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DOI: 10.35117/A_ENG_25_05_02

Assessment of direct connections provided by public transport between the left-bank and right-bank areas of Szczecin

Abstract: The article presents selected organizational changes in Szczecin's public transportation system between 2014 and 2024. The focus is primarily on direct connections between the city's two central hubs, located on opposite sides of the Oder River. The main evaluation criterion was the number of bus and tram line services, considering the type of rolling stock used, dysfunctions within the transportation system, and alternative travel options. The discussion also includes ongoing and planned investments, whose completion may influence the transportation preferences of passengers.

Keywords: Public transportation; Direct connections; Rolling stock and rail vehicles

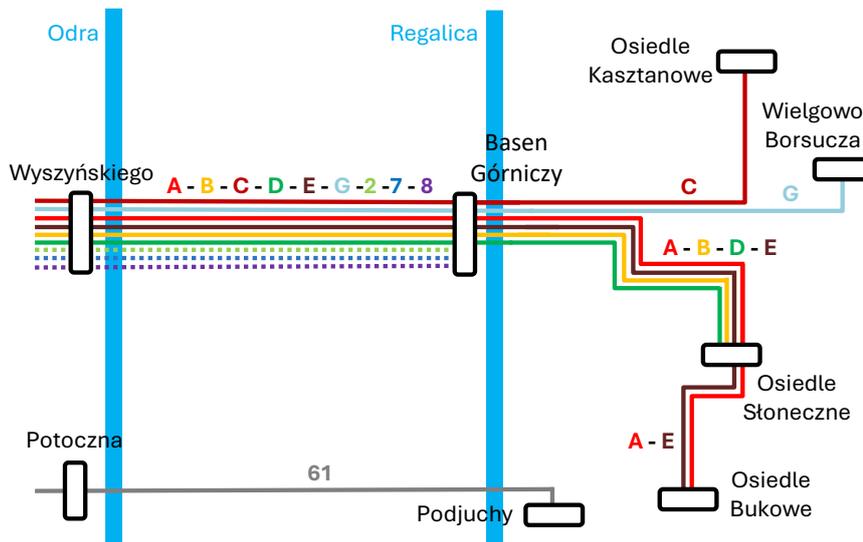
Introduction

The spatial specificity of Szczecin is clearly delineated by a division into two heavily urbanized centers located on either side of the Oder River. The left-bank center is characterized by a concentration of urban, regional, national, and international services, constituting the largest cluster of workplaces, academic institutions, and cultural establishments. In contrast, the right bank, separated from the rest of the city by the Międzyodrze - Wyspa Pucka area and the Regalica River, primarily serves residential purposes, with a focus on local and suburban services. The development of these centers and their symbiosis is determined by the quantity and quality of transportation connections, crucial for efficient passenger service over significant distances. Despite constant intensification of motor traffic, the operation of the internal road and street network is gradually deteriorating, compounded by various factors such as unfinished sections of the inner-city bypass, limited number of bridges and their restricted capacity, and the postponement of the expansion of the second phase of the Szczecin Rapid Tram (SST), among others. As a result, traffic disturbances are increasingly widespread, negatively impacting public transportation efficiency. Recent reorganization efforts have failed to achieve significant progress, notably affecting direct travel between the two poles of the city. Moreover, these changes have revealed a host of new problems, which are addressed in this article.

Direct transportation organization

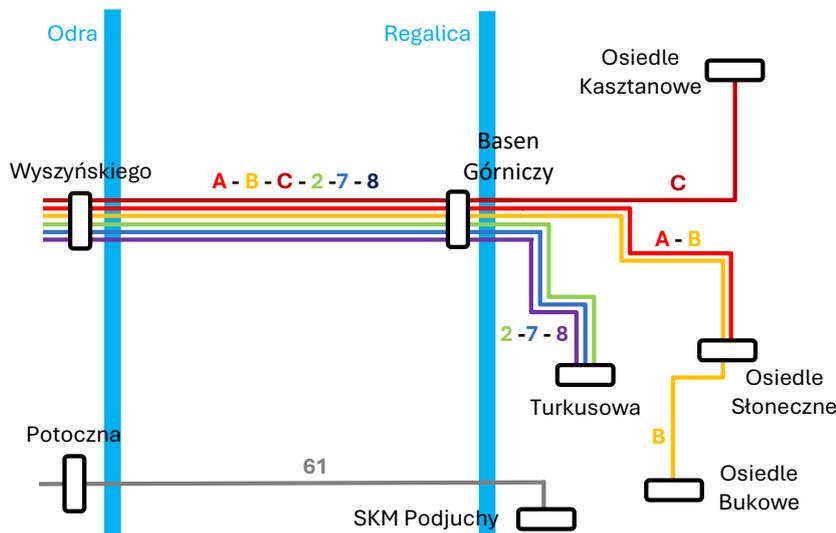
Before 2015, the tram transport system in Szczecin was limited to the left-bank area, terminating at the Basen Górnicy terminus (Figure 1) [11]. As a result, direct transportation to the right bank was provided exclusively by express bus lines (A, B, C, D, E, G) and a standard bus line (61). The notable advantage of this arrangement was the availability of numerous, relatively fast, and direct connections, even for passengers traveling to the city center from the most distant southeastern housing estates. The launch of the Szczecin Rapid Tram necessitated a partial reorganization of the existing network, which was largely restructured to accommodate the new infrastructure. The priority became ensuring bus access

