

Pavlo Shylepnytskyi,*DrHab (Economics), Professor,*

ORCID 0000-0002-5517-5858

e-mail: p.shylepnytskii@chnu.edu.ua

Yuriy Fedkovych Chernivtsi National University, Chernivtsi

Iryna Petrova,*PhD in Economics, Senior Researcher,*

ORCID: 0000-0002-0515-5349

e-mail: Petrova_I@nas.gov.ua

Institute of Industrial Economics of the NAS of Ukraine, Kyiv

ECONOMIC RECONSTRUCTION OF UKRAINE'S INDUSTRIAL MACROREGIONS BASED ON PUBLIC-PRIVATE PARTNERSHIP UNDER CONDITIONS OF WAR AND POST-WAR RECOVERY

Introduction. The full-scale war has caused extensive destruction of production capacities, logistics hubs, and critical infrastructure, which has particularly exacerbated structural imbalances in the development of Ukraine's industrial macroregions. Under these conditions, the reconstruction of industrial territories acquires a dual nature: on the one hand, it involves restoring basic life-support and production functions; on the other, it requires modernization based on the build back better principle – i.e., increasing technological sophistication, energy efficiency, climate resilience, and competitiveness. Accordingly, a key challenge is the formation of institutional and financial mechanisms capable of ensuring not only the speed of reconstruction but also the long-term effectiveness of structural transformation in industrial macroregions.

Traditional instruments of budget financing, given wartime risks, fiscal constraints, and growing needs for public investment, are insufficient to ensure the required scale of reconstruction. At the same time, the private sector possesses resources, managerial competencies, and innovative solutions, but requires predictable rules, guarantees, and an adequate allocation of risks. In this context, public-private partnership (PPP) is viewed as an institutional instrument for mobilizing capital and competencies to restore and modernize infrastructure, as well as to launch industrial projects within macroregions. Its potential lies in the possibility of long-term contractual alignment of public and business objectives, the use of a life-cycle approach, the introduction of performance-based payments, and the allocation of risks according to the parties' capacity to manage them.

Of particular importance is the integration of climate resilience into PPP models, as climate change increases the frequency and intensity of extreme events affecting transport, energy, water, and urban infrastructure. For industrial macroregions, this implies a higher probability of disruptions in resource supply, logistics failures, additional emergency repair costs, and

increased fiscal risks. Therefore, reconstruction based on PPP should combine recovery objectives with resilience requirements – both technological and climatic – thus ensuring the long-term reliability of infrastructure and the stability of service provision.

The problem of substantiating long-term transformational directions for the economic reconstruction of Ukraine's industrial macroregions under conditions of war and post-war recovery is complex and includes: defining reconstruction scenarios for macroregions as multi-level spatial entities (including the Dnipro macroregion) based on sustainable development principles; improving resource and institutional support with due regard to traditional and smart specialization; and forming a regime of international public-private partnership (IPPP) in the context of relocation and European integration. This necessitates a transition to the build back better principle, which in international documents is interpreted as recovery, rebuilding, and reconstruction aimed at increasing resilience and reducing future risks in line with sustainable development principles [1, pp. 11, 21–22]. Foreign studies of post-war recovery emphasize the decisive role of reindustrialization, investment, institutional reforms, and coordination between the state and business (notably based on European experience) [2–5]. In Ukrainian academic discourse, emphasis is placed on the need to abandon the reproduction of the pre-war low-technology model in favor of structural transformation with the development of technology-intensive industries [6]. At the same time, despite existing research on regional strategizing and public-private partnership [7–14], as well as the growing relevance of relocation as a driver of spatial shifts [15], there remains a need to develop a comprehensive methodology for reconstructing industrial macroregions that combines a macroregional approach, smart specialization, and PPP/IPPP mechanisms adapted to wartime risks to implement the principles of resilience and build back better.



© Publisher Institute of Industrial Economy of National Academy of Sciences of Ukraine, 2025

© Publisher State Higher Education Institution «Luhansk Taras Shevchenko National University», 2025

The purpose of the article is to substantiate a conceptual model for the economic reconstruction of Ukraine's industrial macroregions based on public-private partnership, taking into account wartime, fiscal, and climatic risks.

Research Results. Economic reconstruction of Ukraine's industrial macroregions under conditions of war and post-war recovery requires a systemic approach that goes beyond restoring individual facilities or sectors [16–17]. In this context, a macroregion is considered a complex spatial-economic entity within which infrastructure networks, industrial complexes, and innovation-technological ecosystems interact. Accordingly, the key directions of reconstruction should be defined as an integrated combination of three interrelated contours: infrastructure, industrial, and innovation [18–20].

