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Role of the Multimodal Centre in Shaping Sustainable Mobility and Quality of Life in a Medium-sized City – Nysa Case Study

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Summary
The article presents the results of the evaluation of the relationship between the way of shaping public space related to ensuring sustainable mobility in the city and the experiences of users influencing the perceptible quality of life. The assessment was carried out for one of the medium-sized cities, which was included in the list of cities threatened with exclusion. The subject of the evaluation was the city multimodal centre organised around the railway station in Nysa. The aim of the research was to identify a selected, small group of key challenges and recommendations aimed at improving user experience in using a multimodal centre in the city. The article highlights the role of service infrastructure (stops, stations, transfer centres) in the ecosystem of sustainable urban mobility. Each element of this ecosystem (designed in accordance with the idea of universal design) can have a significant impact on the improvement of the perceptible (declared) quality of life in the city, if the applied solutions positively influence the user's experience (including the sense of comfort and care). The authors focused on the current state of play in order to identify the key areas of intervention needed to improve the user experience in using the multimodal centre in a small and medium sized city. Attention was paid not only to the aspect of infrastructure accessibility, but also to the relations between urban, architectural and engineering solutions in the context of their impact on the assessment of the multimodal centre in terms of its usefulness in three dimensions: functional, rational and perceptible. The summary outlines the process of achieving from the basic solution standard to interoperability. This knowledge will allow better decision making in the planning of user-oriented projects in the city. This may be of particular importance when the conscious objective of the action is to achieve the level of interoperability expected by users of facilities such as, inter alia, a multimodal centre, which is one element of an urban public space with a significant impact on the quality of life of the citizen.

Keywords: user experience, quality of life, universal design, interoperability, sustainable mobility

1. Introduction

The 21st century has already been called the urban century, since more than half of the world's population now lives in cities and towns [8]. Although the problems of mega-cities and metropolises are discussed worldwide, in Europe a significant part of the population still lives in large and medium-sized cities. The phenomenon of strong urbanisation makes it a key task to improve the quality of life in increasingly congested and polluted cities in the context of 21st century development. Given the existential threat to humanity, such as global warming and the resulting climate change, congestion, or demographic changes, climate issues have now become crucial, which is undoubtedly a well-founded trend [8].

However, this should not hide the fact that sustainable development is not just about environmental problems. It also includes social and economic issues that are directly related to the quality of the built environment and the organisation of everyday life [8]. They concern public spaces, the solutions that shape the habitat of human, which is a modern city, and the solutions on which the feeling of the quality of our lives depends. A key role in this respect is played by the possibility of comfortable mobility during everyday activities. In the context of climate and demographic challenges, the pursuit of sustainable mobility, with the provision of solutions that can significantly reduce the carbon footprint, is placed among the pro-development priorities. In this perspective, rail transport is currently experiencing a renaissance. The

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idea of sustainable mobility should therefore be developed around these two modes of transport. However, to make this possible in the first instance, these two modes of transport need to become more attractive by ensuring a high level of safety, accessibility and usability. In practice, especially in small and medium-sized cities, the attractiveness of this type of transport or its accessibility is below expectations. In Poland, this situation has a chance for a significant improvement both due to large infrastructural investments in the railway sector and such civilization pro-development projects as the Central Transport Port (cf. Figure 2).

In order to achieve a better quality of life effect, it is necessary to ensure a high standard of uniform solutions for each element of the sustainable mobility ecosystem that is developed in parallel with the concept of mobility as a service (MaaS – *Mobility as a Service*). This service promotes an approach that allows everyone to plan a comfortable and reliable "door-to-door" journey. In this context, a very important role is played by the direct passenger service infrastructure, which consists of stops, stations and multimodal centres. The article, based on the example of current (cf. Figure 6, Figure 7, Figure 8,) and planned (cf. Figure 9) solutions, indicates the scale of challenges related to improving the quality of life in such urban centres with particular emphasis on sustainable mobility. The bone of this mobility should be based on rail transport and its public spaces (service infrastructure), which should set the standard for multimodal centres. These centres provide a kind of gateway to the ecosystem of sustainable mobility which, for the most part, is also the gateway to modern cities (Figure 1).

The current solutions in this area are the result of different processes over the decades in cities, which have been developed at different speeds and standards. Hence, substandard and restrictive solutions, at both service and infrastructure level, make it too often the case that private cars are used, due to the limited possibility to travel by alternative means of transport [1, 6]. Developing the new habits, that are needed to achieve sustainable urban mobility, is a long-term process and requires a missionary and holistic approach to ensure mobility in every element of the ecosystem (cf. Figure 1).

It is recommended that sustainable mobility, in which public transport plays a significant role, should be seen as attractive to the end-user. It is particularly important that such experiences are also created for PRM (Person with reduced mobility), which includes not only people with disabilities (in Poland 12,2% according to 2011 National Census of Population and Housing) but also older people (21,4%), children (18,1%) [16] and their carers when they travel with them. Moreover, this group includes, among others, pregnant women or people who do not speak the local language. The PRM group's participation in urban space may constitute almost half of all traffic participants (mobility). Therefore, solutions attractive to this group (PRM) may determine the global perception of sustainable mobility as attractive.

