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INFLUENCE OF ECO-INDUSTRIAL PARKS ON REGIONAL SUPPLY CHAINS

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ВПЛИВ ЕКО-ІНДУСТРІАЛЬНИХ ПАРКІВ НА РЕГІОНАЛЬНІ ЛАНЦЮГИ ПОСТАЧАННЯ

The article analyses the changes in supply chains in Ukraine after the beginning of Russian aggression in 2022. The impact of eco-industrial parks (EIPs) on regional development, in particular through supply chains, is assessed. Eco-industrial parks contribute to regional economic growth, sustainability and innovation by increasing efficiency and environmental friendliness. Based on the analysis of the most promising industrial supply chains, a study of inter-sectoral linkages was conducted to develop new clusters of eco-industrial parks. The authors propose to use the strategy of complexity, which focuses on ensuring the availability of goods within the EIP and their use in the conditions of expected demand for products. The essence of the strategy is to organise an extensive system of interaction focused on the participants of the EIP and their customers. The main stages of achieving strategic supply chain compliance are analysed. The functioning of eco-industrial parks is a crucial factor in regional development by ensuring the sustainability of supply chains. The concept of supply chain sustainability involves gaining knowledge about all components of the supply chain from suppliers to customers. It implies the ability to effectively adapt and respond to unforeseen changes, including changes in demand, supply or external circumstances. Provides additional backup and resource allocation systems to ensure continuity of operations in the event of disruption. Ensures collaboration and information sharing and effective interaction with partners, suppliers and stakeholders. Supply chain-based analyses will help ensure the efficiency of the companies participating in eco-industrial partnerships, increase their profitability and investor interest. The key industrial supply chains concentrated in western Ukraine will contribute to increased profitability, job creation, clustering to reduce production costs and the possibility of hosting internally displaced persons.

У статті проведено аналіз зміни в ланцюгах постачання в Україні після початку російської агресії у 2022 році. Проведена оцінка впливу еко-індустріальних парків (ЕІП) на регіональний розвиток, зокрема через ланцюги поставок. Еко-індустріальні парки сприяють регіональному економічному зростанню, стійкості та інноваціям шляхом підвищення ефективності та екологічності. На основі аналізу найбільш перспективних промислових ланцюгів постачання було проведено дослідження міжгалузевих зв'язків для розробки нових кластерів еко-індустріальних парків. Запропоновано використання стратегії комплексності, яка зосереджена на забезпеченні наявності товарів у межах ЕІП і використання в умовах передбачуваного попиту на продукцію. Суть стратегії полягає в організації розгалуженої системи взаємодії, орієнтованої на учасників ЕІП та їхніх клієнтів. Було проаналізовано основні етапи досягнення

відповідності стратегічного ланцюга постачання. Функціонування еко-індустріальних парків є вирішальним фактором регіонального розвитку за рахунок забезпечення стійкості ланцюгів постачання. Концепція стійкості ланцюга постачання передбачає отримання знань про всі компоненти ланцюжка поставок від постачальників до клієнтів. Передбачає здатність ефективно пристосовуватися та реагувати на непередбачені зміни, включаючи зміни в попиті, пропозиції чи зовнішніх обставинах. Забезпечує додатковими системами резервного копіювання та розподілу ресурсів для безперервності операцій у разі збоїв. Забезпечує співпрацю і обмін інформацією та ефективну взаємодію з партнерами, постачальниками та зацікавленими сторонами. Проведений аналіз на основі ланцюгів постачання, дозволить забезпечити ефективність роботи підприємств-учасників еко-індустріальних парків, збільшить їх прибутковість та зацікавленість інвесторів. Ключові промислові ланцюги постачання зосереджені на заході України будуть сприяти підвищенню прибутковості, створенню робочих місць, розвитку кластеризації для зниження собівартості виробництва та можливості прийняття внутрішньо переміщених осіб.

Key words: eco-industrial park, supply chain, regional development, industrial symbiosis, industrial park.