The infrastructure contour forms the basic conditions for the functioning of industrial macroregions and serves as a prerequisite for the recovery of economic activity. Its reconstruction covers transport, energy, engineering, digital, and logistics infrastructure that has suffered significant destruction due to military actions. Unlike the pre-war logic of inertial recovery, the infrastructure contour should develop based on the build back better principle, with embedded requirements for resilience, capacity redundancy, and adaptation to climate risks.

Within macroregions, infrastructure reconstruction involves not only the physical restoration of facilities but also the structural modernization of networks: reorientation of transport corridors in line with the new geoeconomic configuration; increasing energy efficiency and decentralizing energy systems; and developing water and environmental infrastructure in response to resource scarcity. The infrastructure contour provides the foundation for attracting private capital through PPPs, particularly via life-cycle projects and availability-payment models.

The industrial contour of reconstruction is aimed at restoring and structurally transforming the production potential of industrial macroregions. Its key feature is the rejection of reproducing the pre-war sectoral structure characterized by high resource and energy intensity, low technological complexity, and limited integration into global value chains. Instead, reconstruction of the industrial contour should be based on the principles of a new-type reindustrialization oriented toward technological upgrading, diversification, and greening of production.

At the macroregional level, this implies the development of industrial parks, clusters, and specialized production zones adapted to new security, logistics, and market conditions. PPP mechanisms play a special role in implementing industrial projects, as they allow the alignment of public objectives – employment and regional development – with private interests in efficiency and profitability. The industrial contour is also linked to enterprise relocation processes, which necessitates the coordination of reconstruction decisions at the macroregional rather than individual community level.

The innovation contour of reconstruction ensures the long-term competitiveness of industrial macroregions and forms the basis for their transition to a knowledge- and technology-oriented development model. Its content lies in the creation and development of innovation ecosystems that bring together research institutions, universities, business, startups, and development institutions. In post-war conditions, the innovation contour becomes particularly important as a mechanism for overcoming the technological gap and integrating Ukrainian industry into the European innovation space.

Within macroregions, the innovation contour is implemented through smart specialization instruments, the development of engineering competence centers, digital platforms, R&D infrastructure, and demonstration projects. Its close connection with PPP manifests in the possibility of co-financing innovative solutions, sharing risks at early stages of technology adoption, and scaling successful pilot projects. The innovation contour ensures synergy between infrastructure and industrial transformations, shifting reconstruction from a restorative to a transformational format.

The combination of infrastructure, industrial, and innovation contours forms an integrated model for the economic reconstruction of industrial macroregions. The infrastructure contour creates basic conditions and reduces systemic risks; the industrial contour ensures the recovery of production and employment; and the innovation contour forms long-term sources of growth and structural modernization. It is precisely at the macroregional level that these contours are aligned through a portfolio approach to project planning implemented using public-private and international public-private partnership mechanisms [21–23].

Effective economic reconstruction of Ukraine's industrial macroregions requires not a universal but a differentiated application of PPP models depending on the nature of projects, risk levels, the financial capacity of the public partner, and the strategic objectives of recovery. In this context, PPP should be viewed not as a single contractual instrument but as a portfolio of models adapted to the tasks of the infrastructure, industrial, and innovation contours of reconstruction.

For projects aimed at restoring and modernizing transport, energy, municipal, and digital infrastructure, the most relevant are PPP models based on long-term life-cycle contracts. Their key feature is the transfer to the private partner of responsibility not only for construction or reconstruction but also for subsequent operation and maintenance throughout the contract period.

In post-war conditions, PPP models with availability payments become particularly important, whereby the private partner is remunerated by the public side for ensuring a defined level of service quality and continuity, regardless of actual demand. This approach minimizes demand-risk exposure – typical for regions with disrupted economic activity – and enhances the investment attractiveness of projects. Infrastructure PPPs also enable the integration of energy-efficiency require-

ments, climate resilience, and digital monitoring into contractual arrangements.

The industrial contour of reconstruction requires the use of specific PPP models focused on creating and developing production capacities, industrial parks, logistics-production hubs, and clusters. Unlike classic infrastructure projects, industrial PPPs are characterized by higher market and technological risks, which necessitates more flexible contractual structures.

In this segment, mixed partnership models combining elements of concessions, joint activity agreements, and special investment contracts are appropriate. The public partner typically provides land preparation, basic infrastructure, and regulatory incentives, while the private partner invests in production facilities, technologies, and management. Such models make it possible to align regional development objectives, job creation, and structural diversification with business interests in profitability and production scaling.

An important feature of industrial PPPs in post-war conditions is their close link to enterprise relocation processes, which requires coordination at the macroregional level and the application of a portfolio approach to project selection.

The innovation contour of reconstruction drives the use of PPP models aimed at supporting research and innovation activities, developing technological infrastructure, and forming innovation ecosystems. Unlike infrastructure and industrial projects, the main constraint here is the high level of outcome uncertainty and a long payback horizon.

