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The Ukraine and Eastern Europe Model in Local Economic Improvement and Cultivation Strategy

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Abstract. *The article examines regional economic recovery through a comparative analysis of Ukraine and Eastern European countries, identifying key determinants of national economic resilience and growth. Particular attention is paid to the synergies among infrastructure, digitalization, environmental sustainability, social development, and innovation as complementary drivers of recovery. The study emphasizes the importance of integrated approaches that combine multiple sectors to ensure long-term stability and competitiveness. The methodological framework is based on systemic, structural, and comparative analytical approaches, complemented by an integral assessment method. This method aggregates indicators into eight thematic blocks, which are further synthesized into a composite index (R) measuring regional recovery. This approach enables cross-country comparison and provides a comprehensive evaluation of national recovery strategies. The findings reveal distinct recovery profiles among the analyzed countries. Ukraine achieved the highest R score (0.47), reflecting a balanced combination of infrastructure, energy, digitalization, and social reintegration. Hungary (0.45) demonstrates strong digital and innovation performance, while Slovakia and Romania (0.34) emphasize environmental and transport development. Poland and Bulgaria (0.28) show more fragmented innovation patterns. The study concludes that the most effective recovery strategies are based on "mixed" portfolios with strong inter-sectoral complementarity. For Ukraine, an optimal financing structure is proposed, prioritizing infrastructure and energy, followed by digitalization, innovation, social development, and green modernization. The research contributes a unified index for comparative analysis and offers a practical monitoring framework to support strategic planning and alignment with European development trajectories.*

Keywords: *regional economic recovery, development strategies, integral index, digitalization, environmental sustainability, innovation potential*

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Yerli iqtisadi təkmilləşdirmə və becərmə strategiyasında Ukrayna və Şərqi Avropa modeli

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Xülasə. *Məqalə Ukrayna və Şərqi Avropa ölkələrinin müqayisəli təhlili əsasında regional iqtisadi bərpa məsələsini araşdırır, milli iqtisadi dayanıqlığın və inkişafın əsas determinantlarını müəyyən edir. Xüsusi diqqət infrastruktur, rəqəmsallaşma, ekoloji dayanıqlılıq, sosial inkişaf və innovasiya kimi amillər arasında sinerjiyə, onların bərpanın tamamlayıcı drayverləri kimi roluna yönəldilir. Tədqiqat uzunmüddətli sabitlik və rəqabətqabiliyyətliliyi təmin etmək üçün çoxsektorlu inteqrasiya olunmuş yanaşmaların əhəmiyyətini vurğulayır. Metodoloji çərçivə sistemli, struktur və müqayisəli analitik yanaşmalara, eləcə də inteqral qiymətləndirmə metoduna əsaslanır. Bu metod göstəriciləri səkkiz tematik blok üzrə birləşdirərək regional bərpanı ölçən kompozit indeksə (R) çevrir. Bu yanaşma ölkələrarası müqayisəyə imkan yaradır və milli bərpa strategiyalarının kompleks qiymətləndirilməsini təmin edir. Nəticələr təhlil olunan ölkələr arasında fərqli bərpa profillərini göstərir. Ukrayna ən yüksək R göstəricisinə (0,47) malik olmuşdur ki, bu da infrastruktur, enerji, rəqəmsallaşma və sosial reinteqrasiyanın balanslı birləşməsini əks etdirir. Macarıstan (0,45) güclü rəqəmsal və innovasiya komponenti ilə seçilir, Slovakiya və Rumıniya (0,34) ekoloji və nəqliyyat istiqamətinə üstünlük verir, Polşa və Bolqarıstan (0,28) isə innovasiya komponentlərinin parçalanmış strukturu ilə xarakterizə olunur. Tədqiqat göstərir ki, ən effektiv bərpa strategiyaları sektorlararası yüksək tamamlayıcılığa malik "qarışıq" portfellərə əsaslanır. Ukrayna üçün optimal maliyyələşdirmə strukturu təklif olunur: prioritet olaraq infrastruktur və enerji, daha sonra rəqəmsallaşma, innovasiya, sosial inkişaf və yaşıl modernizasiya. Tədqiqat ölkələrarası müqayisə üçün vahid indeks təqdim edir və strateji planlaşdırmanı, həmçinin Avropa inkişaf istiqamətləri ilə uyğunlaşmanı dəstəkləyən praktiki monitorinq çərçivəsi formalaşdırır.*

Açar sözlər: *regional iqtisadi bərpa, inkişaf strategiyaları, inteqral indeks, rəqəmsallaşma, ekoloji dayanıqlılıq, innovasiya potensialı*

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Introduction

The relevance of the study is determined by the deep structural, economic and social challenges faced by Ukraine as a result of military aggression and the objective need to restore the regional economy on a qualitatively updated basis. The large-scale destruction of infrastructure, disruption of logistics links, and degradation of production potential have actualized the need for a conceptual rethinking of regional development mechanisms in the context of Ukraine's integration processes into the European economic area. The issues of rational use of the resource potential of regions, their digital transformation, and the development of strategies focused on innovation, sustainability, and competitiveness gained a special status (Tymoshenko, 2024).