A greater share of public transport in the modal split in a city may prove difficult or even impossible to achieve without improving all the elements of the ecosystem that may affect its attractiveness. In the following, the basic ecosystem elements that can signifi-

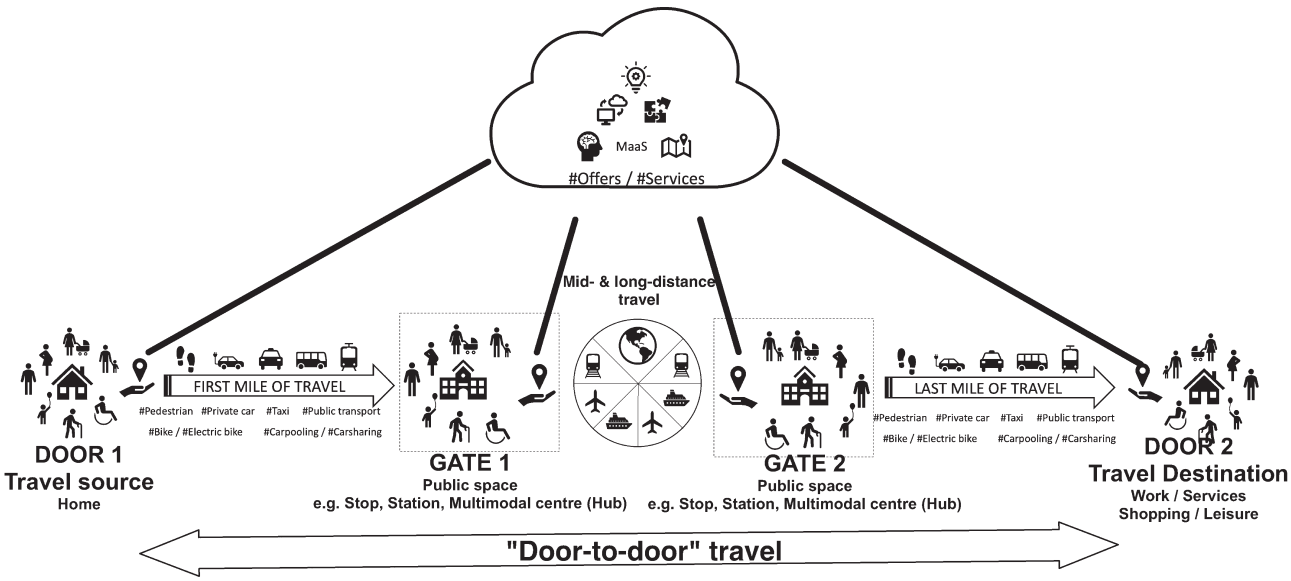

Fig. 1. Ecosystem of mobility [own elaboration]

cantly influence the subjective assessment of a user with the attractiveness of public transport for private motorised transport are shown:

- Offer: punctuality, frequency, timetables, reliability,
- Urban infrastructure i.e. stops, interchanges, stations: accessibility, interoperability, aesthetics, usefulness,
- Rolling stock: driving comfort, accessibility, efficiency, interoperability,
- Organisation: spatial accessibility, low physical effort with use and transfer, clear and comprehensible information,
- Other: economic accessibility, security, integration with other modes of transport, efficient dynamic passenger information.

Therefore, apart from the transport offer (e.g. timetable, cost of travel), the location of the boarding and disembarkation points or the quality of the rolling stock, the quality of the public space related to traveller direct service is very important. This aspect has often been underestimated, but in the future, it may be one of the most important factors in achieving and maintaining sustainable urban mobility. For this reason, the article focuses on the quality of the public space directly related to traveller service.

2. Theses, methods and objectives of the study

The impact of urban public space (in this case, passenger service space) on the quality of life of the resident is indisputable. However, still too often, striving for optimal solutions at the level of user experience has less priority than meeting formal and legal conditions in public purpose undertakings. The pursuit of solutions that comply with technical regulations does not guarantee the improvement of the attractiveness and accessibility of solutions for the user.

A thorough analysis of facts resulting from the space encountered [3], i.e. shaped historically as a result of various unrelated processes and objectives, may be a foundation for the process of qualitative change of this space for many cities. The results of the analysis can be a useful basis for evidence-based public governance and inspire the search for solutions to improve the quality of life of residents. Starting from the current standards and further searching for their compatibility with the missing (created) standards, the result is the shaping or implementation of open standards templates, which are the basis for ensuring interoperability.

The aim of the analyses was to assess the existing state of affairs in order to recommend solutions to improve user experience by identifying areas for which it is recommended to use open standards in the process of shaping the interoperability of public space elements of an multimodal centre. In the research work, apart from the literature study, the following research methods and techniques were used: questionnaire survey, multi-criteria evaluation, Sati preferences testing, expert evaluation with elements of accessibility audit and Road Safety audit, ex-post evaluation with the use of a list checking compliance with the requirements of TSI PRM, method of spatial analysis according to the Walk Score methodology.

The choice of methods and techniques was made on the assumption that they can be used without the need to involve significant resources for the implementation of research in the process of planning public objectives and undertakings. Such research and analysis can also be the basis for obtaining greater value from the available data (facts) in the implementation of evidence-based development policies. An authors' critical look, in order to outline the scale of challenges related to the analysed issue, made it possible to formulate general recommendations for solutions improving the experience of persons using offers and solutions in the public transport space. These recommendations are suggested to be used in the context of the search for innovative and user-oriented open standards that can help achieve sustainable mobility objectives more quickly.

3. Case study – justification for the choice of a city example

As indicated in the report prepared by the Polish Academy of Sciences [13] a number of medium-sized cities in Poland are at risk of exclusion. These cities face many socio-economic problems but are also characterised by dependence on private cars for citizens mobility to meet daily needs, which stems from the transport policy of the last century. The Report classifies 122 cities recognized in Polish conditions as medium and at risk of exclusion, i.e. non-voivodeship cities with more than 20 thousand inhabitants and cities with 15–20 thousand inhabitants that are the seats of poviats [17].

The development problems of these cities obviously have an impact on both the objective and perceptible quality of life of the inhabitants. One of the factors hindering sustainable development is the substandard service of the residents in terms of ensuring the expected mobility. From a social point of view, transport accessibility and the opportunity to increase sustainable mobility, with rail transport as a backbone, is an important challenge for local authorities. Therefore, the authors analysed the multimodal centre of one of the medium-sized cities marked in the Report [17].