to transfer points and the Turkusowa terminus, which plays a central role in this system (Figure 2). This prioritization arose because the tram tracks were located far from major residential areas, public utility facilities, and commercial-service centers [12, 13]. The extension of tram lines (2, 7, 8) provided direct access for residents of only two districts (Zdroje, Słoneczne). However, it simultaneously led to the elimination of a significant portion of the popular express bus routes. Notably, after numerous protests by local communities, the express bus line A was reinstated in mid-2024 (Table 1) [20].



1. Direct connections between the right-bank and left-bank parts of the city in 2014

Source: Author's own work



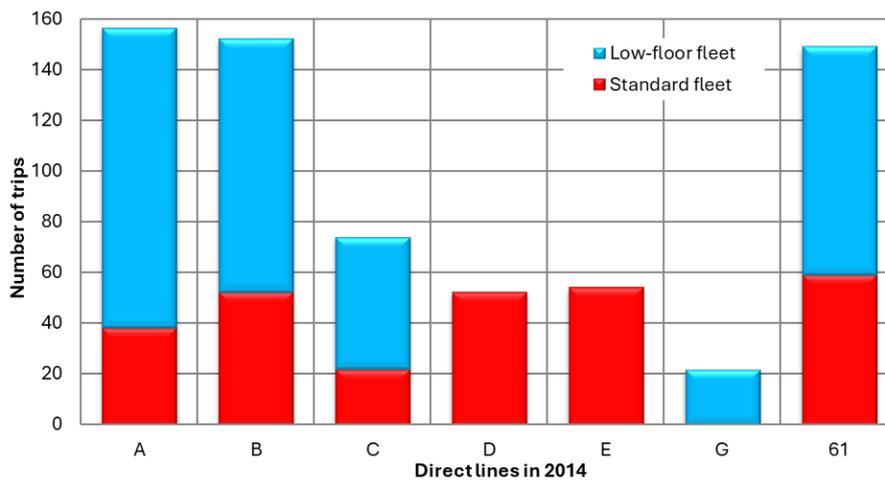
2. Direct connections between the right-bank and left-bank parts of the city in 2024

Source: Author's own work

Bus and tram rolling stock

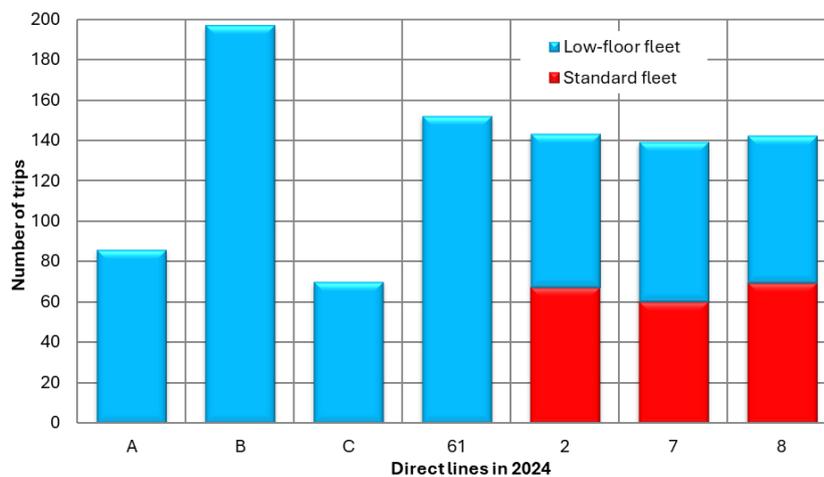
Data presented in Figures 3 and 4 indicate that the total number of direct trips increased by nearly 30% during the analyzed period. The discontinued express lines (D, E, G) operated exclusively during peak traffic hours, coinciding with periods of heightened passenger demand. A similar situation occurred with trams only during the post-COVID-19 pandemic period when driver training sessions were suspended for sanitary reasons. Due to staffing

shortages, the frequency of line 8 was reduced from September 16, 2023, to February 19, 2024 [21]. Additionally, a renewal of rolling stock by Szczecin’s transport operators is evident. For buses, only low-floor vehicles are now in use, both for direct and feeder routes connecting passengers to key transfer hubs. There is a clear trend toward fleet standardization, which has a significant impact on rational fleet management, contributing to reduced maintenance and repair costs (Figure 5) [3, 7]. For example, SPA "Dąbie" Sp. z o.o., by the end of 2024, operates exclusively buses from two manufacturers: Solaris (Urbino 12, Urbino 18) and Mercedes-Benz (O530 Citaro, O530 G Citaro) [19].



