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Managing of Perceived Passenger Safety in Integrated Transport Hubs in the Metropolis GZM*

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Abstract

The article analyzes the management of passengers' perceived safety at integrated transport hubs within the Metropolis GZM (GZM - Górnośląsko-Zagłębiowska Metropolia). The theoretical section discusses the importance of mobility and accessibility in the context of social integration and passenger inclusion at intermodal hubs. The literature indicates that the perception of safety depends primarily on users' subjective feelings, with women and older individuals more frequently reporting a higher sense of risk. A quantitative study was conducted at five major transport hubs: Katowice Dworzec, Katowice Sądowa, Chorzów Rynek, Dąbrowa Górnicza, and CP Gliwice (Centrum Przesiadkowe – ang. Transfer Hubs) covering a sample of 265 respondents. The results show that the majority of passengers feel safe (67%), while over 79% do not experience fear of crime. The highest level of perceived safety was recorded at Katowice Sądowa, whereas the lowest was observed at Chorzów Rynek and CP Gliwice. Women and older passengers reported lower levels of perceived safety compared to men and middle-aged respondents. The findings confirm that perceived safety constitutes a key element of the passenger experience and a prerequisite for fair and sustainable mobility. The authors highlight the need to improve lighting, enhance staff visibility, and upgrade signage, particularly at the lowest-rated hubs. The objective of this study is to assess passengers' perceived sense of safety at five integrated transport hubs within the GZM Metropolis.

Keywords: perceived safety; public transport; Metropolis GZM; integrated transfer nodes

Introduction

In recent years, the issue of free movement for people with special needs has gained growing attention in research and policy discussions. Individuals with special needs often encounter limited or restricted possibilities to travel between cities using different modes of public transportation. These challenges primarily result from insufficient adaptation of infrastructure and transfer points that form parts of integrated interchanges. Therefore, integrated nodes should be designed to ensure full accessibility, eliminating architectural and functional barriers for all users.

The fundamental concept behind transfer nodes lies in the integration of various modes of transport across cities and metropolitan areas. This intermodal approach is crucial not only for efficient urban mobility but also for enabling both short- and long-distance travel. While long journeys are typically planned based on the most convenient mode of transport, such as trains, buses, or airplanes, so-called "last-mile" connections are increasingly recognized as essential, particularly in large metropolitan regions. Addressing these challenges requires the development of transfer nodes that adhere to the principles of universal design.

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Literature Review

Mobility plays a vital role in fostering the social inclusion of individuals with disabilities. Through the ability to travel and combine multiple modes from different branches of transport, people with special needs can cover significant distances. Integrated Transfer Nodes[1] (ITNs), as defined in the Act on Public Transport (Act of December 16, 2010, on Public Transport), serve as hubs that connect various forms of public transportation. This legal act, referenced throughout this study, establishes specific requirements regarding accessibility and universal design, ensuring that the needs of people with special needs are considered. These provisions address not only accessibility but also the safety of individuals and property, as well as the protection of health within ITN areas. Furthermore, the Act on Ensuring Accessibility for People with Special Needs (Journal of Laws of 2019, item 1696) mandates the fulfillment of minimum standards in architectural, digital, and information-communication accessibility. Its primary goal is to improve the capacity of all citizens, including persons with disabilities to access public services, thereby promoting social participation and inclusion.

Social inclusion denotes a process aimed at guaranteeing that every individual, regardless of social, economic, cultural, or physical differences, can actively participate in social, political, and economic life. It constitutes an essential component of public policy and social development strategies focused on removing barriers that marginalize specific groups. Public transport is a key instrument in fostering inclusion, as it provides access to employment, education, healthcare, and other vital services. Reliable and user-friendly public transport serves as a cornerstone of sustainable urban and regional growth, helping to reduce exclusion and enhance social mobility. In this context, social inclusion means designing and operating transport systems that remain both accessible and affordable for all, including people with disabilities, older adults, low-income populations, and residents of rural areas. Ensuring inclusivity in public transport is a fundamental part of sustainable development and building an equitable society. Well-functioning and universally accessible transport networks can play a major role in diminishing social and economic inequalities. Nevertheless, achieving these goals requires ongoing monitoring, flexible policymaking, and the participation of all relevant stakeholders in the planning and maintenance of inclusive mobility systems (Allen and Farber, 2020; Boisjoly and El-Geneidy, 2021; Cui et al., 2019).

