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TOURIST INFRASTRUCTURE OF SILESIA'S INDUSTRIAL MONUMENTS ROUTE IN THE CONTEXT OF THE X-MINUTE CITY CONCEPT

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Purpose: The aim of the paper is to assess the accessibility of Google Points of Interest surrounding the Industrial Monuments Route (IMR) sites, using travel time and distance criteria, within the framework of the X-minute cities concept.
Design/methodology/approach: To achieve the goal, the data obtained from Google Maps analyzed was used, focusing on Points of Interest (POIs) in the proximity of IMR sites.
Findings: The tourist infrastructure around the sites of IMR has been identified, along with the potential of the x-minute city concept to assess the surroundings of tourist attractions.
Research limitations/implications: IMR might be a specific case of an industrial route, because all of its sights are located within a large agglomeration. Other thematic tourist routes might differ significantly from this example.
Practical implications: The research can serve as a starting point for spatial planning or the creation of a collaboration network.
Social implications: The implementation of the research can serve as a basis for making decisions about transforming the area and influencing its quality.
Originality/value: The application of the 15-minute city concept perspective to study the surroundings of a tourist attraction.
Keywords: 15-minute city, the Industrial Monument Route, post-industrial heritage.
Category of the paper: case study.

1. Introduction

Silesia is a unique region in Poland, primarily known for its rich natural resources. It was in this region that the largest industrial plants of the 19th and 20th centuries were located. Following socio-economic changes from a centrally planned economy to a market-based one, many of these plants became unprofitable. Attempts at restructuring and privatization allowed

some to survive, while others were closed. This resulted in the emergence of post-industrial areas, often degraded by human activity, which required new functions, one of which was tourism, leading to the development of industrial heritage tourism sites preserving the culture and traditions of industrial professions.

The shift of a company's focus to tourism does not always lead to the development of tourism infrastructure around the site. This happens despite the fact that it presents an excellent opportunity to create urban spaces that are functional and accessible for both tourists and local residents. Factors such as land ownership, building characteristics, and urban planning may play a role. However, appropriate actions can positively impact the city's image and local entrepreneurship. In this context, the concept of the 15-minute city, where key services are within 15 minutes on foot or by bike (Moreno et al., 2021), can inspire the creation of sustainable spaces that combine tradition with modern urban planning requirements.

To make such actions effective, it is crucial to thoroughly understand the current state of infrastructure and its needs. Therefore, the aim of this paper is to assess the accessibility of Points of Interest around the Industrial Monuments Route (IMR) in the Silesian Voivodeship by using one of the most commonly used map service – Google Maps. This study focused on Points of Interest located within a 1500-meter radius from the sites belonging to the Industrial Monuments Route

Such a study could be of great importance for the integration of tourist infrastructure with the concept of sustainable urban spatial development, especially in the context of modern ideas addressing contemporary needs, such as reducing the number of cars in cities, promoting a healthy lifestyle, better urban planning, and reducing pollution.

To achieve this goal, it is essential to clarify the concepts of the 15-minute city and the tourist attraction.

2. Theoretical background

A tourist attraction is a place that encourages people to leave their place of residence (Lew, 1987). Industrial heritage tourist attractions, on the other hand, are sites that refer to industrial history and traditions, often resulting from repurposing closed factories while attempting to preserve the memory of the heritage (Garrod, Fyall, 2000; Szromek et al., 2021). These places serve many different functions and purposes (Vukosav, 2015), providing entertainment, education, or preserving artifacts from the past. Additionally, creating such tourist attractions is an instrument for regional restructuring and economic development. This is exemplified by the Ruhr Area (Germany), where significant structural changes took place due to the decline of the mining and steel industries. Post-industrial areas were transformed into tourist attractions within the Emscher Park (Ćopić et al., 2014). In Poland, particular attention should be given to

the tourist attractions located in the Silesian Voivodeship. These attractions are part of the Silesian Industrial Monuments Route (IMR) (szlakzabytków.pl). Although they have been the subject of numerous studies (Szromek et al., 2021; Bogacz et al., 2019; Bujok et al., 2015), this area has not been fully analyzed, especially in terms of its surroundings. Therefore, a study was conducted on the tourist infrastructure located near these attractions, using some of the principles of the 15-minute city concept.

