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Adaptive reuse of industrial heritage in a polycentric metropolitan area: the case of GZM (Silesian Province, Poland)

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Abstract. The article discusses the process of converting industrial heritage for new uses in a large Central European metropolitan area (the case of GZM: Górnośląsko-Zagłębiowska Metropolia – Metropolis GZM). The aim of the research is to investigate the distribution of industrial heritage sites and to identify the factors influencing their current use. The methods include desk research (analysis of documents and database queries), field research and spatial analysis. The research has found 119 preserved industrial heritage sites, whose distribution reflects the historical spatial pattern of industrialisation and the priorities of the restructuring policy. To date, 70 sites have been converted, with commercial and institutional uses dominating and residential and recreational uses being much less common. Although minor differences in the average distance of industrial heritage sites from the city centre, shopping centre, university, train station or motorway exit depending on their current use have been observed, they were not statistically significant.

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Contents:

1. Introduction

By the most common definition, industrial heritage can be described as:

> the remains of industrial culture which are of historical, technological, social, architectural or scientific value. These remains consist of buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and stores, places where energy is generated, transmitted and used, transport and all its infrastructure, as well as places used for social activities related to industry such as housing, religious worship or education. (TICCIH, 2003:2).

However, as it is a very broad approach, the author decided to limit the scope of the study to the Polish legal definition of this term, which includes technical facilities such as mines, metallurgical plants, power plants and other industrial plants, as well as devices, means of transport, machinery and tools (*Ustawa o ochronie zabytków i opiece nad zabytkami*). Adaptive reuse, in turn, can be simply defined as "a process of converting a building for a new use, different from the initial aim of its construction" (Arfa et al., 2022: 148), carried out in order to "preserve the essential qualities and values of a heritage building while improving it to be used in the present and transferring it to the future" (Arfa et al., 2022: 149). This term can be used interchangeably with "conversion" or "recycling" (Caves, 2005).

The cultural values of industrial heritage were long disregarded because modern heritage protection criteria were established in the age of industrialisation, focusing on the legacy of the bygone pre-industrial era (Alfrey & Putnam, 2003). However, a change in approach emerged in the 1960s, with the United Kingdom taking a pioneering role as the first country to experience deindustrialisation (Stratton, 2000; Falconer, 2016), soon followed by Germany and other Western countries (Berger, 2022; Berger et al., 2022). Thereafter, the initial plans to demolish obsolete industrial plants began increasingly to be halted due to public pressure. Interestingly, it was not the redundant workers or trade unions who initiated this change, but rather academics, artists and local activists (Berger & Pickering, 2018; Berger, 2022). The deindustrialisation of the post-socialist countries, including Poland, followed a similar pattern, resulting in the destruction of several industrial complexes before their value was recognised (Mérai & Kulikov, 2021; Németh, 2021; Kunc et al., 2023).

Nowadays, industrial heritage is widely appreciated for its intrinsic values, which include, inter alia, evidence of the past, technological and scientific values, aesthetic qualities, its role in constituting local landmarks and its social values as former places of work (Oevermann & Mieg, 2014; Cossons, 2016; Smith, 2016). The complete process of valorisation of industrial heritage should encompass recognition, investigation, analysis, interpretation and evaluation of its cultural values, which comprise: integrity, authenticity, technical-aesthetical value, associated parts of intangible heritage, social identity value, historical value, artistic value and uniqueness. The valorisation should be followed by revalorisation, which can be described as the process of negotiating the socio-economic values that can be achieved through the revitalisation. These values include political context, legibility (preservation of integrity and authenticity), landscape value, mobility, diversity, tourist attractiveness, educational value and social relevance (Affelt, 2012; 2015). In practice, however, heritage services often tend to focus primarily on aesthetic qualities, which may result in the underrating of specific sites, such as standardised late modernist industrial architecture (Kisiel, 2021). Furthermore, values can change over time, so the assessment should ideally be reviewed and updated regularly (Falconer, 2016).