The scientific problem lies in the lack of a comprehensive methodological framework that would integrate the task of restoring the economic potential of regions with the long-term strategic goals of sustainable development. The issues of adapting European practices to the specifics of the Ukrainian context, in particular in terms of regional resource management, digitalization of the public sector, modernization of production infrastructure, and creation of favorable conditions for human capital development, remain insufficiently developed (Kulinich & Obushok, 2024). Identification of optimal models of regional economic recovery requires a thorough scientific justification, harmonization of national and local priorities, as well as the design of a management system capable of ensuring sustainability, efficiency, and full integration of Ukraine into the European economic space.

In the scientific space, where the issues of regional development are discussed, several research approaches have been formed to interpret the essence of this phenomenon, its goals and factors. Scientists, in particular Al Zoubi (2024), Firlej et al. (2024), define development as a set of qualitative and quantitative changes that occur under the influence of internal and external factors and ensure a transition to a more balanced state of the regional economic system. This shortcoming is critical in the current recovery environment, as the effectiveness of regional policy is determined by the system's ability to adapt to crisis challenges and the corresponding transformations of the country's economic structure.

Authors such as Ji et al. (2025) and Martyniuk et al. (2020) have studied the processes of spatial differentiation, structural changes, and transformational trends within regional economic systems. Their work proves that regional development is a dynamic process that covers the economic, social, environmental, and institutional spheres, and its result is an increase in the competitiveness of territories and living standards. At the same time, the interaction between structural, institutional, and spatial factors of regional development in the context of digitalization and military reconstruction remains insufficiently studied within existing models.

Studies by Biru et al. (2024), Jaźwiński (2023), Novykova et al. (2023) and Trejo Nieto (2025) have shown that the key criterion for development is the region's ability to sustainably reproduce its resources, as well as ensure social and environmental balance. At the same time, there is a problem of reconciling economic and environmental priorities, as most concepts leave the environmental component out of the systemic assessment of economic dynamics. This approach narrows the understanding of development as a complex process, where economic growth should be combined with environmental protection and increased social cohesion.

In the works of McCaffrey & Poitiers (2024). Medeu et al. (2025), Zakari & Musibau (2023), economic development is seen as the result of the targeted impact of public policy, which should coordinate the activities of government, business, and the public sector. In turn, Tyrkalo et al. (2022), Sumets et al. (2022) and Javaid et al. (2024) emphasize that the effectiveness of strategic management is determined by the degree of integration between levels of government and the ability of regions to implement their own development strategies. However, the question of institutional mechanisms for implementing such strategies remains open, especially in the context of decentralization, when regional entities receive more autonomy but do not always have sufficient financial and human resources to use it effectively.

A significant contribution was made by Bokovets et al. (2024), Hamann (2019), who emphasize that regional development is not only an economic but also a socio-cultural process that shapes new patterns of population behavior, increases the role of human capital and innovative competencies. At the same time, the issue of assessing intangible factors of development, such as innovation, social activity, and trust in institutions, which do not have universal dimensions but have a significant impact on competitiveness, remains problematic.

Some authors, such as Almazán-Gómez et al. (2025), Hramotniev et al. (2025), Suhendra et al. (2025), propose a comprehensive approach that takes into account human potential, the level of institutional development, innovation capabilities, and entrepreneurial activity. Their work demonstrates that regional development depends on the ability of society to create conditions for the effective use of intangible assets and knowledge. However, most studies lack a systematic analysis of the impact of digitalization on regional processes, as well as the relationship between digital innovations, economic system sustainability, and regional security. Thus, the review of the scientific literature shows that despite the significant amount of available research, the issue of regional economic recovery requires further conceptualization in the context of Ukraine's integration into the European "family".

The aim of the study is to substantiate the ways of regional economic recovery and the use of sustainable development strategies on the example of Ukraine and Eastern European countries.

Methods

The methodological basis of the study is based on systemic, structural-analytical and comparative approaches that provide a comprehensive study of the dynamics of socio-economic processes within national and supranational recovery programs. The paper applies an integral method of evaluating the effectiveness of programs, which makes it possible to aggregate heterogeneous quantitative indicators into a single generalized evaluation index. The integral index will be calculated by the formula:

$$R = \frac{\sum_{i=1}^{n} W_i}{n} \quad (1)$$

where R is the integral index of the effectiveness of recovery programs;

Wi is the average normalized value of indicators for each of the assessment blocks;

n is the number of blocks included.

