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INDUSTRIAL HERITAGE AS A RESOURCE FOR SUSTAINABLE DEVELOPMENT OF INDUSTRIAL REGIONS: THE CASE OF KRYVYI RIH

B a c k g r o u n d . In modern conditions of post-industrial territorial transformation, the issue of preserving and re-evaluating industrial heritage gains particular relevance. The decline of functioning industries leaves behind numerous objects that can be either a source of decline or a potential for development. Kryvyi Rih, as one of Ukraine's most prominent industrial regions, has accumulated a significant array of such objects. The aim of this study is to analyze the industrial heritage of Kryvyi Rih as a resource for the sustainable development of the region, identify its potential for preservation and reuse, and outline the key challenges and opportunities for transforming the post-industrial landscape into a hub of public and tourist activity.

M e t h o d s . The study was conducted based on the theoretical foundations of the International Committee for the Conservation of Industrial Heritage (TICCIH), including the Nizhny Tagil Charter and the Dublin Principles. Historical-geographical analysis, cartography, analysis of archival and field materials, typologization and systematization of objects were applied. Additionally, a research algorithm was developed, encompassing four stages: preparatory, expeditionary, analytical, and conceptual.

R e s u l t s . Within the scope of the study, foreign and Ukrainian discourses on industrial heritage were analyzed. An inventory of over 800 industrial heritage objects in Kryvyi Rih was conducted. Their typologization is proposed based on their subject essence, time of origin, and degree of preservation. A subject classification is presented, which considers manufacturing, infrastructure, social, memorial components, and intangible industrial heritage. Three historical periods of the region's industrial heritage formation and three levels of its preservation have been identified.

C o n c l u s i o n s . The industrial heritage of Kryvyi Rih is an integral part of the regional identity and holds significant potential for integration into sustainable development concepts. The proposed research algorithm and classification can be used as a methodological basis for developing programs for the preservation, revitalization, and promotion of industrial heritage. The identified objects form the basis for creating industrial culture clusters, developing industrial tourism and creative industries, and fostering a sustainable urban environment based on local resource potential.

K e y w o r d s : industrial heritage, sustainable development, revitalization, industrial spaces, Kryvyi Rih.

Background

In the 21st century, the re-evaluation of industrial heritage has gained particular importance in the context of sustainable development for territories that have undergone prolonged technogenic impact. The legacy of industrial production – mines, quarries, factories, plants, and transport infrastructure – is no longer perceived solely as waste from the industrial era. Instead, these elements are increasingly viewed as a valuable resource for the socio-cultural, economic, and spatial transformation of cities, representing their territorial capital.

In European countries, the significance of industrial heritage has been recognized and re-evaluated, as evidenced by numerous successful revitalization cases in regions such as the Ruhr region in Germany, North West England in the UK, Nord-Pas-de-Calais in France, Silesian Voivodeship in Poland, Moravian-Silesian Region in the Czech Republic, and many other localized industrial spaces. The revitalization of industrial heritage in these regions is often combined with the development of cultural, industrial, and ecological tourism, creating attractive public spaces, new economic hubs, and recreational areas.

In Ukraine, most industrial heritage sites are devalued and effectively destroyed after their industrial function ceases. Thus, industrial heritage remains an undervalued resource, whose future depends on state policy, local community initiatives, scientific support, and cultural re-evaluation.

Kryvyi Rih is one of the most striking examples of a post-industrial region in Ukraine, where a mono-economy based on iron ore mining and heavy industry has been formed for decades. Today, this city has a unique concentration of industrial objects, many of which have lost their functional

significance but possess significant potential as elements of cultural, tourist, and public infrastructure. The revitalization of such objects could open new opportunities for economic diversification, the formation of a new urban identity, and an improved quality of life for the population.

The aim of this article is to analyze the industrial heritage of Kryvyi Rih as a resource for the region's sustainable development, identify the potential for its preservation and reuse, and outline key challenges and opportunities for transforming the post-industrial landscape into a hub of public and tourist activity.