The city of Nysa in the Opolskie Voivodeship was selected, which is also indicated in the investment process related to the improvement of transport accessibility at the national level as one of the cities requiring intervention in order to improve the transport of this city with the rest of the country by improving the railway connection (cf. Figure 2).

Nysa is a poviat town in the Opolskie Voivodeship, located on the border of the Sudeten Foothills and the Silesian Lowlands, on the Nysa Kłodzka River and the artificial water reservoir Nysa Lake. As of 31.12.2018 Nysa (the city) had 44.397 inhabitants and the population density was 1614 inhabitants /km^2, the city occupied an area of 2751 ha. The city of Nysa is the seat of the urban-rural municipality of Nysa. There are no electrified railway lines to Nysa. The quality of the railway track excludes access at a higher speed both from Opole and from Wrocław and Brzeg. Currently, the Nysa-Opole railway tracks are being modernized and conceptual works on modernization of the multimodal centre around the railway station, which is owned by the local government, are in progress.

4. Research results – synthesis

The quality of life study was conducted in the extent to which it is influenced by the accessibility of rail transport (guaranteeing sustainable mobility of residents), in terms of subjective and objective assessment. In other words, the overall infrastructure conditions [13] related to the functioning of the Nysa multimodal centre have been assumed to be the objective quality of life in the aspect under study. Urban and architectural-engineering criteria were examined. In terms of subjective quality of life, the question was asked about the feelings of users (UX) about using a multimodal centre. The subjective aspects were examined on the basis of the assessment of 145 respondents. An extended definition of accessibility has also been adopted, which is understood both in terms of infrastructure (location, no obstacles to access, ease of movement, the ability of each user to reach themselves, etc., etc.) and the availability of services related to the traveller direct service (railway and additional service).

Assessment according to urban criteria

The pedestrian accessibility of the multimodal centre is described using the walkscore [17]. This indicator is used in research and development planning of transport hubs in American cities. One of the examples for the application of TOD analysis of this indicator was "Analyzing Light Rail Station Area Performance in Phoenix" [17].

The multimodal centre is located at Racławicka Street in Nysa. This location received 79/100 points

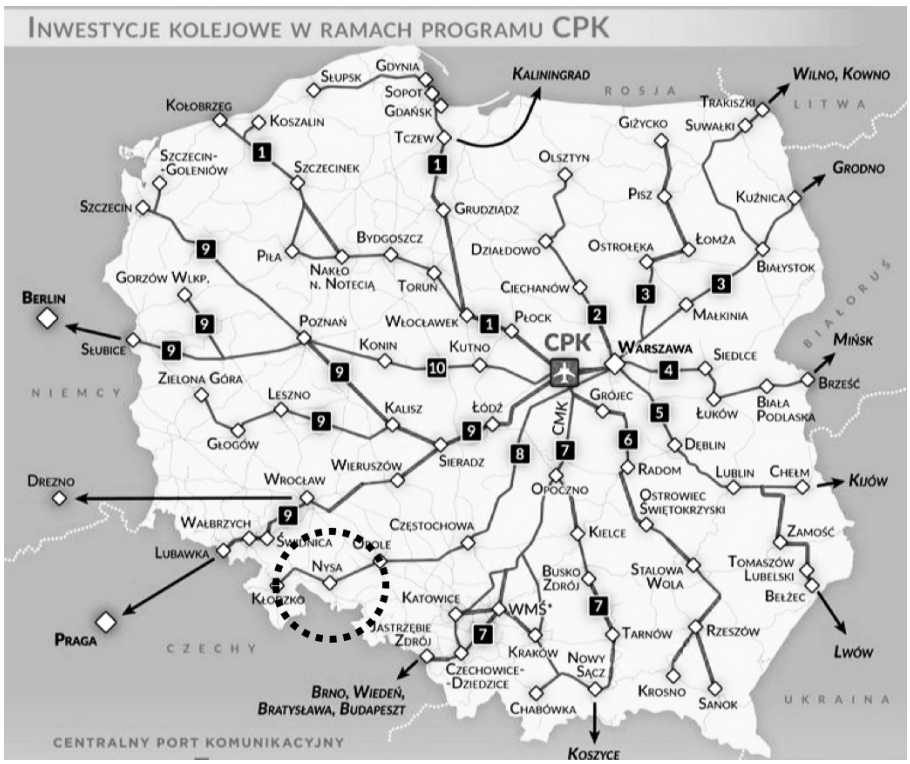

Fig. 2. Nysa's location in the transport network [WWW https://cpk.pl/uploads/media/5d133e2b9bac2/info-cpk-program-kolejowy-mapa-25032019.jpg.]

in the WalkScore application and on this basis, it can be considered as a very walkable (cf. Figure 3). Meaning that most errands can be accomplished on foot. However, after an in-depth analysis of the Walk Score, it has been noted that most of the categories affecting the score are within walking distance, but more than 400 m from the multimodal centre.

Analysing the potential of the mix land use in the interchange area, there are no offers that have contributed to such a good result (cf. Figure 4). This result should be reduced to less than 69 (somewhat walkable – some errands can be accomplished on foot) after adjusting the distance to 400 m. There are no public transport stops at or in the immediate vicinity of the multimodal centre. The nearest public transport stop is located at approx. 400 m from the main exit from the railway station.

The results of the analysis presented in Figure 5 were developed by adopting the criteria of accessibility of public transport in terms of isochronizing of walking and driving (bicycle, car) access proposed by Poelman and Dijkstra [10]. Only 3 urban transport stops are located within an acceptable distance of a 10-minute walk from the multimodal centre. All except for the 400 m limit, which with regard to PRM persons, may constitute a nuisance.