Ключові слова: еко-індустріальний парк, ланцюг постачання, регіональний розвиток, індустріальний симбіоз, індустріальний парк.

The development of eco-industrial parks is of particular relevance, as traditional production models no longer meet the requirements of sustainable development. Manufacturing companies need to meet new environmental standards, minimise their negative impact on the environment and use resources efficiently. Establishing supply chains within an industrial or eco-industrial park will help to reduce inventory, shorten lead times and improve service quality. Efficiency will be achieved through the integration and coordination of business processes to maintain a constant balance between demand and supply along the entire value chain within the eco-industrial park. In this regard, it is relevant to study the impact of eco-industrial parks on regional development based on supply chains, which will ensure the efficiency of participating enterprises, increase their profitability and investor interest.

ANALYSIS OF THE LATEST RESEARCH AND PUBLICATIONS

In the scientific works of domestic and foreign experts, the problems of defining, forming and efficiency of supply chains have been studied by scientists, including: Glynn F. [1], Kolodizieva T.O. [2], Sigida L.O. and Sigida N.O. [3], UNIDO conducted a study of supply chains in post-conflict conditions in Ukraine [4]. The issue of regional development is highlighted in the works of domestic scientists. Kryshchal T.M., Chechetova N.F., Goncharuk V.V. devoted their research to the peculiarities of regional development in terms of social, economic and environmental subsystems [5]. Lisnichuk O.A. analysed the factors of regional development [6]. Zane Zeibote, Tatjana Volkova, Kiril Todorov identified the impact of globalisation

on regional development and competitiveness on the example of individual regions [7]. The development of eco-industrial parks is covered in the following studies Hein A.M. [8], Thu Trang Vu [9], Tulchynska S.O. [10—12], as well as the United Nations Industrial Development Organization (UNIDO) [13—15]. However, most scholars have focused on the concept of supply chain management, while the definition of the supply chain in eco-industrial parks remains open and needs to be studied.

The article is aimed at determining the impact of eco-industrial parks on regional development based on supply chains.

SUMMARY OF THE MAIN RESEARCH MATERIAL

Ukraine has a diverse economy, with a strong agricultural sector and a growing industrial base. The country is also a major producer of energy, including natural gas and coal.

The socio-economic context of Ukraine has been challenging in recent years. The country has been plagued by political instability, corruption, and economic recession. The war in the east of Ukraine, which began in 2014, and the armed conflict with Russia since 2022, have further exacerbated these challenges.

As of the year 2024, Ukraine has undergone a crisis related to unpreparedness for a full-scale war and is preparing for the recovery of its economy, which suffered significant losses during the period from 2022 to 2024.

The Ukrainian industrial sector has been hit hard by the war. Many factories have been damaged or destroyed, and there has been a significant decline in industrial output. The war has also disrupted the country's transportation and