Methods

This research draws upon the guiding principles and agreements of TICCIH (The International Committee for the Conservation of the Industrial Heritage), specifically: the Nizhny Tagil Charter for the Industrial Heritage (The Nizhny Tagil Charter, 2003), which, adopted in July 2003, formulated the conceptual foundations of industrial heritage; and the Dublin Principles (Dublin Principles, 2011), joint ICOMOS-TICCIH principles for the conservation of industrial heritage sites, structures, areas, and landscapes, ratified in 2011. Additionally, the TICCIH Guide to Industrial Heritage Preservation (Douet, 2016) is fundamental to understanding the value and role of industrial heritage, evidence of its existence, and its potential.

The primary methods used to study industrial heritage include working with archival materials, analyzing and systematizing historical data, old cartographic information, eyewitness accounts, old photographs, and diagrams. This study is based on the results of numerous field expeditions conducted in Kryvyi Rih between 2005 and 2013 under the leadership of V. Kazakov. The

collected factual material was systematized and classified. Furthermore, an algorithm for studying industrial heritage was proposed based on analytical research of various information sources.

Results

Mining, industrial, and post-mining regions are typically perceived as territories with extremely tense ecological situations, heavily disturbed landscapes (badlands), and an unattractive environment for living or developing various types of economic activity (Patsiuk, Ostapchuk, & Kazakov, 2023). However, according to the concept and goals of sustainable development, this sharply negative perception can be changed through the preservation and subsequent revitalization of their industrial heritage, which subsequently contributes to the diversification of these regions' economies, the activation of their cultural and creative industries, and the development of tourism.

The concept of "industrial heritage" emerged in England only in the mid-20th century, a period when several outdated industrial buildings and landscapes were demolished. This concept was definitively formulated in one of the key documents of the TICCIH organization – the Nizhny Tagil Charter for the Industrial Heritage. According to the interpretation presented in this Charter, industrial heritage consists of the remains of industrial culture that have historical, technological, social, architectural, or scientific value. These remains consist of buildings and machinery, workshops, mills and factories, mines and processing and refining sites, 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 rites, or education (The Nizhny Tagil Charter, 2003). Additionally, the Charter states that industrial heritage has social value as part of the history of life, and as such, it provides an important sense of identity. It holds technological and scientific value in the history of production, engineering, and construction, and can possess significant aesthetic value for the quality of its architecture, design, or planning.

Polish researchers A. Konior and W. Pokojska define industrial heritage as a very specific type of heritage, consisting of the remains of industrial culture that have historical, technological, social, architectural, or scientific value. It can include buildings, equipment, workshops, factories, warehouses, mines, transport infrastructure, and places of social activity indirectly related to industry: residential architecture, places of religious worship, or education. Industrial heritage can vary in size and form. However, it is rarely limited to a single object or territory; a single machine tool is only part of a larger process. Often, the manifestation of industrial heritage is a series of several spatially connected places that together form an industrial landscape (Konior, & Pokojska, 2020).

German researchers P. Itzen and C. Müller note that industrial heritage encompasses many forms, objects, narratives, and questions about the place of industrialization in late-industrial societies without a clear definition of its nature in the general heritage discourse. Scholars point out that industrial heritage includes diverse phenomena united by a single dominant: industrial museums; the preservation of old industrial buildings and their reuse for cultural purposes such as concerts, art exhibitions, and permanent galleries; scholarly discussions about industrial remnants and their interpretations as witnesses to the past (often referred to as "industrial archaeology"); the representation of an imagined industrial era in film, music, and popular culture; attempts by companies to develop their corporate

identity through the cultivation of their past; and the hope of former industrial regions to leverage their industrial past (Itzen, & Müller, 2013).

Among many scholars working on the topic of industrial heritage, there is a broad consensus that industrial heritage includes more than just "big things," but also many more subtle, intangible forms of heritage that do not have a direct connection to material culture (Wicke et al., 2018).

In Ukraine, at the legislative level, the definition "objects of science and technology" is traditionally used instead of "industrial heritage" – unique industrial, production, scientific-production, engineering, engineering-transport, and mining objects that define the level of development of science and technology of a certain era, certain scientific directions, or industrial branches (On Cultural Heritage Protection, 2000).