3. Number of direct trips conducted in 2014

Source: Author's own work based on [14]



4. Number of direct trips conducted in 2024

Source: Author's own work based on [21]

In the case of trams, the situation is entirely different, as Szczecin's tram fleet is among the most diverse in Poland. For many years, the condition of the track infrastructure did not allow for the operation of modern low-floor vehicles [4]. Consequently, during the first decade of the 21st century, only high-floor trams were purchased, including both new ones (Konstal 105N2k/2000) and used ones (Tatra KT4DtM and T6A2D) [15]. The latter purchases were driven by the need to reduce replacement costs and accelerate the retirement of the oldest vehicles, whose repair was either impossible or economically unviable [5]. As a result, the first low-floor tram, the PESA 120NaS, began operating on February 11, 2011, followed by the debut of an updated version, the PESA 120NaS2, two years later [20]. The

launch of the Szczecin Rapid Tram did not bring any changes in this regard, as the chosen approach was integrative, linking the existing (conventional) network with the newly built section from Basen Górniczy to the Turkusowa terminus. This integration ensured direct passenger transport between the two poles of the city. However, over 46% of the trips are still conducted using high-floor trams (Figure 6).



5. Examples of bus fleet standardization: a) O530 G Citaro, b) O530 Citaro
 Source: Author's own work



6. Examples of SST fleet diversity: a) 105N2k/2000, 120NaS2 (x2), b) KT4Dt, T6A2M
 Source: Author's own work

Dysfunctions of the transportation system

Studies on passengers' transportation preferences conducted in recent years in various cities have consistently highlighted the demand for direct travel to the destination as one of the most frequently mentioned priorities [6, 8, 9, 10]. Respondents emphasized that this factor has a decisive influence on the decision to use public transport, far outweighing the cost of such services. As a result, the demand for express bus services remains high, even though ticket prices for these routes are twice as high as those for indirect connections (Table 1). Another critical factor is the total travel time, which is shorter and does not require waiting for a transfer at designated interchange hubs. Examples of studies addressing this issue, including those focused on the Basen Górnicy terminus, have been presented in [2]. It is also worth noting that in the second half of 2024, residents of the Wielgowo housing estate submitted a petition to reinstate the operation of line G (Table 2), which had previously provided direct access to the city center within 35 minutes [21]. Currently, journeys involving transfers have doubled this travel time.

Tab. 1. Implementation of direct and indirect trips on selected sections

Source: Author's own work based on [21]

Type of route	Line number	Travel time [min]	Cost of travel [PLN]	Transport hub
Osiedle Słoneczne - Wyszyńskiego	A	17	6	-
	B	19	6	-
	54/84/91/94 + 2/7/8	4 + 16 = 20	3	Turkusowa
Osiedle Kasztanowe - Wyszyńskiego	C	36	8	-
	96 + 2/7/8	31 + 10 = 41	4	Basen Górnicy

Tab. 2. Timeline of significant events in direct transport from 2014 to 2024

Source: Author's own work based on [20]

Date	Type of Event	Mode of Transport
29.08.2015	Launch of Turkusowa Loop for lines 2 and 8	Tram
16.06.2016	Launch of Turkusowa Loop for line 7	
14.12.2016	Launch of P+R (Park and Ride) at the Hangarowa tram stop	
29.01.2018	Launch of the bus section of the Turkusowa Loop	Bus
	Suspension of service for lines D and F	
01.09.2018	Opening of the Hangarowa bus stop	
09.10.2021	Suspension of service for line G	
01.07.2024	Resumption of service for line A	