One of the key research issues related to industrial heritage is the cultural, environmental, economic and social benefits of its adaptive reuse. Finding a suitable new use for redundant industrial buildings and structures is a prerequisite to retaining their cultural values (Stratton, 2000; Alfrey & Putnam, 2003; Németh, 2021; Oevermann & Jones, 2022). The adaptive reuse of buildings provides significant environmental benefits in comparison to demolition and new construction, as it enables the embodied energy to be saved and thus contributes to reducting carbon emissions (Watson, 2016; Baker et al., 2021; Yıldız, 2024). Specifically, converting industrial heritage site to cultural use can attract visitors and further investment, as well as providing means of interpreting the buildings and their history (Stratton, 2000; Fragner, 2016). A successful heritage reuse project can be a catalyst for the regeneration of the entire surrounding area by creating a new image (Martinović & Ifko, 2018; Sun et al., 2019; Andrade et al., 2024) and, consequently, can attract new residents of the middle and creative classes (Oevermann & Mieg, 2014; Wicke et al., 2018) and increase property values (van Duijn et al., 2016; Dell'Anna, 2022). However, Maciejewska and Turek (2019) argue that, in Poland, the leverage effect is

mainly limited to the improvement of technical and commercial infrastructure without the expected reduction in social problems. Reusing industrial heritage may also have positive impacts on local communities by strengthening their identity and social cohesion to help them cope with the consequences of deindustrialisation (Berger, 2020; Mérai & Kulikov, 2021; Guitart, 2022; Moro, 2022), and in certain cases it can foster social innovations (Tiran et al., 2022; Scaffidi, 2024). Other benefits include the improvement of the quality of public space and housing standards, inspiration for cultural and social activities, and the activation of senior citizens (which is particularly important in aging post-industrial communities), resulting in improved quality of life (Konior & Pokojska, 2020; Konior, 2021).

Moreover, industrial heritage creates opportunities to develop the tourism sector. Industrial heritage tourism encompasses five major components: the cultural component – to connect with the past; the physical component – to present authenticity; the product – to appeal to tourists; the experience – to relive history; and sustainability – to gain stakeholder participation. It provides means of understanding the industrial past by promoting its culture, celebrating its achievements and revitalising its industrial products (Xie, 2015). Furthermore, this type of tourism activity generates employment and external income, enables formal memorisation of heritage and counteracts negative perceptions of post-industrial areas (Harfst, 2015; Berger & Pickering, 2018; Rhodes et al., 2020). It is estimated that, in the European Union, industrial heritage attracts 18 million overnight tourist trips plus 146 million day visits, generating a direct spend of almost €9 billion annually (Lane et al., 2013). In the Polish context, there is also evidence that industrial tourism increases the tourist attractiveness of former mono-functional cities (Kronenberg, 2012) or even regions (Molenda, 2015).

Nevertheless, there are also some threats related to the process of industrial heritage reuse. To begin with, numerous conversion projects focus on aesthetic qualities of the outer shell of the buildings, with little reference to the original industrial use, which compromises the authenticity of heritage sites (Alfrey & Putnam, 2003; Wicke et al., 2018; Berger, 2022; Moro, 2022). From the social perspective, heritage- and culture-based urban regeneration schemes carry the risk of gentrification, which deprives the local community of the benefits of the transformation (Matthews, 2014; Rhodes, 2020; Yang, 2023). Although industrial heritage tourism creates new workplaces, it cannot replace the lost industrial employment in terms of quantity and qualifications required (Harfst, 2015; Yıldız, 2024). In the case of commercial adaptive reuse projects, the goals of developers may not align with local community interests (Moro, 2022), and public access to the site may be severely restricted (Aranđelović, 2021).

There are several drivers and barriers that affect the feasibility of reusing industrial heritage. A crucial positive factor is the involvement and cooperation of multiple stakeholders representing public and private sectors, NGOs and local communities (Fragner, 2016; Berger & Pickering, 2018; Oevermann & Jones, 2022; Zhang et al., 2022). In particular, the support of central government may be necessary in regions strongly affected by the consequences of deindustrialisation (Berger, 2020; Hua et al., 2021). The physical characteristics of the site also play an important role, as some buildings and structures are more amenable to conversion (e.g., textile mills, warehouses), whereas others, such as headframes, power plants or blast furnaces are much less so (Oevermann & Mieg, 2014; Fragner, 2016; Stratton, 2000). Investors are often reluctant to engage in conversion projects due to the negative image of post-industrial areas (Alfrey & Putnam, 2003; Preite, 2016; Bosák et al., 2018; Moro, 2022). The aspect of location is, however, somewhat ambiguous. On the one hand, centrally located sites with good transport accessibility can attract investment, but on the other hand, the developers may also aim at maximising profit through demolition and the construction of new buildings with higher floor area ratios (Stratton, 2000; Berg, 2017; Moro, 2022). This issue seems to be insufficiently investigated so far and requires further research.

