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Achieving Sustainability in Ukraine through Military Brownfields Redevelopment

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Chapter 23
Transformation of Brownfields in Western Ukraine

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Abstract The article examines the concept of brownfields, which gained popularity in the 1990s, and explores successful foreign experience in brownfield redevelopment. Brownfields became widespread in Europe after the collapse of socialism due to deindustrialization and outdated industries, especially in Central and Eastern European countries like Ukraine. Despite the challenges, recent geopolitical events have brought changes to brownfield utilization policies in Ukraine. The authors analyze the factors influencing their formation, highlighting the role of historical, temporal, and internal geographical factors in reconstruction models. The article investigates the potential of brownfields for revitalizing economically developed territories through functional transformation, emphasizing the effectiveness of creating industrial parks on abandoned lands. Special attention is given to studying the experience of using neglected territories that were previously industrialized within regions in western Ukraine. The Russian-Ukrainian war has had a significant impact on this situation, leading to the relocation of enterprises from hazardous regions. The research indicates a correlation between the location of post-industrial developed projects and their subsequent use. Despite their significance, brownfields in the Western Ukrainian region primarily former enterprises from the planned economy era, often remain overlooked. Their attractiveness for reconstruction depends on location, available infrastructure, logistics, and the investment climate. The use of brownfields in the region involves creating industrial parks to rejuvenate economic activity or relocating enterprises from conflict-affected areas.

Keywords Brownfields · Reindustrialization of territories · Western Ukraine

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23.1 Introduction and Review of Previous Scientific Developments in This Area

23.1.1 Introduction

Traditionally, brownfields are associated with industrial spaces. The term emerged in the early 1990s when practitioners and researchers observed how new regulatory frameworks, developed to protect the environment (as a side effect), hindered the reuse (cleanup and redevelopment) of former industrial and commercial sites. The first brownfields appeared in the United States because many industrial facilities were moved abroad. The vacated territories, which were recognized as polluted as a result of previous industrial activity, needed to be revitalized. In 2003, the United States adopted a brownfields redevelopment program. One of the most prominent examples of a brownfield is the Highline Industrial Park in New York City, which was created on the site of an unusable railroad in 2004–2014. The Highline Industrial Park in New York City, created on the site of a disused railroad The Pearl District (Portland, Oregon) was once an abandoned industrial area dominated by railroad stations, warehouses, and factories. In the 1990s, a group of developers and urban planners began to revitalize the area, turning it into one of Portland's most vibrant neighborhoods. Today, the Pearl District is a mixture of residential buildings and shops.

Many European countries (Germany, France, Czech Republic, Romania) have experienced issues with the use of derelict areas since the 1970s. Brownfields emerged in large numbers immediately after the collapse of socialism and the transition from a centralized planned economy to a market economy in Central and Eastern European countries. Brownfields are associated with deindustrialization and the overvalued and non-competitive industry in Ukraine. The enterprises simply lacked the capability to adapt to market conditions while their owners had enough financial resources and flexibility to continue their industrial use. In many regions of Western Ukraine, redevelopment proved to be less effective than in other areas of the country. Potential investors are afraid of the risks and uncertainties associated with the regeneration of brownfields and prefer projects in new areas. The situation changed in the last decade when Russian armed aggression forced a reconsideration of the policy regarding the use of such industrial sites specifically in Western Ukraine.

23.1.2 Theoretical and Methodological Features of Brownfields Research

This work has the following objectives. Firstly, to identify the key factors influencing why only certain areas of former industrial development have been successfully regenerated and repurposed within the Western Ukrainian region, while others have

not. Secondly, to determine the justification of industrial parks as a key tool for regenerating former industrial sites. Thirdly, to investigate why the private sector invests in some regeneration zones but not others, and to understand the local and specific factors influencing the decisions of investors and developers. This study can be applied by central and regional government bodies, regional development agencies, urban planners, and other decision-makers involved in effectively utilizing territories [1, 2].

The formation of brownfields is influenced by temporal and historical factors. However, the role of internal geographical factors is also important, as they influence the actual situation and redevelopment models. M. Soldak believes that the strategic goal of initiating revitalization processes in brownfield areas is the modernization of the economy in old industrial districts by creating a new industrial base through the preservation and development of medium- and high-tech production [9].

Frantál B., Josef Kunc J., Nováková E., Klusáček P., Martinát S., Osman R synthesized most of the contemporary approaches to defining brownfields in their research [4].

In a broad sense, brownfields are areas that were previously industrial or commercial activities and need to be reconstructed or rehabilitated. This phenomenon is quite common both in global practice and in Ukraine. Research by Ray Perez and Rodrigo Eugenio [7] indicates that 2.8 million such sites recorded within the territory of the EU [8]. They was a source of ecological threats, inconvenience, and discomfort for the local population.

