ISSN 2313-092X
E-ISSN 2411-9199
Ukrainian Black Sea Region Agrarian Science
Vol. 30, No. 1
UDC: 332.1:330.341.1(262.5)
DOI: 10.56407/bs.agrarian/1.2026.119

The strategy for enhancing the competitiveness of local communities in the Black Sea economic region based on innovation

Liudmyla Melnyk*
Doctor of Economic Sciences, Professor
Uman National University
20300, 1 Instytutska Str., Uman, Ukraine
https://orcid.org/0000-0003-2498-5556
Hennadiy Nikolenko
Postgraduate Student
Uman National University
20300, 1 Instytutska Str., Uman, Ukraine
https://orcid.org/0009-0000-9316-866X
Vitalii Storozhuk
Postgraduate Student
Uman National University
20300, 1 Instytutska Str., Uman, Ukraine
https://orcid.org/0009-0005-3883-7636

Abstract. The current economic development, characterised by accelerated globalisation, digitalisation, and transformation of social relations, poses new challenges for local communities, while opening up opportunities for their innovative development, which makes it critically important to develop adapted strategies to increase competitiveness in the context of decentralisation reform and structural transformations in Ukraine. The purpose of the article was to develop an innovative strategy to enhance the competitiveness of territorial communities in the Black Sea economic region. The limitations of the traditional "triple helix" model ("university-government-business") for the Ukrainian context were analysed, and the necessity of implementing the "quadruple helix" approach, which includes civil society as a key element, are substantiated. An integrated innovation model consisting of five core components – innovation strategy, innovation ecosystem, innovation infrastructure, innovation culture, and innovation management system – was proposed. A comprehensive algorithm for implementing the innovation strategy, covering twelve sequential stages from comprehensive diagnostics to the institutionalisation of innovation activities, was presented. Special attention has been given to the development of territorial competence centres, mechanisms of adaptive strategic planning, and inter-territorial innovation alliances based on public-private partnerships. Specific proposals for implementing the innovation strategy in the short term (1-2 years) and long term (5-10 years), taking into account the unique characteristics of the region's local communities, are outlined. The research results confirmed that successful implementation requires systematic coordination among stakeholders, leadership from local self-government bodies, and flexible responses to changes in the external environment. The proposed approach is shown to provide comprehensive solutions to challenges in the

Article's History:
Received: 09.10.2025 Revised: 03.03.2026 Accepted: 31.03.2026 Published: 13.04.2026

Suggested Citation:
Melnyk, L., Nikolenko, H., & Storozhuk, V. (2026). The strategy for enhancing the competitiveness of local communities in the Black Sea economic region based on innovation. *Ukrainian Black Sea Region Agrarian Science*, 30(1), 119-132. doi: 10.56407/bs.agrarian/1.2026.119.

*Corresponding author

field of innovation-driven development through the integration of strategic planning, institutional development, and the practical execution of implemented measures

Keywords: competitiveness; innovation strategy; innovation ecosystem; "quadruple helix" model of innovative development; strategic planning

INTRODUCTION

Contemporary global development is characterised by accelerated globalisation, digitalisation, and transformation of social relations, presenting territorial communities with new challenges whilst opening opportunities for advancement. Traditional approaches to regional development, predominantly based on macroeconomic indicators and sectoral policies, prove insufficient for ensuring sustainable and balanced development at the local level. Therefore, there is a need to develop strategy of the development of territorial communities, which require the application of innovative approaches to mechanisms for ensuring the development of territories and ensuring their competitiveness in the current conditions of transformation.

It is confirmed by the views of N. Gavkalova *et al*. (2023), who analysed territorial development effectiveness within Ukraine's regional policy framework, demonstrating that development prospects depend on strategies accounting for global digitalisation trends and innovation levels in developed economies. However, it has been scientifically proven that there are certain limitations and peculiarities in innovative development that need to be taken into account. P. Marques & K. Morgan (2021) critically examined the limitations of regional innovation concepts that rely too heavily on the experiences of advanced regions, arguing that such approaches neglect the realities of less-developed regions. They highlighted the importance of understanding formal institutional dynamics to avoid culturally deterministic explanations of underdevelopment, stressing that firm-level innovation alone is insufficient to generate regional growth. R. Chornyi *et al*. (2025) analysed the consequences of war for Ukraine's innovation-industrial regional development, identifying systemic technological lag and widening disparities between central and peripheral regions. Their study emphasised that enterprise relocation and industrial park development, supported by legislative improvements, foster diversification and competition. They concluded that effective state support mechanisms are essential to stimulate innovation diffusion, strengthen regional business environments, and enhance national resilience.

I. Tomashuk & I. Tomashuk (2023) examined the strategic foundations of innovation-driven territorial community development, emphasising entrepreneurship as the main catalyst of local economic transformation. Their study highlighted that a favourable business climate and integrated innovation structures, such as technology parks and incubators, are essential for fostering competitiveness and sustainable growth. F. Fidanoski *et al*. (2023) can be presented as a broader reflection on innovation development models. Their work illustrates how the Triple Helix framework (built on the interaction of academia, industry, and government) remains a milestone in knowledge-based economies, yet still faces efficiency challenges. This underscores the need for innovation models that not only stimulate technological progress but also integrate social participation, and institutional adaptability. Such perspectives reinforce the argument that territorial development strategies must evolve toward inclusive, resilient, and sustainable innovation systems, which include state, business and science. Meanwhile, analysing various views on the formation of the foundations of innovative development A. Zarichniak *et al*. (2025) investigated regional innovation models through comparative analysis of EU and US experiences, critically examined how concepts developed in advanced regions may inadequately address the realities of less-developed territories. The authors emphasised the need for context-sensitive approaches that account for local institutional dynamics and resource endowments rather than direct transfer of Western models.