Considering the state of research to date, the aim of this paper is to investigate the distribution of industrial heritage sites in the metropolitan area of GZM in Poland and to identify the factors influencing their current use. The research attempts to address following research questions:

1. RQ1: How are the preserved industrial heritage sites distributed in the study area?
2. RQ2: How are the industrial heritage sites adaptively reused in the study area and what are the basic factors affecting their current use?
3. RQ2: Is there a relationship between the location of industrial heritage sites and their current use?

2. Study area, research methods and materials

The study area is the GZM (abbreviation of Polish Górnośląsko-Zagłębiowska Metropolia – Upper Silesia-Zagłębie Metropolis), which is the only legally established metropolitan territorial body in Poland. It is located in the south of the country, in the centre of the Silesian Province (Fig. 1) and covers an area of ~2,500 km^2, with a population of 2.1 million. It comprises 41 communes, including 18 cities in the urban core, with its seat in the largest city – Katowice (Metropolis GZM). Historically, the area is situated on the borderland of two regions: Upper Silesia (central and western part) and Lesser Poland (eastern part), which, however, share the history of rapid industrialisation dating back to turn of the 19th century, fuelled by the discovery of lead-zinc ore and coal deposits. Consequently, in the 19th century, the area developed into one of the largest industrial centres in central Europe. It was only the change of political system in 1989 combined with the economic crisis that triggered the deindustrialisation, with its negative economic, social and spatial consequences (Krzysztofik, 2021; Krzysztofik et al., 2024). While the coal mining industry is still being phased out (Gwosdz et al., 2022), the potential of reusing the derelict collieries and post-mining landscapes for tourism has been recognised (Lamparska, 2019; Szromek & Butler, 2023).

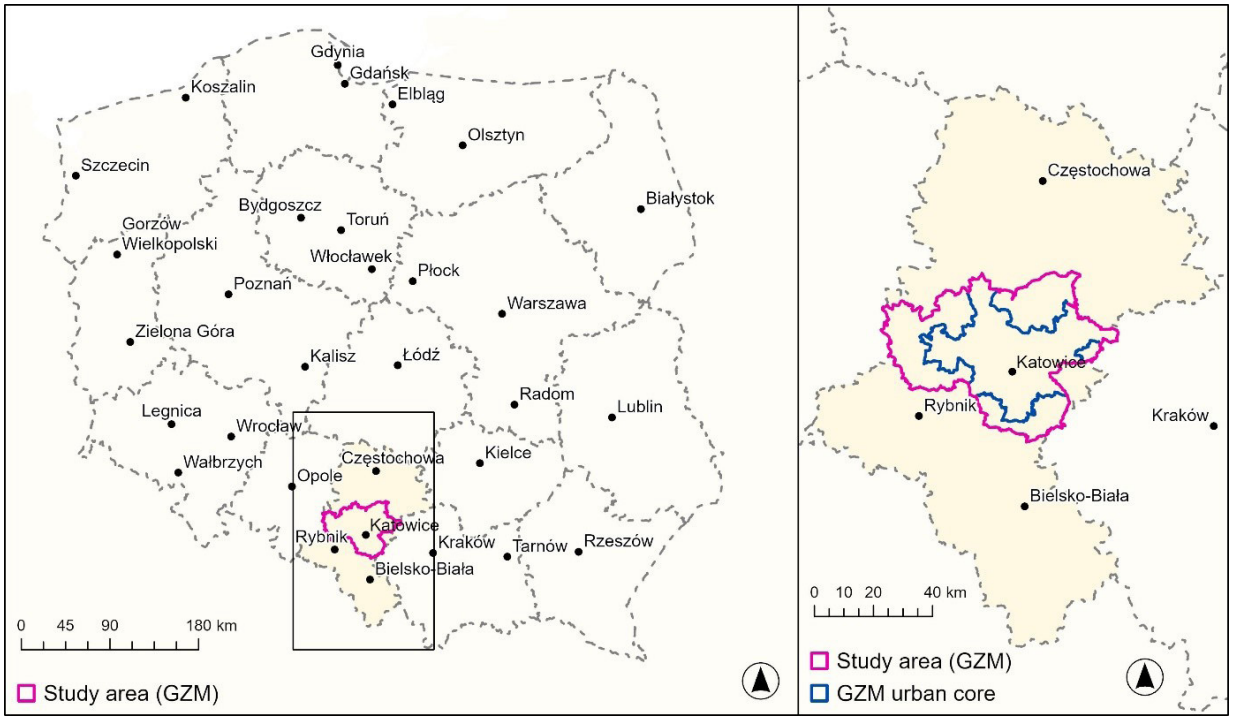

Fig. 1. Location of the study area
Source: author's work based on data provided by Metropolis GZM

The research is a mix of qualitative and quantitative methods, with some use of spatial analysis. The qualitative methods include analysis desk research (analysis of documents, database queries) and field research, and the qualitative methods include descriptive statistics of collected numerical data, whereas the spatial analysis was done using GIS tools in order to measure the distance to the nearest point of interest.