Relevant are partnership models based on co-financing R&D, establishing engineering competence centers, innovation hubs, and digital platforms. The public partner assumes part of the initial risks, provides access to research infrastructure, and creates demand for innovative solutions, while the private partner is responsible for commercialization and scaling of technologies. Such PPP models facilitate the integration of Ukrainian macroregions into European innovation networks and increase the technological complexity of the economy.

Systematizing PPP models in the context of reconstructing industrial macroregions requires accounting for specific wartime and post-war risks, including security, fiscal, logistics, and climate-related risks [24–25]. This necessitates adapting classical PPP models through the use of guarantees, force majeure compensation mechanisms, phased commissioning of facilities, and flexible contract renegotiation provisions.

In this regard, the shift from isolated projects to a portfolio approach in PPP implementation becomes especially important, whereby different models are combined within a single macroregional reconstruction program. Such an approach makes it possible to balance risks across infrastructure, industrial, and innovation projects, thereby ensuring financial sustainability and strategic coherence of the recovery process.

A systemic reconstruction of industrial macroregions requires a differentiated application of PPP

models depending on the functional purpose of projects, the level of risks, and expected outcomes. In this context, PPP should be considered as a portfolio of interconnected models, each corresponding to a specific reconstruction contour—infrastructure, industrial, or innovation (Table 1).

Table 1. Linking PPP models to the reconstruction contours of industrial macroregions

Reconstruction contour	Typical assets and projects	Relevant PPP models	Key features of the models	Main risks and risk bearer
Infrastructure	Transport, energy, municipal, digital, logistics infrastructure	Life-cycle contracts (DBFM, DBFOM); availability-payment PPPs; concessions with limited demand risk	Long-term horizon; integration of design, construction and operation; payment for performance and quality	Construction and operational risk – private partner; demand and fiscal risk – public partner
Industrial	Industrial parks, production clusters, logistics–production hubs, relocated enterprises	Mixed PPPs; concession and quasi-concession models; joint activity agreements	Combination of public investment in basic infrastructure with private investment in production	Market and technology risk – private partner; regulatory and infrastructure risk – public partner
Innovation	R&D centers, innovation hubs, digital platforms, engineering competence centers	Innovation-oriented PPPs; co-financing contracts; partnerships with allocation of intellectual property rights	High uncertainty; long payback horizon; joint governance of results	Innovation risk – shared; commercialization risk – private partner

Source: compiled based on [17–25].

For the infrastructure contour, priority should be given to PPP models that minimize unstable demand risks and ensure predictable cash flows. Life-cycle contracts and availability-payment models allow the public side to retain control over strategically important assets while leveraging the managerial and technological advantages of the private sector. These models are the most adapted to wartime and post-war conditions, where market demand is volatile and service continuity is the primary priority.

Within the industrial contour, PPP application becomes more flexible. Mixed and quasi-concession models dominate, under which the state provides favorable starting conditions (infrastructure, land, regulatory incentives), while the private partner invests in production assets and operational activity. This configuration enables combining reindustrialization, employment, and regional development objectives with the market logic of efficiency and scaling.

The innovation contour requires PPP models oriented not toward rapid financial returns but toward building a technological base. Key arrangements here include partnerships with joint R&D financing, allocation of intellectual property rights, and support for pilot solutions. In such models, the public side acts as an innovation catalyst – lowering entry barriers for business and ensuring demand for new technologies – while the private partner assumes commercialization risks.

Linking PPP models to the three reconstruction contours makes it possible to form a balanced project portfolio at the macroregional level: infrastructure PPPs provide a stable recovery base, industrial PPPs ensure economic activity and employment, and innovation PPPs generate long-term drivers of structural growth. At the same time, implementing such an integrated approach under conditions of war and post-war recovery inevitably increases uncertainty and complicates project risk profiles, limiting the applicability of standard peacetime PPP models.

Under these conditions, the effectiveness of the *build back better* principle is determined not only by the choice of organizational partnership forms, but also by the ability to adequately identify, systematize, and allocate risks between public and private partners, taking into account the specificity of each reconstruction contour. This makes it necessary to develop an expanded risk matrix that incorporates wartime, financial, institutional, climate, and innovation factors and serves as a key element of the conceptual model of economic reconstruction of Ukraine's industrial macroregions (Table 2).

Table 2. Risk matrix and principles of risk allocation by reconstruction contour

Risk group	Infrastructure contour	Industrial contour	Innovation contour	Allocation principle
Wartime/security	Public partner / state	Public partner / state	Public partner / state	Sovereign risk beyond private-sector control
Project/construction	Private partner	Private partner	Private partner	Control over design and construction
Operational	Private partner	Private partner	Mixed	Responsibility for facility management
Demand	Public partner	Private / mixed	Public	Dependence on macroeconomic dynamics
Financial	Mixed	Mixed	Public	Constraints in access to capital
Regulatory	Public partner	Public partner	Public partner	Rule-making authority
Climate	Mixed	Mixed	Public	Long-term external effects
Innovation	–	Partly private	Mixed	High uncertainty of outcomes

Source: compiled based on [24–25].