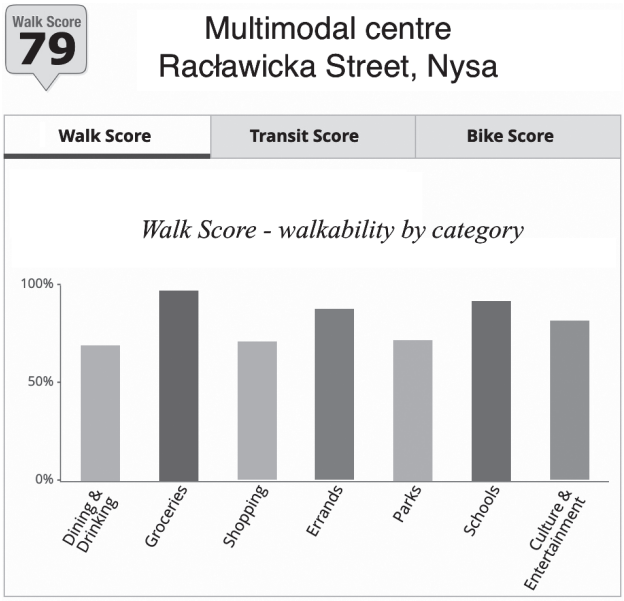

Fig. 4. Walk Score components [18]

The availability of a multimodal centre by bicycle allows to reach a destination (interchange centre) from almost anywhere in Nysa in a 10-minute journey. However, in view of the substandard cycling in-

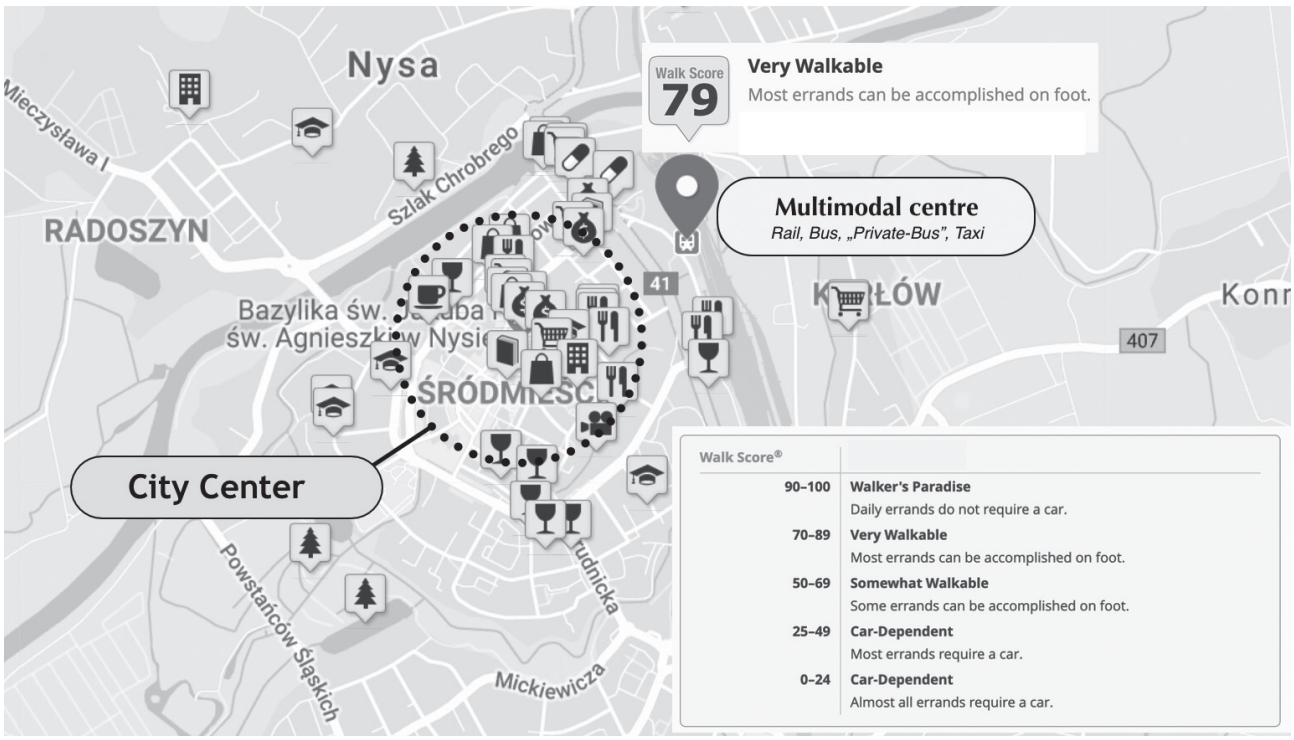

Fig. 3. Walk Score indicator [own elaboration based on walkscore.com]