For each block, the indicators are calculated as the arithmetic mean of normalized partial data:

$$W_i = \frac{\sum_{j=1}^{m} Y_{ij}}{m} \quad (2)$$

where $Y_{(ij)}$) is the normalized value of *the j-th* indicator in the *i-th* block;

m – number of indicators within the block.

Normalization is carried out by the method of min↔ max:

$$Y_{ij} = \frac{X_{ij} - X_{min}}{X_{max} - X_{min}} \quad (3)$$

where $X_{(i)\ is}$the actual value of the indicator;

X_{max}, X_{min}– maximum and minimum values among all programs.

The study uses the primary statistical base (Annex A), which includes statistics on national regional development programs of both Ukraine and the group of Eastern European countries. All indicators are brought to a single unit of measurement (million euros) and normalized against the largest program to ensure comparability.

Results

The Architectonics of Creating the Potential for Regional Economic Recovery: The Military Aspect of Ukraine

In order to ensure the ongoing stabilization of regional economic recovery, the processes of coherence of strategic goals and policies of national economic development should be of primary importance. Also, intensifying compliance with the management functions of processes that ensure operational coherence between levels of government, institutional stakeholders and territorial communities forms a controlled trajectory of transformations based on the integration of infrastructure reconstruction, modernization of the production base, energy transition and social cohesion into a single model of structural renewal (Ukraine on the way to the EU: Realities and perspectives, 2022) (Figure 1).

Figure 1

Conceptual framework for the development of regional recovery and cooperation between Ukraine and Eastern Europe

Source: Created by the authors.

Involvement of the regions of Ukraine and Eastern Europe in cross-border initiatives, from digital services and shared data centers to smart specialization programs to stimulate deeper mobilization processes and efficient use of the existing potential of the territories, creates a synergistic effect in the form of new market niches, increased productivity, and increased resilience to economic shocks (Beisengaliyev & Kossymbayeva, 2025).

Using a systemic approach, the authors should identify a triad of basic processes for which management functions should be clearly defined and institutionalized. First, the development of regional economic systems as integral spatial complexes on the basis of diversification of growth sources and increased resilience to external threats. Secondly, the transformation of the potential-forming space, i.e., the mobilization and reconfiguration of the region's key resources: human capital, infrastructure, natural resource base and knowledge networks towards their greater productivity and environmental balance (Gorokhova et al., 2024). Thirdly, digitalization as a cross-cutting mechanism for manageability, transparency, and accelerated scaling of decisions in policy planning, monitoring, and evaluation (Table 1).

Table 1

Management functions for regional economic recovery and development strategies for Ukraine and the countries of Eastern Europe

Management functions	**Strategies for the recovery of regional economic systems**	**Ensuring the transformation of economic potential**	**Digitalization in the context of regional recovery**
1	2	3	4
Social	Improving human subjectivity, quality of life and poverty reduction in the regions of Ukraine and Eastern Europe in accordance with the principles of sustainable development	Overcoming disproportions in the lives of the population of different territories, in particular between urban and rural populations, with a focus on intellectualization and capitalization of human potential for post-crisis recovery	Ensuring access to quality digital services, creating infrastructure for social protection, and improving the efficiency of services through digital platforms
Reproductive	Development of plans and programs for balanced territorial recovery, taking into account available resources in post-conflict regions	Planning to maximize the potential of the territories to achieve strategic recovery goals, transformation and resource mobilization in the context of regional strategies	Planning for the introduction of digital tools for expanded reproduction, building digital infrastructure and cybersecurity systems for sustainable development

Organizational	Ensuring the interaction of all actors of regional systems, employment and efficient use of resources in the process of economic recovery	Taking into account regional peculiarities in capacity building and transformation with a focus on the needs of end users in Eastern Europe	Focusing on the formation of new areas of economic activity, rationalization of resource use through digital coordination and process optimization
Innovation.	Directing regional development in the innovation and information direction for the formation of a post-industrial society in the context of the recovery of Ukraine and neighboring countries	Formation and use of innovative potential to increase the competitiveness of regions in long-term growth strategies	Development of innovative and digital infrastructure with regard to regional peculiarities, implementation of technologies for accelerated economic recovery
Distributional	Effective redistribution of resources to achieve self-sufficiency and self-financing of regional recovery	Stimulating the rational use of the region's own resources and potential, mobilizing potential opportunities for strategic development	Stimulation and concentration of efforts on highly efficient digital technologies and new areas of production to strengthen regional resilience

Source: Compiled on the basis of: (United Nations, 2024; UNDP, 2022; UN DESA, 2024).

These functionalities are dual in nature: on the one hand, they are independent tools for influencing regional processes. Each of them forms its own sphere of action aimed at improving the efficiency of resource management, and on the other hand, they remain interdependent, as their implementation is subject to the overall goal of modernizing the spatial economy, ensuring cohesion and increasing the resilience of regions within the European Economic Area (Ordonez-Ponce et al., 2021).