Within infrastructure PPPs, the priority is ensuring continuity of service provision, which implies that wartime, demand, and regulatory risks remain with the

public side. At the same time, construction and operational risks should be transferred to the private partner, as it possesses the necessary technical and managerial competencies.

Industrial PPPs are characterized by elevated market and technological risks. Therefore, fully transferring them to either the public or the private side is inefficient. The optimal allocation model is one where the state assumes institutional, regulatory, and part of the infrastructure risks, while the private partner is responsible for production, operational, and commercial aspects.

In innovation PPPs, the key risk is uncertainty of outcomes, which makes full transfer to any one party impossible. Therefore, shared risk allocation is appropriate, using co-financing mechanisms, pilot projects, and staged decision-making. The public side acts as a catalyst by lowering barriers to innovation activity.

The proposed risk matrix and allocation principles make it possible to: increase the investment attractiveness of PPP projects in post-war conditions; reduce fiscal and systemic risks for the state; ensure coherence between infrastructure, industrial, and innovation projects; and move from individual to portfolio risk management at the macroregional level. At the same time, the effectiveness of practical application depends not only on correct risk identification but also on the capacity of the institutional system to translate these principles into consistent managerial decisions and program actions.

The Prydniprovia macroregion (Prydniprovia) has traditionally played a system-forming role in Ukraine's economy as a center of metallurgy, machine building, mining, energy, and transport logistics. The full-scale war has significantly intensified the region's structural imbalances, causing infrastructure destruction, disruption of production chains, environmental risks, and the need to reorient industry toward new markets and technological standards. Under such conditions, PPP implementation in Prydniprovia should be based on a portfolio approach combining the infrastructure, industrial, and innovation reconstruction contours and ensuring a gradual reduction of the overall risk burden.

Accordingly, there is a need for an instrument that operationalizes the proposed risk-management principles and the portfolio approach into a time- and institutionally structured sequence of actions. Such an instrument is the PPP roadmap for reconstructing the Prydniprovia macroregion (Table 3), which structures the stages of preparation, launch, and scaling of PPP projects and the expected outcomes of implementation.

In the Prydniprovia macroregion, priority is given to PPP projects aimed at restoring transport corridors, modernizing energy networks, and rehabilitating water management infrastructure that ensures the functioning of industrial hubs. The most relevant instruments are life-cycle contracts and availability-payment models, which make it possible to reduce demand risks and ensure continuity of service provision.

Table 3. PPP roadmap for the reconstruction of the Prydniprovya macroregion

Stage	Stage content	Key PPP projects for Prydniprovya	Expected effect
I. Diagnosis and strategic alignment	Establishing a macroregional PPP framework	Audit of damaged transport, energy and water infrastructure; inventory of industrial sites and tailings/slurry storage facilities	A shared vision for Prydniprovya's reconstruction
II. PPP portfolio formation	Selecting projects across the three contours	Infrastructure PPPs (bridges, railway nodes, power grids); industrial parks; environmental recultivation projects	A balanced portfolio of PPP projects
III. Institutional and financial preparation	Project structuring	Feasibility studies for modernization of metallurgical clusters; PPPs for industrial energy modernization; engagement of IFIs	Investment readiness of projects
IV. Contracting and piloting	Launching the first PPPs	Life-cycle contracts in transport and energy; concession elements in industrial parks	Increased investor confidence
V. Implementation and monitoring	Portfolio management	KPI monitoring; risk management; contract adjustments	Stable PPP implementation
VI. Scaling and innovation integration	Deepening transformation	Innovation PPPs in hydrogen energy, green metallurgy, digital platforms	Technological modernization of the region
VII. Evaluation and strategic adjustment	Final assessment	Analysis of socio-economic and environmental impacts	Transition to a sustainable development model

Source: compiled based on [24–26].

Within the industrial contour, the implementation of industrial PPPs focused on the creation and modernization of production sites, clusters, and logistics-production hubs is characteristic. The public partner concentrates on providing basic infrastructure and regulatory support, while private partners invest in technological upgrading and operational activities.

The innovation contour in Prydniprovya is formed through PPPs in the field of environmental modernization of industry, digitalization of production processes, and the development of R&D infrastructure. It is precisely within this contour that the transition from recovery to transformation takes place, with a focus on European standards of green and climate-neutral industry.

Linking the PPP roadmap to the Prydniprovya macroregion makes it possible to combine the restoration of critical infrastructure, the structural transformation of industry, and innovation-driven development within a single macroregional logic. Such an approach increases the region's investment attractiveness, reduces systemic risks, and creates the prerequisites for implementing the build back better principle in post-war economic reconstruction.

