

UKRAINE'S ENVIRONMENTAL TRANSFORMATION IN THE CONTEXT OF EUROPEAN INTEGRATION AND SUSTAINABLE DEVELOPMENT: THE CHALLENGES AND PROSPECTS FOR ADAPTING TO EU STANDARDS

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Ukraine's Environmental Transformation in the Context of European Integration and Sustainable Development: The Challenges and Prospects for Adapting to EU Standards

This article examines the characteristics of Ukraine's environmental transformation in the context of European integration and sustainable development, and identifies the main challenges involved in adapting national environmental policy to European Union standards. It is substantiated that the country's environmental modernization is one of the key directions in the implementation of Ukraine's European integration course and an important prerequisite for the formation of a competitive European-style economy. It is found that the process of harmonizing Ukraine's environmental legislation with EU standards is accompanied by a number of complex problems related to the insufficient implementation of European directives, the low efficiency of the environmental control system, the obsolescence of industrial technologies, and the economy's high resource dependence. Particular attention is paid to analyzing the impact of the Russian Federation's full-scale armed aggression on Ukraine's environmental condition. It is determined that military actions have caused large-scale destruction of natural ecosystems, pollution of the atmosphere, water resources, and soil, an increase in the volume of destruction-related waste, and an intensification of man-made risks. It has been demonstrated that, under wartime conditions, the process of environmental transformation is significantly complicated by limited financial resources, the need to restore critical infrastructure, and the complexity of implementing long-term environmental programs. This article analyzes the main areas of alignment between Ukraine's environmental legislation and EU standards, particularly in the fields of waste management, air quality protection, decarbonization of the economy, renewable energy development, environmental monitoring, and ecological safety. The key stages of legislative harmonization and the need to strengthen the institutional capacity of government agencies in the field of environmental protection are identified. The importance of developing a green economy, a circular economy, and implementing the principles of the European Green Deal as the foundation for Ukraine's postwar recovery is substantiated. It is demonstrated that attracting international financial support, developing environmental innovations, digitizing environmental monitoring systems, and raising public environmental awareness will contribute to the efficient implementation of the state's environmental policy. It is concluded that Ukraine's environmental transformation is a necessary condition for successful European integration and an important factor in ensuring the country's sustainable development in the context of contemporary global challenges.

Keywords: European integration; environmental transition; sustainable development; environmental policy; European Union; European Green Deal; circular economy; environmental safety.

Fig.: 1. **Tabl.:** 2. **Bibl.:** 18.

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Шекета Є. Ю., Казюка Н. П., Гуменюк В. В., Грицуляк Г. М., Мацола М. М. Екологічна трансформація України в умовах євроінтеграції та сталого розвитку: виклики та перспективи адаптації до стандартів ЄС

У статті досліджено особливості екологічної трансформації України в умовах євроінтеграції та сталого розвитку, а також визначено основні виклики адаптації національної екологічної політики до стандартів Європейського Союзу. Обґрунтовано, що екологічна модернізація держави є одним із ключових напрямів реалізації євроінтеграційного курсу України та важливою передумовою формування конкурентоспроможної економіки європейського зразка. Встановлено, що процес гармонізації екологічного законодавства України із нормами ЄС супроводжується низкою складних проблем, пов'язаних із недостатньою імплементацією європейських директив, низькою ефективністю системи екологічного контролю, застарілістю промислових технологій та високою ресурсозалежністю економіки. Особливу увагу приділено аналізу впливу повномасштабної збройної агресії Російської Федерації на екологічний стан України. Визначено, що воєнні дії спричинили масштабні руйнування природних екосистем, забруднення атмосферного повітря, водних ресурсів і ґрунтів, збільшення обсягів відходів та посилення техногенних ризиків. Доведено, що в умовах війни процес екологічної трансформації значно ускладнюється через обмеженість фінансових ресурсів, необхідність відновлення критичної інфраструктури та складність реалізації довгострокових екологічних програм. У статті проаналізовано основні напрями адаптації екологічного законодавства України до стандартів ЄС, зокрема у сферах управління відходами, охорони атмосферного повітря, декарбонізації економіки, розвитку відновлюваної енергетики, екологічного моніторингу та забезпечення екологічної безпеки. Визначено ключові етапи гармонізації законодавства та необхідність посилення інституційної спроможності органів державної влади у сфері охорони довкілля. Обґрунтовано важливість розвитку «зеленої» економіки, циркулярної економіки та впровадження принципів європейського зеленого курсу як основи післявоєнного відновлення України. Залучення міжнародної фінансової підтримки, розвиток екологічних інновацій, цифровізація систем моніторингу доповілі та підвищення рівня екологічної свідомості населення сприятимуть ефективній реалізації екологічної політики держави. Зроблено висновок, що екологічна трансформація України є необхідною умовою успішної євроінтеграції та важливим чинником забезпечення сталого розвитку держави в умовах сучасних глобальних викликів.