Between February 2023 and February 24, 2024, the World Bank, together with the Government of Ukraine and the European Commission, prepared a large-scale analytical report "Rapid Assessment of Damage and Recovery Needs", which became the first systematic document to quantify the extent of the destruction caused by full-scale aggression and identify priority areas for reconstruction, taking into account the socio-economic specifics of individual regions. According to the study, Ukraine's priority reconstruction needs amounted to USD 22 billion, including the restoration of energy and water supply. This includes the reconstruction of the energy sector, housing, social, transport and critical infrastructure, as well as measures to ensure life support in the areas that have suffered the greatest destruction (Figure 2) (World Bank, 2025).

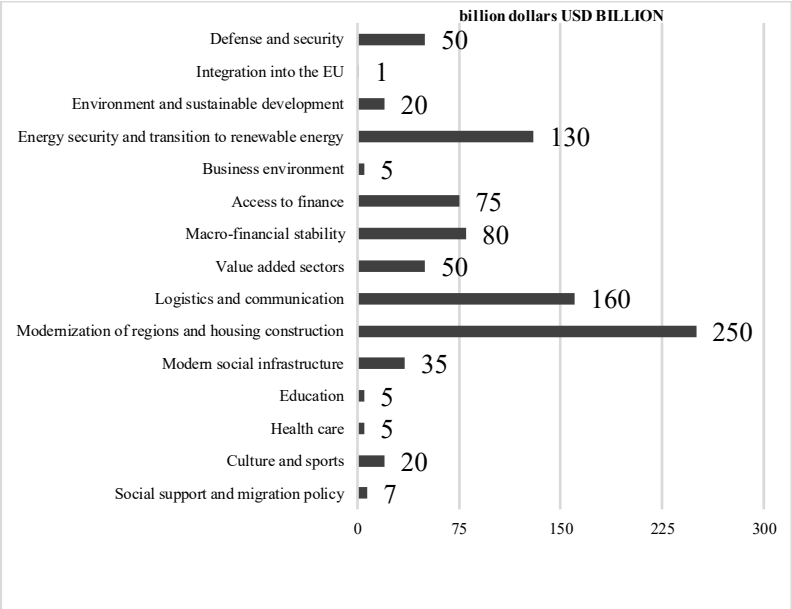

Figure 2
Structure of financing needs for regional economic recovery of Ukraine until 2032, billion USD. USD

Source: Based on the World Economic Forum (2024).

That is why the current analytics is dynamic and is constantly updated as new data is obtained. In the context of the Eastern European region, the results of the assessments are becoming systematic: they show that the processes of spatial reconstruction in Ukraine are already forming the latest architectonics of regional development, similar to the post-crisis transformations in Eastern European countries (Shpak et al., 2024). These processes actualize the need to develop integrated strategies aimed at restoring territorial integrity, stimulating intraregional mobility, increasing investment attractiveness, and creating preconditions for balanced development within the European Economic Area.

European Guidelines for Supporting and Sustaining Regional Development

At the level of national strategies, Eastern European countries are gradually forming their own comprehensive approaches to regional economic recovery, focusing on the European framework priorities for development set by EU institutions within the framework of spatial, innovation and social cohesion programs. At the same time, there are significant differences in the content and structure of policies aimed at economic growth within the regions of Eastern Europe, due to different levels of economic maturity, specific macroeconomic environment, historical development models, and the degree of approximation to EU standards (U-LEAD with Europe, 2023). Countries such as the Czech Republic and Hungary are actively integrating industrial transformation, digitalization of production processes, and green infrastructure modernization into their strategies, while Bulgaria and Romania focus on regional development balance and increasing the resilience of peripheral areas (European Commission, 2023; Makedon et al., 2024). Slovakia and Poland, in turn, demonstrate a systematic approach to combining environmental policy with industrial initiatives aimed at decarbonizing production, developing transport infrastructure, and energy independence (Figure 3).