The basic data source used for identification of industrial heritage sites was the database and archive provided by the National Institute of Cultural Heritage, including the Register of monuments (nationally listed sites) and the Inventory of monuments (locally listed sites). The data gathered from the documents were verified during the field research. The current use of each site was investigated using the "REGON" database on economic activity, the "EU Grants Map" portal and the results of the field research. The analysis included only sites that met the following criteria: they were no longer in their original industrial use at the time of data collection, and they were not converted to their current use before 1989. The

spatial analysis focused on the location of industrial heritage sites in relation to the nearest point of interest of the following types:
point of interest of the following types:

- city centre (location of main seat of the municipal authorities)
- shopping centre (data provided by the Polish Council of Shopping Centres)
- university (data provided by the Register of higher education institutions)
- train station (data provided by the Polish Railway Lines company)
- motorway exit (data provided by General Directorate for National Roads and Motorways)

The first three categories of points of interest were selected because they attract large groups of people, while the last two categories are related to transportation accessibility.

The research procedure consisted of the following steps. First, all records marked as industrial heritage sites located in the study area were extracted from the database of National Institute of Cultural Heritage. Second, all sites that continued to be used for their original industrial purpose as of 31 December 2022 were excluded from further analysis. Then, the current use of each site was investigated using the "REGON" database, allowing each site to be assigned to one the four categories: industrial/warehousing, commercial, institutional or residential/recreational. The economic activities registered on each site between the years 1990 and 2022 were considered; the earliest date of commencement of activity was regarded as the year of conversion. In the case of sites with no registered activity, the current use was investigated during the field research (October 2022 – May 2023). In the case of all other sites, this method was used for verification purposes.

3. Research results

3.1. Distribution and basic characteristics of industrial heritage sites in the GZM

The research identified 119 preserved industrial heritage sites in the study area, with the highest number (18) located in the largest city (Katowice). Additionally, five other cities have more than ten listed sites. Generally, heavy industry heritage is concentrated in the centre of the urban core along the east–west railway lines, which historically provided the first connection of the area to the outside world. However, there is a prevalence of industrial monuments in the central and western parts of the area, i.e. the historical Upper Silesia. Interestingly, some building material factories, such as brickworks or glass-works, can be found in peripheral, isolated locations. There is also an underrepresentation of collieries in certain parts of the area, such as the city of Gliwice in the west. This is related to the fact that, unlike in the study area as a whole, in some cities coal mining played only a secondary role to other industries (Fig. 2).

The diversity of industries to which these sites were originally linked shows the dominant role of coal mining, metallurgy, and energy and water supply, which together account for almost 75% of the identified heritage sites. Sites previously used for food processing and manufacturing of building materials are also relatively common. Other sectors, such as mechanical engineering, chemical or textile industries, are less well represented, and have therefore been clustered into one category. It should be noted, however, that a single mining site may represent either a whole colliery or a part thereof, such as a peripheral pithead complex, listed separately from the main plant. The metallurgical sector includes both steelmaking and non-ferrous metallurgy. Examples of sites originally related to different industries are shown in Figure 3.

3.2. Main trends in the adaptive reuse of industrial heritage in the GZM

There are 49 industrial heritage sites in the study area (41%) that have not yet found a new use. Considering the converted sites (70 in total), the most common use was commercial, including retail facilities, office premises, restaurants and car repair shops. The second most important group is related to institutional use, represented mainly by cultural institutions and social service centres. Somewhat less obvious are the cases of industrial reuse, including warehousing, which are related to launching a manufacturing activity different than originally took place on a given site. The examples include manufacturing of customised metal products, electrical engineering and timber processing. The least common are the sites converted into residential or recreational facilities, such as public parks where post-industrial structures are used as viewing platforms (Fig. 4, Fig. 5).