It is believed that they can be used to renew the economy within the territory that has been industrially developed. This problem can be overcome through revitalization, which involves repurposing abandoned industrial facilities to meet the emerging socio-cultural needs of the city and its residents. Revitalization provides an opportunity for urban development by densifying urban areas, revitalizing depressed areas, reducing costs associated with urban sprawl (such as environmental degradation, infrastructure expansion, increased transportation costs) [3].

Brownfields have two options for implementation. The first is within the territory of an enterprise that has ceased to operate and produce for various reasons. The second is the territory associated with former mining operations. In both cases, this issue has a spatial dimension and is related to the regeneration of the territory. The global organization CABERNET (Concerted Action on Brownfield and Economic Regeneration Network, EU) has developed an A-B-C classification, aimed at analyzing the potential for the effective utilization of brownfields.

According to the classification established in global practice, three forms of organizing the reuse of obsolete industrial zones have emerged.Form A is applied to minimally contaminated sites located in commercially attractive areas, which can be rev italized by private investors to generate high profits. The role of the government in these projects is limited to necessary approvals and permits within the city's development planning framework. Form B is applied to sites with moderate or severe contamination. Projects are implemented through public-private partnerships, which are becoming increasingly common. Various stages of the process are

regulated through relevant agreements and contracts. Sometimes, direct financial assistance from the government sector is allocated for the reconstruction of production, subject to the completion of planned socio-economic tasks. Form C involves socially oriented projects, primarily executed in situations involving significant contamination of industrial zones, uncertainty about the brownfield's specialization, and prospects for commercial land use. However, there are several modern studies that critically evaluate the functioning of this model (Franz et al., Vojvodíková et al.) and even propose supplementing it with Form D, where the site poses a danger due to pollution or degradation of buildings.

Pollution Risk Assessment
When we work on brownfields, we always need to work with risk assessment and analyze whether the risk is acceptable or not.

Advantages of Brownfield Projects:
- Reducing construction on new, non-polluted sites;
- Reducing the threat to public health;
- Improved air and water quality;
- Short- and long-term job creation;
- Local economic growth and investment;
- Increase in the value of surrounding real estate;
- Recovery of tax revenues;
- Increase in the tax base;
- Efficient use of existing infrastructure;
- Renewed use of existing commercial facilities;
- Revitalization of the district;
- Slowing down urban sprawl.

There are many positive practices of implementing brownfields in the planning of territories in different countries.

23.2 Positive Aspects of Brownfields Practice in Western Ukraine

23.2.1 Spatial Aspects of Industrial Parks Organization as a Tool for Brownfields Regeneration

Usually, the initiative to introduce brownfields is associated with the initiatives of the communities themselves, who are interested in redeveloping their own territories. However, the possible results of such activities can be of two kinds. On the one hand, the successful functioning of the industrial or mining areas themselves. On the other hand, it can result in the pollution of the territory (environmental problems) or the existence of outdated or inappropriate housing and social infrastructure. The development of industrial parks within brownfields is an effective process

of qualitatively utilizing land that already has a certain level of developed production infrastructure. Global experience suggests that establishing industrial parks within brownfield areas is an effective organizational and economic tool for accelerating the socio-economic development of these territories and creating "points of regional growth" by applying a system of stimulating organizational and economic conditions for their participants.

Industrial parks of the "greenfield" type, created on previously undeveloped industrial land, will be primarily attractive to large companies seeking space for constructing industrial facilities tailored to their specific needs. Industrial parks of the "brownfield" type, established on the basis of industrial sites with infrastructure reconstruction or capital works according to the specialization of the industrial park and its participants, are likely to attract interest from small companies whose production complexes can be accommodated in standard premises. The "time to market" (the time from investment initiation to product release and sales) for participants in brownfield-type industrial parks is expected to reduce from two to three years to six to nine months [7].

Most examples of brownfields in Western Ukraine (includes the territory of seven regions of the country) are industrial parks. These are the territories planned for organizing the management of certain land use.

Industrial parks were included in the strategies of socio-economic development of most regions of Western Ukraine: in 2006—Rivne region, in 2007—Ivano-Frankivsk and Lviv regions, in 2008—Ternopil and Zakarpattia regions, and in 2012—Volyn region. This was the first step in introducing brownfields in these areas.

According to part 3, paragraph 1, article 1 of the Law of Ukraine "On Industrial Parks", an industrial park is a territory determined by the initiator of the industrial park creation in accordance with the urban planning documentation and equipped with the appropriate infrastructure, within which the participants of the industrial park may carry out economic activities in the field of industrial production, as well as research activities in the field of information and telecommunications, under the conditions specified by this Law and the agreement on economic activity within the industrial park [6].

23.2.2 Brownfields Within the Western Ukrainian Region: Challenges of War and Spatial Organization

Today, local community websites offer information and proposals for the use of abandoned territories that have already been industrialized. However, such proposals have not yet been systematized and are mostly fragmentary (Table 23.1).