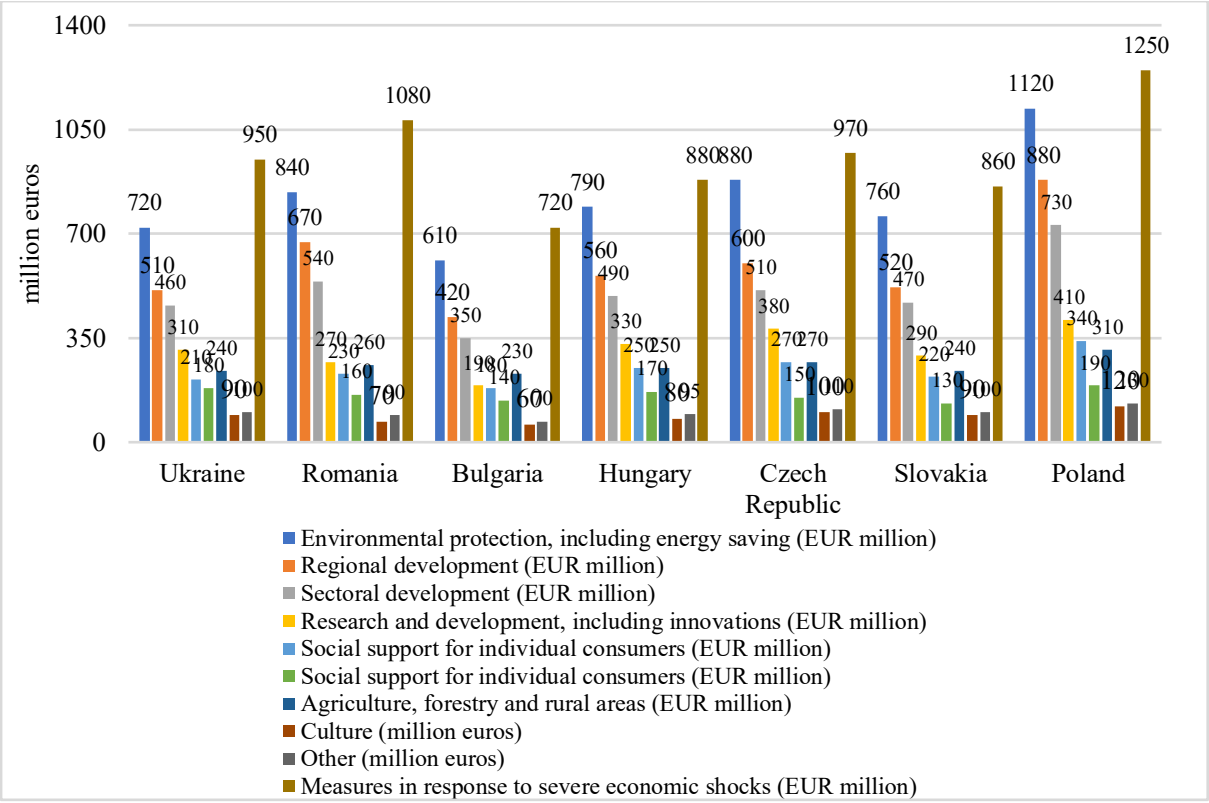

Figure 3

Structure of state aid in the main areas of economic recovery/development in Ukraine and Eastern Europe, 2023, EUR million

Source: Built on the basis of: European Commission (2024).

About half of the European Union countries have national strategic documents that define the basic directions of regional development and economic recovery after the crises of the last decade (Belu Manescu, 2024). In particular, the Czech Republic and Hungary, among other countries, have introduced special concepts of territorial cohesion that focus on innovative regional growth, digital transformation of governance, and institutional strengthening of local economies. Similar program documents are also in place in Slovakia, Poland, Romania, and Bulgaria, where reports on the progress of implementation of recovery strategies, financing of infrastructure projects, environmental modernization, and the formation of new cluster initiatives are updated annually (IRENA, 2023).

An analysis of the structure of policies and programs implemented in Eastern European countries in 2023 (Fig. 4) shows that the dominant areas of state regulation were to support the digital and environmental transformation of regions, develop skills and human capital, create an enabling environment for innovation, and remove administrative barriers and build industrial ecosystems (Figure 4).