The "15-minute city" is an urban planning concept rooted in the idea of "chrono-urbanism". It suggests that quality of life is inversely proportional to the time spent on transportation, particularly car travel (Moreno et al., 2021). The core premise of this model is that all essential services for residents should be accessible within a 15-minute walk or bike ride. This model is based on four key principles. In addition to proximity (the 15-minute range), it emphasizes density, which ensures an optimal population level considering pollution and service provision; diversity, which provides access to a wide range of services; and universality, which underscores independence from an individual's socio-economic status (Murgante et al., 2023).

The concept promotes the creation of self-sufficient residential areas with access to services such as employment, healthcare, education, and entertainment (Bocca, 2021; Ferrer-Ortiz et al., 2022). The idea was first introduced in 2016 and became widely known when Anne Hidalgo used it in her campaign for Mayor of Paris, aiming to solve the city's traffic problems (Teixeira, 2024). It gained even more popularity during the Covid-19 pandemic, as people began to value local services and shorter commutes (Moreno et al., 2021).

However, the idea is not entirely new (Pozoukidou, Chatziyiannaki, 2021). It draws from historical concepts like the Garden City, the Neighbourhood Unit, and later, the Smart City (Howard, 1902; Khavarian-Garmsir et al., 2023a; Rohe, 2009), while aligning with contemporary trends emphasizing the need for sustainable urban development (Khavarian-Garmsir et al., 2023b).

The concept has also served as a foundation for new or modified urban planning models. One notable approach is the idea of the x-minute city (Logan et al., 2022). Unlike the 15-minute model, this concept does not adhere to a fixed time frame for accessibility. Instead, it acknowledges that the characteristics of specific areas may shorten or lengthen access times to infrastructure. Consequently, one can speak of 10-minute or 30-minute cities. This flexible approach not only facilitates city planning but also enables the analysis of current conditions and the proposal of targeted development strategies.

Another example of applying the 15-minute city concept is its use in assessing tourism potential. Jasion (2023) identified a sports fan visiting a stadium as the central point of reference for evaluating the accessibility of key tourist infrastructure. Similarly, Herman (2023) used a tourist arriving at a railway station as the focal point to assess infrastructure accessibility from their perspective. This approach enables the application of the concept to the development of areas surrounding tourist attractions, enhancing their functionality and appeal.

The above examples highlight the versatility of the 15-minute city concept and its applicability in research on tourist attractions and their surroundings, particularly in terms of tourism infrastructure and its accessibility.

Tourism infrastructure itself can be understood in different ways. On one hand, it can be viewed broadly as all facilities that help tourists meet their daily needs (Panasiuk, 2008). Alternatively, it can be interpreted more narrowly, such as being seen as a bridge connecting resources, for example, linking people and nature (Humagi et al., 2021). Regardless of the chosen interpretation, from a practical perspective, it represents a functional entity with a specific geographic location.

This same practical perspective applies to the concept of a Point of Interest (POI). According to Google, a POI is a pin on the map with precise coordinates, accompanied by a name recognized by Google (Google, 2024). In tourism, POIs are closely tied to tourist infrastructure. They are essential for identifying and searching for places through Google's search engine, serving as a key tool for exploring destinations.

3. Methods

The subject of the study was the Industrial Monuments Route of the Silesian Voivodeship, which, during the research period, comprised of 42 tourist sites. The focus of the research was the tourist infrastructure surrounding these sites, facilitating the fulfillment of cognitive, transport, and catering needs. The data used in the analysis was obtained from Google Maps and dated on February 2024. It included a list of points located within a 1500-meter radius of each IMR site which is an equivalent of 30 minutes' walk. According to the Points of Interest (POI) classification used by Google, the list featured hotels, tourist attractions, dining establishments, bars, cafes, grocery stores, museums, parks, and public transport stops. For all the objects identified in this manner, the list was supplemented with the walking time from the tourist site to the given POI, and, if the object had reviews on Google, its average rating and the number of reviews were also recorded.

4. Results

4.1. Overall characteristics of the obtained data

The collected dataset consisted of 4739 records, with each record corresponding to a single POI located within the vicinity of one of the IMR sites. The number of individual POI types is presented in Table 1.

Table 1.
The number of POI types within 1500m radious of IMR

Type	N	Share
gastronomy	999	21.08%
transport	777	16.40%
hotels	647	13.65%
attractions	624	13.17%
park	551	11.63%
convenience_store	362	7.64%
bar	297	6.27%
cafe	269	5.68%
art_gallery	107	2.26%
muzeum	106	2.24%
TOTAL	4739	100,00%

Source: Own work.