Ключові слова: євроінтеграція; екологічна трансформація; сталий розвиток; екологічна політика; Європейський Союз; європейський зелений курс; циркулярна економіка; екологічна безпека.

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In the current context of global environmental change and increasing integration, the issue of environmental transformation is of particular importance for Ukraine. The European Union places significant emphasis on ensuring sustainable development, protecting the environment, and implementing the principles of the

“green” and “blue” economies, which necessitates the adaptation of candidate countries to the EU environmental standards. For Ukraine, which has officially received candidate status for accession to the European Union, environmental policy is becoming one of the key areas of reform and modernization of the national economy.

An additional factor exacerbating Ukraine's environmental problems has been the full-scale armed aggression by the Russian Federation, which has caused massive destruction of natural ecosystems, industrial facilities, and critical infrastructure. Military operations have led to the contamination of soil, water resources, and the atmosphere, an increase in debris from destruction, the outbreak of fires in natural areas, and the disruption of the ecological balance across significant portions of the country. Particularly dangerous are the risks of man-made disasters associated with damage to energy facilities, the chemical industry, and water supply systems.

In the context of war, Ukraine's environmental transformation process is significantly complicated by limited financial resources, the need to prioritize the State's defense needs, and the challenges of implementing long-term environmental programs. A significant portion of the infrastructure requires restoration or modernization in accordance with the European environmental standards, which demands substantial investment and international support. At the same time, Ukraine is forced to simultaneously address issues of postwar reconstruction and fulfill its obligations within the framework of its European integration course.

The complexity of adapting to the European Union standards also lies in the need to harmonize environmental legislation, implement modern environmental monitoring systems, and ensure efficient control over the use of natural resources. The European Union sets high standards for reducing greenhouse gas emissions, developing a circular economy, energy efficiency, and environmental safety, which requires Ukraine to implement comprehensive structural changes across various sectors of the economy.

Despite significant challenges, it is the path toward European integration that creates the conditions for the country's environmental renewal. Support from the European Union, participation in international environmental programs, and the attraction of investment in green recovery can serve as the foundation for shaping Ukraine's modern environmental policy and ensuring its sustainable development in the postwar period.

The issue of Ukraine's environmental transformation in the context of European integration and adaptation to the European Union standards is the subject of research by many national scientists. The specifics of harmonizing Ukraine's environmental legislation with EU norms and the legal aspects of the State's environmental policy were studied by S. M. Danylyuk [1]. The issue of implementing sustainable development principles in the context of cooperation

between Ukraine and the European Union is explored in the works of Derii Zh., Zosimenko T., and Shadura-Nykiporets N. [2]. The impact of the Russian Federation's full-scale armed aggression on the environmental sector and the issue of formulating a strategy for the postwar economic recovery of Ukraine are analyzed in the works of A. Bugaychuk and V. Yemets [4; 6]. The works of Gudz M. V. and Skoryk M. O., Danilenko S. V. [9; 11] are devoted to the study of the role of European integration as a factor in Ukraine's economic transformations under wartime conditions; the problems and prospects of Ukraine's European integration policy were examined by Dudkevych V. I. and Nahirnyak A. M. [5; 14]. The specifics of sustainable development, economic security, and the circular economy were studied by Ishchuk Y. A. and Bida M. B. [7; 8].