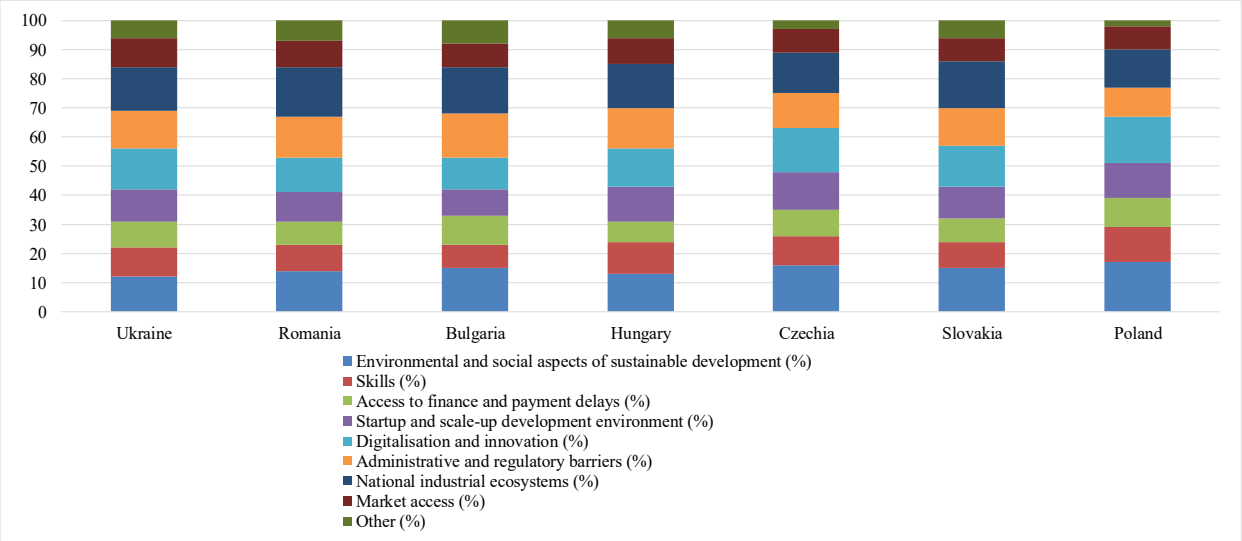

Figure 4
Structure of the main barriers and drivers of regional economic development in Ukraine and Eastern Europe

Source: Based on: Eurostat (2025).

According to an analytical report by the World Economic Forum (WEF), the global economic system in its conceptual development is only halfway to achieving a conditionally ideal growth model that involves an organic combination of innovation, inclusiveness, sustainability, and resilience, which are considered four interrelated dimensions of future economic progress. Within this approach, innovation is the weakest link, as the global average score is only 45.5 points out of 100. This situation is explained by the high concentration of innovation centers in a small number of developed economies, while most countries, including Eastern Europe, are still at the stage of transforming their innovation ecosystems and forming sustainable mechanisms of technological development. For both Ukraine and Eastern European countries, this problem is painful, because the process of economic recovery in the face of military, energy, and climate challenges requires a combination of environmental, innovative, and social approaches to regional development (Tymokhova et al., 2025; World Economic Forum, 2024).

For Ukraine, these manifestations and shortcomings have already become strategically significant, as recovery programs after the devastating effects of the war require the creation of sustainable institutional structures, diversification of economic ties, and attraction of foreign investment.

Econometric Evaluation of the Effectiveness of Regional Economic Recovery Programs in Ukraine and Eastern Europe

The authors propose a model for evaluating regional economic recovery based on an integral approach that provides an in-depth understanding of the complex architecture of spatial processes that determine the current landscape of economic dynamics in a particular country (Chen & Xing, 2025). The corresponding calculations were made using formulas (1–3). Then, for each country, the authors determined normalized indicators for all blocks (Table 3), using the statistical data from Appendix A.

Table 3
Normalized block indices of the effectiveness of regional recovery programs and the integral index *R* for Ukraine and Eastern European countries

Country	Economic (E)	Digital (D)	Environmental (G)	Social (S)	Innovative (I)	Energy (EN)	Investment (P)	Resilience (Res)	Integral index R
Ukraine	0.51	0.54	0.56	0.49	0.42	0.39	0.52	0.38	0.47
Romania	0.35	0.41	0.36	0.32	0.28	0.30	0.33	0.31	0.33
Bulgaria	0.26	0.23	0.28	0.21	0.20	0.22	0.25	0.18	0.23
Hungary	0.44	0.48	0.45	0.47	0.50	0.41	0.46	0.42	0.45
Czech Republic	0.33	0.36	0.38	0.35	0.32	0.29	0.34	0.30	0.33
Slovakia	0.36	0.30	0.37	0.33	0.27	0.35	0.38	0.34	0.34
Poland	0.32	0.25	0.30	0.28	0.25	0.26	0.29	0.29	0.28
CEE Aggregate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Compiled by the authors.

Let's take an example of the calculation for Ukraine. Maximum values among all programs: X_1max = 100 million. EUR, X_2max = 28.4 million. EUR, X_3max = 189.4 million. EUR. Minimum: X_1min = 2.5 mln. EUR, X_2min = 0.75 million. EUR, X_3min = 5 million. EUR.
For Ukraine (X_1= 50 mln. EUR; X_2= 15 million. EUR; X_3= 100 million. EUR) we get:

$$Y_{1,UA} = \frac{50000 - 2500}{100000 - 2500} = 0.487, Y_{2,UA} = \frac{15000 - 750}{28400 - 750} = 0.519, Y_{3,UA} = \frac{100000 - 5000}{189400 - 5000} = 0.514.$$

Average value for the economic development block of Ukraine:

$$WE(UA) = \frac{0.487 + 0.519 + 0.514}{3} = 0.507 \approx 0.51.$$

The calculation for other programs and countries is done in a similar way.

According to the results of the integrated assessment (Table 3), Ukraine, with an average generalized efficiency index of *R* = 0.47, took one of the leading places among Eastern European countries, second only to the consolidated EU Cohesion Policy for CEE program *(R* = 1.00), which contains a set of European cohesion policy instruments. Ukraine's high score is explained by the scale of the

Ukraine Facility program due to the martial law, which covers not only infrastructure and energy recovery, but also digital transformation, social stabilization, and mandatory support for innovation.