The distribution of sites by their current use does not appear to follow a clear pattern, although there is a small prevalence of commercial projects

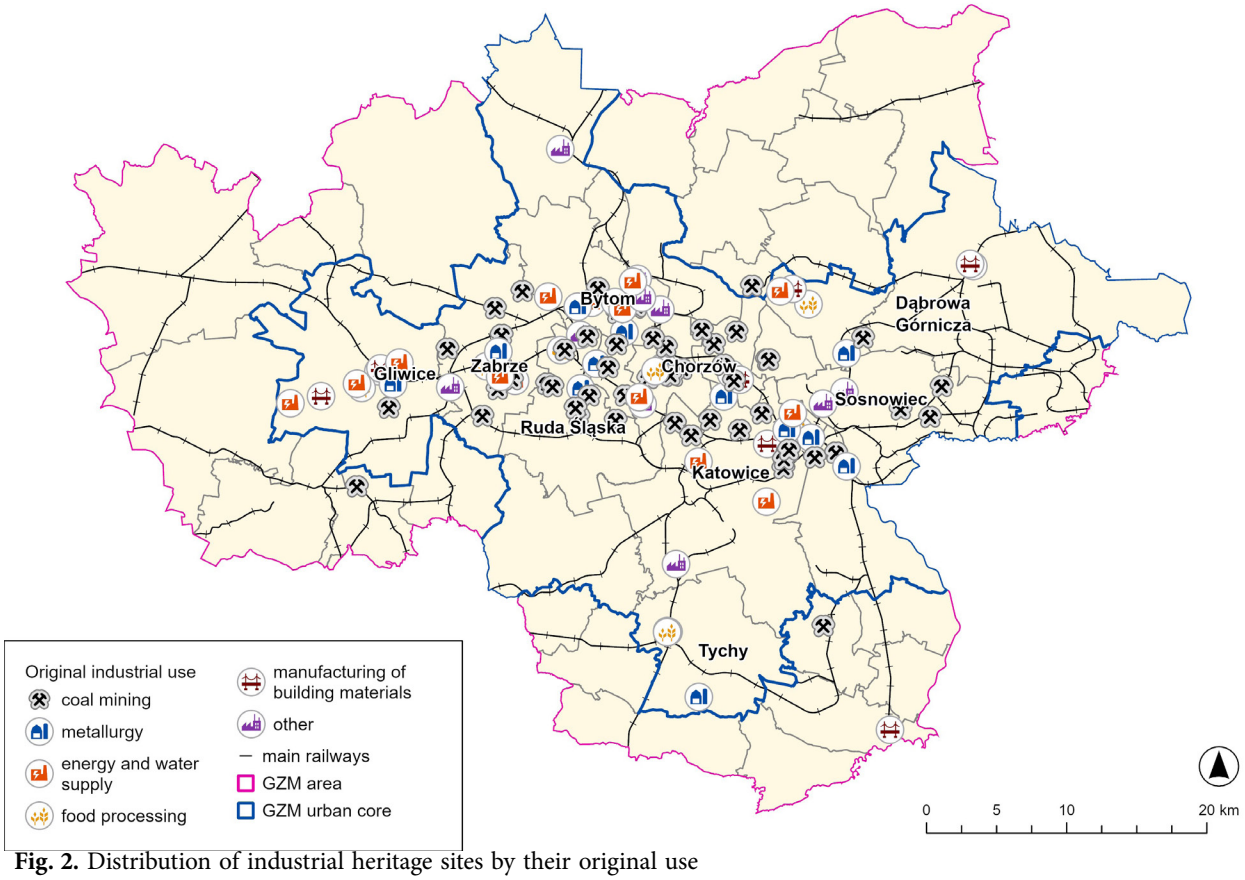

Fig. 2. Distribution of industrial heritage sites by their original use
Source: author's work based on research findings

Fig. 3. Examples of industrial heritage sites representing different industries in the study area. From left to right: coal mining ("Mysłowice" Coal Mine in Mysłowice), non-ferrous metallurgy ("Silesia" Zinc Works in Świętochłowice), steelmaking (blast furnace of the "Pokój" Steelworks in Ruda Śląska), energy supply ("Szombierki" Power and Heating Plant in Bytom)
Source: author's archive

in neighbouring cities of Katowice and Chorzów. Interestingly, the sites reused for new industrial activities and warehousing tend to be clustered in the central part of the area rather than in the peripheries, while the institutional uses can be found in central and peripheral locations alike. Moreover, there are some concentrations of unused sites on the western and eastern edges of the urban core, as well as around the city of Bytom (Fig. 6).