The *aim* of this article is to conduct a comprehensive study of Ukraine's environmental transformation in the context of European integration, to identify the main environmental challenges caused by the Russian Federation's full-scale armed aggression, and to substantiate the key directions for adapting national environmental policy, legislation, and the environmental management system to the standards and requirements of the European Union. Particular attention is paid to analyzing the prospects for implementing the principles of sustainable development, environmental security, and the green modernization of Ukraine's economy in the process of its integration into the European space.

The issue of European integration is becoming critically important for Ukraine, especially in the context of the full-scale military invasion that began in 2022 and the subsequent transformation of the country's political, economic, and environmental systems. The current geopolitical situation, instability in the region, and the threat posed by the aggressor are pushing the State to revise its strategic priorities and actively implement the European governance standards [5].

The European Green Deal EGD or "green deal" was adopted by the European Parliament on 11.12.2019. The EGD is a set of interrelated policy initiatives put forward by the European Commission with the overall goal of making the European continent climate neutral by 2050 through a radical transformation of virtually all sectors of the economy [18].

The European Union's environmental policy is one of the most developed and comprehensive environmental regulatory systems in the world. The EU's environmental policy is based on the principles of sustainable development, the precautionary principle, liability for pollution, and the rational use of natural resources. The European Union pays significant attention to reducing greenhouse gas emissions, developing

a circular economy, improving energy efficiency and preserving biodiversity. The Europe's own security order will depend not only on the EU's ability to demonstrate its own resilience, but also its ability to develop new tools and approaches that allow it to reach beyond its own normative orbit and into a more normatively diverse 'Eurasian' space [17, p. 94].

Current Ukrainian legislation fails to fully guarantee the rights of Ukrainian citizens to a healthy environment, does not resolve existing environmental problems, and does not prevent new ones from arising. Reforming environmental protection legislation is an absolute necessity. A systemic and integrated approach to strengthening environmental standards through legislation should promote the development of new environmentally friendly production methods, increase citizens' legal awareness, ensure the improvement of methods for civil oversight of environmental relations, encourage the reduction of negative impacts on the environment, and help overcome existing problems [1, p. 158].

An important element of the EU's current environmental strategy is the European Green Deal, which aims to achieve climate neutrality by 2050. Within the framework of this strategy, the EU Member States are implementing measures to reduce the use of fossil fuels, develop renewable energy, modernize industry, and promote environmentally safe production.

Under the Association Agreement between Ukraine and the European Union (Article 289), the parties recognize the importance of taking into account, to the fullest extent possible, the economic, social, and environmental interests not only of their respective populations but also of future generations, and guarantee that economic development, environmental, and social policies are supported jointly [3].

For Ukraine, aligning with the EU environmental standards is a key prerequisite for further progress toward European integration. The Association Agreement between Ukraine and the EU provides for the implementation of a significant number of directives and regulations in the field of environmental protection. In particular, this concerns waste management, air quality protection, water policy, industrial pollution, and environmental monitoring.

Tbl. 1 summarizes the main challenges of aligning Ukraine's environmental policy with the European Union standards. The analysis shows that the process of harmonizing Ukraine's environmental legislation with the EU standards is accompanied by a number of complex challenges in various areas of environmental policy. In particular, despite the gradual alignment of national legislation with European requirements, the problem of incomplete implementation of the EU directives and insufficient oversight of compliance with environmental standards persists. Significant difficulties are observed in the field of waste management,



Fig. 1. Ukraine's Environmental Challenges on the Path to European Integration

Source: [15].

where the practice of landfilling waste still prevails in Ukraine, while EU countries are guided by the principles of the circular economy and the development of waste recycling systems. High levels of air pollution, insufficient effectiveness of environmental monitoring, and the deterioration of water treatment infrastructure remain significant challenges.