K. Gorb, researching industrial heritage within the national heritage system, proposes distinguishing the following levels of its consideration: 1) as historical objects and phenomena-artifacts of industry (initially "industry" substantively refers specifically to industrial production); 2) as artifacts of production in general, not only industry; 3) as artifacts of the economy as a whole, including historical structures and technologies of industrial, transport, construction, trade, and other sectors, primarily secondary and tertiary economic spheres; 4) as the heritage of the industrial era in general, a unique monument to scientific and technological progress that fundamentally changed the character and rhythm of life of the world community (Gorb, 2008).

S. Dychkovskyyi understands the industrial heritage of a city as an element of cultural space that reflects the traditional features of the industrial landscape, through which a person forms images that act as the industrial mentality of the place (Dychkovskyyi, 2020).

Substantial research on urban planning monuments as forms of industrial heritage was conducted by Y. Tyutyunnik, who noted that in relation to production facilities, the category of urban planning monuments is used extremely rarely in domestic heritage protection theory and practice, almost never (Tyutyunnik, 2014).

Significant attention has also been paid to the classifications of industrial heritage objects. M. Falser and M. Yang, in their study, refer to a very detailed classification system for industrial heritage developed by the Historic American Engineering Record (HAER), a division of the U.S. National Park Service. The classification system for industrial structures consists of 10 subcategories:

1. Extractive industries (e.g., ore or gold mining).
2. Bulk product industries (e.g., primary metallurgy).
3. Processing industries (e.g., mechanical engineering).
4. Utilities (e.g., water supply, electricity).
5. Power sources and prime movers (e.g., water wheels, steam turbines).
6. Transportation (e.g., railways, canals, ports).
7. Communication (e.g., radio, telephone).
8. Bridges, viaducts, aqueducts.
9. Building technologies (roofing systems, enclosures).
10. Specialized structures/objects (e.g., dams, tunnels, hydraulic structures) (Falser, & Yang, 2001).

A fundamental scheme for systematizing national heritage was proposed by N. Duk and I. Sumatohina. The scholars took a comprehensive approach to the issue, classifying industrial heritage objects in Ukraine by considering various characteristics: origin, form of territorial localization, historical features and correspondence to a certain stage of development, naturalness of the

environment where heritage objects are located, primary purpose of the objects, their degree of preservation, leading social function, etc. (Duk, & Sumatohina, 2015).

G. Pidgrushnyi proposes dividing industrial heritage into five key types:

1. Energy objects (thermal and hydroelectric power plants, power lines, etc.).
2. Production objects (mines, quarries, plants, factories, individual technological lines, equipment, etc.).
3. Warehousing facilities (warehouses, storage facilities, cellars, etc.).
4. Transport infrastructure objects (railway stations, port complexes, hangars for vehicles, individual railway branches, etc.).
5. Social infrastructure objects (residential buildings for engineering and technical personnel and workers, clubs, hospitals, schools, colleges, etc.) (Pidgrushnyi, 2016).

The authors of this study have individually proposed their own visions for the classification of industrial heritage objects in their previous works (Kazakov, 2010; Patsiuk, 2024).

In Ukraine, the study of industrial heritage objects should be based on the provisions of the Law of Ukraine "On Cultural Heritage Protection" (On Cultural Heritage Protection, 2000). According to this law, these objects can be identified across several categories. First, they can be categorized as objects of science and technology – unique industrial, manufacturing, scientific-production, engineering, engineering-transport, and mining facilities that defined the level of scientific and technological development of a specific era or particular industrial sectors. Second, some human-made mining industrial heritage objects (waste heaps, quarries, sinkholes, etc.) are landscape complexes – natural lands with historical value as areas of industrial development in ancient times and consequences of technological work. Third, the residential industrial heritage objects of workers' settlements in old mines and factories are carriers of distinctive architectural and urban planning styles – as individual architectural structures characterized by features of a particular culture, epoch, styles, and traditions, as well as architectural ensembles of historical centers, streets, quarters, squares, and fences. A small number of industrial heritage objects associated with the lives and activities of prominent industrialists and figures in science and technology are characterized by historical value – residences of enterprise owners and administrative offices, individual burials and necropolises, and significant places connected with important historical events in industrial development (mine territories), and with the lives and activities of famous individuals who worked at particular enterprises.