The important role played by European Union aid funds in facilitating the reuse of industrial heritage cannot be overlooked. In the study area, out of 70 identified conversion projects, 26 received financial support from the European Funds for a total amount of almost €180 million, with a mean project value of €7 million . However, the vast majority of these funds (over 70%) were assigned to projects related to institutional use, which, as stated above, has

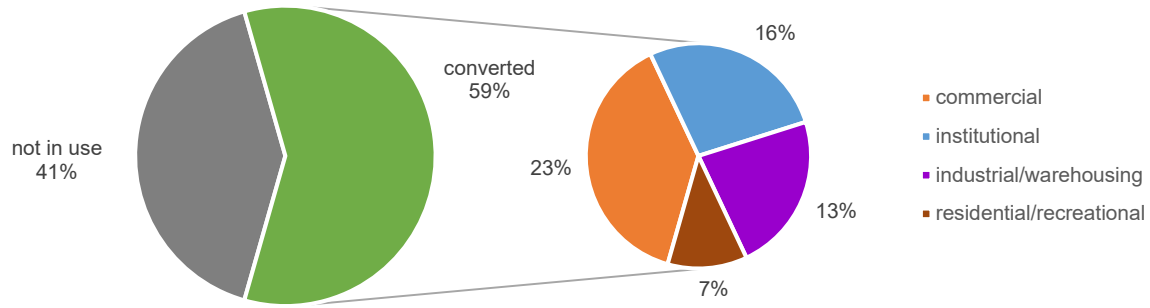

Fig. 4. Current uses of industrial heritage sites
Source: author's work based on research findings

Fig. 5. Examples of converted industrial heritage sites in the study area. From left to right: commercial use ("IT Loft Park" office complex in the former "Obywatelski" Brewery in Tychy), institutional use ("Carboneum" coal museum in a former water tower in Zabrze), industrial use ("Invest Park Hajduki" Business Park in former "Hajduki" Chemical Plant in Chorzów), recreational use (a public park with a viewing platform located at the top of the "Prezydent" Shaft headframe in Chorzów)
Source: author's archive

not proven to be a dominant conversion type (EU Grants Map). Therefore, most of the commercial, industrial and residential reuse projects had to be financed from either private or national public funds.

The proportions between different types of conversion projects have varied significantly over time (Fig. 7). Until 1995, the industrial and warehousing reuse dominated, whereas in the years 1996–2015 the commercial use dominated, which represents the evolving economic condition of the analysed area. The institutional use, in contrast, started to gain importance only around 2005, when substantial financial support from the European Union became available. A common awareness of the potential of industrial heritage to develop residential and recreational uses appeared relatively late in the study area, such that such projects were mainly observed after 2015. Overall, the highest number of projects were completed after 2015, which reflects not only the availability of external funding, but also the general health of the economy. Interestingly, the second largest group includes projects completed by 1995, which may be related to the entrepreneurial boom of the early economic transition in Poland.

3.3. Relationship between the location of industrial heritage sites and current use

Looking at the proximity of the industrial heritage sites to the city centre by current use, the most centrally located were commercial sites, while the unused and industrial sites were the most peripheral. When it comes to the relation to shopping centres, only minor differences between different uses were noted, with the residential and recreational having the shortest distance. Interestingly, the unused sites and industrial facilities are located closer to universities than any other type of reuse. The commercial sites are distinguished by their proximity to train stations, whereas the unused sites are on the opposite extreme in this case. Somewhat unexpectedly, the industrial heritage sites converted into residential or recreational uses are the most