As one can note, the most common type of POI in the studied case are public gastronomy points (21.08%), public transport stops (16.40%) and hotels (13.65%). Whereby high culture sites like art galleries (2.26%) and museums (2.24%) were least occurring types of POI's.

The average number of POIs in the specified range from a site was 132. Whereby 15 of the IMR sites have more than that, and the remaining 27 less. The indicates that the distribution of POI among IMR sites is right-skewed, with was by a histogram of this variable, that was shown in figure 1.

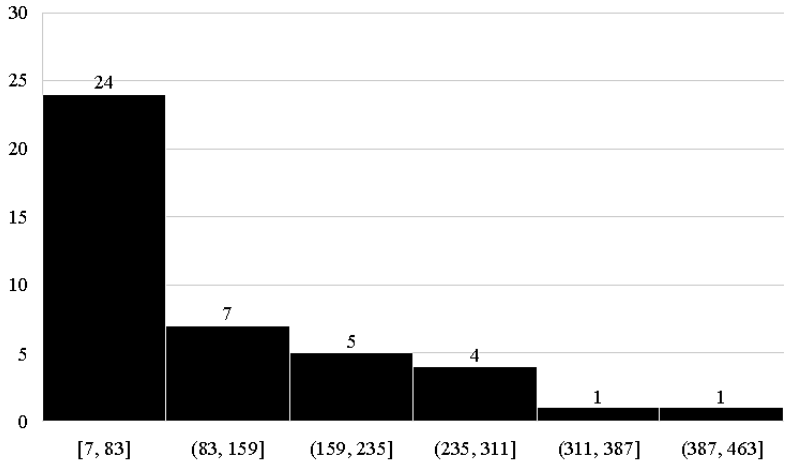

Figure 1. Histogram of POIs numbers in the range of IMR sites.
Source: Own work.

The strong right-skew explains why most of the sites have less than the average number of POI, where most of them fit into the range between 7 and 83, and the median value was 102.

In table 2 the number of all POI's for each site was presented. One might expect that the city where a given site is located would affect the number of POI most, and the sites with most POI's would be in the capital city of the Silesian voivodeship – Katowice, but the results show that this is not a rule. The site with most POI's was Stara Fabryka (Old Factory) in Bielsko-Biała, flowed by Muzeum Śląskie (Silesian Museum) in Katowice and Muzeum Górnictwa Rud Żelaza (Iron Ore Mining Museum) in Częstochowa. Similarly, a site that is located in the

4th most populated city in Silesia – Gliwice, was the one with least POI. This leads to the conclusion that the specific location of a site, especially the distance to town center is more impactful in this aspect.

Table 2.
The number of POI's within 1500m radious of given IMR site

Site	N	Share	Site	N	Share
Stara Fabryka	388	8.19%	Park Tradycji	73	1.54%
Muzeum Śląskie	361	7.62%	Muzeum Techniki Sanitarnej	68	1.43%
Muzeum Górnictwa Rud Żelaza	285	6.01%	Fabryka Porcelany	67	1.41%
Muzeum Drukarstwa	276	5.82%	Galeria Sztuki Współczesnej - Elektrownia	66	1.39%
Browar Zamkowy	252	5.32%	Muzeum Hutnictwa Cynku	63	1.33%
Muzeum Produkcji Zapałek	245	5.17%	Szyb Wilson	62	1.31%
Centrum Wycieczkowe Tyskich Browarów Książęcych	196	4.14%	Giszowiec	61	1.29%
Muzeum Hutnictwa	193	4.07%	Nikiszowiec	61	1.29%
Muzeum Ustrońskie	193	4.07%	Centralne Muzeum Pożarnictwa	52	1.10%
Szyb Prezydent	187	3.95%	Stary Młyn Muzeum Dawnych Rzemiosł	49	1.03%
Kopalnia Ćwiczebna Sztygarka	169	3.57%	Szyb Maciej	45	0.95%
Kopalnia Guido	131	2.76%	Zabytkowa Kopalnia Srebra	41	0.87%
Muzeum Prasy Śląskiej	123	2.60%	Stacja Biblioteka MBP w Rudzie Śląskiej	38	0.80%
Oddział Odlewnictwa Artystycznego	122	2.57%	Familoki - Czerwionka	37	0.78%
Wieże KWK Polska	122	2.57%	Zabytkowa Kopalnia Ignacy w Rybniku	32	0.68%
Muzeum Historii Kolei	116	2.45%	Muzeum Chleba, Szkoły i Ciekawostek	30	0.63%
Sztolnia Królowa Luiza	112	2.36%	Sztolnia Czarnego Pstrąga	26	0.55%
Górnośląskie Koleje Wąskotorowe	103	2.17%	Zabytkowa Stacja Kolei Wąskotorowej w Rudach	26	0.55%
Radiostacja Gliwice	83	1.75%	Muzeum Browaru Żywiec	15	0.32%
Kolonia Robotnicza Ficinus	78	1.65%	Muzeum Energetyki	9	0.19%
Browar Obywatelski	76	1.60%	Zabytkowa Stacja Wodociągowa Zawada	7	0.15%

