

POLICY FRAMEWORK TO COVER ECO-INDUSTRIAL PARKS PILLARS

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Abstract. *The concept of eco-industrial parks has gained significant global attention, particularly in the context of sustainable development goals, which emphasize the necessity of balancing economic growth with environmental stewardship. Industrial zones and industrial parks have traditionally contributed to economic output; however, their environmental footprints present challenges, necessitating a shift toward more sustainable industrial practices. In Ukraine, the need for eco-industrial transformation is further exacerbated by its unique socio-political and economic conditions, where resource efficiency and environmental sustainability are critical for long-term industrial competitiveness. This study aims to propose a comprehensive policy framework for the establishment and governance of eco-industrial parks in Ukraine, focusing on creating a balance between industrial growth and sustainable practices. By utilising mixed-method approach, combining both qualitative and quantitative research methods, this research integrates global experiences—particularly those from China, Italy, and Vietnam—into a model that can be adapted to Ukraine’s specific needs. Key pillars such as regulatory support, management commitment, environmental performance, and industrial symbiosis were identified as central to the successful implementation of eco-industrial parks. The findings demonstrate that structured policy interventions, supported by governmental commitment and cross-sector collaboration, can significantly enhance resource efficiency, reduce emissions, and promote sustainable development. Additionally, the study emphasizes the importance of aligning industrial and urban planning to foster a holistic approach to sustainable development. The practical implications of this research suggest that by adopting a robust policy framework, Ukraine can improve its environmental performance in industrial zones, enhance industrial competitiveness, and contribute to broader national sustainability goals. This framework can serve as a guide for policymakers and stakeholders, offering a clear roadmap for the transition toward eco-industrial parks that are aligned with both national objectives and international sustainability commitments.*

Keywords: *eco-industrial parks, policy framework, sustainable development goals, EIP pillars, circular economy.*

JEL Classification: *O11; P11; Q28*

Formulas: *0, fig.: 1, tabl.: 1, bibl.: 11*

Introduction. The urgency of developing eco-industrial parks (EIPs) in Ukraine arises from the pressing need to balance economic growth with environmental sustainability. Industrial sectors are critical drivers of economic output, contributing significantly to national income and employment. However, this industrial development comes at a substantial environmental cost, particularly in regions like Ukraine, where resource-intensive industries dominate the landscape. The environmental impact of these industries includes high levels of emissions, inefficient resource use, and waste generation, all of which contribute to environmental degradation. With the global community increasingly focusing on sustainable development, the challenge for Ukraine is to shift from traditional industrial practices to more sustainable models that minimize environmental harm while maintaining economic growth. This transition is particularly relevant in the context of the Sustainable Development Goals (SDGs), which call for responsible consumption and production, climate action, and the protection of terrestrial ecosystems. Eco-industrial parks offer a viable solution by promoting industrial symbiosis, where businesses within the park share resources, reduce waste, and optimize energy and material flows. The relevance of this research lies in its potential to provide a comprehensive policy framework for Ukraine, which can facilitate the successful implementation of EIPs. The study draws from global best practices, particularly from countries such as China and Italy, where EIPs have been successfully integrated into national industrial strategies. The study seeks to address the complex challenges associated with developing a policy framework that not only fosters economic growth but also ensures environmental sustainability, making it highly relevant to national policymakers. This study aims to bridge the gap between theoretical models of eco-industrial development and their practical application in the Ukrainian context.

Literature review. Based on the [1], the development of a roadmap for EIPs policy implementation in Ukraine requires a comprehensive understanding of the transition from traditional industrial parks to eco-industrial models. This transition hinges on industrial symbiosis principles, which facilitate resource exchange among firms, enhancing environmental, social, and economic performance. A critical challenge lies in defining and validating the attributes driving this transition, as existing studies have often overlooked the causal and hierarchical interrelationships among them. In this context, the Delphi method and fuzzy set theory offer robust tools for addressing the qualitative nature of these attributes and their inherent uncertainties. The successful implementation of EIP policies will depend on key factors such as regulatory support, price reforms, management commitment, and information sharing, all of which are crucial for fostering collaboration between tenant firms. Thus, Ukraine's EIP policy framework must focus on integrating these attributes into its policy framework to achieve sustainable industrial development.