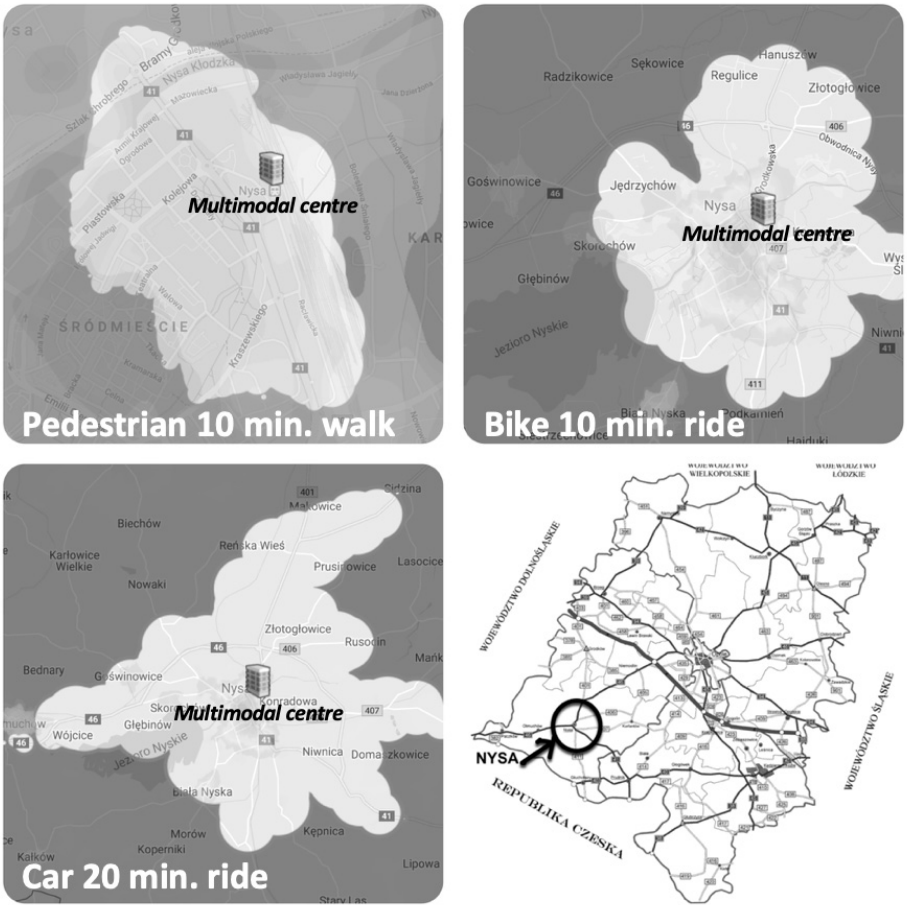

Fig. 5. City area accessible from the multimodal centre within 10 minutes on foot, by bike and within 20 minutes by car [18]

frastructure (bicycle roads and parking lots), including in the region of the centre, the usefulness of combining cycling with bus and rail transport is significantly limited. The most comfortable at the moment is access by private car, both for residents of the city of Nysa and the whole municipality (cf. Figure 5 – isochronous T = 20 for car ride). This leads to the clear conclusion that the potential of a multimodal centre is used only to a limited extent and has practically no impact on reducing congestion in urban traffic or on the development of habits that are desirable for sustainable mobility. Therefore, the public space of the multimodal centre and its immediate surroundings on the basis of urban analyses should be defined as underdeveloped with a high potential for change in the assumption of a conscious policy of implementing sustainable mobility.

Assessment according to architectural and engineering criteria

The analysis of architectural and engineering criteria included, among others, parking lots, parking spaces, pavements, obstacle-free routes, cycling service infrastructure and city furniture. Attention was also paid to esthetics and contrast (cf. Figure 6).

In front of the station there are no designated parking spaces for disabled people and families. There is also no designated Kiss&Ride place. Travellers using the station most often park their vehicles using the station's yard. There is an unused parking lot for about 20 parking spaces, of which only about 5 are formally designated (cf. Figure 6).

The pavement surface in the multimodal centre area is paved with bevelled concrete blocks, and in the case of the only access to the railway station building on a stair-free route – stone blocks with numerous cavities. The pavement leading along Racławicka Street on the route to the city centre is made of concrete pavement slabs in a state requiring maintenance. On the roadway there are numerous lateral and longitudinal cracks, as well as local surface defects and post-intervention patches. This significantly reduces the comfort of reaching stations, especially with luggage.

The entrance to the railway and bus station buildings (as part of the transfer centre) is above ground level. Therefore, access to the buildings and their ticket offices is only possible after climbing the stairs (cf. Figure 6). Persons with reduced mobility (PRM) need to walk around the railway station building on uneven terrain and get to the ticket offices from platform level

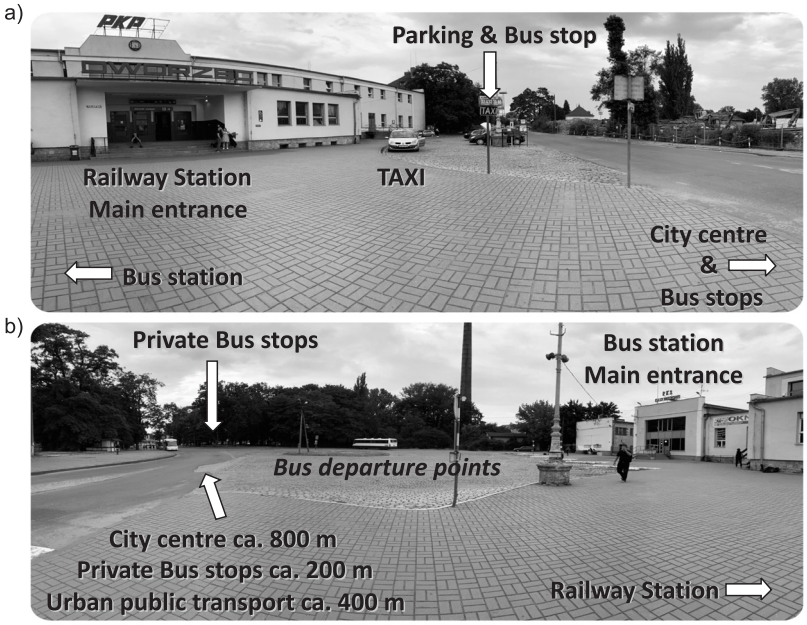

Fig. 6. Nysa Multimodal Centre – current status 07.2019: a) public space (railway station), b) public space (bus station and private Bus stops) [authors' resources]

to avoid this barrier. The station, apart from the ticket office, does not provide any services for travellers or persons using the station, there are no information points or detailed passenger information (dynamic). Static passenger information, both bus and train, is located in places difficult to reach for PRM. The passenger system of voice announcement is unlikely to meet the STIPA parameters of 0.5 as required by law [12]. The perceived sound quality is very poor and the information in many cases is incomprehensible. Announcements for bus transportation in sound form are not given. Neither in the area of the bus station nor in the area of the railway station, no elements of the road finding system were used (touch surface).