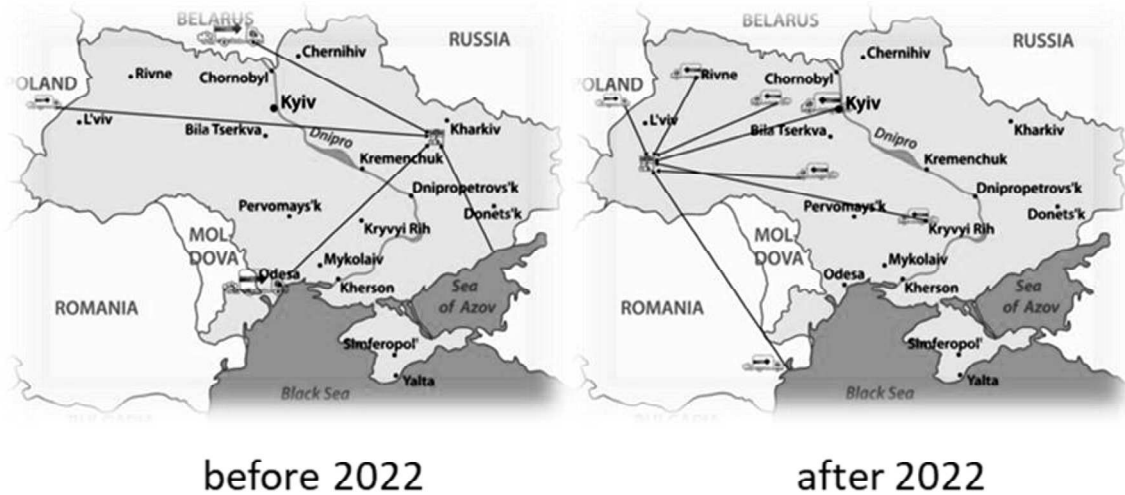


Figure 1. Change of supply chains in Ukraine

Source: Systematized, summarized and grouped according to data [4].

energy infrastructure, which has made it difficult to get goods to market.

The challenges facing the Ukrainian industrial sector are significant, but there are also reasons for optimism. The country has a skilled workforce and a number of natural resources.

The industry is reorienting towards Western markets and shifting its capacities to the western regions of Ukraine, forming new clusters.

Figure 1 shows the change in supply chains in Ukraine after the start of Russian aggression in 2022.

After the shock of the year 2022, the Ukrainian economy is gradually recovering, as evident from the GDP dynamics depicted in the figure 2.

Eco-Industrial Parks are industrial zones designed to promote environmental sustainability, economic efficiency, and social responsibility by fostering collaboration among businesses and integrating ecological principles into industrial processes. This assessment evaluates the impact of EIPs on regional development, particularly through their influence on supply chains. The focus

is on understanding how EIPs contribute to regional economic growth, sustainability, and innovation by enhancing the efficiency, resilience, and environmental performance.

The post-war recovery of Ukraine's economy has great potential for the development of industrial parks according to the principles of EIPs by implementing resource efficiency and circular economy approaches, attracting investments, increasing the employment of the population, in particular internally displaced persons, and ensuring balanced regional and local development. The transformation of ordinary industrial parks into EIPs provides an opportunity to achieve inclusive and sustainable industrial development and achieve the goal of the Industrial Parks Development Strategy for the period up to 2030 of supply chains.

Based on an analysis of the most promising industrial supply chains, a cross-industry linkage study was conducted to develop new EIPs clusters.

To date, 87 industrial parks (IP) have been registered, and even more industrial zones are

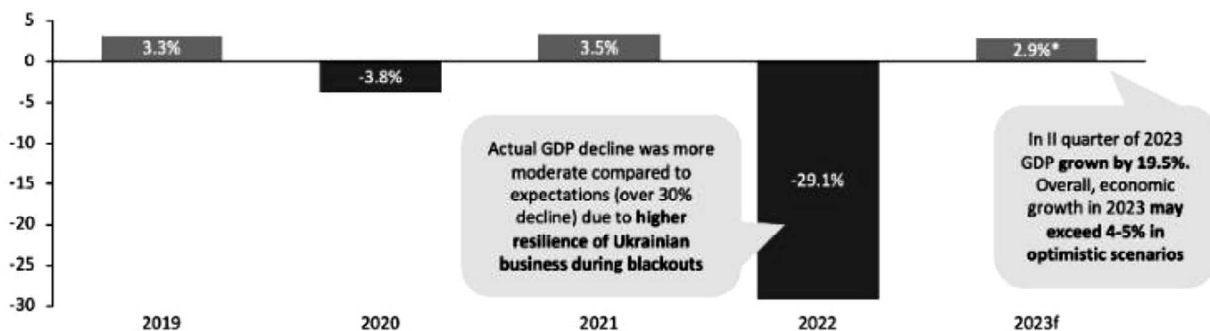


Figure 2. GDP dynamic in Ukraine

Source: Systematized, summarized and grouped according to data [4].