While the integral indices for Hungary (R = 0.45), Slovakia (R = 0.34), and Romania (R = 0.33) reflect relatively balanced but smaller programs, the results of Bulgaria *(*R = 0.23) and Poland (R = 0.28) show a lower threshold of effectiveness, due to fragmented funding and a limited share of innovation components in the expenditure structure (Makedon et al., 2025). It should be noted that even EU countries with more developed institutional structures do not always achieve a high level of synergy between sectoral policies, while in Ukraine, despite martial law, there is a tendency to harmonize recovery policies, in particular within the framework of IFI programs (World Bank, EIB, EBRD) and the EU's direct budget support mechanism (Table 4).

Table 4
Comparative assessment of regional recovery programs: integral index R and qualitative characteristics of effectiveness

Country/Program	Integral index R	Economic coherence	Digital transformation	Innovation capacity	Environmental sustainability	Social impact
Ukraine Facility (Ukraine)	0.47	High	Moderate	Medium	High	High
TOP Plus (Hungary)	0.45	High	High	High	Average	High
OPII (Slovakia)	0.34	Medium	Low	Medium	High	Average
ROP (Romania)	0.33	Average	Moderate	Low	Medium	Low
IROP (Czech Republic)	0.33	Average	Average	Low	Average	Average
EPOP (Poland)	0.28	Low	Average	Low	Low	Medium
OPRG (Bulgaria)	0.23	Low	Low	Low	Medium	Low
EU Cohesion Policy (CEE)	1.00	Very high	High	High	High	High

Source: Compiled by the authors.

Comparison of the block components shows that the economic block was the most important for the formation of the overall development index. In particular, countries with large amounts of funding for infrastructure, transportation and energy have significantly higher integrated results. For Ukraine, this block now accounts for about 43% of the overall index, which emphasizes the strategic role of

restoring transport corridors, logistics systems, and industrial zones in the national economic recovery.

At the same time, the digital block demonstrated one of the highest correlations with the level of expected GDP growth, especially in the case of Romania and Hungary's programs. This indicates that even relatively small investments in the digitalization of public administration, e-services, and digital education provide a high multiplier effect, and contribute to transparency, reduced transaction costs, and increased efficiency of public finances. Ukraine has considerable potential in this regard, as the national digital platform Diia already integrates more than 30 administrative services and can become the core of the digital reconstruction of public administration.

The environmental block in Eastern European countries is mainly focused on the implementation of European climate directives and is associated with financing projects to restore energy efficiency, modernize water supply, waste management, and develop green infrastructure. In this context, despite the war's destruction, Ukraine has the opportunity to integrate an environmental component into reconstruction programs based on Slovak and Czech models focused on green cities and energy-efficient municipal projects.

The authors also note that the social pillar, which includes investments in employment, education, and social inclusion, remains the weakest link for most countries in the region. Ukraine is estimated to have a relatively high level of focus on the social reintegration of internally displaced persons and labor market adaptation, but needs to deepen coordination between employment, retraining, and digital skills programs.

The distribution of weighting coefficients between the blocks showed that with a 10% increase in the share of funding for the innovation and digital blocks, the integral index increases by an average of 0.03–0.05 points, while the increase in infrastructure funding has a less pronounced effect (up to 0.02 points). This is explained by the effect of "structural saturation," when excessive concentration of resources in traditional sectors (roads, energy) yields lower returns without accompanying digital and social reforms. For Ukraine, the optimal balance of sectoral distribution is 35–40% of funds allocated to infrastructure and energy, 20% to digitalization and innovation, 15% to social development and employment, 15% to environmental programs, and the rest to ensure the economic sustainability of the regions.

Discussion

The results of the quantitative assessment of the effectiveness of regional recovery programs for Ukraine and Eastern European countries are generally consistent with current publications and analytical reports that emphasize the role of institutionally coordinated investments in infrastructure, energy transition, and digital transformation as flagship drivers of post-crisis growth (Petrukha et al., 2023; European Commission, 2023; World Economic Forum, 2024; Almazán-Gómez et al., 2025). The advantage of Ukraine over most Eastern European countries in terms of the integral index *R* revealed in the proposed model does not contradict the works that document the high multiplier effect of conditional financing from EU partners and international financial organizations in the presence of a clear programmatic framework (McCaffrey & Poitiers, 2024; Hramotniev et al., 2025). At the same time, these estimates partially correct the more cautious conclusions of some studies about the "limited return" on infrastructure spending in catching-up countries: *R* growth is recorded to be faster when infrastructure investments are accompanied by digital and innovative components, which is consistent with the thesis of the complementarity of the financial capital used.