It is noteworthy that scholarly consensus has affirmed the inclusion of not only tangible and actually preserved objects as industrial heritage but also sites where they once existed, even if they are now buried, destroyed, or reclaimed. This is crucial for studying a specific territory during expeditionary research. Furthermore, the understanding of industrial heritage objects not as isolated monuments but as cultural heritage complexes is constructive – topographically defined aggregates of individual or interconnected objects along with significant places – human-made landscapes and natural-human-made creations that have retained their value from an archaeological, aesthetic, historical, architectural, and scientific perspective. The complex principle (e.g., a mine, road, settlement with infrastructure: power station, canteen, outpatient clinic, church, etc.) of industrial development in Kryvbas dictates the nuclearity

and diffuseness of industrial heritage objects' distribution across the region. This is not only a key to researching industrial heritage objects but also a basis for identifying their compact placement areas and outlining the main territories for museumification and the creation of landscape-industrial parks.

Thus, the goal of studying industrial heritage objects is a historical-geographical and technical-technological analysis of ancient industrial objects. The objectives stem from this goal but will vary for different specialists. For historians, the primary interest lies in understanding the logic, content, and chronology of industrial heritage objects' development, and the description and assessment of the preservation status of technical objects. In geographical studies, the main tasks involve the spatio-temporal analysis of the location and formation of industrial objects and complexes across various historical eras and the present, conducting an inventory of industrial heritage objects, and compiling specialized maps. For technical science, the tasks include: reconstructing the structure of lost industrial heritage objects, describing old technical devices, determining the technologies used in production, and identifying preserved technical artifacts for museum purposes. Common tasks that unite the efforts of specialists from many scientific fields include assessing the current state of industrial heritage objects and their potential, developing concrete museumification projects for the protection of industrial heritage complexes in the form of landscape-industrial parks or reserves, and justifying development programs for industrial tourism based on these museums with cognitive, extreme, scientific, ecological, and other motives.

Thorough research on the topic allows for proposing an algorithm for industrial heritage research, presented in Fig. 1.

The study of industrial heritage in Kryvyyi Rih began in 2005, with expeditions led by V. Kazakov to explore the heritage of various locations in the region. The conducted research allowed for the systematic compilation of a comprehensive database of industrial heritage objects, with over 800 units identified and mapped.

The study of the industrial culture history of the Kryvyyi Rih region organically fits not only into the system of heuristic motives but also into the complex of culturological education, fostering patriotism through examples of ancestors' scientific and technical achievements, and ultimately – preserving historical memory and pride in one's homeland. The establishment of efforts to identify, study, and protect monuments of industrial culture in the Kryvyyi Rih territory is an important, if not primary, task for historians, geographers, local historians, miners, and representatives of technical sciences.

The history of industry in Kryvbas from the late 19th to the 20th century is primarily a process of developing mining, ferrous metallurgy, mechanical engineering, and construction (transport, hydraulic, residential). This led to the emergence of a large number of monuments of the region's industrial culture, their character, and the problems associated with their preservation and potential use in recreation, education, and the upbringing process.

The monuments of industrial culture in the Kryvyyi Rih region, in the general context of European industrial heritage, are iconic and among the largest in Europe (mines, quarries, metallurgical complex, power plants). The specificity of the industrial history of the Kryvbas territory, which contains numerous monuments, is reflected in their composition and typology. The most constructive typology is based on time, level of preservation, and genesis.