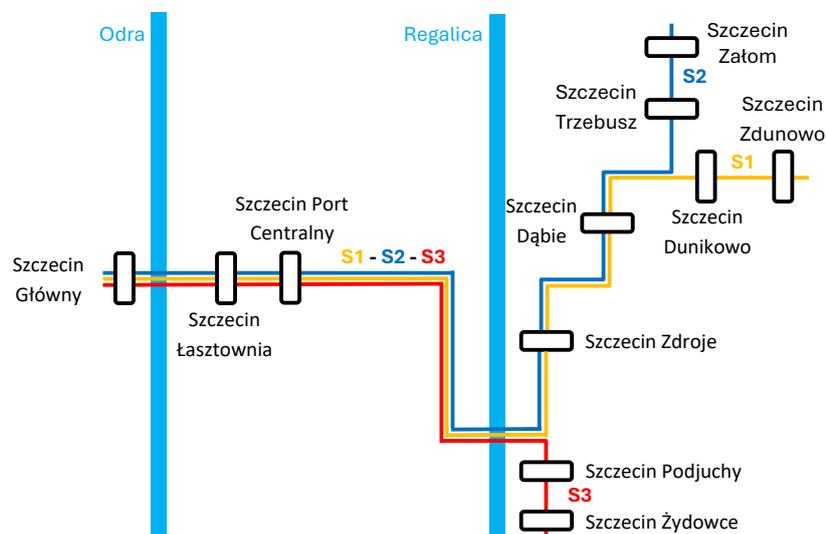
Another issue is the complete lack of flexibility in the SST network, which constitutes its major drawback. Any disruptive factor on the Turkusowa – Wyszyńskiego section leads to a paralysis between the left-bank and right-bank parts of the city [1]. Examples of selected failures and their causes are summarized in Table 3. In the event of an unexpected incident, the limited number of express buses are unable to handle the increased passenger flows, and the organization of replacement transport becomes unfeasible to a satisfactory extent. This results from the lack of sufficient fleet and staffing reserves and the necessity of reallocating vehicles from currently serviced routes. This exacerbates the disruptions, increasing the number of dissatisfied passengers. Additionally, in the case of minor incidents, no additional measures are taken, as regular tickets are accepted on express buses (A, B, C). During this time, drivers stop at all bus stops along the aforementioned section.

Tab. 3. Example failures on the Szczecin Rapid Tram route
Source: Author's own work based on [16, 17]

Date	Incident site	Cause of failure
29.08.2015	Jaśminowa ZUS	Pantograph damage
	Basen Górniczy	
31.08.2015	Jaśminowa ZUS	
22.11.2015	Most Pionierów	Rail damage (detachment)
29.01.2016	Most Długi	Rail damage (subsidence)
24.10.2018	Most Pionierów	Road accident
	Basen Górniczy	
18.06.2021	Most Długi	Rail damage (buckling)
19.07.2021	Gdańska	Overhead line power supply failure
12.07.2022	Basen Górniczy	Overhead line damage caused by an excavator
31.07.2022	Energetyków	Tram derailment
15.12.2022	Brama Portowa	Overhead line power supply failure
30.04.2024	Wyszyńskiego	Rail damage (buckling)
21.11.2024	Basen Górniczy	Tram damage
02.12.2024		

Szczecin Metropolitan Railway

An interesting alternative for travelers may be the Szczecin Metropolitan Railway (SKM), which began operations on March 10, 2024. This includes not only direct access to the left-bank city center but also to businesses located in industrial zones and parks. As part of this, entirely new stations have been constructed, such as Szczecin Trzebusz and Szczecin Żydowce (Figure 7). This solution should be convenient for residents of the city’s most distant neighborhoods and for commuters from Stargard (S1), Goleniów (S2), and Gryfino (S3). An additional incentive is the Szczecin Metropolitan Ticket, with various zonal options available for purchase starting September 1, 2024. Currently, this is a temporary solution (monthly), but there are plans to introduce the option of single-trip payments. The ticket allows travel on all modes of transport available within the Szczecin Metropolitan Area. To support this, local governments are creating a modern environment around the SKM stations, primarily focusing on public transport stops and parking facilities (buffer, park&ride, bike&ride). The second phase of the investment is also underway, which plans to connect the town of Police to the system by the end of 2025 [18].



7. SKM connections between the right-bank and left-bank parts of the city in 2024

Source: Author's own work

Conclusion

In recent years, a reorganization of the connection network has been carried out as part of the integration with the Szczecin Rapid Tram, with the primary goal of ensuring feeder services to terminals and transfer hubs. This approach aimed to provide the necessary service to passengers who lost the ability to travel directly between the central parts of the city, as well as to offer coordinated transport on the right bank. A definitive assessment of this process is not possible, as the introduced changes impose a specific mode of transport that, despite numerous advantages, remains relatively inflexible. As a result, there are calls to reinstate express bus lines, which would guarantee fast and comfortable travel for residents of the most distant and densely populated neighborhoods. An improvement in this situation could be seen with the implementation of the second phase of the SST, which is still in the planning stage and is unlikely to be developed until the completion of the SKM. However, it should be noted that, in its current form, the railway lines provide a solution that is beneficial primarily for the areas surrounding the city proper, as it supports the relocation of residential functions beyond its administrative boundaries.

Source materials

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