As far as the basic components of the passenger service for the multimodal centre are concerned, the most onerous is the lack of access to toilets, baby-changer room and places for the caretaker with the mentee (outside the building is only a temporary portable toilet). This serious deficiency was also indicated in the UX study (cf. results of subjective assessment).

The availability of a ticket office at the station is limited to a few hours per day. The window of the ticket office was not adjusted to the service of PRM people. The window is located at a height of approx. 1.3 m (see Figure 7). There are no ticket vending machines, no vending machines and no trade or services at the stations. The furniture in the waiting room is not suitable for PRM and there is no designated space for wheelchair users. The waiting room is not heated or air-cond itioned.

Free access to the railway platforms via a stair-free route is only possible to platform 1 (one of the three platforms). Only the platform directly located at the exit from the railway station does not require the use of the tunnel. To the next two there are underground passages with stairs. The access to the tunnel is not fitted with lifts, elevators or other solution such as a ramp. In case the PRM gets off on platform 2 or 3, it is necessary to be accompanied by the railway service to cross the rail level. Most of the traffic is directed to platforms 2 and 3 (platform 3 after the renovation) (see Figure 7). In terms of accessibility to rolling stock, there is also a horizontal and vertical difference between the carriage and the train platform interface that the passenger has to overcome.

As far as the bus station is concerned, access to the vehicle at departure stations does not guarantee access from platform level to floor level (cf. Figure 8).

5. Subjective assessment – current user experiences (UX)

The survey was conducted in June 2018 and involved 150 people, which ultimately resulted in 145 respondents. The survey was conducted in a direct interview model (70% of the questionnaires) together with an online survey (30% of the questionnaires). The survey covered a group of people performing various everyday activities, 77% of whom were active on the labour market, 12% were students and 11% were inactive on the labour market and not learners, including housekeepers and pensioners.

In order to better understand the potential development paths of the Nysa interchange centre organised

Fig. 7. Nysa Multimodal Centre – current status 07.2019: a) railway station (ticket office), b) railway station (passenger information), c) railway station (platform standard), d) railway station (access to platform), e) bus station (main entrance, departure points), f) bus station (passenger information) [authors' resources]

on the basis of railway and bus stations, taking into account the users' point of view, it was necessary to identify categories of actual users of the centre. As a result of nearly one year long participatory surveys and observations it was possible to diagnose potential groups that use alternatives to those offered by the Nysa multimedia centre (train, long distance bus, private bus).

When asked about the frequency of use of the multimodal centre (open on working days from 5.50 to 17.40) or bus station (open on working days from 7.00 to 15.00), 34% of respondents replied that they use the station very rarely, and another 25% do not use it at all. Such a state of affairs may have its source both in its limited availability and functionality. Only 9% of respondents declared that they use the station very often, including 5% every day. Among those who rarely (34%) declare to use the stations of the multimodal centre, as many as 27% declare that it is only a few times a year. Such low use of railway and bus station infrastructure is a result of a lack of offers and reduced functionality and usability of these facilities. Of course, the substandard offer, the unsuitable timetable, the public space and infrastructure of the Nysa interchange with limited accessibility for many user

Fig. 8. Nysa multimodal Centre – current status 07.2019: a) Bus stop (arrivals), b) private Bus stops (departure points), c) railway station (parking, Taxi, Bus stop), d) railway station (Bus stop), e) bus station (departure points), f) bus station (waiting area – public space) [authors' resources]

groups, including PRM, and the lack of alternative connections for the private car, which is still a necessary means of transport to ensure the expected basic mobility, have shaped the habits that still maintain the advantage of the private car over other modes of transport in Poland [1, 6].

Against this background, Nysa not only does not stand out due to the attractiveness of its public transport offer and the quality of its infrastructure, but in the opinion of the authors, it is still a city where the priority of development is a transport network based on a private car and belongs to a large group of cities where the expected mobility depends on owning or accessing a private car. Although the Authors did not reach the Nysa modal split research, it was found on the basis of their own, almost three years long observations, that the share of private car in the Nysa modal split is predominant and the availability of private car significantly exceeds the availability of public transport in the everyday life of the city's inhabitants. These stations are most often used in situations requiring shelter from unfavourable weather conditions (temperature, rainfall, strong wind), and travellers most often wait for transport in public spaces in the im-

mediate vicinity of station buildings. The correlation between the quality of station infrastructure, together with the quality and quantity of offers (connections, ticket offices, toilets, commerce, services, etc.) and the attractiveness expressed in terms of the declared frequency of use by travellers should be the basis for an in-depth analysis of the appropriateness of maintaining two ticket offices in two separate buildings (one for bus and one for rail traffic), while no other services are provided to travellers.

In order to verify the potential for change, the survey respondents were asked to identify three key elements that would improve both the attractiveness of the multimodal centre and the quality of life. Among the three most frequently indicated elements were: toilets, Park & Ride and improvement of safety (perceptible) [cf. Figure 9].

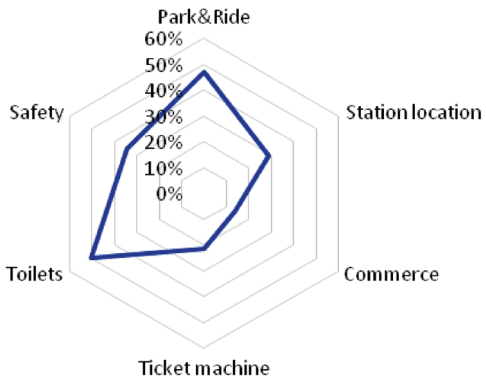

Fig. 9. Importance of elements in using multimodal centre (percentage distribution) [own study]

Indication in the research results that inhabitants feel that the stations location is not optimal (suggestion of change) is not a reference to a physical location in relation to the city centre and housing estates, but may be a result of experience related to access to a multimodal centre ("last mile" effect). This problem was noticed by a large number of respondents, but among the group of people who use the centre frequently and on a daily basis, it ranked among the top three challenges which change could positively affect their quality of life.