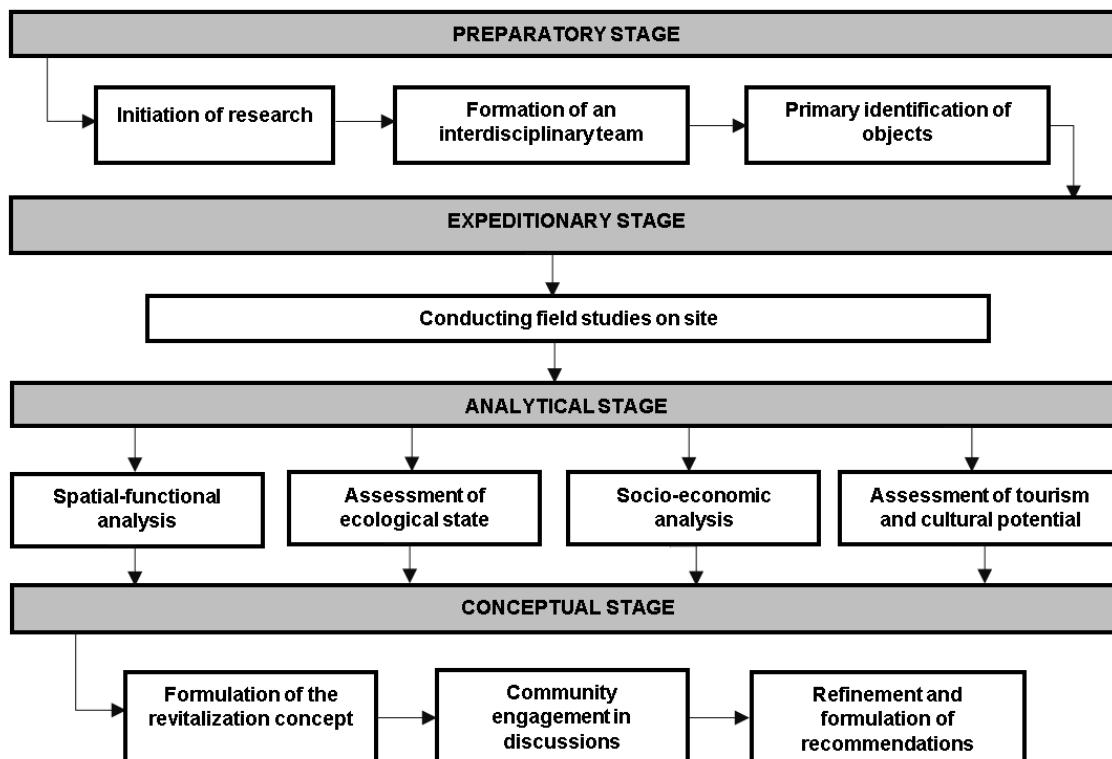


Fig. 1. Algorithm for industrial heritage research (Source: Created by the authors)

Determining the temporal category of industrial heritage objects is one of the primary tasks in their identification. The monuments of industrial culture in the Kryvyi Rih region, in the general context of European industrial heritage, are neither the most ancient nor the best preserved among similar objects. However, some industrial heritage objects are outstanding and among the largest in Europe (mines, quarries, metallurgical complex). Based on the principle of antiquity and the sequence of appearance of historically valuable industrial heritage objects, V. Kazakov and V. Titov proposed distinguishing three periods of formation of industrial culture monuments in Kryvyi Rih:

- Before 1881: Industrial heritage objects from this period were not very diverse. Agricultural production predominated during this time, so the industrial heritage of this period is little known in the region's history. For instance, there were small sand, clay, and limestone quarries in the ravines, artisanal mining of slate (from the late 18th century), iron ore mining from the Scythian period in the Dubova, Kovalska, and Chervona Pividenna ravines; watermills and windmills, pond dams along Kryvyi Rih ravines, etc. Almost none of these have been preserved to date.

- 1881–1918: These are industrial heritage objects from the early industrial period – the era of the "ore fever", active iron ore development, the growth of cast iron production, and road and residential construction. During this period, between 39 and 79 iron ore mines emerged (with fluctuations), along with the Hdanskyi Cast Iron Plant in 1892, the Katerynynska Railway (1884), monumental railway bridges over the Inhulets (1882) and Saksahan rivers and deep ravines. By the late 19th to early 20th century, about 20 mining settlements and other facilities appeared. The degree of preservation of objects from this time is below average.

- 1921–1955: This type includes industrial heritage objects from the period of iron ore industry reconstruction after the wars – up to the so-called minor reconstruction of mines. New mines emerged, and about 40 existing mines were reconstructed. The Kryvyi Rih plants – metallurgical (1934) and coke-chemical (1936) – were built, along with mechanical workshops (1922) and the city's power station (1929). Pre-war workers' settlements expanded. Despite their more recent age, the mining industrial heritage objects from this period are even less preserved (compared to other objects), as their territories were subject to further expansion of mining operations (Kazakov, & Titov, 2007).