Integrated transfer nodes are pivotal components of contemporary transport networks, allowing smooth connections between various modes of travel such as buses, trams, railways, and shared bicycles. A central element of their functionality is accessibility for users with special needs, among them, people with disabilities, older adults, parents with small children, and those with reduced mobility. Great emphasis is placed on ensuring infrastructure and facilities that enable all passengers to navigate the space independently. The accessibility of such nodes is governed by specific guidelines and standards that must be observed by designers and infrastructure operators. Within the European Union, documents such as Regulation (EC) No 1371/2007 on rail passengers rights establish minimum accessibility standards (Regulation EC No 1371/2007). In Poland, similar obligations are defined in national construction regulations and public transport legislation (Sitarz et al., 2023). Persistent barriers often stem from insufficiently adapted infrastructure and the absence of proper procedures. Additional difficulties arise from the need to keep pace with evolving legislation and rapidly changing technologies that quickly render earlier solutions obsolete. The high financial burden of modernizing public spaces also poses a serious challenge. Another factor contributing to accessibility gaps is the lack of unified regulations, standards, and best practices that could serve as a consistent procedural framework (Zając, 2016; Nielsen, 2024).

In recent years, studies have consistently emphasised the importance of perceived safety among passengers using integrated transfer nodes, i.e. transfer points. The key conclusion from this line of research is that there are differences in the perception of safety among different user subgroups, which may influence their behaviour and transport choices. Many studies showed that women have greater concerns about personal safety than men, which significantly influences their decisions regarding the choice of transport mode (Moodley and Venter, 2022). These results are consistent with the findings of Ibrahim et al., who demonstrated that perceived safety is a key factor in transport behaviour, especially in urban areas such as the Dominican Republic (Ibrahim et al., 2023). In turn, the research by Alonso et al. confirm this relationship, indicating that an increase in perceived safety is associated with less dependence on public transport in favour of walking or cycling (Alonso et al., 2020).

Integrated transfer nodes are an important part of multimodal transport networks, serving as key transfer points between different modes of transport, such as buses, trains and cycling infrastructure. Their design and functionality significantly influence how users perceive safety. As public transport systems become increasingly

[1] Integrated Transfer Nodes means in Poland the same with Integrated Transfer Hubs or Integrated Transfer Interchanges

integrated, understanding passengers perceived safety at transport hubs is becoming increasingly important. The perception of safety and security has a significant impact on passengers willingness to use integrated transport, which translates into the overall efficiency of the system and user satisfaction. In transport literature, the term "safety" usually refers to the absence of risk of harm or danger, while "security" refers to protection against deliberate threats such as crime or terrorism (Mandhani et al., 2023; Li et al., 2023). Both concepts have distinct, albeit partially overlapping, meanings for passenger experiences. Ceccato et al. emphasise that perceptions of safety can be significantly shaped by the environment, including crime levels and spatial design, which can induce fear and affect overall feelings of safety (Ceccato and Loukaitou-Sideris, 2021). Consequently, both physical security measures and psychological perceptions play an important role in shaping how safe passengers feel in transport spaces (Ma et al., 2022).

The objective of this study is to assess passengers' perceived sense of safety at five integrated transport hubs within the GZM Metropolis. The research analyzes the overall level of perceived safety and fear of crime, and compares the hubs with the highest and lowest safety ratings. Furthermore, the article presents recommendations for the planning and design of safer and more user-friendly transport hubs.