Source: Own work.

Although the search radius for POI was limited to the radial distance from a site to 1500 m, some of the found locations are hard to reach by pedestrians and therefore limit the accessibility and walkability of a tourist site. Therefore the next step of the analysis was to examine the detailed information on distance from sites to different types of POI.

4.2. POI walking distance to sites analysis

The bare number of POIs near a tourist site does not fully reflect how accessible they are. A significant impact on the accessibility of a site to a tourist is actually if his or hers needs after the visit at a site can be satisfied in a short time and can be reached without entering a vehicle. Therefore in figure 2 the number of POI in the proximity of IMR sites was additionally divided into ranges of time required to reach them by a pedestrian.

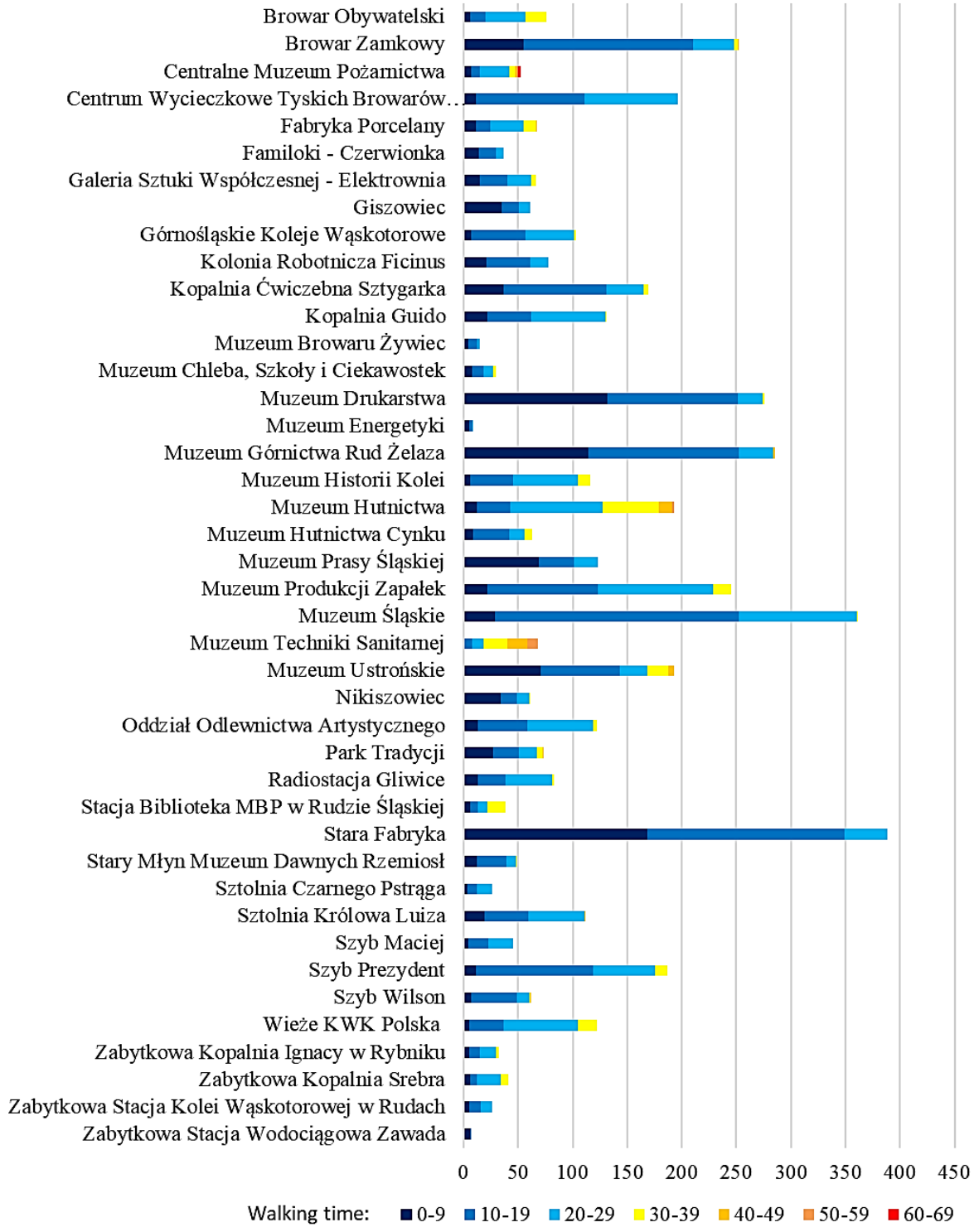

Figure 2. The number of POI within given walking range from IHR sites.

Source: Own work.

Most of the sites have high share of POI within walking range under 29 min. In cases of IMR sites that are located directly in city center over half of the identified POI are reachable in 9 min. or less walking time. One of the sites strongly differs from the rest in this aspect – Muzeum Techniki Sanitarnej (Sanitary Technology Museum) in Gliwice. Moreover the presented data indicates that most Points of Interest near the sites of IMR are within a short