Based on the degree of preservation, it is proposed to categorize industrial heritage objects in Kryvbas into three groups:

1. Relatively well-preserved objects that have survived to the present day.
2. Partially lost objects (e.g., semi-ruined mine headframes, subsidence funnels above mine shafts, partially backfilled old quarries, flooded quarries, remnants of industrial buildings and workers' settlements, etc.).
3. Completely lost objects – only the locations where they once stood remain (e.g., approximately 100 mines that operated between 1886 and the 1950s have vanished, as have several dozen small quarries and spoil heaps, branches of the Katerynynska railway with pre-revolutionary bridges, and remnants of Scythian-era iron ore mining, among others).

At the initial stage of V. Kazakov's research, the subject typology was based on the sectoral structure of the economy. However, over time, this framework was deepened and expanded, as reflected in V. Patsiuk's classification. Nevertheless, in the process of systematizing the array of industrial heritage objects in Kryvyi Rih, this classification was also supplemented and is presented in Table 1.

Table 1

Subject typology of industrial heritage objects in Kryvyi Rih
(Source: Created by the authors)

Type	Subtype	Varieties	The number in Kryvyi Rih
Production heritage	Mining	Mines:	
		– Old operational mines	3
		– Mine ruins and sites	50
		– Compressor shaft	1
		– Open mine shafts or their locations	17
		– Drifts	2
		– Adits	11
		– Exposed underground workings	4
		– Cross-cuts	1
		– Prospecting pits	1
Infrastructure industrial heritage	Transport	– Protective embankments of mine fields	2
		Quarries	45
		Dumps	64
		Sludge ponds	6
		Mine collapse zones	15
		Mine displacement zones	15
		Factories	6
		Elevator	1
		Watermill	2
		Bridges	6
Social	Energy	Bridge ruins	7
		Ore hoisting structures	5
		Railway tracks and sidings	20
		Mine haulage roads	17
		Overpass tunnels	30
		Sections with road paving	3
		Railway station buildings	8
		Locomotive depot structures	3
		Power plants	2
		Underground diversion tunnels	2
Burial	Water	Water towers	4
		Aqueduct	1
		Pump station	1
		Drainage canal	1
		Water discharge canals	3
		Culvert tunnels	29
		Railway station buildings	42
		Warehouse structures	3
		Fire station buildings	1
		Operational workers' settlements	49
Memorial	Residential	Ruins of old workers' settlements	12
		Individual valuable residential buildings	161
		Mine offices and administrations	2
		Mine hospitals	5
		Ruins and sites of workers' settlement churches	5
		School buildings at mines	8
		Parks and squares of workers' settlements	11
		Clubs	2
		Miners' cemeteries	8
		Workers' mass graves	2
Industrial technical artifacts	Museums	Industrial museums	9
		Monuments and memorial signs of industrial significance	74
		Alleyway and stelae of Labor glory	17
		Panels with industrial content	5
		Memorial plaques	17
Intangible industrial heritage	Commemorative dates	Samples of equipment used in various production processes	
		Metallurgist's day	
		Miner's day	
	Festivals	Railway worker's day	
	Festivals	IndustrialFEST	

The subject typology essentially serves as a passport for industrial heritage objects in Kryvyi Rih and simultaneously as a guide for reconnaissance fieldwork aimed at inventorying existing and lost industrial and related objects.

It is worth noting that five objects in Kryvyi Rih are part of the European Route of Industrial Heritage (ERIH, 2025): PJSC "North Mining and Processing Plant" Open Air Museum of Mining Equipment, "Inhulets Mining and Processing Plant" Open Cast Mine, "ArcelorMittal Kryvyi Rih" Coking Plant and Museum, "South Mining and Processing Plant" Quarry, and PJSC "Arcelor Mittal Kryvyi Rih" Open Air Museum of Mining Equipment.

Discussion and conclusions

In contemporary conditions of post-industrial transformation of urbanized territories, the investigation of industrial heritage for its subsequent transformation is becoming increasingly relevant.