Methodology

A quantitative survey was conducted to assess passengers needs, satisfaction, and perceived safety at selected integrated transport hubs in the Metropolis GZM. The research focused on five major integrated transport hubs within the GZM region, selected based on their size and passenger volumes:

- Katowice Railway Station (Katowice Dworzec)
- Katowice Sądowa Metropolitan Bus Station (Katowice Sądowa)
- Chorzów Rynek Interchange (Chorzów Rynek)
- Dąbrowa Górnicza Center Interchange (Dąbrowa Górnicza)
- Gliwice Interchange Centre (CP Gliwice)

The study was conducted using a quantitative research approach supported by modern research methods. The entire study was carried out through an electronic survey, eliminating the need for paper questionnaires, thereby aligning with the values of ecology and corporate social responsibility. Participation was open to all passengers aged 20 and above who use public transport at the five designated intermodal transport hubs.

The research employed diverse strategies to ensure broad respondent outreach, including both direct in-person engagement and online participation.

The study was conducted in the following forms: Face-to-face interviews carried out by trained interviewers stationed at the five selected intermodal hubs; Online self-administered questionnaires. The data collection took place between March and April 2025.

The survey covered the following thematic areas:

- Introductory questions (e.g., travel purpose, assessment of mobility level, identification with groups of people with special needs);
- Demographic questions (e.g., gender, age, place of residence);
- General questions regarding the use of public transport (including needs, frequency of use, and satisfaction level);
- Detailed questions concerning a specific interchange hub (including needs, frequency of use, and satisfaction level).

The sample consisted of 50.6% women and 48.3% men. The age distribution of respondents was structured to ensure a minimum of 50 participants in each age category. Consequently, passengers of different age groups were represented, with each group constituting approximately 19–20% of the total sample.

The questionnaire included 32 questions in total:

- 27 substantive questions (closed, semi-open, and open-ended formats), and

- 5 demographic questions (age, gender, place of living, etc.).

It covered four thematic blocks:

1. introductory questions (e.g., travel purpose, physical mobility, special needs status),
2. general questions on public transport use (e.g., frequency, travel time, satisfaction, transfers),
3. hub specific questions (e.g., satisfaction, ease of navigation, availability of timetables, possibility of transfers, perceived safety, accessibility for passengers with special needs), and
4. sociodemographic questions.

Respondents were informed of the study's purpose at the beginning of the survey and were thanked graphically upon completion. Participation was voluntary and anonymous.

Descriptive statistical analysis was applied to all collected responses. Frequency distributions and percentages were used to summarise passenger characteristics and their evaluations of each hub. For key variables, such as perceived safety, fear of crime, satisfaction, and ease of navigation, average ratings were calculated on a five-point Likert scale (1 = very poor to 5 = very good).

Results

The survey revealed that a majority of respondents generally felt safe while using integrated transport hubs in the Metropolis GZM. Specifically, 67.0% of passengers declared that they feel safe when moving through the hubs, while 24.9% reported feeling moderately safe, and 6.4% stated they do not feel safe (Fig.1). In parallel, 79.2% of passengers indicated they do not experience any fear of crime at the hubs, whereas 19.6% reported some fear (Fig.2).