walking distance, primarily in the 10-19 minute range, which constitutes the largest number of records. The second-largest group of POIs falls within the 0-9 minute range, highlighting the high accessibility of tourist infrastructure in close proximity to the sites. Noticeably fewer POIs are located at greater distances, with the number of points decreasing significantly in categories beyond a 30-minute walk.

Among the sites with the highest infrastructure accessibility, Stara Fabryka stands out for having the most POIs within a 9-minute walking distance, while Muzeum Śląskie and Szyb Prezydent dominate in the 10-19 minute category. Sites such as Browar Zamkowy and Muzeum Górnictwa Rud Żelaza have a greater number of POIs in the 20-29 minute range, suggesting a more dispersed infrastructure around these locations.

The sites with the least accessible infrastructure include Muzeum Energetyki, with only 9 POIs in its vicinity, mostly within a 9-minute walk, and Sztolnia Czarnego Pstrąga and Muzeum Browaru Żywiec, which have relatively few POIs in any time category. POIs located at greater distances, such as in the 40-49 minute range or over 50 minutes, are rare, indicating limited extended infrastructure accessibility.

The overall distribution of data confirms that tourist infrastructure is most concentrated within a short distance of IMR sites, enhancing their appeal to visitors. Muzeum Śląskie, Stara Fabryka, and Szyb Prezydent stand out as locations with the densest infrastructure across various time categories, making them particularly attractive to tourists.

The next step of the analysis was to investigate if there are clear accessibility differences between different POI types. Figure 3 Shows the share of walking time ranges from IMR sites to a given type of POI.