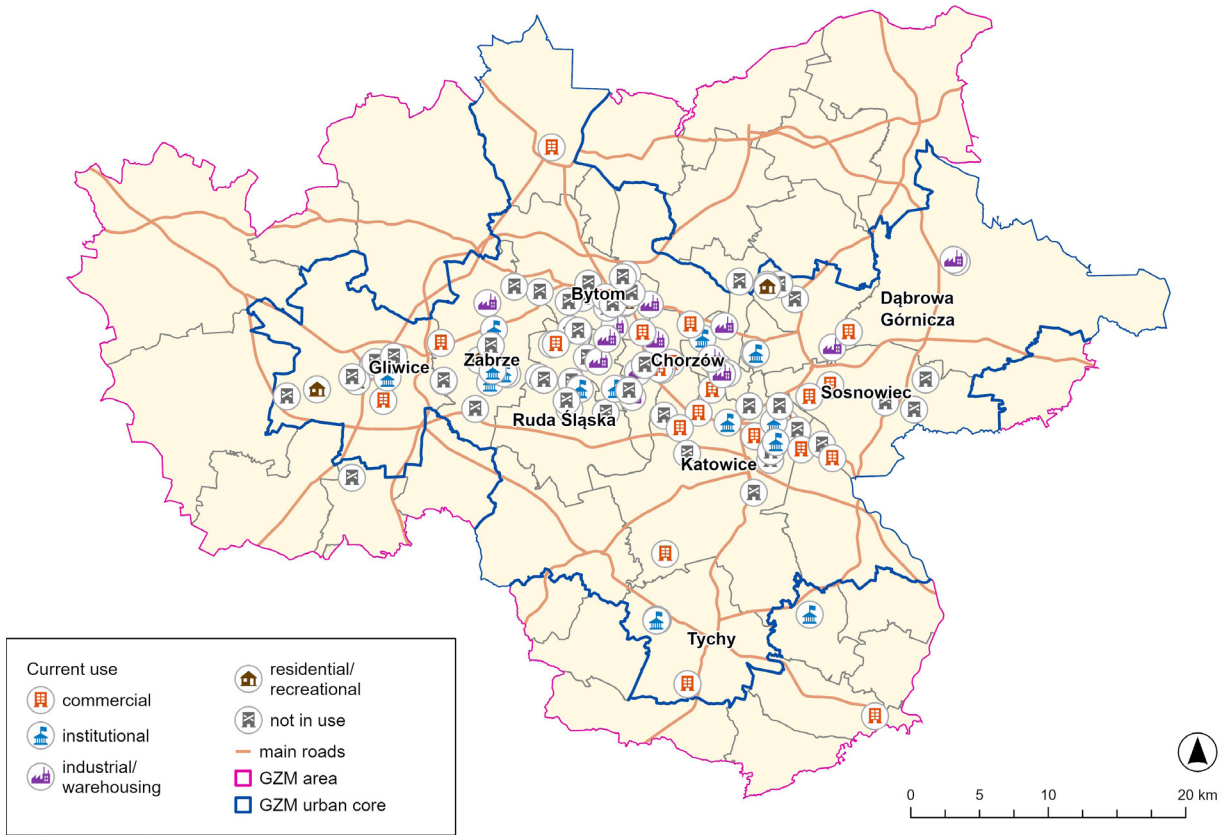

Fig. 6. Distribution of industrial heritage sites by current use
Source: author's work based on research findings

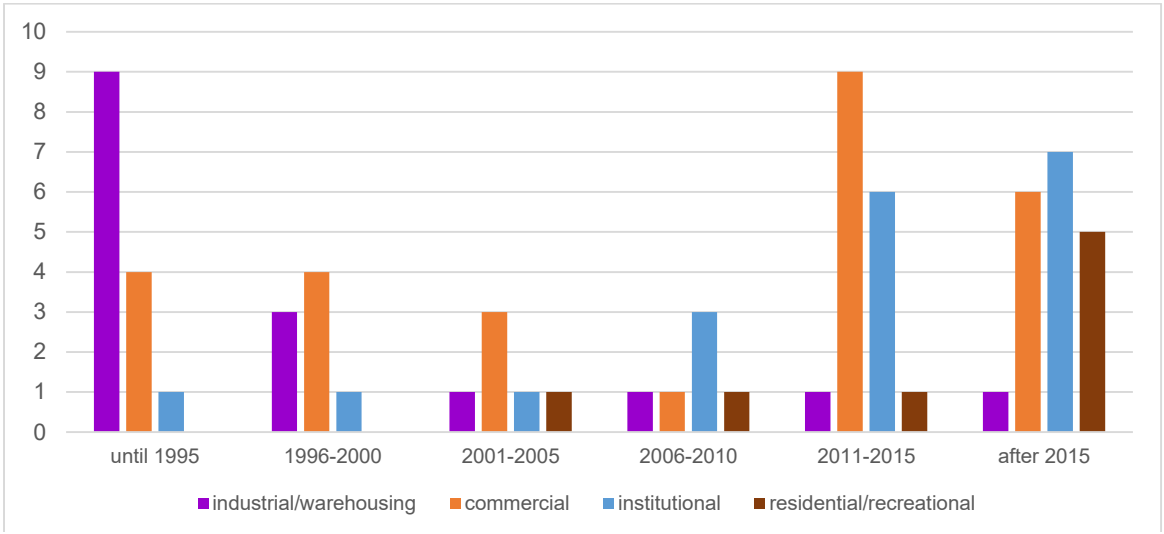

Fig. 7. Timeline of completed industrial heritage conversion projects
Source: author's work based on research findings

Table 1. Average distance of industrial heritage sites to nearest points of interest by current use

Current use of industrial heritage site	Average distance to nearest point of interest [km]				
	City centre	Shopping centre	University	Train station	Motorway exit
Not in use	2.61	1.85	3.94	2.68	4.57
Commercial	2.27	2.00	4.86	2.24	6.61
Institutional	1.73	1.94	4.73	2.46	5.28
Industrial/warehousing	2.50	1.97	4.02	2.44	6.10
Residential/recreational	1.94	1.79	4.88	2.47	4.26

Source: author's work based on research findings

closely located to motorway exits, while those converted into commercial facilities are situated furthest away (Table 1). Nevertheless, the one-way analysis of variance (ANOVA) did not prove the differences in mean values to be statistically significant in any case. Therefore, it cannot be stated that there is a clear relationship between the location and the current use of industrial heritage sites in the study area.