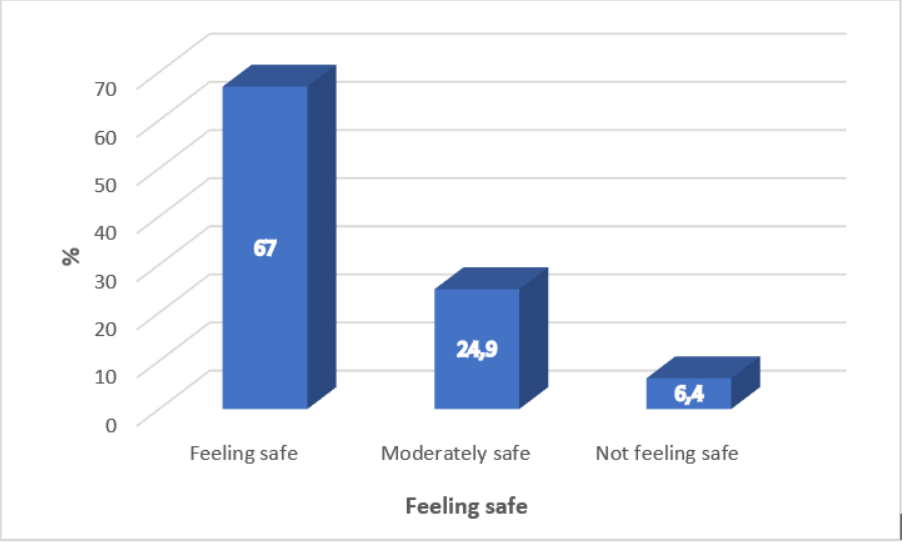

Figure 1: Feeling safe

These results suggest that, although most users perceive the hubs as safe environments, a substantial minority experience moderate or low feelings of safety, which could influence their mobility behaviours.

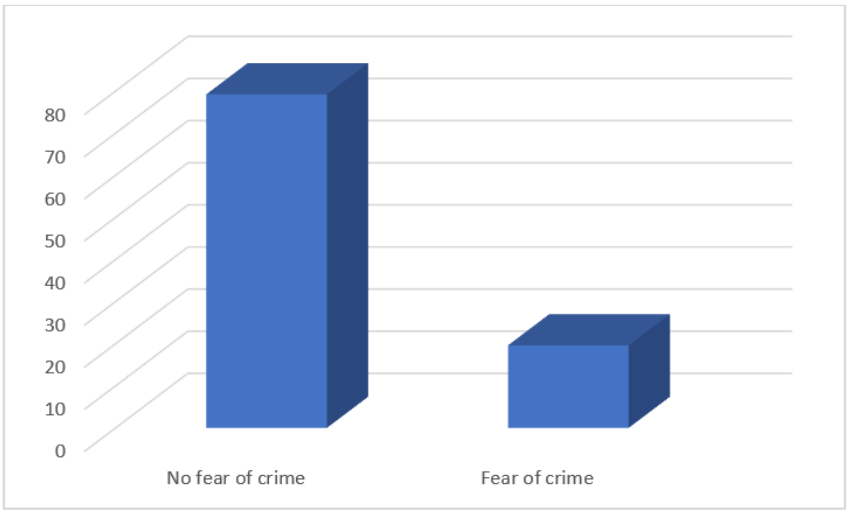

Figure 2. Fear of crime

Perceived safety varied notably by gender (Fig.3). Men reported significantly higher levels of perceived safety than women: 78.0% of men stated they felt safe at the hubs, while only 59.0% of women did so. Moreover, 38.8% of women reported that they do not feel safe (including those who feel only moderately safe), compared to 22.0% of men.

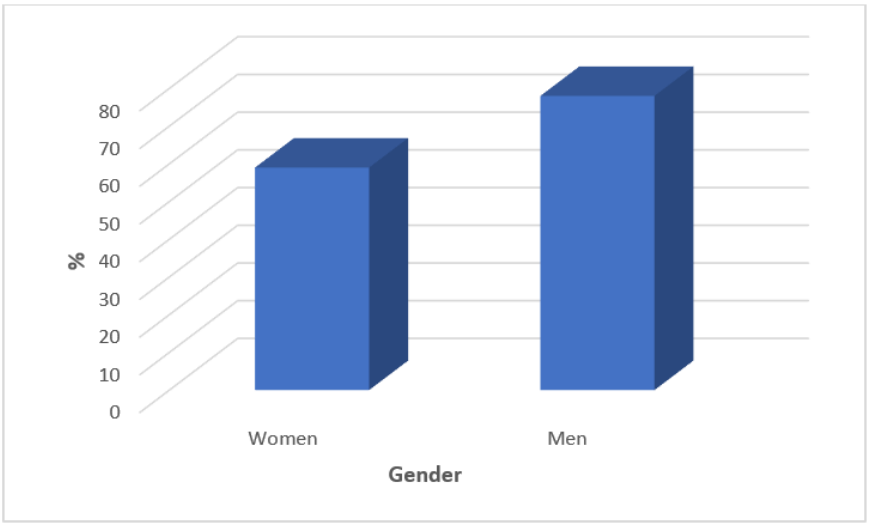

Figure 3. Feeling safe and gender

The distribution of extreme scores reinforces this gap: only 6.0% of women declared feeling “very safe”, compared to much higher shares among men. These findings indicate that gender is a crucial factor shaping perceptions of safety and confirm patterns observed in previous studies that women tend to feel more vulnerable in public transport environments.