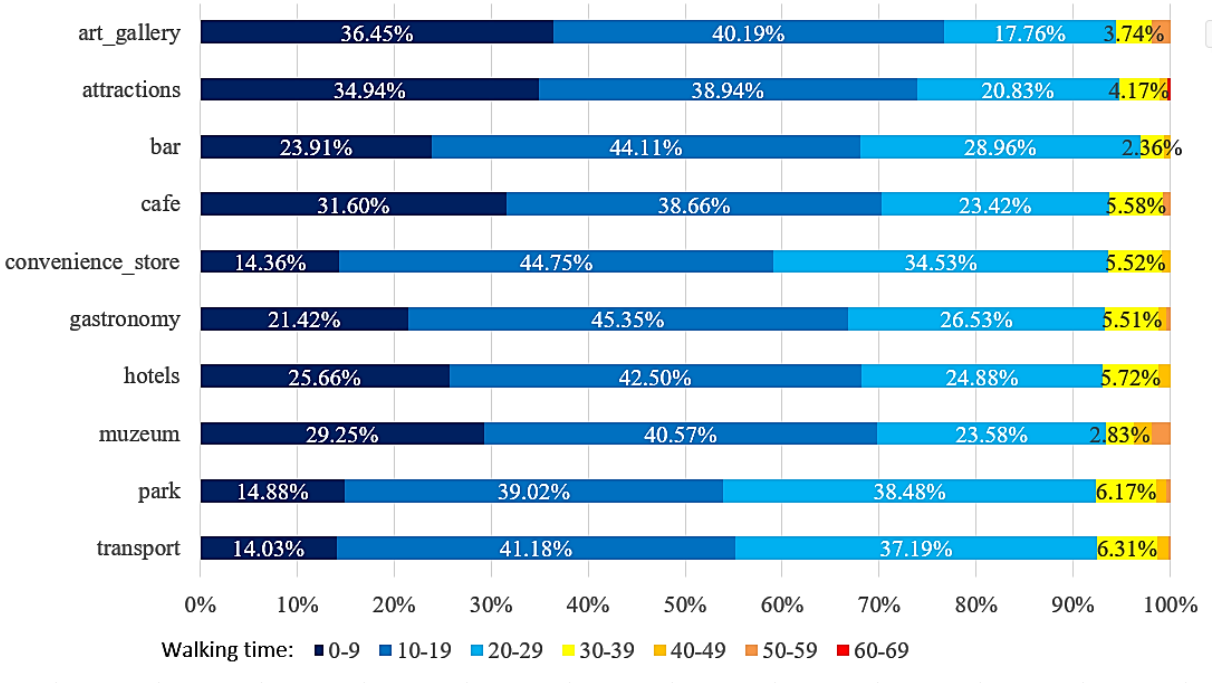

Figure 3. The walking time ranges from IMR sites.

Source: Own work.

Overall, the largest percentage of POIs (41.97%) is concentrated within the 10-19 minute walking range, followed by 29.01% in the 20–29 minute range and 22.52% in the 0-9 minute range. POIs located beyond a 30-minute walking time are sparse, with percentages dropping significantly for these categories.

For gastronomy, which is the most numerous category, 45.35% of POIs are within the 10-9 minute range, followed by 26.53% within 20-29 minutes, and 21.42% within 0-9 minutes. Transport and parks show a similar distribution, with the majority of their POIs in the 10-19 and 20-29 minute categories, accounting for over 75% of their total for both types. Hotels have a slightly higher proportion within the 10-19 minute range (42.50%) and a notable share in the 0-9 minute category (25.66%).

Museums and art galleries differ slightly, with higher proportions of their POIs in the 0-9 minute range (29.25% and 36.45%, respectively). This indicates that cultural POIs are often more accessible within shorter walking distances. Cafes and bars are predominantly located within the 10-19 minute range (38.66% and 44.11%, respectively), though a significant portion of cafes is also within 0-9 minutes (31.60%).

Attractions, while spread out across various ranges, have the highest percentage (34.94%) within 0-9 minutes, indicating that many key tourist sites are highly accessible. Similarly, art galleries have a notable concentration of POIs in the 0-9 minute range, with 36.45% of their total, followed by 40.19% in the 10-19 minute category.

In summary, the percentage breakdown confirms the earlier observation that most POIs are concentrated within a 20-minute walking range of IHR sites. The data also highlights variations in accessibility among different categories, with cultural and attraction-based POIs tending to be closer, while facilities like transport, parks, and gastronomy are slightly more dispersed.

The final step of the analysis was to investigate the distribution of POI types among given IHR sites. The numbers of POIs of given type within the range of a given IMR site from table 3 were used to prepare the visualization of POIs type share in figure 4.

