used all over the world. Seidenglanz, Chvátal and Nedvedová (Seidenglanz, Chvátal & Nedvedová, 2014) made a comparison of urban and suburban rail transport in Germany and in the Czech Republic. Additionally, a study on the operation mode of suburban railway at home and abroad by Peng, Wang and Wu (Peng, Wang & Wu, 2019) was also carried out. In their opinion, "the suburban railway is regarded as the way of connecting urban centers and suburban areas, such as Satellite city, as well as reshaping the layout of urban space". Challenges and innovative solutions in urban rail transit network operations and management were presented for the example of China by He, Liang and Fang (He, Liang & Fang, 2016), while the analysis of urban rail transport in China for 2008-2015 was presented by Lu et al. (Lu et al., 2016).

A very interesting article also concerning the re-use of previously abandoned railway lines has also been published. This is all the more important as this was a key consideration for the SKM for many sections of its railway tracks. According to the authors, "the abandoned railways could be transformed into urban rail transit systems, including light rail, urban tram lines, suburban railways, or urban roadways with a combination with the existing transportation network. Many urban railways had been constructed along with the cities,

such that they are always located in the center area with a relatively high-density population. Retaining the transportation function and serving the surrounding neighborhoods might be one of the most effective strategies for the reuse of abandoned railways” (Zhang, Dai & Xia, 2020).

The SMA Szczecin Metropolitan Railway project (SKM, 2020) aims to build a major public transport network using the already existing railway lines (the no. 351 line between Stargard and Szczecin Central station, the No. 273 line between Gryfino and Szczecin Central station, the No. 401 line between Szczecin and Goleniów branching into the LK 402 and 434 lines to Szczecin–Goleniów Airport, the No. 406 line along with the modernization of the

Szczecin–Police section and construction of a second track between Szczecin Central station and Szczecin Turzyn) within the territory of the following municipalities: City of Szczecin, City of Stargard, Goleniów, Gryfino, Kobylanka, Police and Stargard. A transit map is shown in Figure 2.

The railway transport system will be supplemented by bus and tram lines tasked with taking over the job of transferring passengers to and from interchange stations. The building of interchange stations combining the various modes of transport with the appropriate associated infrastructure (stops with P&R and B&R parking lots equipped with elevators and disabled ramps, as well as transport integration devices, i.e. ticket machines/validators), will