It should be noted that despite the relatively close proximity to most urban services in the centre of Nysa (reach of about 15 minutes on foot), no offers were located in the immediate vicinity of the transfer centre (up to 10 minutes on foot). Access to the multimodal centre is provided by residents of Nysa and the municipality of Nysa mainly using a private car and at the same time lacking convenient parking infrastructure. This state of affairs has shaped the perception of a reduced standard in terms of the location of the multimodal centre in the city. In practice, the challenge for the residents is not to cover the distance from the source of travel (place of residence) to the gateway, which is a multimodal centre, but the feeling related to the usefulness and quality of the distance covered, the so-called „last mile". In this area, in addition to improving the quality of infrastructure, it is recommended to implement the development of additional offers. Striving for spatial development through the consolidation of the fabric in this area to the "mix land use" model, of course scaled to the urban development potential of the Nysa city. Conclusions in this respect are consistent with conclusions based on expert assessment, including the analysis of the Walk Score index.

In the survey of user preferences, attention was also drawn to the fact that in the group of frequent and daily users of the multimodal centre, the travellers value more the possibility of getting to the station by foot than the presence of a parking lot in front of the station. This result should be interpreted as an indication for the development of more beneficial solutions for users, the so-called "last mile" section and an indirect indication of the need to improve the standard of pedestrian connections – obstacle-free route (cf. Conclusions and recommendations).

The analysis of the 10 basic criteria that can influence both the attractiveness of an multimodal centre and the quality of life of its inhabitants in relation to the centre's basic urban mobility needs is presented in the radar diagram (cf. Figure 10).

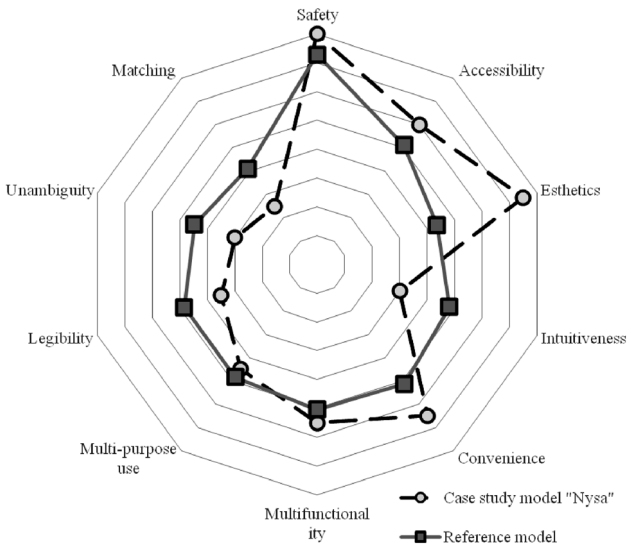

Fig. 10. Model of residents' expectations regarding the improvement of the Nysa multimodal centre [own elaboration]

The following criteria used in Figure 10 have been assumed to be of the following significance:

- **SAFETY:** Safety (perceptible) when using the infrastructure;

- **ACCESSIBILITY:** Ability to use the offer / usability provided to each user;
- **ESTHETICS:** Well-maintained and aesthetic public space / infrastructure;
- **INTUITIVENESS:** Easy-to-understand purpose and use of the infrastructure;
- **CONVENIENCE:** Convenient and trouble-free use;
- **MULTIFUNCTIONALITY:** Multitasking in one place;
- **MULTI-PURPOSE USE:** Using the same infrastructure / solution to handle more than one type of need;
- **LEGIBILITY:** Easy to see and with a clear way to locate offers and functions;
- **UNAMBIGUITY:** Popularity of the intended use / purpose;
- **MATCHING:** Adequate integration with the environment (space and place).

The image of an multimodal centre as an infrastructure solution with reduced quality and functionality, both outlined in the expert assessment and confirmed in a large part of the results of the subjective assessment of residents, was also confirmed by a study of expectations based on evaluation in comparison with a pair of 10 key criteria that may affect the quality of life in the city.

The indication of the highest priority for the criteria of Safety, Esthetics and Convenience in the study and high Accessibility with a slightly lower priority for multifunctionality should be considered from the point of view of users' experiences. In comparison with comparable studies conducted in over 36 small and medium cities in Poland using the same method (pair comparison), one should pay attention to significant differences in the prioritisation of such criteria as: Esthetics, Intuitiveness and Convenience.

Taking into account the fact that the opinion of the inhabitants is shaped by years of experience, it can be pointed out that in the case of Nysa, the process of shaping the basic urban transport junction, i.e. the multimodal centre, in the model of unrelated processes and decisions, could have had a key impact on the subjective assessment of the inhabitants and the shaping of their transport habits. The need to change this has been outlined quite clearly in the analysis. Improvement of the quality of life of the residents is possible by using a holistic approach in the planning process, taking into account the key challenges of proposing solutions to change the attractiveness of the public space and the organization of a multimodal centre together with actions to improve the tangible comfort resulting from the location of the centre in the urban structure. The generalised recommendations together with a reference to the case study are indicated in the summary of this article.