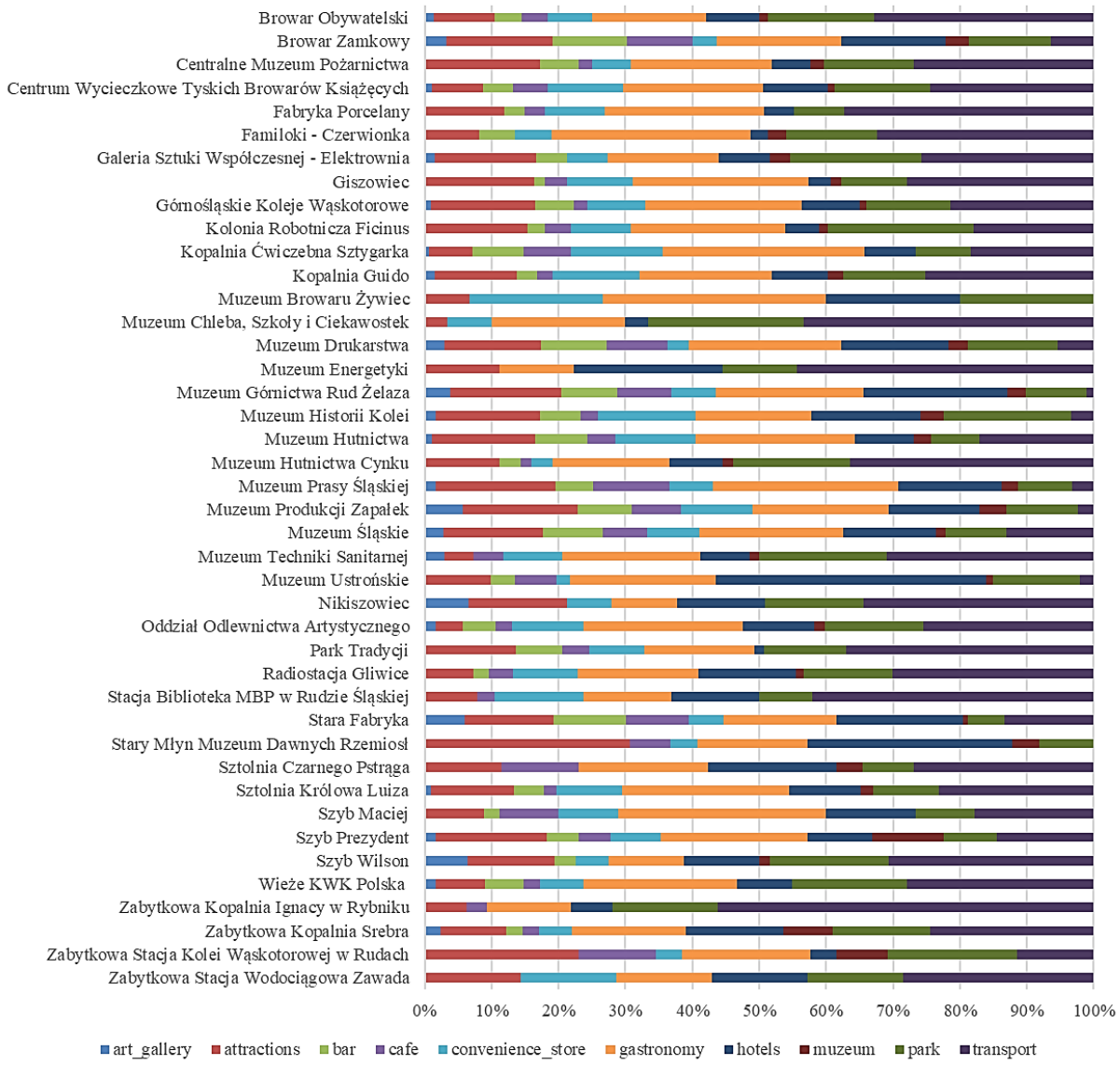

Figure 4. The distribution of given POI types among IHR sites.

Source: Own work.

Table 3.
The number of given POIs within 1500 m from given IMR site

Site	N	Share	Site	N	Share
Stara Fabryka	388	8.19%	Park Tradycji	73	1.54%
Muzeum Śląskie	361	7.62%	Muzeum Techniki Sanitarnej	68	1.43%
Muzeum Górnictwa Rud Żelaza	285	6.01%	Fabryka Porcelany	67	1.41%
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Muzeum Ustrońskie	193	4.07%	Centralne Muzeum Pożarnictwa	52	1.10%
Szyb Prezydent	187	3.95%	Stary Młyn Muzeum Dawnych Rzemiosł	49	1.03%

Cont. table 3.

Kopalnia Ćwiczebna Sztygarka	169	3.57%	Szyb Maciej	45	0.95%
Kopalnia Guido	131	2.76%	Zabytkowa Kopalnia Srebra	41	0.87%
Muzeum Prasy Śląskiej	123	2.60%	Stacja Biblioteka MBP w Rudzie Śląskiej	38	0.80%
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Browar Obywatelski	76	1.60%	Zabytkowa Stacja Wodociągowa Zawada	7	0.15%

Source: Own work.

Overall, gastronomy accounts for the largest overall share, making up 21.08% of POIs, followed by transport at 16.40% and hotels at 13.65%. Attractions represent 13.17%, while art galleries and museums are the least represented categories at 2.26% and 2.24%, respectively.