The issue of decarbonizing the economy and implementing climate policy in line with the European

Green Deal requires special attention, as it demands a large-scale modernization of Ukraine's energy sector and significant financial resources. The adaptation process is further complicated by the full-scale war, which has caused massive environmental damage, infrastructure destruction, and the need to implement postwar environmental restoration programs. Additionally, significant challenges remain, including the insufficient efficiency of the environmental manage-

Table 1

Key Challenges in Aligning Ukraine's Environmental Policy with the European Union Standards

Environmental Policy	European Union Standards	Current Situation in Ukraine	Key Challenges in Adaptation
Environmental Legislation	A comprehensive system of the EU directives and regulations, requiring all member states to comply with environmental standards	The process of harmonizing legislation with the EU standards is ongoing	Incomplete implementation of the EU directives and insufficient enforcement of laws
Waste Management	Principles of the circular economy, waste sorting and recycling, and minimizing landfill disposal	Landfilling remains the predominant method of waste disposal, with low recycling rates	Inadequate infrastructure for waste sorting and recycling
Air Quality	Strict standards for industrial and transportation emissions, and continuous monitoring	High levels of pollution in industrial regions	Outdated production technologies and insufficient environmental oversight
Water Resources	Integrated water resource management in accordance with the EU Water Framework Directive	Problems with river pollution and inadequate wastewater treatment	Aged wastewater treatment facilities and a lack of funding for modernization
Energy and Decarbonization	Active development of renewable energy and reduction of CO ₂ emissions	Partial dependence on fossil fuels	The need for large-scale modernization of the energy sector
Climate Policy	Implementation of the European Green Deal and achievement of climate neutrality	The development of national climate policy is ongoing	High energy intensity of the economy and limited resources
Environmental Monitoring	Modern digital systems for environmental monitoring	Monitoring is inconsistent and requires modernization	Insufficient technical capacity
Environmental Safety in Times of War	In the EU, significant attention is paid to preventive environmental measures and the minimization of man-made risks	Significant environmental damage due to hostilities and infrastructure destruction	Need for large-scale postwar environmental restoration
Environmental Management and Oversight	High standards of environmental auditing and corporate responsibility	Control mechanisms are not functioning effectively enough	Corruption risks and a weak environmental management system
Funding for Environmental Programs	Significant investments in the green economy and environmental projects	Limited State resources due to martial law	Need for international financial support and investment
Public Environmental Awareness	A high level of environmental awareness and support for sustainable development	Environmental awareness is gradually increasing	Insufficient promotion of environmental education and culture

Source: compiled by the authors.

ment system, the presence of corruption risks, limited funding for environmental programs, and a low level of environmental awareness among the population.

Adapting Ukraine's environmental policy to the European Union standards requires a comprehensive approach that involves simultaneously reforming the legislative framework, modernizing the economy, strengthening the State's institutional capacity, and mobilizing international support for environmental transformation.

Today, the EU has strict environmental standards in place. EU and national governments have set clear goals for shaping European environmental policy by 2050. Special research programs, as well as relevant legislation and funding, support this policy. These goals include protecting, conserving, and enhancing the EU's natural resources; transforming the EU economy into a resource-efficient, green, and competitive low-carbon economy; and protecting the population from environmental pressures and threats to health and well-being. Green growth is a key element of EU policy and plays a crucial role in promoting sustainable development at the global level [2, p. 12].

Ukraine's aspiration to join the European Union, enshrined in the Constitution and reaffirmed by the Revolution of Dignity, has gained new momentum amid the ongoing war. The EU candidate status granted to Ukraine in June 2022 has become not only a symbol of support from the European community but also a clear roadmap for further reforms. Ukraine's European integration is not merely a geopolitical choice but also a strategic mechanism for economic transformation, helping the country adapt to new challenges and ensure its long-term development [11, p. 42].

Ukraine's environmental transformation is closely linked to economic processes and requires significant financial resources. The implementation of the European environmental standards necessitates the modernization of industry, the energy sector, transportation infrastructure, and the waste management system.

A significant portion of Ukraine's industrial enterprises continues to use outdated production technologies and is characterized by a high degree of resource dependence, which leads to excessive consumption of energy and natural resources, increased levels of harmful emissions, and a significant negative impact on the environment. The problem is exacerbated by the high environmental impact of certain industrial sectors and the trade in hazardous or harmful products. This creates a macroeconomic challenge linked to negative material flows, which requires decisive institutional shifts toward a circular economy [7, p. 138].