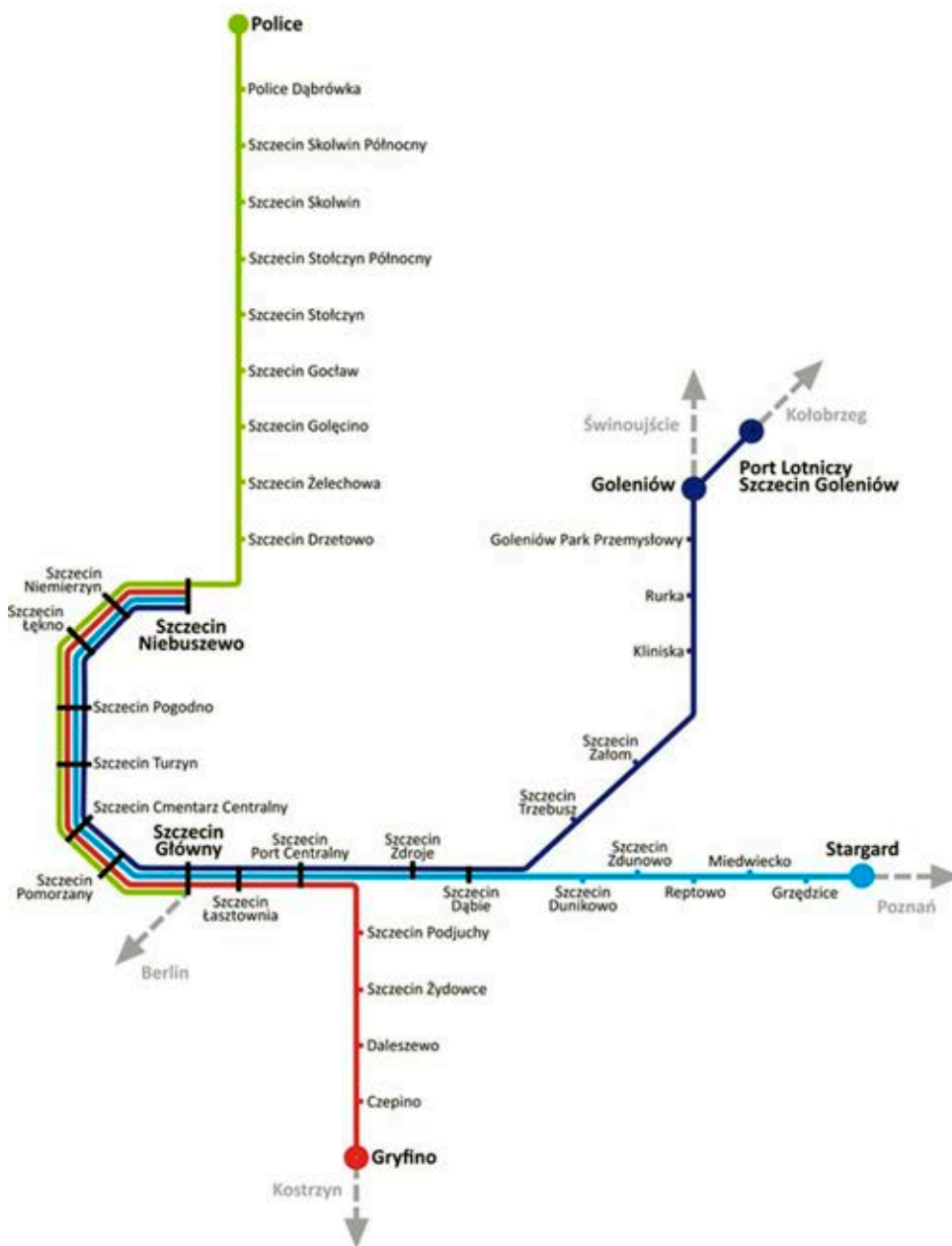


Figure 2. SKM transit map (Nasze Miasto, 2020)

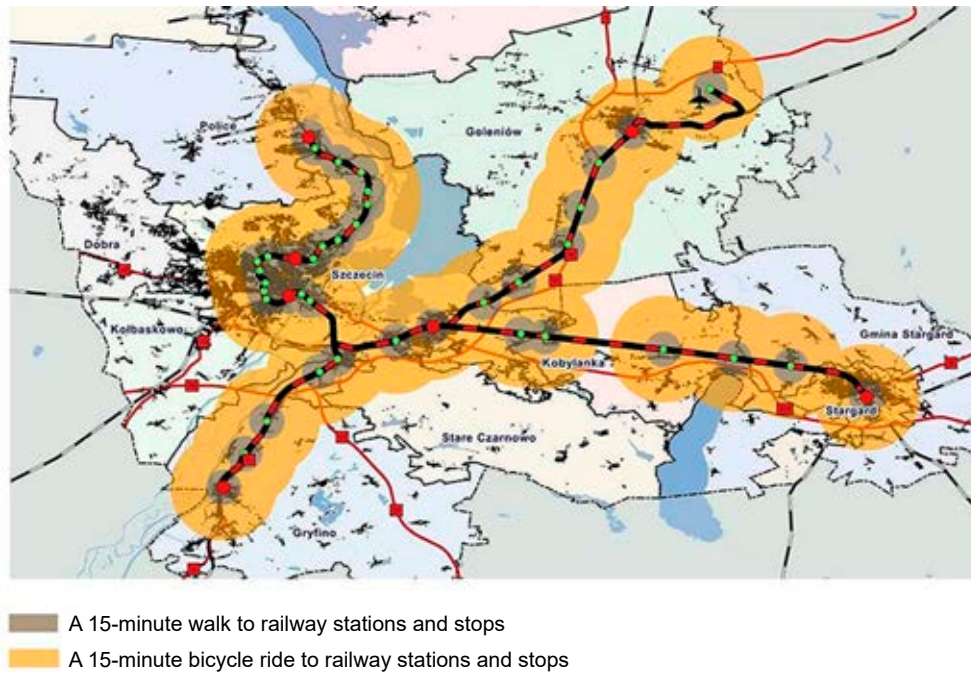


Figure 3. Accessibility of SKM stops and stations (Wyborcza.pl. 2019)

increase the role of public transport in relation to individual transport.