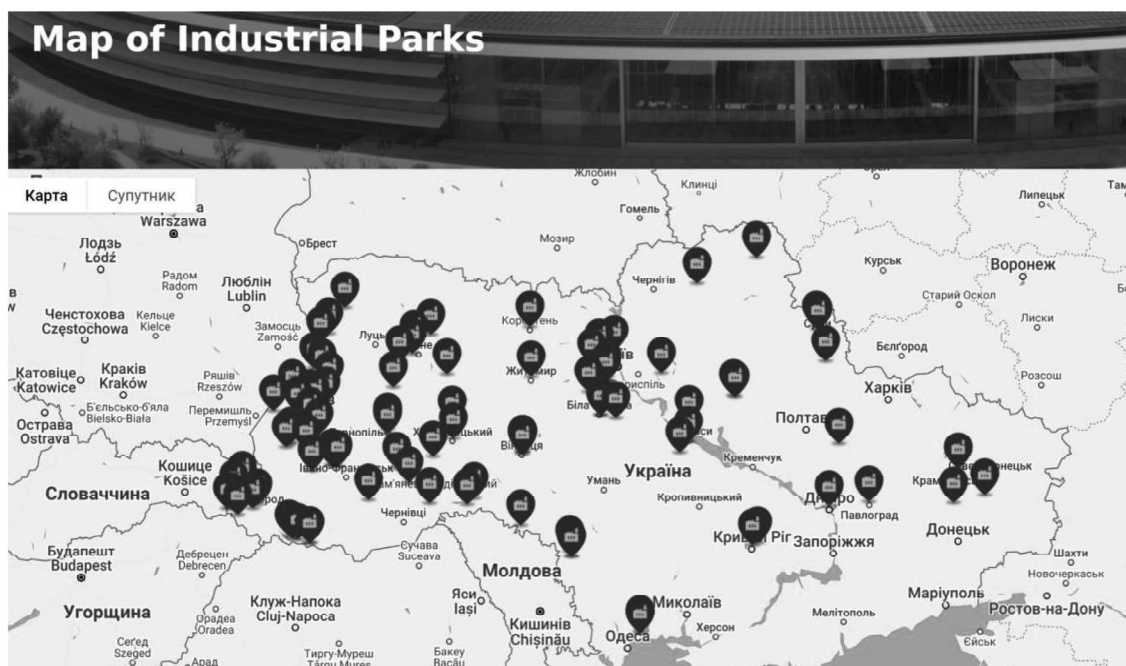


Figure 3. The GEIPP Ukraine free online platform "Map of Industrial Parks"

Source: Systematized, summarized and grouped according to data [4].

operating without been registered. To monitor promote the available industrial areas/zones/parks (registered and not registered), the GEIPP Ukraine is providing the free online platform "Map of Industrial Parks" Figure 3.

As can be seen from the map, the majority of IP is concentrated in the Western part of Ukraine. Also, it is important to note that significant economic growth is predominantly occurring in the western regions of Ukraine, as illustrated in the figure below.