Browar Obywatelski stands out for its high proportion of transport-related POIs, which make up 32.89%, alongside gastronomy at 17.11% and parks at 15.79%. Browar Zamkowy has a more diverse distribution, with gastronomy at 18.65%, attractions at 15.87%, and hotels at 15.48%. Fabryka Porcelany shows a strong focus on transport, which constitutes 37.31%, and gastronomy at 23.88%, indicating its utility-oriented nature. Familoki - Czerwionka has a similar emphasis on gastronomy at 29.73% and transport at 32.43%, but other categories are sparsely represented.

Muzeum Śląskie offers a balanced profile, with gastronomy making up 21.61%, followed by attractions at 14.96% and hotels at 13.85%. Muzeum Górnictwa Rud Żelaza has a similar balance, with gastronomy accounting for 22.11%, hotels at 21.40%, and attractions at 16.49%. These locations offer a mix of practical amenities and cultural experiences. In contrast, Muzeum Browaru Żywiec has a more concentrated profile, with 33.33% in gastronomy and smaller shares in hotels and parks, limiting its appeal to a narrower audience.

Kopalnia Guido has a well-distributed profile, with 19.85% in gastronomy, 12.98% in convenience stores, and smaller but significant shares in transport and attractions. Stara Fabryka features a wide range of POIs, with the largest share in hotels at 18.81%, followed by gastronomy at 17.01% and attractions at 13.40%, making it a comprehensive destination.

Locations such as Zabytkowa Kopalnia Srebra and Szyb Wilson show notable shares in transport and gastronomy but have lower representation in other categories. Muzeum Energetyki and Zabytkowa Stacja Wodociągowa Zawada have profiles heavily dominated by transport or parks, with limited variety in other categories. These sites could benefit from expanding their offerings to attract a broader range of visitors.

Sites with a more even distribution of POIs, such as Browar Zamkowy and Stara Fabryka, tend to appeal to diverse visitor groups, while those with a narrow focus, like Muzeum Browaru Żywiec or Muzeum Energetyki, may attract niche audiences but lack general appeal. The data

suggests that locations with strong representations in gastronomy, transport, and hotels provide more comprehensive visitor experiences, while sites with limited POI diversity might consider adding complementary services to enhance their attractiveness.

5. Discussion and summary

By utilizing elements of the 15-minute city concept and urban Points of Interest (POIs), it is possible to assess the environment surrounding tourist attractions. The conducted research indicated that for the analyzed IMR sites, the number of POIs is asymmetrical, meaning that most of the studied sites do not exceed the average number of POIs. This is influenced by objects located in city centers, such as the Old Factory in Bielsko-Biała, which has the highest number of identified POIs in its vicinity. On the other hand, it was observed that due to the specificity of industrial heritage tourist attractions, some sites are located in less accessible areas, outside residential zones or in sparsely populated areas. An example of this is the Zawada Water Station. Such a location limits the number of POIs nearby.

The presented data shows that most of the identified POIs within a 1500-meter range are within a 0-20 minute walk. This is a distance conducive to walking decisions. However, it is not the only factor influencing the decision. This relates to the concept of "walkability," which consists of a set of factors influencing the decision to take a walk (Southworth, 1997). These factors can be categorized into usability, safety, comfort, and the attractiveness of the walking route (Abdelfattah et al., 2022).

The presence of POIs near IMR sites does not always enhance the tourist offering of the attraction. In order for visitors to take advantage of other services, they must be actively promoted. This is confirmed by Sormaz et al. (2016), who characterize the foodservice industry, highlighting the need for support and promotion, emphasizing that it contributes to regional development.

The conducted research also demonstrated that using elements of the 15-minute city concept along with Google POI effectively allows for an understanding of the surroundings of a tourist attraction in terms of tourist infrastructure. Such preliminary analysis can provide valuable insights for landowners or municipal authorities regarding planned investments or serve as one of the elements in assessing the tourism potential of a given area. From the perspective of local governments, the research can act as an initiative for introducing changes to the city structure, ultimately contributing to its development. For entrepreneurs, it may serve as a signal to, for example, establish collaborations or network tourism products.

Future studies could focus on w wider set of tourist objects and expand the analysis on a larger scale. Moreover, data obtained for such wide set could be used to develop a scoring method, similar to the walkability score, which would allow for a systematized and more objective comparison between tourist sites.

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