This study proposes an algorithm for industrial heritage research, which includes the following stages: preparatory (involving the study of the preconditions for the emergence and development of industrial heritage objects); expeditionary (entailing the study of objects through field research); analytical (during which spatial-functional analysis of objects, assessment of their ecological state, socio-economic analysis, and evaluation of their tourism and cultural potential are conducted); conceptual (where recommendations for the future use of the object are developed).

A logical continuation of this algorithm should be the stage of practical heritage preservation, which involves its museumification or revitalization.

The industrial heritage of Kryvyi Rih is a unique resource, reflecting deep historical, social, architectural, and technical layers of development of one of Eastern Europe's largest industrial regions. The conducted inventory of over 800 objects allows for their classification by several parameters: genesis, time of origin, degree of preservation, and so on. The proposed classification of industrial heritage objects by content can serve as a basis for forming a register of cultural heritage objects in the region.

The most complete and reliable knowledge about old industrial objects allows for raising the question of their preservation, which specifically requires recognition by the Center for Monument Studies of the National Academy of Sciences of Ukraine and the Ukrainian Society for the Protection of Historical and Cultural Monuments, and their revitalization for future use. Industrial objects that have been fully or partially preserved can become nuclei for the creation of industrial culture clusters, which will contribute to the formation of a new urban cultural identity and the further development of its tourism sector, increasing the region's investment attractiveness, and engaging the public in urban modernization processes.

Authors' contribution: Viktoriia Patsiuk – conceptualization, formal analyses, methodology, analysis of sources, review of literature, partial collection and analysis of field research results, writing (original draft, revision and editing); Volodymyr Kazakov – conceptualization, formal analyses, methodology, collection and analysis of field research results, writing (original draft).

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ІНДУСТРІАЛЬНА СПАДЩИНА ЯК РЕСУРС СТАЛОГО РОЗВИТКУ ІНДУСТРІАЛЬНИХ РЕГІОНІВ: КЕЙС КРИВОРІЖЖЯ

Вступ. У сучасних умовах трансформації постіндустріальних територій проблема збереження та переосмислення індустріальної спадщини набуває особливої актуальності. Відмова від функціонуючої промисловості залишає по собі численні об'єкти, які можуть бути як джерелом занепаду, так і потенціалом для розвитку. Криворіжжя, як один з найяскравіших індустріальних регіонів України, накопичило значний масив таких об'єктів. Метою дослідження є аналіз індустріальної спадщини Криворіжжя як ресурсу для сталого розвитку регіону, визначення потенціалу її збереження та повторного використання, окреслення ключових викликів та можливостей трансформації постіндустріального ландшафту в актив громадської і туристичної діяльності.

Методи. Дослідження здійснено на основі теоретичних засад Міжнародного комітету зі збереження промислової спадщини (TICCIH), включно з Нижньотагільською хартією та Дублінськими принципами. Застосовано історико-географічний аналіз, картографування, аналіз архієніх і польових матеріалів, типологізацію та систематизацію об'єктів, а також розроблено алгоритм дослідження, що охоплює чотири етапи: підготовчий, експедиційний, аналітичний та концептуальний.

Результати. У межах дослідження проаналізовано закордонний та український дискурси щодо індустріальної спадщини. Проведено інвентаризацію понад 800 об'єктів індустріальної спадщини Криворіжжя. Запропоновано їх типологізацію за предметною сутністю, часом виникнення та ступенем збереженості. Представлено предметну класифікацію, яка враховує виробничі, інфраструктурні, соціальні, меморіальні компоненти та нематеріальну індустріальну спадщину. Виділено три історичні періоди формування індустріальної спадщини регіону та три рівні її збереження.

Висновки. Індустріальна спадщина Криворіжжя є невід'ємною частиною регіональної ідентичності та має значний потенціал для інтеграції в концепції сталого розвитку. Запропонований алгоритм дослідження та класифікації можуть бути використані як методологічна база для розробки програм збереження, ревіталізації та популяризації індустріальної спадщини. Виявлені об'єкти становлять основу для створення кластерів індустріальної культури, розвитку індустріального туризму та креативних індустрій, формування сталого міського середовища на основі локального ресурсного потенціалу.

Ключові слова: індустріальна спадщина, сталий розвиток, ревіталізація, виробничі простори, Криворіжжя.

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