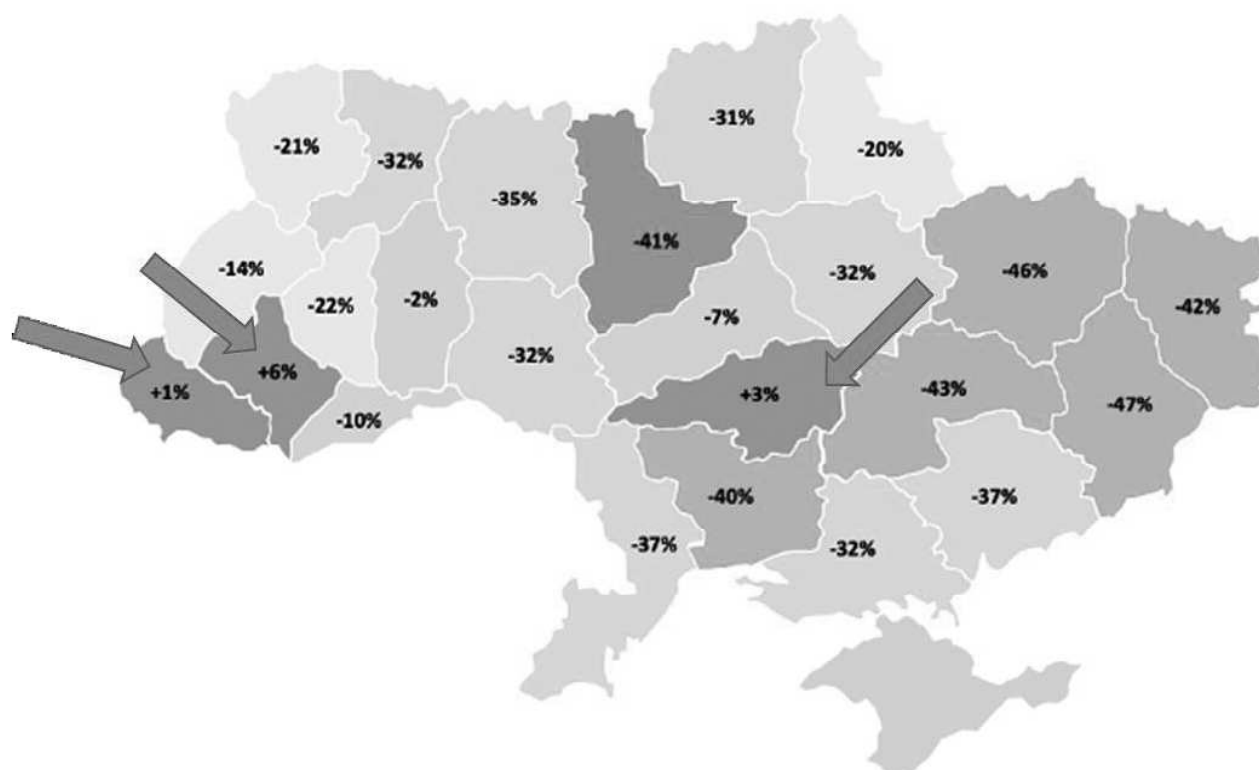


Figure 4. GDP growth in 2023 in Ukraine by oblast

Source: Systematized, summarized and grouped according to data [4].

This is explained by the relocation of enterprises away from the conflict zone. Particularly noteworthy is the Kirovohrad region in the center of Ukraine. The growth of its GDP is attributed to a large number of internally displaced persons from the eastern and southern regions of Ukraine.

Thus, one can speak of a gradual recovery of the Ukrainian economy close to the borders with the EU, which is explained by the search for business-safe locations and short logistical distances to new markets.

The supply chain can be the following strategies can be implemented:

- comprehensiveness
- focus on sales channels;
- individualised customer service;
- operational dynamism.

For EIPs the most appropriate using a comprehensiveness strategy. This strategy focuses on ensuring the availability of goods within the EIPs and is used in conditions of predictable demand for products. The supply chain is responsible for ensuring that the product is available in the the right place at the right time. The essence of this strategy is to organise an extensive sales system, heavily focused on EIPs participants and their customers.

There are three main stages of achieving strategic supply chain compliance:

The significance of supply chain resilience in the dynamic realm of international trade cannot be overemphasised. Contemporary businesses encounter a diverse array of obstacles that have the potential to impede the smooth operation of goods and services, encompassing interruptions spanning from natural calamities to geopolitical tensions. The strategic utilisation of industrial parks is a crucial factor in augmenting the resilience of supply chains.

Prior to exploring the significance of industrial parks, it is imperative to gain a comprehensive understanding of the idea of supply chain resilience. Supply chain resilience pertains to the capacity of a supply chain to swiftly recuperate from unanticipated disruptions while mitigating the adverse effects on operational processes and clientele. The process entails adopting a proactive stance in identifying vulnerabilities and executing solutions to effectively minimise risks.