The development of a green economy, which combines economic growth with environmental protection,

is of particular importance. The European Union actively supports environmental innovation, energy efficiency, and the use of renewable energy sources.

For Ukraine, the development of a green economy could become a key factor in postwar recovery. Attracting international investment, participating in European environmental programs, and modernizing production will help boost the competitiveness of the Ukrainian economy. At the same time, implementing this environmental transformation requires efficient government support. It is necessary to create favorable conditions for the development of green entrepreneurship, stimulate investment in green technologies, and improve the environmental taxation system.

As part of the "Europe 2030" strategy, key objectives include achieving an employment rate of at least 78% among the economically active population and increasing investment in research and innovation to 3% of GDP. These quantitative targets are intended to trigger a "virtuous cycle" of increased productivity, technological renewal of industry, and rising prosperity, which will ultimately ensure the sustainable development and strategic autonomy of the European Union [6, p. 204].

Green transformation and energy security, the steps of which include aligning the decarbonization roadmap with the European Green Deal; focusing on renewable energy sources, energy efficiency, hydrogen projects, and grid modernization; and establishing a carbon market and CBAM adaptation mechanisms for exporters [12]. Ukraine should integrate into the European Green Deal through the development and implementation of a coordinated decarbonization roadmap. The main areas of focus are: the development of renewable energy sources, improving energy efficiency in industry and the residential sector, supporting hydrogen projects, and modernizing energy grids [8, p. 159–160].

Despite significant challenges, the process of European integration is opening up new opportunities for Ukraine in the field of environmental modernization. A key area is the development of renewable energy, which will help reduce dependence on fossil fuels and cut greenhouse gas emissions.

Another promising area is the digitization of environmental monitoring and natural resource management systems. The use of modern information technologies will improve the effectiveness of environmental monitoring and ensure the transparency of environmental information.

Next factor affecting environmental safety in the context of the war has been the increased public and media attention to the issue of pollution resulting from potential accidents at nuclear power plants or the use of nuclear weapons. This issue has been addressed by

Ukrainian government officials, international organizations, and environmental NGOs [4, p. 165].

International cooperation plays a crucial role in the process of environmental transformation. Ukraine actively collaborates with the European Union, international organizations, and environmental foundations in the implementation of environmental protection programs.

The development of an environmental culture within society will be of particular importance. Raising public environmental awareness, developing environmental education, and supporting community-based environmental initiatives will contribute to the efficient implementation of the State's environmental policy.

The democratic world wants to help our country return to peaceful life as quickly as possible. Beyond feelings of compassion and support, there is also a pragmatic interest at stake. Participation in large-scale and prestigious international projects to rebuild Ukrainian cities, infrastructure, and other sectors of our economy will give Western companies the opportunity to profit and establish a foothold in the promising Ukrainian market [13, p. 263].

The process of European integration amid war is a complex and multifaceted challenge. On the one hand, the war destroys infrastructure, the economy, and the social fabric of society, creating obstacles to reform. On the other hand, it unites Ukrainian society around shared values, mobilizes resources, and stimulates innovation [11, p. 46].

One of the key areas of Ukraine's European integration is the harmonization of environmental legislation with European Union law. Under the Association Agreement, Ukraine has committed to implementing a significant number of the EU directives in the field of environmental protection (*Tbl. 2*).

Key areas of adaptation include improving legislation in the fields of waste management, air quality protection, industrial pollution, environmental impact assessment, and biodiversity conservation. In recent years, Ukraine has adopted a series of legislative acts aimed at aligning with the European standards (see *Tbl. 2*). At the same time, the process of harmonizing legislation is accompanied by significant challenges.

The main challenges remain insufficient funding, the difficulty of implementing reforms amid the war, inadequate technical resources, and ineffective environmental oversight.