The policy framework for EIPs policy implementation in Ukraine must address the balance between economic development and environmental protection, a challenge similar to China's experience [2]. Industrial parks are critical to Ukraine's industrial output, but their environmental footprint necessitates urgent structural changes. A multi-criteria model, such as China's industrial structure adjustment framework, could be adapted for Ukraine to optimize resource use efficiency and reduce pollutant

emissions while maintaining economic growth. This approach focuses on adjusting key industries, improving water and energy management, and reducing emissions to decouple economic progress from environmental degradation. Regulatory frameworks, particularly targeting water use and pollution control, will be essential to guide this transition. By adopting such models, Ukraine can strategically reform its industrial parks, promoting high-quality, sustainable development aligned with eco-industrial principles.

The adoption of voluntary certification schemes, such as the one implemented by the regional government of Tuscany [3], offers valuable insights for the development of EIP policies in Ukraine. This approach emphasizes a cooperative framework between local actors, balancing economic growth with environmental sustainability, and can be adapted to Ukraine's context. By utilizing public-private partnerships and fostering community involvement, similar schemes could enhance the diffusion of industrial ecology concepts across Ukrainian industrial areas. The success of this model in Italy, particularly its focus on pollution prevention and resource efficiency, suggests that voluntary certification schemes can serve as powerful tools for driving eco-industrial transformations. Moreover, Ukraine could benefit from the flexibility and adaptability of this model, which allows for tailored responses to local environmental challenges. Comparing this approach with established standards, such as those in China [3], could further refine Ukraine's policy framework toward sustainable industrial development by learning from both European and global experiences.

China's experience [4] with EIP development offers valuable lessons for Ukraine as it seeks to implement sustainable industrial policies. The assessment of 40 Chinese industrial parks using Data Envelopment Analysis highlights the variability in eco-efficiency across parks, emphasizing the need for tailored strategies. Ukraine can draw from China's approach by focusing on improving resource efficiency, reducing waste emissions, and aligning industrial growth with environmental goals. The findings reveal the importance of industrial structure, environmental policies, and scale in influencing eco-efficiency, suggesting that Ukraine's policy framework should incorporate these factors. Additionally, the observed inefficiencies in Chinese parks underscore the necessity of clear performance metrics and regular monitoring to ensure continuous improvement. As Ukraine develops its EIP framework, leveraging eco-efficiency evaluations can help create parks that balance economic output with minimal environmental impact, supporting long-term sustainability.

The development of Suzhou Industrial Park (SIP) into an eco-city [5] provides valuable insights for Ukraine as it seeks to implement eco-industrial park policies. The transformation of SIP from an industrial hub to a flourishing urban district highlights the potential for EIPs to drive urbanization while maintaining environmental sustainability. For Ukraine, incorporating strict regulatory instruments, such as those targeting emissions and energy efficiency, will be crucial in fostering a similar evolution. SIP's success in decoupling economic growth from environmental degradation underscores the importance of integrating industrial and urban planning. Furthermore, promoting the tertiary sector alongside industrial activities can facilitate synergies between production and residential functions. Ukraine's policy framework

for EIPs should therefore emphasize eco-efficiency, policy coherence, and infrastructure development to ensure both industrial growth and urban sustainability.

The development of a sustainability assessment framework for eco-industrial parks is a crucial component in formulating a policy framework for their implementation in Ukraine. Industrial parks, as interconnected systems of companies and infrastructures, pose challenges in measuring sustainability across environmental, social, and economic dimensions [6]. The application of multi-criteria analysis, such as the weighted arithmetic mean and Choquet integral, offers a comprehensive mechanism for managers to evaluate both individual sustainability pillars and overall performance. This dual approach ensures a balanced assessment of trade-offs and synergies between competing priorities, such as economic growth and environmental preservation. For Ukraine, adopting such a framework will empower industrial park managers to implement evidence-based action plans that align with national sustainability goals. Ultimately, this tool can guide strategic decisions, ensuring long-term sustainability while enhancing industrial competitiveness.

The policy framework for implementing EIPs in Ukraine must address the lack of standardized methods and flexible management schemes for such parks, as evidenced by global experiences. Drawing on lessons from Vietnam's participatory [7], bottom-up approach under the UNIDO program, Ukraine can adopt a similar framework to foster EIP development in its transition economy. This strategy would involve early stakeholder engagement to define minimum requirements and continuous improvement processes that align with national conditions. A tiered standardization system—such as bronze, silver, and gold—can be adapted to monitor environmental, social, and governance indicators effectively. Policy and legal frameworks must support these initiatives to ensure sustained implementation and alignment with broader sustainable development goals [8]. By adopting this structured yet adaptable approach, Ukraine can position its industrial parks as models for resource efficiency and sustainable development, contributing to its broader economic and environmental objectives.