The concept of supply chain resilience encompasses more than just the ability to endure and recover from disruptions; it also involves the capacity to flourish and succeed in the midst of challenging circumstances. This entails:

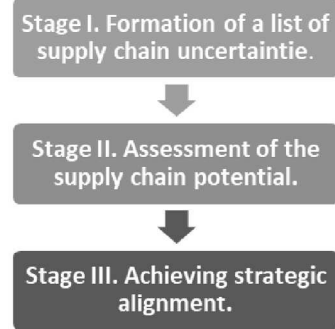


Figure 5. Stages of achieving strategic supply chain compliance

Source: Systematized, summarized and grouped according to data [3—4].

— **Visibility:** Gaining comprehensive knowledge of all components within the supply chain, spanning from suppliers to customers.

— **Flexibility:** Flexibility refers to the ability to effectively adjust and respond to unforeseen alterations, encompassing shifts in demand, supply, or external circumstances.

— **Redundancy:** Redundancy refers to the practice of establishing additional backup systems and allocating resources to ensure the continuity of operations in the event of disruptions.

— **Collaboration:** Collaboration entails the proficient exchange of information and effective cooperation with partners, suppliers, and stakeholders.

Industrial parks, also known as industrial estates or business parks, are designated zones that accommodate numerous industrial and commercial establishments. These parks provide a variety of advantages that can greatly assist in the improvement of supply chain resilience.

Shared resources and facilities are commonly offered by industrial parks, encompassing various amenities such as warehouses, transportation hubs, and utilities. The utilisation of shared infrastructure can serve as a crucial resource during periods of interruptions, enabling firms to adjust their operations temporarily without the need for substantial financial investments. For example, in the event of an unforeseen interruption in the supply chain, a manufacturing company could potentially mitigate the impact by relocating production to an alternative facility situated inside the same industrial park.

Security and risk mitigation are key priorities for numerous industrial parks. Organisations allocate resources towards implementing several strategies, including the adoption of robust security systems, the development of disaster preparedness plans, and the establishment of

redundant utility systems. The implementation of a proactive risk management strategy enhances the resilience of industrial parks, thereby safeguarding the uninterrupted functioning of firms operating inside them.

Industrial parks frequently cultivate a communal atmosphere among the enterprises that operate inside their premises. The collaborative nature of this environment fosters cooperation and the exchange of information, which can be of great value in times of disturbances. Organisations have the ability to consolidate their resources, exchange optimal methodologies, and collaboratively tackle obstacles, thus augmenting their total capacity to withstand adversity.

Regulatory and environmental advantages are commonly observed in industrial parks, wherein they frequently enjoy advantageous regulatory conditions and incentives, such as tax exemptions or expedited approval procedures. Furthermore, it is possible that they prioritise sustainability and adhere to environmental regulations. These features have the potential to mitigate regulatory risks and bolster the long-term viability of firms operating within the park.

Partnership among stakeholders in the supply chain, enhancing product quality, and implementing effective marketing strategies are crucial for fostering economic growth and job creation in western Ukraine.

CONCLUSIONS AND PROSPECTS OF FURTHER INVESTIGATIONS IN THIS DIRECTION

Based on the results of the EIP impact assessment on regional development based on supply chains, the following conclusions can be drawn: Improving the efficiency and sustainability of the supply chain will contribute to the better development of the EIP through more efficient, integrated and sustainable supply chains with an emphasis on resource sharing and collaboration.

EIPs will contribute to sustainable regional economic development by attracting green industries, creating jobs and increasing the competitiveness of local enterprises.

Assessing the environmental benefits associated with EIPs, including reducing emissions, waste and resource consumption, and promoting circular economy practices.

The implementation of the EIP policy will contribute to the stimulation of innovation and the introduction of sustainable technologies in regional supply chains.

The findings will be valuable for policymakers, businesses, and stakeholders in optimizing the

design and implementation of EIPs to maximize their economic, social, and environmental benefits.

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