Therefore, as also stated previously, the project aims to increase the number of commuter rail passengers within the specified areas and contribute to reducing car traffic density in the area. To this end, analyses have been carried out on the pedestrian and bicycle accessibility of SKM stops and stations, the results of which are depicted in Figure 3.

The project also aims to improve the separation of urban and freight traffic by using modern railway traffic control equipment on the 406 railway line currently under modernization, to build a second track from Szczecin Central to Szczecin Turzyn stations, and to separate the SKM from long-distance traffic by building the SKM main station within the Szczecin Niebuszewo railway station, while reserving long-distance traffic for Szczecin Central station.

Research results

As mentioned previously, 150 personal interviews were conducted using a questionnaire. The survey was carried out between May 11 and 31, 2020, with the respondents selected randomly. 74% of the respondents were women and 26% were men. Other characteristics of the respondents are shown in Figure 4.

The results of the study indicate that future SKM users expect the commuter rail to ensure high quality transit while satisfying their transport needs. This

may be confirmed by the share of responses concerning the elements characterizing the Szczecin Metropolitan Railway project. Where respondents indicated all the elements they believed were necessary for the SKM to function correctly. The respondents replies are shown in Table 1.

Table 1. Expectations of the SKM

Characteristic	Number of responses	
Reduced travel time	147	98.00%
Improved travel experience	145	96.67%
Punctuality	139	92.67%
Reduced bus and tram overcrowding during peak hours	124	82.67%
High service frequency	131	87.33%
Safe travel	126	84.00%
No need for multiple transfers	97	64.67%
Good degree of connection with other public transport modes	112	74.67%

The reduced travel time and punctuality expectations are the result of the residents' experience with high traffic congestion and the resulting insufficient road capacity. The SKM, unlike other modes of urban transport, will not be affected by traffic congestion.

Reduced bus and tram overcrowding will also occur due to the distribution of traffic over a larger number of services. This will also improve the travel experience. At present, no changes to the existing transit map and no reduction in the number of other urban transport services are planned after the launch