The construction of five processing plants is being completed on the territory of a former brick factory in Rivne: for the packaging of cereals, the production of teas, spices, pasta, and gluten-free sweets. The total area of the industrial complex is 6.5 hectares, according to the Rivne Regional State Administration. The work began in

Table 23.1 Brownfields for socio-economic development in the plans for the territories of the Western Ukrainian regions in 2020–2023 (proposed by the authors according to [5, 6, 7, 10])

Administrative territory (territorial community)	Number of plots bleached for brownfields	Area, hectares	Planned profile of activities	Number of newly created jobs, people
Volyn region				
Vyshniv	1	41	Feed mill	***
Kovel	3	***	***	***
Transcarpathian region				
Perechin	1	16,5		745
Solomonovo	1	7,9		
Solotvyno	1			
Ivano-Frankivsk region				
Dolyna	1	27,1	Mechanical engineering, Forestry and woodworking industry	***
Hryplyn (Ivano-Frankivsk)	1	42	Solar power plant, Construction industry enterprises	***
Lviv region				
Brody	1	***	***	***
Vinnyky	3	***	***	***
Lviv	4	98	Mechanical engineering, Light industry	7500
Stryj	1	13,95	Food production, Electrotechnical engineering, Furniture industry	700
Solonycya	1	7,9	***	***
Rivne region				
Rivne	2		***	***
Demydivka	2		Light industry Food industry	1400
Ternopil region				
Ternopil	1	15	Food industry	***
Chernivtsi region				
Rukshyn	1		Food industry	***

2021, the dismantling of the old structures took eight months, and the new premises appeared a year later. Today, interior finishing is ongoing, the improvement of the territory is in progress, and commissioning has already begun. Investments in construction materials exceed UAH 75 million for today. Most of the equipment is made in Ukraine. Several dozen workers, mostly people who were internally displaced, are currently employed here. In total, more than 800 workplaces will be

created. In the future, the industrial complex also plans to start processing fish and milk. This example is typical for most brownfields in Western Ukraine that have undergone redevelopment. Summarized information looks as follows.

According to the available information from open sources, within this region, 21 post-industrial brownfield regeneration projects identified, mainly located in the central and most urbanized parts of the regions. The total value of these projects by the end of the third quarter of 2022 amounted to 1.1 billion euros, primarily attributed to land issues and infrastructure aspects.

Tthe largest group consisted of obsolete objects of various purposes. Almost all of these projects were implemented by state institutions, mainly local government bodies. The second largest group of enterprises consisted of commercial projects carried out exclusively by private entities, mainly without the support of state funds. However, it is worth noting that the average cost of projects in this category is traditionally higher. Post-industrial brownfields were also often used to create various types of investment zones aimed at supporting local economic development and, in some cases, repurposed for new types of industrial activities. These projects represent a field of interaction between state structures, which are active in the stage of reclamation and infrastructure improvement, and private investors, who redevelop the site for economically beneficial use.

The war in Ukraine has become another reason for the revitalization of brownfields. Currently, relocation is possible to one of the sixteen regions. As of October 2023, 840 Ukrainian enterprises have been successfully relocated from dangerous regions with the support of the state. 667 of these are already successfully operating at their new locations, while 239 companies are still searching for a suitable location or mode of transportation. More than 650 companies refused to relocate due to the de-occupation of the territories where they are located. Some companies are also returning to their previous locations due to improved security in the Kharkiv, Chernihiv and Sumy regions. 44 companies have already returned.

A total of 1816 companies have registered applications for relocation on the corresponding online platform, ProZoro. However, 601 companies refused to relocate due to the de-occupation of the territories of Ukraine. Most companies were relocated to Lviv (30% of relocated companies), Zakarpattia (17%), Chernivtsi (11%), Ivano-Frankivsk (8%), Khmelnytskyi (7%), and Ternopil (7%) regions.

Among the relocated enterprises that have already resumed their operations at the new location, the largest share is made up of: wholesale and retail trade, repair of motor vehicles and motorcycles (40.24% of the total number of relocated companies); processing industry (31.71%); information and telecommunications (6.34%); professional, scientific and technical activities (5.85%); and construction (4.15%). This associate the impact of location with a local development potential or the area competitiveness, being the resultant of environmental conditions, economic potential, and social capital.

Relocation has significantly changed the spatial features of the territories where it is carried out. In particular, some regions are gradually getting rid of the term “agrarian-industrial” due to such processes.

Another point related to revitalization is changes in the housing market in terms of quantity and quality. The increase in demand has generated a kind of boom in the quantitative indicators of construction and housing prices.