A comparative analysis with empirical studies on the green transition shows consistency: a higher share of the environmental pillar correlates with better medium-term results, but only if cities and

regions have the institutional capacity for project management (IRENA, 2023; Medeu et al., 2025). At the same time, the findings on the relative weakness of the social sector in most countries (except Ukraine) partially contradict studies that consider social spending as the main catalyst for labor market recovery. Our data show that without integration with digital employment services and educational tracks, their multiplier is lower than expected.

The scientific novelty of the study lies in the construction of a single integral index *R*, which includes eight thematic blocks and shows how to conduct a cross-country comparison of programs of different architectures. The methodological contribution is complemented by analytical commentary, through the introduction of the identification of profiles of national development (restoration) programs (infrastructure-oriented, digitally integrated, green, social and reintegration) and the demonstration that the highest *R* values are achieved in "mixed" portfolios with a high degree of inter-block complementarity. The practical significance for Ukraine lies in the clearly defined configuration of priorities for the introduction and implementation of both regional and national development programs, in the current conditions of war and military pressure on the economy.

The issues of measuring intangible factors (trust, managerial capacity, quality of procurement procedures) and time lags of returns remain unresolved; future research should expand the panel to the regional level of NUTS-2 and apply dynamic models to track the diffusion of effects in time and space.

Conclusion

The analytical reconstruction of Ukraine's regional recovery has shown that the manageability of growth trajectories is determined by the linkage between strategic and operational levels of governance, where social, reproductive, organizational, innovative, and distributional functions should be considered as interrelated mechanisms. It has been determined that cross-border initiatives with Eastern Europe, from smart specialization to common logistics corridors, enhance the multiplier effect of investments, which together form the basis for the structural modernization of the regional economy, increase its resilience to shocks and lay the foundation for an integrated return to a sustainable growth trajectory.

A comparative analysis of the national approaches of Eastern European countries to the European Cohesion Framework has shown that the most effective strategies are those in which industrial transformation, digitalization of public services, and green modernization are integrated into a single budgetary and programmatic framework with clear performance indicators. Fragmented models dominated by traditional infrastructure spending provide a short-term effect but do not build long-term sustainability. It is determined that institutional compatibility with EU policy, implementation of mandatory components of digital governance and ESG criteria in project selection, as well as strengthening the capacity of regions to plan and monitor results are critical for Ukraine.

Econometric modeling has shown that Ukraine, with an index of $R = 0.47$, occupies a leading position among the analyzed countries, second only to the EU's consolidated cohesion policy. The strength of the profile is due to the combination of significant infrastructure and energy allocations with digital transformation and targeted social support. It was found that a 10% increase in the share of financing for innovation and digitalization increases the integral indicator by 0.03 to 0.05 percentage points. Additional infrastructure expenditures without accompanying reforms are characterized by lower marginal returns, which justifies the recommendation to rebalance budgets in favor of the triad "digitalization + innovation + social integration", and confirms the need for institutional strengthening of mechanisms for monitoring and managing the implementation of development programs at the regional level.

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Appendix A

Primary statistical indicators (in millions of euros) for the regional recovery and development programs of Ukraine and Eastern Europe (2023–2027) (European Commission, 2024; UN DESA, 2024).

№	Program	Country/Region	Total budget (EUR million)	Allocation to infrastructure (transport, housing; EUR million)	Digitalization focus (e-governance, IT; EUR million)	Allocation to environmental sustainability (green infrastructure; EUR million)	Allocation to social development (employment, education; EUR million)	Allocation to innovation (R&D, technology; EUR million)	Allocation to energy (renewable sources; EUR million)		Attracted private investment (leverage; EUR million)	Expected impact on GDP (growth; EUR million)	Allocation to regional resilience (resilience; EUR million)
1	Ukraine Facility (Recovery and Resilience Plan)	Ukraine	50 000	20 000	7 500	10 000	7 500	2 500	1 500	15 000	100 000	1 000	
2	Regional Operational Program (ROP)	Romania	6 700	2 500	1 871	1 200	800	400	500	2 000	13 400	429	
3	Operational Program Regions in Growth (OPRG)	Bulgaria	2 500	1 000	500	600	200	100	300	750	5 000	50	
4	Territorial and Settlement Development Operational Program (TOP Plus)	Hungary	22 000	8 000	2 000	3 000	5 300	1 500	1 000	6 600	44 000	1 200	
5	Integrated Regional Operational Program (IROP)	Czech Republic	5 000	2 000	800	800	1 000	500	400	1 500	10 000	0	
6	Operational Program Integrated Infrastructure (OPII)	Slovakia	6 000	3 000	600	1 200	800	200	1 000	1 800	12 000	400	

7	Eastern Poland Operational Program (EPOP)	Poland	2 500	1 000	300	500	400	200	100	750	5 000	250
8	EU Cohesion Policy for Central and Eastern Europe (aggregate)	Eastern Europe (CEE)	100 000	37 500	13 571	17 300	16 000	5 400	4 800	28 400	189 400	3 329