6. Conclusions and recommendations

The example of the Nysa Multimodal Centre analysed here is a classic illustration of the accidental formation of a service area in the immediate vicinity of a railway and bus stations. Although the location of transfer functions around the railway station is an advantageous solution, in this case the components of public space development used to service particular means of transport (train, bus, bus) are not compatible with each other. The planned redevelopment of the multimodal centre (Fig. 11) will give rise to the following identified challenges and recommendations for a holistic approach suggested by the authors:

1. Change in the perceptibility level of the perception of the interchange as unrelated to the urban fabric – it is recommended to follow the TOD approach scaled to a size of Nysa city.
2. Non-connection of urban transport with a multimodal centre – it is recommended to introduce as a complementary component of urban public transport services in a multimodal centre space.
3. Too large an area for traffic purposes that extends access routes and transfer times – it is recommended to design a compact transfer centre with interchangeable functions allowing for handling around the railway station of bus transport, buses, taxi. In the future, also other car-based modes of transport with incentives such as carpooling and carsharing based on a fleet of emission-reduced cars such as electric or hybrid cars will be encouraged.
4. Substandard public space related to zero-emission forms of transport – it is recommended to design universal public space including PRM and to introduce cycling service infrastructure and improve the comfort of pedestrian access within the range of obstacle-free routes.
5. Change in the form of shaping and development of the multimodal centre in response to the challenges of climate and demographic change – it is recommended to eliminate the urban heat island, increase the resting space, increase the resistance to severe weather phenomena, both in terms of better protection of travellers.
6. Separation of the basic function of traveller service and lack of sanitary facilities and a comfortable place to wait for the journey – it is recommended to combine the functions of waiting rooms, cash desks and sanitary facilities within a common station space and to determine the zones of the so-called external waiting rooms close to the departure points in the form of space management enabling comfortable waiting for transport.
7. Lack of service for PRM needs – it is recommended to introduce a uniform system of PRM support for all types of public transport based on open stand-

ards based on the requirements of TSI PRM (valid in railway transport) and the principles of universal public space design taking into account the principle of non-discrimination of Konrad Kaletsch.

8. Lack of passenger information standard and system of finding the way implemented in at least two sensory channels and taking into account the needs of people who do not know the local language – it is recommended to introduce a system of multisensory signs supported by a set of intuitive pictograms and introduction of a common, coordinated and uniform passenger information, both dynamic and static in the area of the multimodal centre.

The changeover process should be carried out with the aim of ensuring interoperability as far as possible. The application of solutions to ensure interoperability shall be preceded by a public space for the direct service of travellers using different modes of transport, taking into account the design process from solutions complying with technical conditions (basic standard) to solutions of an interoperable public space, meaning application at the level of both components and elements of open standards (cf. Figure 12).

The differences shown in Figure 12 between a basic standard applied to a single element or component and de-facto standard that ensures the compatibil-

Fig. 11. Project of the Nysa multimodal centre: a) public space (multimodal centre), b) railway station (main entrance), d) bus station (bus departure points) [own study based on WWW http://grebski.pl/galeria/66/centrum-przesiadkowe-nysa.html]

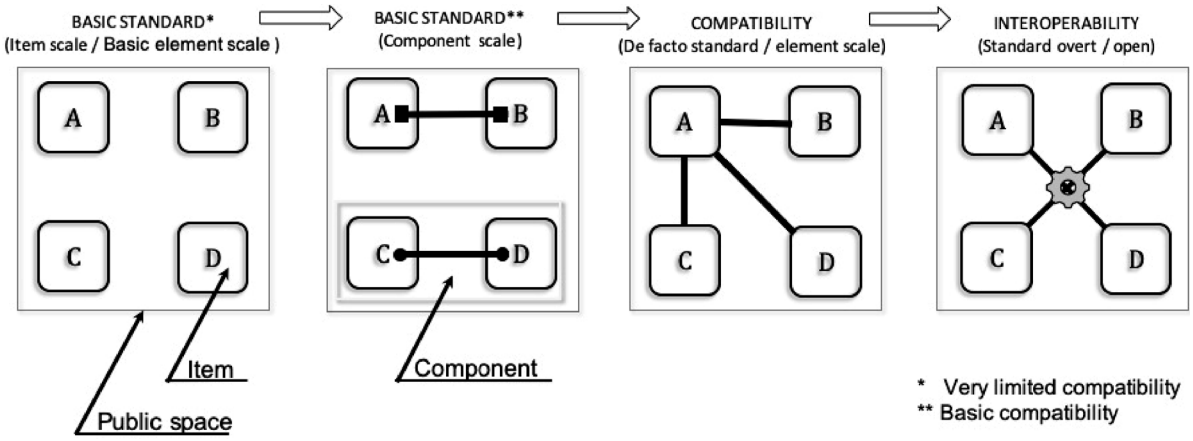

Fig. 12. Shaping the interoperability of public space [own elaboration on the basis of definition available at WWW http://interoperability-definition.info/en/ (06.2018)]

ity of the component with the environment (level of boundary matching) and an open standard that guarantees the interoperability of the solution taking into account the environment in which it operates.

In the classical approach, a limited approach is most often used to provide a basic standard for a single development element, e.g. a bus shelter, platform or pavement with a possible fit to the environment at the boundary of the intervention (space transformation). This ensures, in case of a proper implementation, only the compatibility of the basic standard with selected management components. However, providing the most advantageous service to the user requires a slightly more sophisticated and holistic approach. It should be based on the pursuit of open standards to ensure interoperability of the development components. Such an approach makes it possible to achieve a coherent and useful solution in three dimensions: a functional, rational and perceptible solution oriented towards the most advantageous user service. In the authors' view, knowledge of this process is the key to ensuring that the space from randomly developed (Technical Approach) can be transformed into a high-quality service space (Functional Approach) based on the pursuit of open standards of interoperability in system-based land use planning.

The Nysa multimodal centre is an interesting example of how in practice the sum of functions gathered in the neighborhood without ensuring interoperability of solutions (and in the case of this centre also in large part without ensuring compatibility of individual components of the space) may lead to substandard service of users' needs.

Even if the solutions applied were not so degraded (low quality of maintenance), the space as a whole certainly cannot be considered to be optimally developed because of rather random and substantial part of the incompatible combination of its various components.

In the opinion of the authors, the critical analysis contained in the article may also serve as an inspiration for the application of open interoperability standards in order to improve the quality of life of inhabitants of small and medium-sized towns, where the quality of the neighborhood organised around interchange centres plays a particularly important role.

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