Additional activation of the use of spatial opportunities is associated with interest in buildings that have ceased to be used for their intended purpose and have become a kind of ghosts on the territories of Ukrainian cities. Let's consider the case of Ternopil city. Several factories have been preserved here, built in the late 1980s or 1990s. It was a period of gigantomania in Ukraine, a Soviet disease of self-assertion. There are two examples of radio equipment factories—Saturn and Orion—that created monumental buildings and refused to maintain them (Fig. 23.1). Their fate was different. A certain part of the Saturn plant was given new life by the construction of the largest shopping and entertainment center in the region (Fig. 23.2). The territory was developed. This has significantly "revitalized" the entire surrounding area.

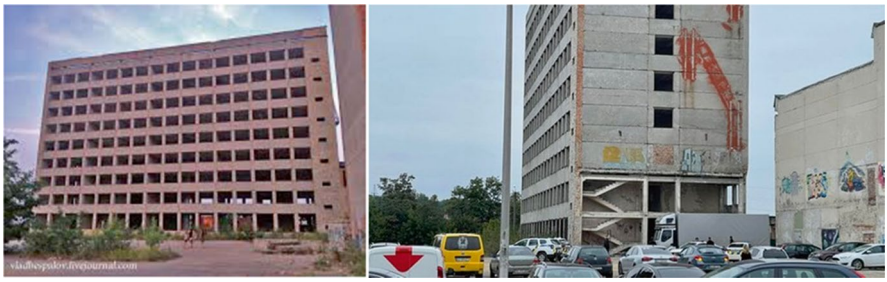

Fig. 23.1 Brownfields of industrial facilities in Ternopil (Orion and Saturn)

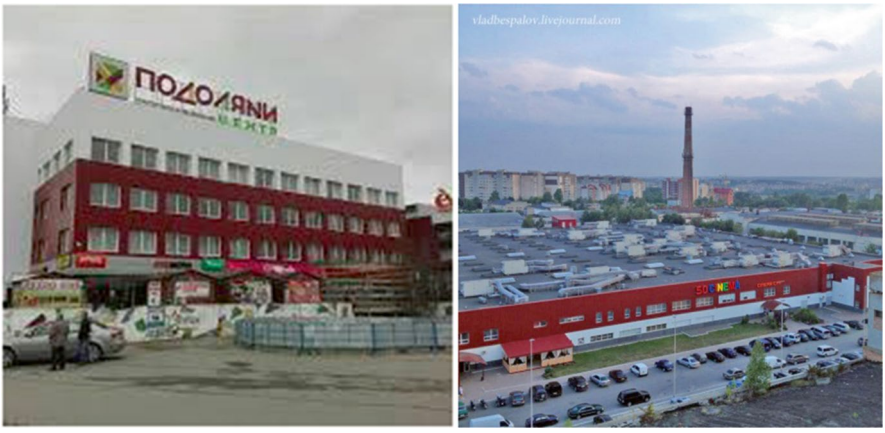

Fig. 23.2 Brownfields of industrial facilities in Ternopil (Orion and Saturn)

But this example is rather an exception. We do not emphasize that the industrial facility has changed its functionality into a shopping and entertainment centre.

The central location of brownfields and their good transport accessibility positively correlate with their conversion into commercial objects and offices, and negatively correlate with their conversion into residential and public services.

23.3 Conclusion

Brownfields are an important tool for planning the territory within urban settlements. Their implementation should be well thought out and take into account all components of spatial change. Institutional measures for the restoration of neglected territories should be aimed at cultivating special institutions to promote the revitalization of brownfields in order to modernize the economy of the regions.

As a result of this research, it was found that there is a relationship between the location of a post-industrial brownfield regeneration project and the new use of the site.

The number of brownfields is significant and underreported in the Western regions of Ukraine. Traditionally, these are former enterprises that operated under a planned economy and were unable to adapt to market conditions. Although these regions are not predominantly highly urbanized, brownfields are traditionally associated with urban settlements. The attractiveness for further use of such territories is influenced by their location, the presence of functioning infrastructure, logistics, and the ability to optimally utilize available space. Another important factor driving investor interest in such spaces is the creation of a favorable investment climate.

The use of brownfields in Western regions of Ukraine is associated with two main aspects. The first is the establishment of industrial parks, which are designed to “revive” the economic life of old industrial districts (here, it is possible to draw on the experience of European countries in addressing this issue). The second option is the relocation of enterprises from those territories of Ukraine that have been occupied or were located in the front-line zone as a result of the Russian-Ukrainian war (a forced option, but it allows for the intensification of the use of old industrial sites for further use).

Several factors hinder the regeneration of brownfields. These include the excessive length of time between the cessation of initial industrial activity and the decision to redevelop the renewable sites, as well as the information asymmetry that is unfavorable to potential investors. In addition, the generally negative image of brownfields is cited as a deterrent to redevelopment. Even the terrain, irregular plot shape, and water bodies can act as deterrents to land development.

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