Conclusions. It is substantiated that the economic reconstruction of Ukraine's industrial macroregions under conditions of war and post-war recovery cannot be reduced to reproducing the pre-war production and infrastructure structure, but requires a systemic transformational approach oriented toward the build back better principle, enhanced resilience, greater technological complexity, and long-term competitiveness. The expediency of considering the macroregion as the key level of spatial-economic coordination of reconstruction is demonstrated, within which the alignment of infrastructure networks, industrial complexes, and innovation ecosystems is ensured. A conceptual model of economic

reconstruction based on the integration of infrastructure, industrial, and innovation contours is proposed.

It is justified that, under conditions of war and post-war recovery, public-private partnership should be viewed as a portfolio of adapted models differentiated by the functional purpose of projects, risk levels, and expected socio-economic effects. It is shown that life-cycle contracts and availability-payment models are most relevant for the infrastructure contour; mixed and quasi-concession PPPs for the industrial contour; and partnerships based on joint R&D financing and the sharing of innovation risks for the innovation contour.

A risk matrix and principles of risk allocation across reconstruction contours are proposed, taking into account wartime/security, financial, regulatory, climate, and innovation risks. It is demonstrated that a transition to portfolio-based risk management at the macroregional level increases the investment attractiveness of PPP projects, reduces fiscal and systemic risks for the state, and ensures strategic coherence of reconstruction.

Using the Prydniprovya macroregion as a case study, the possibilities for practical operationalization of the proposed model are demonstrated through the development of a PPP reconstruction roadmap, which structures the process from diagnostics and portfolio formation to scaling and innovation integration. It is concluded that a macroregional portfolio approach to PPP creates the prerequisites for combining infrastructure recovery, reindustrialization, and innovation-driven development within a unified logic of post-war economic reconstruction.

Further research should focus on the development of quantitative indicators for assessing the effectiveness of portfolio-based PPPs and on deepening methodologies for integrating climate and security factors into the financial and economic modeling of reconstruction projects.