Age was also associated with differences in perceived safety (Fig.4). The highest levels of perceived safety were observed among respondents aged 31–40 and 41–50, with approximately 73% in both groups declaring they feel safe.

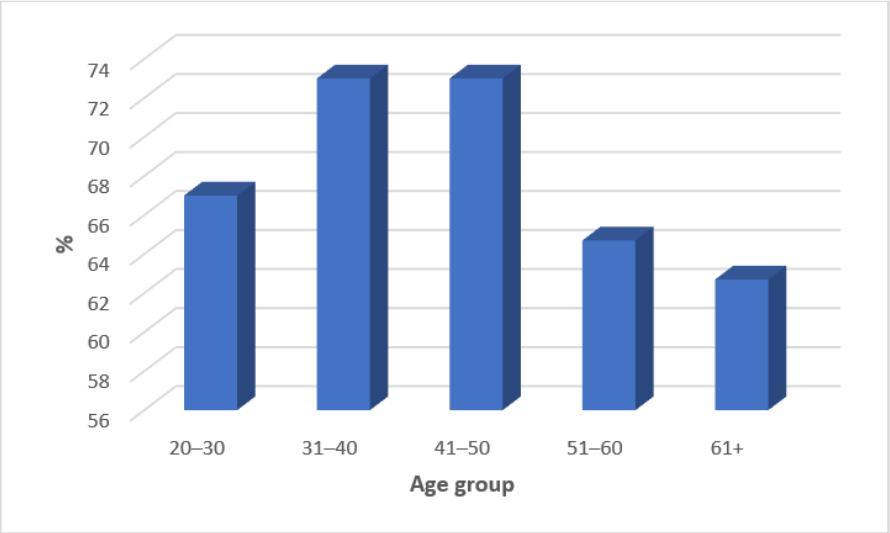

Figure 4. Feeling safe in age groups

Perceived safety was slightly lower among the youngest group (20–30 years), where 67% felt safe, and lowest among older passengers: 64.7% in the 51–60 age group, and 62.7% among those aged 61 and over reported feeling safe. Conversely, older groups had the highest shares of respondents reporting low or no feelings of safety, 35.3% in the 51–60 group and 37.3% among 61+, compared with 26.9% among 20–30-year-olds. These findings suggest that perceived safety declines with age, which may relate to greater perceived vulnerability or reduced physical mobility. Clear spatial variations in perceived safety emerged across the five studied hubs (Fig. 4).

The highest perceived safety was reported at Katowice Sądowa, where 94.0% of passengers stated they feel safe and only 6.0% do not feel safe (average score: 4.2 on a five-point scale) (Fig.5). Dąbrowa Górnicza ranked second, with 72.7% feeling safe and 27.3% not feeling safe (average: 3.9). Katowice Dworzec followed closely with 71.2% safe vs. 28.8% unsafe (average: 3.8).

In contrast, two hubs (CP Gliwice and Chorzów Rynek) exhibited notably lower levels of perceived safety. In CP Gliwice only 53.7% felt safe and 46.3% did not, and In Chorzów Rynek, where the split was exactly 50% safe vs. 50% not safe (average: 3.4) (Fig.5).

This indicates a clear perception gap between the best- and worst-rated hubs: the share of passengers feeling safe at Katowice Sądowa was nearly twice as high as at Chorzów Rynek.

Perceptions of fear specifically linked to crime followed a similar pattern. Across all hubs, 79.2% of respondents stated they do not feel fear of crime, whereas 19.6% reported experiencing such fear. Fear of crime was highest among women, older passengers, and users of the Chorzów Rynek and CP Gliwice hubs.