Based on the findings from [9], the development of a policy framework for EIPs in Ukraine must address the challenges posed by disruptions such as economic crises, conflict, and environmental degradation. Ukraine's geopolitical situation, notably the ongoing conflict with Russia, has exacerbated the need for sustainable economic models. EIPs offer an avenue to enhance resource efficiency, minimize environmental impact, and foster industrial symbiosis. The creation of a robust policy framework would require a multi-stakeholder approach, integrating governmental, private, and international actors to ensure a balance between economic growth and environmental sustainability. This policy must prioritize circular economy principles, promote industrial symbiosis, and provide regulatory incentives for businesses to adopt eco-friendly practices. Ultimately, a well-structured policy framework for EIPs can drive industrial transformation in Ukraine while supporting national environmental goals and international commitments.

Aims. The primary aim of this study is to propose a robust and comprehensive policy framework that will facilitate the establishment of EIPs in Ukraine. This framework seeks to promote resource efficiency, reduce emissions, and foster

industrial symbiosis, with a focus on sustainable industrial development. The research also aims to identify the key regulatory, managerial, and collaborative pillars necessary for the successful implementation of EIPs. Intermediate objectives include evaluating global best practices, adapting these to Ukraine's unique industrial and environmental context, and proposing actionable steps for policymakers and stakeholders. Ultimately, the research seeks to contribute to Ukraine's broader goals of sustainable industrial growth and alignment with international environmental commitments.

Methodology. This study employs a mixed-method approach, combining both qualitative and quantitative research methods to propose a comprehensive policy framework for EIPs in Ukraine. The qualitative uncertainties and complex interrelationships inherent in policy formulation for EIPs. The study draws on global case studies from countries such as China, Italy, and Vietnam, where EIPs have been successfully implemented. These case studies are analysed through a comparative lens, focusing on the transferability of best practices to Ukraine. The research also incorporates quantitative data, including emissions reductions, resource efficiency metrics, and economic performance indicators from existing EIPs, to evaluate the potential impacts of the proposed policy framework. Furthermore, the study utilizes multi-stakeholder engagement, involving government agencies, private sector representatives, and international organizations, to ensure that the policy framework is comprehensive and adaptable to Ukraine's specific socio-economic conditions. The theoretical foundation of the study is rooted in the principles of industrial ecology and sustainable development, which emphasize the need for integrated approaches to industrial growth and environmental preservation. This combination of methodologies allows for a nuanced and holistic understanding of the challenges and opportunities associated with implementing EIPs in Ukraine.

Results. The study identifies four main pillars for the implementation of eco-industrial parks: management company, environment, social, and economic performance [10]. The policy framework emphasizes the need for regulatory support, management commitment, and information sharing to foster collaboration among firms. The results indicate that a structured approach can significantly enhance resource efficiency, reduce emissions, and promote sustainable development goals [8]. The study also highlights the importance of integrating industrial and urban planning to achieve sustainable development. The findings suggest that a comprehensive policy framework, supported by regulatory measures and stakeholder engagement, can drive the successful implementation of EIPs in Ukraine. The results of the literature review are aggregated in the table 1.

Based on the results from the Table 2, the policy framework in Ukraine should be complex. The assurance of the complex framework needs involvement not only the direct subjects of power, but all the governmental agency to ensure that all the pillars of the eco-industrial parks concept will be covered by the policies and regulations. The policy framework for the eco-industrial parks concept, based on the template from [11], which covers the four pillars is presented on the figure 1.

Table 1. Aggregated results of the policy framework success components

Framework success components	China	Italy	Canada	Vietnam	South Africa
Identification resource-facilitation between the companies in the parks into regulations	X			X	X
Improving water and energy management, and reducing emissions	X	X		X	X
Adoption of voluntary certification schemes with clear metrics	X	X	X		
Development and adoption a national standardisation		X		X	
Improving social and economic performance of industrial zones			X	X	X
Alignment with the sustainable development goals			X	X	X

Source: compiled according to the data [1-9]