LITERATURE

1. Report of the Open-ended Intergovernmental Expert Working Group on Indicators and Terminology relating to Disaster Risk Reduction: Note by the Secretary-General / General Assembly United Nations. New York: UN, 2016. 1 Dec. 41 p.
2. Reinert E. S. How Rich Countries Got Rich ... and Why Poor Countries Stay Poor. London: Constable, 2007. 365 p.
3. Judt T. Postwar. A History of Europe since 1945. New York: The Penguin Press, 2005. 878 p.
4. Eichengreen B. Institutional prerequisites for economic growth: Europe after World War II. *European Economic Review*. 1994. Vol. 38, Iss. 3-4. P. 883-890. [https://doi.org/10.1016/0014-2921\(94\)90124-4](https://doi.org/10.1016/0014-2921(94)90124-4)
5. Cassiers I. Belgium's postwar growth and the catch-up hypothesis. *European Economic Review*. 1994. Vol. 38, Iss. 3-4. P. 899-911. [https://doi.org/10.1016/0014-2921\(94\)90126-0](https://doi.org/10.1016/0014-2921(94)90126-0)
6. Гесць В. М. Формування профілю стратегічно важливих видів промислової діяльності в Україні (погляд на перспективу). *Економіка України*. 2023. № 9. С. 3–29. <https://doi.org/10.15407/economyukr.2023.09.003>
7. Zhang M., Peng C., Shu J., Lin Y. Territorial Resilience of Metropolitan Regions: A Conceptual Framework, Recognition Methodologies and Planning Response – A Case Study of Wuhan Metropolitan Region. *International Journal of Environmental Research and Public Health*. 2022. Vol. 19. Art. 1914. <https://doi.org/10.3390/ijerph19041914>
8. Coyle D., Sensier M. The imperial treasury: appraisal methodology and regional economic performance in the UK. *Regional Studies*. 2020. Vol. 54, Iss. 3. P. 283-295. <https://doi.org/10.1080/00343404.2019.1606419>
9. Boiarynova K., Popelo O., Tulchynska S., Gritsenko S., Prikhno I. Conceptual Foundations of Evaluation and Forecasting of Innovative Development of Regions. *Periodica Polytechnica: Social and Management Sciences*. 2022. Vol. 30, Iss. 2. P. 167-174. <https://doi.org/10.3311/PPso.18530>
10. Papadopoulou C.-A., Papadopoulou M. P., Laspidou C. Implementing Water-Energy-Land Food-Climate Nexus Approach to Achieve the Sustainable Development Goals in Greece: Indicators and Policy Recommendations. *Sustainability*. 2022. Vol. 14, Iss. 7. Art. 4100. <https://doi.org/10.3390/su14074100>
11. Serra V., Ledda A., Ruiui M.G.G., Calia G., Mereu V., Bacciu V., Marras S., Spano D., De Montis A. Adaptation to Climate Change Across Local Policies: An Investigation in Six Cities. *Sustainability*. 2022. Vol. 14, Iss. 7. Art. 8318. <https://doi.org/10.3390/su14148318>
12. Круглов В. В. Державно-приватне партнерство як інструмент інфраструктурного відновлення українських міст. *Актуальні проблеми державного управління*. 2022. № 1 (60). С. 62–76. <https://doi.org/10.26565/1684-8489-2022-1-04>
13. Панченко К. Як колаборація бізнесу та держави допоможе відновлювати Україну. *Економічна правда*. 2022. 22 липня. URL: <https://epravda.com.ua/columns/2022/07/19/689341/>
14. Никифорок О. І., Гусев Ю. В., Чмирьова Л. Ю. Державно-приватне партнерство: інституціональне середовище для розвитку та модернізації інфраструктури України. *Економіка і прогнозування*. 2018. № 3. С. 79-101. <https://doi.org/10.15407/eip2018.03.079>
15. Когутич Т. Релокований бізнес: від гаджетів і броників – до кавунів і сирних снєків. *Укрінформ*. 2023. 15 травня. URL: <https://www.ukrinform.ua/rubric-regions/3709448-relokovaniy-biznes-vid-gadzetiv-i-bronikiv-do-kavuniv-i-sirnih-snekiv.html>
16. Building Back Better: Achieving Resilience through Stronger, Faster, and More Inclusive Post-Disaster Reconstruction [Electronic resource]. Washington, DC: World Bank, 2018. URL: <https://openknowledge.worldbank.org/handle/10986/29867>
17. Climate and Disaster Risk Screening Tools [Electronic resource]. Washington, DC: World Bank. URL: <https://climatescreeningtools.worldbank.org/>
18. Ukraine – Fourth Rapid Damage and Needs Assessment (RDNA4) : February 2022 – December 2024 [Electronic resource]. World Bank; United Nations; European Commission. Washington, DC, 2022–2024. URL: <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099022025114040022>
19. Private Sector Opportunities for a Green and Resilient Reconstruction in Ukraine: Sector Assessments [Electronic resource]. Washington, DC: International Finance Corporation, December 2023. URL: <https://www.ifc.org/content/dam/ifc/doc/2023/sector-assessments-pso-green-resilient-reconstruction-ukraine-en.pdf>
20. Ukraine Recovery Conference. Ukraine Recovery Plan: Materials of the Ukraine Recovery Conference (Lugano, URC2022) [Electronic resource]. 2022. URL: <https://www.urb-international.com/past-conferences/urb-2022>
21. Public-Private Partnerships Reference Guide. Version 3.0 [Electronic resource]. Washington, DC: World Bank, 2017. URL: <https://www.github.org/resources/publications/public-private-partnerships-reference-guide/>
22. The EPEC Guide to Public-Private Partnerships [Electronic resource]. Luxembourg : European Investment Bank; European PPP Expertise Centre, 2021. URL: https://www.eib.org/files/publications/epec_guide_to_ppp_en.pdf
23. A Guide to the Main Provisions of an Availability-based PPP Contract Public-Private Partnerships in the Western Balkans [Electronic resource]. Luxembourg : European Investment Bank; European PPP Expertise Centre, 2018. URL: <https://wbif.eu/storage/app/media/Library/9.Sectors/3.PrivateSectorDevelopment/6.5-Main-Provisions-of-an-Availability-based-PPP-Contract-FINAL-310818.pdf>
24. Recommendation of the Council on Principles for Public Governance of Public-Private Partnerships [Electronic resource]. Paris: OECD, 2025. URL: <https://legalinstruments.oecd.org/public/doc/275/275.en.pdf>
25. Recommendation of the Council on Principles for Private Sector Participation in Infrastructure [Electronic resource]. Paris: OECD, 2007. URL: <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0349>
26. A Guide to Preparing and Procuring a Public-Private Partnership (PPP) Project. Public-Private Partnerships in the Western Balkans / European PPP Expertise Centre (EPEC), Western Balkans Investment Framework (WBIF). Luxembourg : European Investment Bank, 2018. 86 p. URL: <https://wbif.eu/storage/app/media/Library/9.Sectors/3.PrivateSectorDevelopment/4.3-PPP-Preparation-and-Procurement-Guide-FINAL-310818.pdf>

Надійшла до редакції 18.11.2025 р.

Прийнята до друку 19.12.2025 р.