To effectively align with the EU standards, Ukraine needs to take a comprehensive approach to reforming its environmental policy. This entails not only updating the regulatory framework but also strengthening the institutional capacity of government agencies, developing environmental monitoring

systems, and implementing modern environmental technologies, as every Ukrainian has the right to clean water, air, and food. However, the issues of human rights compliance in this sphere and the implementation of the rule of law have come to the fore with full force: for in conditions where the very existence of the country and its people is under threat, when the State temporarily loses control over its sovereign territories, it is impossible to speak of any guarantees on its part for each citizen. In fact, in conditions of an "existential crisis," the need to preserve the country will take precedence over the interests of individual citizens, for as many of our compatriots have clearly seen: where there is no State (where the government is temporarily unable to exercise its authority) – citizens have no rights [10, p. 109].

CONCLUSIONS

Thus, Ukraine's environmental challenges on the path to European integration are multifaceted and encompass a wide range of issues related to environmental pollution, waste management, climate change, insufficient energy efficiency, and the consequences of the full-scale war. The process of adapting to the European Union's environmental standards is a crucial component of Ukraine's path toward European integration and entails a large-scale transformation of the country's environmental policy, legislation, and economy. As evidenced in recent crises facing Europe and the world, the EU has assumed a clear role in organizing a transboundary response to unexpected shocks and disturbances (and continues that role, during the Ukraine crisis). The accumulation of cross-sectoral crisis tools, routines, and resources is one of the most remarkable developments in the EU of late, with some even arguing it has changed the essential character of the EU [16].

The Russian Federation's full-scale armed aggression has significantly complicated Ukraine's environmental modernization process, causing widespread destruction of natural ecosystems, environmental pollution, and significant man-made risks. At the same time, postwar reconstruction creates an opportunity to implement the concept of green development, based on the principles of sustainable development, energy efficiency, and environmental safety.

Ukraine's efficient adaptation to the EU standards requires a comprehensive approach that includes harmonizing legislation, modernizing industry and the energy sector, developing a circular economy, improving the environmental monitoring system, and securing international support. Innovative technologies, international cooperation, and the development of a high level of environmental awareness in society play a crucial role in this process.

Table 2

Stages and Key Measures for Aligning Ukraine's Environmental Legislation with the European Union Standards

Adaptation Phase	Content and Key Actions
1. Analysis and assessment of the current situation	Conduct a comprehensive analysis of Ukraine's current environmental legislation. Identify gaps relative to the EU acquis. Assess institutional and resource capacities for implementation
2. Priority setting and planning	Identify priority areas for harmonization (air, water, waste, protected areas, chemical safety, etc.). Develop a National Plan for the adaptation of environmental legislation to the EU standards with clear deadlines and responsible authorities
3. Harmonization of legislation	Amend existing laws in accordance with the EU directives and regulations. Ensure legal consistency between national legislation and the EU acquis
4. Institutional reform	Strengthen the institutional capacity of government agencies and regulatory bodies. Clearly delineate responsibilities between central and local authorities in the field of environmental protection. Ensure the independence and effectiveness of environmental oversight
5. Development of monitoring and information systems	Establish a modern environmental monitoring system in accordance with EU requirements. Ensure data transparency and public access to data. Integrate national monitoring systems into European networks
6. Economic and financial mechanisms	Introduce economic instruments (environmental taxes, fees, green investments, the "polluter pays" principle). Secure funding from EU funds and international programs. Encourage businesses to adopt environmentally friendly technologies
7. Capacity building and information support	Provide training and professional development for government officials, businesses, and the public. Raise the level of environmental awareness and culture among the population. Ensure consultations with experts and the exchange of experience with the EU
8. Oversight, enforcement and accountability	Ensure the efficient enforcement of environmental legislation. Strengthen accountability for violations of environmental standards. Conduct regular inspections and environmental audits
9. Cooperation with the EU and international integration	Actively cooperate with the EU within the framework of the Association Agreement and other international agreements. Participate in European environmental programs and initiatives. Utilize the experience and best practices of the EU Member States
10. Progress monitoring and continuous improvement	Regularly assess progress in implementing the Adaptation Plan. Make necessary adjustments to legislation and environmental policy. Report to the public and European partners on the results achieved

Source: compiled by the authors.

Thus, Ukraine's environmental transformation is not only a prerequisite for European integration but also a key factor in ensuring the country's sustainable development, improving the quality of life for its citizens, and building a competitive economy based on the European standards. ■

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