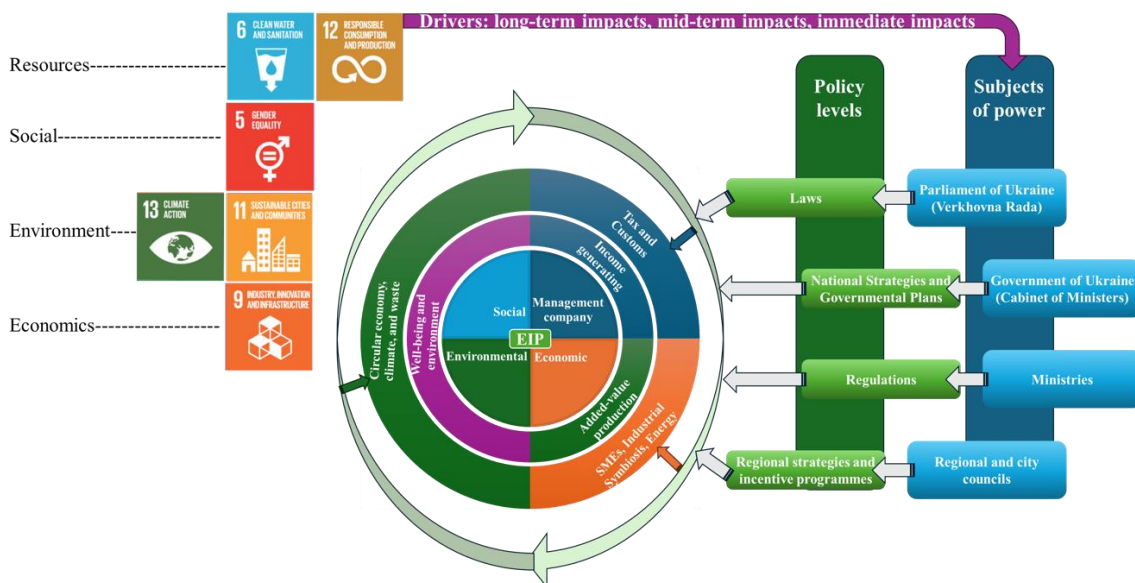


Figure 1. Policy framework for eco-industrial parks pillars

Source: developed by the author

The study’s findings highlight four critical pillars necessary for the successful implementation of EIPs in Ukraine: regulatory support, management commitment, environmental performance, and industrial symbiosis. First, the research underscores the importance of a strong regulatory framework that incentivizes sustainable industrial practices. This includes policies that promote resource efficiency, emissions reduction, and waste minimization. Regulatory frameworks must also provide incentives for

businesses to adopt circular economy principles and engage in industrial symbiosis. Second, management commitment is identified as a key driver of EIP success. The research shows that without the active involvement and commitment of industrial park management, efforts to implement sustainable practices are likely to fail. Third, environmental performance is highlighted as a critical measure of success. The study presents data showing that EIPs with strong environmental performance metrics, such as reductions in greenhouse gas emissions and improved resource efficiency, are more likely to achieve long-term sustainability. Finally, industrial symbiosis is identified as a core component of the EIP model. The research demonstrates that by fostering collaboration between firms within the industrial park, businesses can share resources, reduce waste, and optimize energy and material flows, leading to enhanced environmental and economic performance. The findings also suggest that integrating industrial and urban planning is crucial for the long-term success of EIPs, as it allows for the alignment of industrial growth with sustainable urban development. The study presents a detailed policy framework that incorporates these four pillars, offering a clear roadmap for the successful implementation of EIPs in Ukraine.

Discussion. This research offers a comprehensive comparison between Ukraine's potential EIP framework and global experiences, particularly drawing insights from China, Italy, and Vietnam. China's EIP model emphasizes resource optimization, waste reduction, and eco-efficiency, presenting a clear case for Ukraine to adopt similar strategies. The Chinese model demonstrates that a strong regulatory framework, combined with strict environmental performance metrics, can significantly enhance industrial sustainability. In contrast, Italy's experience with voluntary certification schemes, particularly in the Tuscany region, offers valuable lessons in stakeholder collaboration and public-private partnerships. Italy's model highlights the importance of local adaptability and the need for flexibility in policy implementation, particularly in the context of industrial symbiosis. The research also discusses Vietnam's participatory approach to EIP development, which emphasizes bottom-up engagement and early stakeholder involvement. This model could be particularly relevant to Ukraine, given its need for multi-stakeholder collaboration in policy formulation and implementation. The discussion also addresses the challenges of transferring global best practices to the Ukrainian context, noting that while global models offer valuable insights, they must be adapted to local socio-economic and geopolitical conditions. The study emphasizes the importance of tailoring the policy framework to Ukraine's unique industrial landscape, particularly in light of its ongoing economic challenges and geopolitical situation. The findings suggest that Ukraine must adopt a phased approach to EIP implementation, starting with pilot projects that can be scaled up over time. This approach will allow for the gradual refinement of the policy framework, ensuring that it is both practical and sustainable.