Conversely, the lowest reported fear of crime occurred among men, middle-aged passengers, and users of the Katowice Sądowa hub (Fig.5).

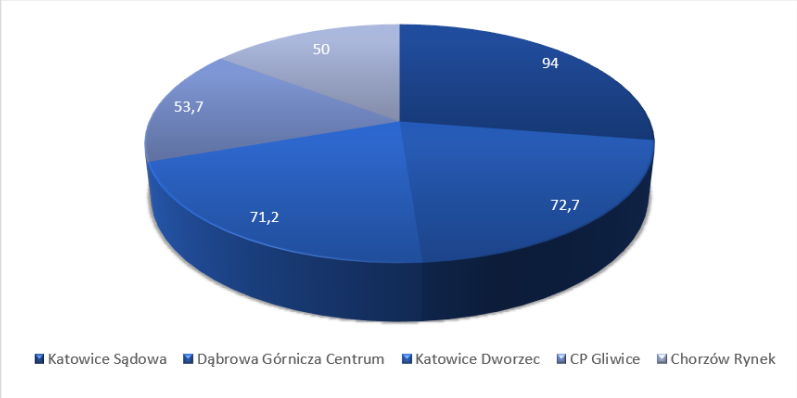

Figure 5. Feeling safe in transport hubs

This supports the interpretation that fear of crime is closely linked to overall feelings of safety but may also be affected by hub-specific environmental cues such as lighting, visibility, crowding, and staff presence (Fig.6).

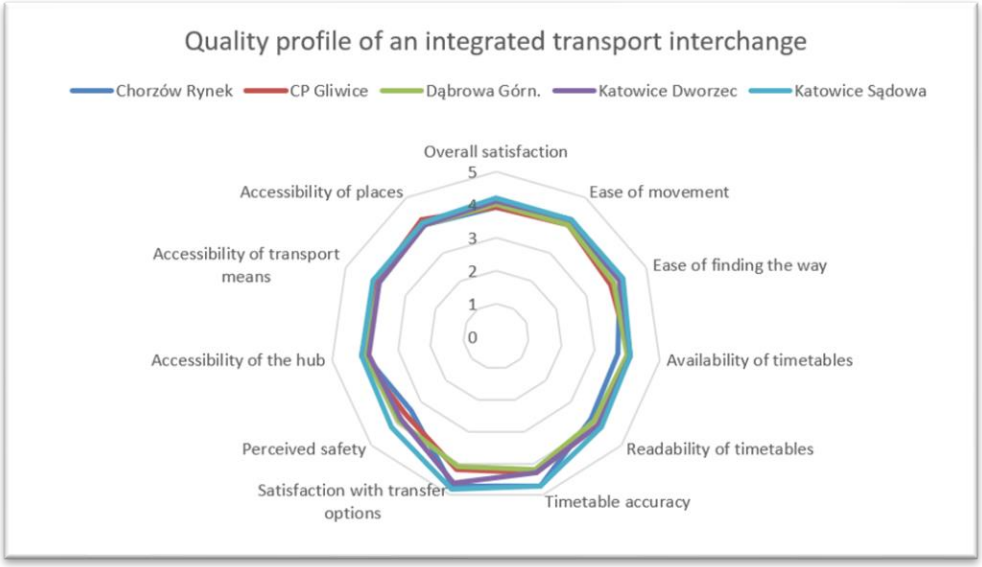

Figure 6. Quality profile of an ITI

Discussion

The findings of this study demonstrate that the majority of passengers perceive integrated transport hubs (ITHs) within the GZM Metropolis as safe environments. A total of 67% of respondents reported feeling safe, while 79.2% indicated that they did not experience fear of crime. These results suggest generally positive perceptions of safety across the metropolitan transport network and are consistent with previous studies, which indicate that users of public transport systems in high-income urban areas typically report moderate to high levels of perceived safety despite objectively low crime risks.