REFERENCES

1. Report of the Open-ended Intergovernmental Expert Working Group on Indicators and Terminology relating to Disaster Risk Reduction. (2016). *Note by the Secretary-General*. New York: United Nations.
2. Reinert, E. S. (2007). *How Rich Countries Got Rich ... and Why Poor Countries Stay Poor*. London: Constable.
3. Judt, T. (2005). *Postwar. A History of Europe since 1945*. New York: The Penguin Press.
4. Eichengreen, B. (1994). Institutional prerequisites for economic growth: Europe after World War II. *European Economic Review*, 38(3–4), 883–890. [https://doi.org/10.1016/0014-2921\(94\)90124-4](https://doi.org/10.1016/0014-2921(94)90124-4)
5. Cassiers, I. (1994). Belgium's postwar growth and the catch-up hypothesis. *European Economic Review*, 38(3–4), 899–911. [https://doi.org/10.1016/0014-2921\(94\)90126-0](https://doi.org/10.1016/0014-2921(94)90126-0)
6. Heiets, V. M. (2023). Formation of the profile of strategically important types of industrial activity in Ukraine (a perspective view). *Ekonomika Ukrainy*, 9, 3–29. <https://doi.org/10.15407/economyukr.2023.09.003> [in Ukrainian].
7. Zhang, M., Peng, C., Shu, J., & Lin, Y. (2022). Territorial resilience of metropolitan regions: A conceptual framework, recognition methodologies and planning response – A case study of Wuhan metropolitan region. *International Journal of Environmental Research and Public Health*, 19, 1914. <https://doi.org/10.3390/ijerph19041914>
8. Coyle, D., & Sensier, M. (2020). The imperial treasury: appraisal methodology and regional economic performance in the UK. *Regional Studies*, 54(3), 283–295. <https://doi.org/10.1080/00343404.2019.1606419>
9. Boiarynova, K., Popelo, O., Tulchynska, S., Gritsenko, S., & Prikhno, I. (2022). Conceptual foundations of evaluation and forecasting of innovative development of regions. *Periodica Polytechnica: Social and Management Sciences*, 30(2), 167–174. <https://doi.org/10.3311/PPso.18530>
10. Papadopoulou, C.-A., Papadopoulou, M. P., & Laspidou, C. (2022). Implementing water–energy–land–food–climate nexus approach to achieve the sustainable development goals in Greece: Indicators and policy recommendations. *Sustainability*, 14(7), 4100. <https://doi.org/10.3390/su14074100>
11. Serra, V., Ledda, A., Ruiu, M. G. G., Calia, G., Mereu, V., Bacciu, V., Marras, S., Spano, D., & De Montis, A. (2022). Adaptation to climate change across local policies: An investigation in six cities. *Sustainability*, 14(7), 8318. <https://doi.org/10.3390/su14148318>
12. Kruhlov, V. V. (2022). Public–private partnership as an instrument of infrastructure recovery of Ukrainian cities. *Aktualni problemy derzhavnoho upravlinnia*, 1(60), 62–76. <https://doi.org/10.26565/1684-8489-2022-1-04> [in Ukrainian].
13. Panchenko, K. (2022, July 22). How collaboration between business and the state will help rebuild Ukraine. *Ekonomichna Pravda*. <https://pravda.com.ua/columns/2022/07/19/689341/> [in Ukrainian].
14. Nykyforuk, O. I., Husiev, Yu. V., & Chmyrova, L. Yu. (2018). Public–private partnership: Institutional environment for development and modernization of Ukraine's infrastructure. *Ekonomika i prohozuvannia*, 3, 79–101. <https://doi.org/10.15407/eip2018.03.079> [in Ukrainian].
15. Kogutych, T. (2023, May 15). Relocated business: From gadgets and body armor to watermelons and cheese snacks. *Ukrinform*. <https://www.ukrinform.ua/rubric-regions/3709448-relokovanij-biznes-vid-gadzetiv-i-bronikiv-do-kavuniv-i-sirmih-snekiv.html> [in Ukrainian].
16. World Bank Group. (2018). *Building Back Better: Achieving Resilience through Stronger, Faster, and More Inclusive Post-Disaster Reconstruction*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/29867>
17. World Bank Group. (n.d.). *Climate and Disaster Risk Screening Tools*. <https://climatescreeningtools.worldbank.org/>
18. World Bank, United Nations, & European Commission. (2022–2024). *Ukraine - Fourth Rapid Damage and Needs Assessment (RDNA4) : February 2022 - December 2024*. <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099022025114040022>
19. International Finance Corporation. (2023). *Private sector opportunities for a green and resilient reconstruction in Ukraine: Sector assessments*. Washington, DC: IFC. <https://www.ifc.org/content/dam/ifc/doc/2023/sector-assessments-pso-green-resilient-reconstruction-ukraine-en.pdf>
20. Ukraine Recovery Conference. (2022). *Ukraine Recovery Plan: Materials of the Ukraine Recovery Conference (Lugano, URC2022)*. <https://www.urc-international.com/past-conferences/urc-2022>
21. World Bank Group. (2017). *Public–Private Partnerships Reference Guide (Version 3.0)*. Washington, DC: World Bank. <https://www.github.org/resources/publications/public-private-partnerships-reference-guide/>
22. European Investment Bank. (2021). *EPEC Guide to Public–Private Partnerships*. Luxembourg: European Investment Bank. https://www.eib.org/files/publications/epec_guide_to_ppp_en.pdf
23. European PPP Expertise Centre. (2018). *A Guide to the Main Provisions of an Availability-based PPP Contract Public–Private Partnerships in the Western Balkans*. Luxembourg: European Investment Bank / European PPP Expertise Centre. <https://wbif.eu/storage/app/media/Library/9.Sectors/3.PrivateSectorDevelopment/6.5-Main-Provisions-of-an-Availability-based-PPP-Contract-FINAL-310818.pdf>
24. OECD. (2025). *Recommendation of the Council on Principles for Public Governance of Public–Private Partnerships*. Paris: OECD. <https://legalinstruments.oecd.org/public/doc/275/275.en.pdf>
25. OECD. (2007). *Recommendation of the Council on Principles for Private Sector Participation in Infrastructure*. Paris: OECD. <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0349>
26. European PPP Expertise Centre, & Western Balkans Investment Framework. (2018). *A Guide to Preparing and Procuring a Public–Private Partnership (PPP) Project. Public–Private Partnerships in the Western Balkans*. Luxembourg: European Investment Bank. <https://wbif.eu/storage/app/media/Library/9.Sectors/3.PrivateSectorDevelopment/4.3-PPP-Preparation-and-Procurement-Guide-FINAL-310818.pdf>