Conclusions. This research provides a comprehensive policy framework for the implementation of EIPs in Ukraine, focusing on regulatory support, management commitment, environmental performance, and industrial symbiosis. The study draws on global best practices, particularly from China, Italy, and Vietnam, to propose a tailored approach for Ukraine. The novelty of the research lies in its use of multi-criteria analysis, Delphi method, and fuzzy set theory to address the uncertainties and

complexities inherent in policy formulation for EIPs. The study concludes that a strong regulatory framework, supported by active stakeholder engagement and management commitment, is essential for the successful implementation of EIPs in Ukraine. The proposed policy framework offers a clear roadmap for policymakers and stakeholders, providing actionable steps for promoting sustainable industrial development. Future research should focus on pilot implementations of the proposed framework, with a particular emphasis on assessing its long-term sustainability impacts. The practical implications of this research suggest that by adopting a robust and adaptable policy framework, Ukraine can position itself as a leader in eco-industrial development, contributing to both national and international sustainability goals.

Author contributions. The author contributed fully.

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References:

1. Tseng, M.-L., Negash, Y. T., Nagypál, N. C., Iranmanesh, M., & Tan, R. R. (2021). A causal eco-industrial park hierarchical transition model with qualitative information: Policy and regulatory framework leads to collaboration among firms. *Journal of Environmental Management*, 292, 112735. <https://doi.org/10.1016/j.jenvman.2021.112735>
2. Hu, W., Tian, J., & Chen, L. (2020). An industrial structure adjustment model to facilitate high-quality development of an eco-industrial park. *Science of The Total Environment*, 142502. <https://doi.org/10.1016/j.scitotenv.2020.142502>
3. Daddi, T., Iraldo, F., Frey, M., Gallo, P., & Gianfrate, V. (2016). Regional policies and eco-industrial development: the voluntary environmental certification scheme of the eco-industrial parks in Tuscany (Italy). *Journal of Cleaner Production*, 114, 62–70. <https://doi.org/10.1016/j.jclepro.2015.04.060>
4. Fan, Y., Bai, B., Qiao, Q., Kang, P., Zhang, Y., & Guo, J. (2017). Study on eco-efficiency of industrial parks in China based on data envelopment analysis. *Journal of Environmental Management*, 192, 107–115. <https://doi.org/10.1016/j.jenvman.2017.01.048>
5. Yu, C., Dijkema, G. P. J., de Jong, M., & Shi, H. (2015). From an eco-industrial park towards an eco-city: a case study in Suzhou, China. *Journal of Cleaner Production*, 102, 264–274. <https://doi.org/10.1016/j.jclepro.2015.04.021>
6. Le Tellier, M., Berrah, L., Audy, J.-F., Stutz, B., & Barnabé, S. (2022). A sustainability assessment model for industrial parks: A Choquet integral aggregation approach. *Journal of Environmental Management*, 316, 115165. <https://doi.org/10.1016/j.jenvman.2022.115165>
7. Massard, G., Leuenberger, H., & Dong, T. D. (2018). Standards requirements and a roadmap for developing eco-industrial parks in Vietnam. *Journal of Cleaner Production*, 188, 80–91. <https://doi.org/10.1016/j.jclepro.2018.03.137>
8. *THE 17 GOALS | Sustainable Development*. (2019). | Sustainable Development. <https://sdgs.un.org/goals>
9. Akinbowale, O. E., Klingelhöfer, H. E., Zerihun, M. F., & Mashigo, P. (2024). Development of a policy and regulatory framework for mitigating cyberfraud in the South African banking industry. *Heliyon*, 10(1), Стаття e23491. <https://doi.org/10.1016/j.heliyon.2023.e23491>
10. Tas, N., et al. (2021). *An international framework for eco-industrial parks* (2nd ed.). Publications of the Global Eco-Industrial Parks Programme. Washington, DC: The World Bank Group. Available at: <https://geipp-ukraine.org/wp-content/uploads/2021/08/EIP-International-Framework-for-EIP-Version-2.0-1.pdf> (Accessed: 08 August 2024).
11. Grossi, F., Strube, R., Xhelili, A., & Stegeman, I. (2018). *An inherit policy roadmap* (The INHERIT project report). inherit.