4. Discussion

The research found that 119 listed industrial heritage sites have been preserved in the study area. Most of them were originally linked to coal mining, metallurgy and energy supply, whereas other sectors are much less visible, which does not accurately reflect the historical structure of industries in this area. For instance, 21 companies in the mechanical engineering industry closed here between 1989 and 2014 (Karpiński et al., 2015), but very few of them retained any material relics. This is a result of the industrial restructuring policy, which adopted a socially responsible stance towards mining industry at the cost of underinvesting in other industries, such as the machine-making or textile industry (Krzysztofik, 2021). A comparison can be drawn with the situation in the Ruhr region of Germany, where the coal mining sector received relatively more political interest during the transformation process, However, at the initial stage of the process, even in that German region it was inevitable that conflicts would arise between the mine restructuring company and heritage protection services (Berger et al., 2018).

Almost 60% of the sites have been converted to new uses so far, which is a substantial figure considering the financial and technical challenges of their reuse. The concentration of commercially reused industrial sites in Katowice and Chorzów can be associated with the joint role of these cities as a metropolitan growth pole (Gwosdz et al., 2022). Although the commercial and institutional uses prevail in total (23% and 16% respectively), the industrial and warehousing conversion played a significant role in the 1990s. This can be explained by the phenomenon of reindustrialisation in the study area, which was largely based on small and medium-sized businesses. Some of these chose the buildings of defunct industrial companies to locate their activities (Krzysztofik et al., 2016; Krzysztofik et al., 2024). The reuse of former industrial sites for new manufacturing and warehousing activities is a common phenomenon in other CEE countries as well, such as the Czech Republic (Osman et al., 2015).

The lack of clear relationship between the location of industrial heritage sites and their current use may indicate a greater significance of other site-specific factors. Considering the industrial or warehousing reuse, the affordability of space might have been more important than the transport accessibility. In the case of commercial conversions, the advertising value of a unique listed building may have attracted the investor to locate his business on the site, despite its unfavourable location. The public bodies, being a latecomer and mostly dependent on EU funding, may have been forced into selecting sites that were unappealing to the private sector, which corresponds to the so-called "ABC brownfield redevelopment model" (Vojvodíková et al., 2021).

5. Conclusions

The aim of this paper was to investigate the distribution of industrial heritage sites in the GZM (Silesia Province, Poland) and to identify the trends regarding their current uses. The research has showed that the distribution of industrial heritage sites reflects the historical spatial pattern

of industrialisation related to the development of railways and specialisation of certain cities. However, the preserved heritage does not accurately represent the historical structure of industries in the study area, with some industries being underrepresented, in contrast to coal mining, which received the strongest political and economic support during the restructuring process. Therefore, it is now crucial to preserve the remaining heritage sites that are rare survivors of other industries. Failure to do so may compromise the authenticity of the post-industrial landscape.

Almost 60% of the sites have been converted to date, with the predominance of commercial and institutional uses. The increasing popularity of institutional use of industrial heritage sites since the mid-2000s is a symptom of the ability of public bodies to raise EU funding; however, it also carries the risk of financial burden related to high maintenance costs. Therefore, it is advisable to create new financing schemes, such as public–private partnerships or repayable financial assistance for private investors.

The research found no significant relationship between the location of industrial heritage sites and their proximity to the city centre, a shopping centre, a university, a railway station or a motorway exit. This may indicate the ambiguous role of location in facilitating the conversion process in comparison to other factors, such as the cultural value of the site or the affordability of usable space. However, the complex polycentric spatial structure of the study area should also be taken into account, as the differences between the municipalities forming the metropolitan area may be more important than the internal diversity of each of them. Thus, a more sophisticated spatial analysis method could be designed for the future research, with a stronger reference to the specificity of the study area.

This study has some potential limitations related to data availability. Primarily, only legally protected (listed) heritage sites were analysed, which may not reflect the full resources of the industrial heritage resources from the point of view of the local community. These resources might, for example, include sites with no buildings or structures preserved, but with only some symbolic relics preserving the collective memory about the industrial history. Therefore, further diversification of data sources and methods would be recommended for further research in this field.

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