Received: 18.11.2025

Accepted: 19.12.2025

Shylepnytskyi P., Petrova I. Economic reconstruction of Ukraine's industrial macroregions based on public-private partnership under conditions of war and post-war recovery

The article substantiates a conceptual model for the economic reconstruction of Ukraine's industrial macroregions under conditions of war and post-war recovery based on public-private partnership (PPP). It demonstrates that large-scale destruction of production capacities, logistics hubs, and critical infrastructure necessitates a transition from fragmented recovery measures to a systemic macroregional reconstruction oriented toward the build back better principle, structural transformation of industry, and increased economic resilience.

The reconstruction of industrial macroregions is proposed to be viewed as an integrated combination of infrastructure, industrial, and innovation contours, ensuring the alignment of the restoration of basic networks, modernization of production potential, and the formation of long-term sources of economic growth. Relevant PPP models for reconstruction and modernization projects are systematized according to their functional purpose and risk levels; the expediency of a portfolio approach to PPP implementation at the macroregional level is substantiated.

A risk matrix for PPP projects is developed, taking into account wartime, fiscal, market, institutional, and climate factors, and principles for allocating these risks between public and private partners according to their risk-management capacities are defined. A roadmap for implementing a portfolio of PPP projects at the macroregional level is elaborated, adapted to the specifics of the Prydniprovyia macroregion as a key industrial region of Ukraine.

Keywords: public-private partnership, economic reconstruction, industrial macroregions, post-war recovery, build back better, resilience, PPP portfolio, Prydniprovia.

Шилепницький П. І., Петрова І. П. Економічна реконструкція промислових макрорегіонів України на засадах публічно-приватного партнерства в умовах війни та повоєнного відновлення

У статті обґрунтовано концептуальну модель економічної реконструкції промислових макрорегіонів України в умовах війни та повоєнного відновлення на засадах публічно-приватного партнерства (ППП). Показано, що масштабні руйнування виробничих потужностей, логістичних вузлів і критичної інфраструктури зумовлюють потребу переходу від фрагментарних відновлювальних заходів до системної макрорегіональної реконструкції, зорієнтованої на принцип build back better, структурну трансформацію промисловості та підвищення резильєнтності економіки.

Запропоновано розглядати реконструкцію промислових макрорегіонів як інтегроване поєднання інфраструктурного, індустріального та інноваційного контурів, що забезпечує узгодження відновлення базових мереж, модернізації виробничого потенціалу та формування довгострокових джерел економічного зростання. Систематизовано релевантні моделі PPP для проєктів відбудови й модернізації залежно від їх функціонального призначення та рівня ризиків; обґрунтовано доцільність портфельного підходу до впровадження PPP на макрорегіональному рівні.

Сформовано матрицю ризиків проєктів PPP з урахуванням воєнних, фіскальних, ринкових, інституційних і кліматичних чинників та визначено принципи їх розподілу між публічним і приватним партнерами відповідно до спроможності управління ризиками. Розроблено дорожню карту впровадження портфеля проєктів PPP у макрорегіональному вимірі, адаптовану до специфіки Придніпров'я як ключового промислового регіону України.

Ключові слова: публічно-приватне партнерство, економічна реконструкція, промислові макрорегіони, повоєнне відновлення, build back better, резильєнтність, портфель PPP, Придніпров'я.