However, the analysis revealed significant differences in perceived safety across the five examined hubs. Katowice Sądowa obtained the highest ratings (94% of passengers feeling safe; M = 4.2), while Chorzów Rynek and CP Gliwice recorded the lowest scores (50% and 53.7% of passengers feeling safe; M = 3.4 and 3.6, respectively).

Overall, the study confirms that most passengers feel safe at GZM integrated transport hubs, although differences exist between individual locations. These findings highlight the importance of continuous monitoring of safety perceptions and targeted improvement efforts at hubs with lower ratings, such as Chorzów Rynek and CP Gliwice.

Ensuring a consistently high sense of safety across all hubs contributes to passengers' comfort and to the overall quality of metropolitan mobility services.

Based on previous publications that have examined transfer hubs, the most frequently identified deficiencies and challenges at the analyzed locations include insufficient information provision (particularly directional signage), the quality of basic infrastructure, and the spatial integration of the hub (Czekała et al. 2017). The results of hub assessments, derived from passenger evaluations, can be utilized to develop improvement and modernization plans for those hubs where the most significant problems have been identified. Low passenger ratings may indicate the need for measures aimed at enhancing the comfort and user-friendliness of transport hubs (Olszewski et al. 2014).

Conclusion

This study analysed the perceived safety of passengers at five integrated transport hubs (ITH) in the Metropolis GZM and identified demographic and location factors that influence the sense of safety. Three main conclusions emerged from the analysis. Firstly, the overall assessments are positive – 67% of respondents declared that they feel safe at the hubs, and 79.2% do not feel afraid of crime. Secondly, there are clear differences between individual hubs, the highest safety ratings were given to Katowice Sądowa, while the lowest were consistently recorded in Chorzów Rynek and CP Gliwice. Thirdly, there are noticeable differences based on gender and age, women and older people report a significantly lower level of safety than men and middle-aged users.

The results confirm that perceived safety is a key dimension of the public transport user experience and a prerequisite for ensuring fair and sustainable mobility. The high scores achieved by Katowice Sądowa indicate that a transparent spatial layout, good visibility and lighting, clear information and effective operational presence can significantly increase the level of perceived safety throughout the system. In contrast, the weaker results of Chorzów Rynek and CP Gliwice suggest the existence of specific, remediable environmental and organisational deficits that may increase the feeling of insecurity (e.g. limited visibility, inconsistent information, lack of visible service).

For hubs managers and metropolitan authorities, the results indicate the need to implement targeted, evidence-based measures:

1. Visibility and lighting – increasing luminance levels, eliminating dark and isolated areas, improving passive surveillance through open lines of sight.
2. Operational presence – increase the visibility of trained staff or patrols and ensure active CCTV monitoring and communication of this to users.
3. Navigation and information – improve the continuity of signage and the accuracy of timetables, especially in transfer corridors and outside peak hours.
4. Transfer experience – simplifying walking routes, reducing unnecessary level changes and locating modes of transport close together to shorten and facilitate transfers.
5. Universal design – prioritising solutions that benefit women and older people (e.g. availability of seating, barrier-free routes, help points, well-lit waiting areas).

These measures should be implemented first in Chorzów Rynek and CP Gliwice, while Katowice Sądowa can serve as a model facility in terms of design and operational standards.

Future research should adopt a mixed approach, combining surveys with observation lists, spatial analysis of environmental factors, and administrative data. Before-and-after evaluations of changes in lighting or staffing, as well as qualitative interviews with women and older people, would provide a better understanding of the mechanisms that influence the sense of safety and help to select the most cost-effective interventions. Extending the analysis to additional hubs and night-time conditions would also strengthen the external validity of the results.

In summary, most passengers in the Metropolis GZM feel safe in integrated transport hubs, but the perception of safety varies spatially and demographically. Focusing investment on environmental quality, visible operational presence and an inclusive navigation system, especially in the lowest-rated hubs, is a concrete and short-term path to improving perceived safety and, consequently, the attractiveness and fairness of metropolitan public transport.

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