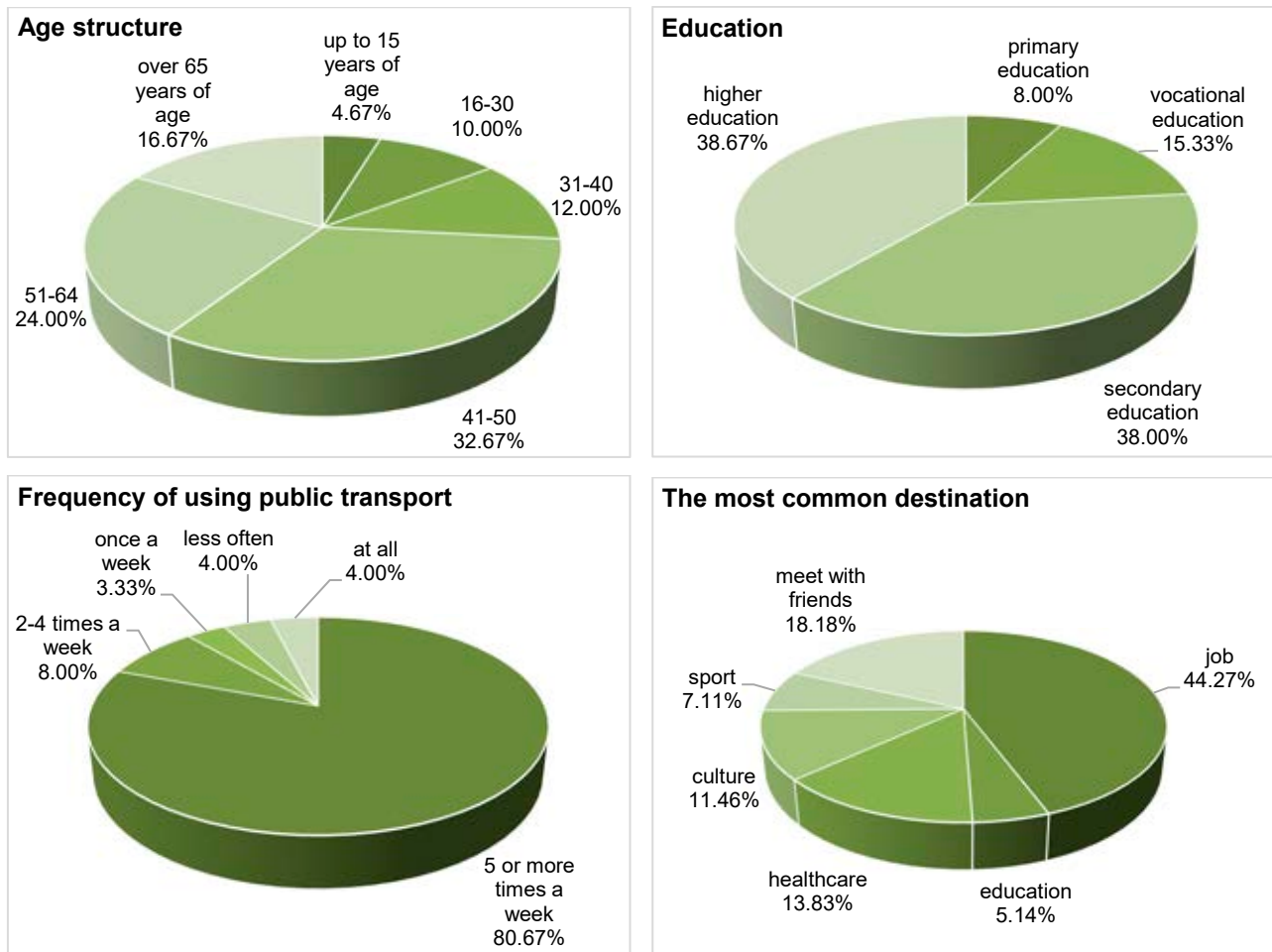


Figure 4. Characteristics of the respondents

of the SKM. The only changes planned are to the timetables in order to ensure the interconnection of the services provided by all the different urban transport modes.

Persons transferring to the SKM will enjoy greater travel safety than they will on other means of transport. This is due to the extremely low accident rate statistics for the rail transit. Unfortunately, road accidents involving buses and trams are not a rarity in Szczecin. In 2020 alone there were nine accidents involving public transport vehicles, seven of which included trams.

Passengers also hope for a high frequency of SKM services and their good connection with other public transport modes. This last expectation is, according to the project developers, to be met to the fullest extent possible.

The questionnaire also asked about air pollution caused by high road traffic densities. This problem was mainly highlighted by young respondents, who were hopeful that many passenger car users would opt to take advantage of the new urban transport solution.

Conclusions

Given the increasing number of cars on roads and the decreasing number of parking spaces in urban areas, the solution offered by the SKM should be able to convince as many people as possible to use public transport. Therefore, continuous monitoring of the quality of the services provided by the SKM and a reasonably flexible introduction of improvements will play a very important role.

This study shows that the residents of the rail development area are very enthusiastic about the planned launch of the SKM. The rail is expected to significantly facilitate passenger transport within SMA, allowing for a significant reduction in travel times.

Analyses of the results confirmed the hypothesis that, in the residents' opinion, the introduction of the SKM will considerably improve the travel experience and facilitate communication within the fast railway system's area of impact. It therefore appears appropriate to survey more respondents in order to obtain a more representative study group. This will

allow for a broader analysis and for conclusions to be drawn covering the entire population of the Szczecin Metropolitan Railway's catchment area.

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