Taken together, these scholarly perspectives confirmed that innovation-driven territorial development requires strategies that combine global trends with local realities, integrate entrepreneurship with institutional adaptability, and foster collaboration among government, business, and academia. This provides a strong rationale for applying the Triple Helix model as the foundation for designing an innovation strategy that enhances the competitiveness of territorial communities in Ukraine. However, most studies either focus on general innovation models in advanced economies or analyse Ukraine's territorial development in broad terms, without tailoring innovation strategies to the unique challenges of coastal and border regions, such as uneven resource distribution, infrastructural gaps, and external shocks. Furthermore, there is limited

integration of the Triple Helix model into practical mechanisms for strengthening competitiveness at the community level, particularly in regions undergoing transformation and recovery. This study aimed to develop an integrated innovation strategy for enhancing the competitiveness of territorial communities in the Black Sea economic region.

MATERIALS AND METHODS

The research employed a comprehensive methodological approach combining theoretical analysis, empirical investigation, and strategic planning techniques. The study focused on territorial communities within the Black Sea economic region of Ukraine, selected due to their strategic importance and diversity of development characteristics. The analytical framework integrated several methodological approaches. Comparative analysis examined the applicability of international innovation models, particularly the triple and quadruple helix concepts, to Ukrainian conditions. Systems analysis facilitated understanding of interactions among different components of the territorial innovation system and their collective impact on competitiveness. The strategy for enhancing the competitiveness of local communities based on innovation was developed through a systematic multi-stage procedure.

The case study method was employed to examine practical applications of innovation helix models in territorial development contexts Theoretical framework analysis – critical examination of existing innovation models (triple helix, quadruple helix) and their applicability to Ukrainian territorial communities, including assessment of structural differences between Western and post-socialist innovation ecosystems. Stakeholder identification – systematic identification of key actors in territorial innovation systems: government bodies, educational and scientific institutions, business sector, and civil society, with analysis of their roles, capacities, and interaction patterns. Component definition – determination of essential elements for the integrated model including: innovation strategy formulation mechanisms, innovation ecosystem architecture, innovation infrastructure requirements, innovation culture development approaches, and innovation management systems. Integration mechanism design – development of coordination and cooperation mechanisms ensuring synergistic interaction among model components, including adaptive planning procedures, partnership frameworks, lobbying and coordination structures, joint financing schemes, and monitoring systems. Priority area selection – identification of key sectors for innovation implementation (education, medicine, infrastructure, social protection, social programs) was based on territorial specificities and community development needs. Implementation algorithm development – formulation of a twelve-stage sequential implementation process through iterative consultation with practitioners, local government representatives, and academic experts, ensuring practical applicability whilst maintaining theoretical rigour. Temporal perspective differentiation – development of short-term (1-2 years) and long-term (5-10 years) implementation scenarios with specific measures, timelines, resource requirements, and expected outcomes for each perspective. Validation through expert consultations. Strategic planning methodology incorporated scenario development for long-term perspectives, participatory planning techniques involving stakeholder engagement, and adaptive planning approaches allowing for flexibility in responding to environmental changes. The participatory approach included workshops and consultations with representatives from local self-government bodies, business associations, educational institutions, and civil society organisations.

Data collection methods included semi-structured interviews with key stakeholders in territorial communities conducted between March and June 2025 with a total of 220 respondents representing 21 territorial communities of the Black Sea economic region, including Vasylivska, Nechaianska, Chohodarivska, Dolynska, Kochubeiivska, Borozenska, Halytsyn'ivska, Stepivska, Uspenivska, Shyriaiivska, Novoolesk'sandrivska, Tiahynska, Yelanetska, Veselynivska, Vylkivska, Ovidiopilska, Vysokopilska, Chornobaiivska, Kryvoozierska, Tarutynska, and Bilozierska, with 10 to 12 respondents per community. By occupational profile, the sample was distributed across five broad sectors: the education sector (teachers, educators, lecturers, and school directors) accounted for 54 respondents (24.5%); the business and commercial sector (entrepreneurs, construction workers, retail workers, accountants, farmers, and pharmacists) for 64 respondents (29.1%); the public administration sector (civil servants and directors of municipal enterprises) for 28 respondents (12.7%); healthcare (physicians and nurses) for 16 respondents (7.3%); and other categories, including pensioners, unemployed persons, military personnel, and security guards, for the remaining 58 respondents (26.4%). This broad occupational diversity reflects the heterogeneous social structure of the surveyed communities and ensures a representative range of perspectives on local innovation capacity and development needs.

Case Study Selection. Two international cases were selected for comparative analysis using a purposive selection protocol based on three criteria: documented application of triple or quadruple helix

models in a territorial development context; availability of published peer-reviewed assessments of both outcomes and limitations; and contrasting institutional environments to maximise analytical diversity. The Berlin-Adlershof Science City (Germany) was selected as a benchmark case of a well-resourced, government-driven triple helix implementation in a mature market economy, widely cited in helix model literature and subject to critical evaluation regarding resource asymmetries among stakeholders. The Flottsund Bridge project (Uppsala, Sweden) was chosen as a contrasting case in which triple helix collaboration explicitly failed due to inadequate civil society engagement, thereby illustrating the rationale for transitioning to a quadruple helix framework. Both cases are drawn from leading scholarly publications and provide complementary empirical evidence directly relevant to the Ukrainian context analysed in this study. The synthesis of theoretical frameworks with empirical findings enabled development of an integrated innovation model specifically adapted to the characteristics of Ukrainian territorial communities, addressing the structural limitations identified in the comparative analysis while leveraging constitutional provisions regarding civil society's role in governance.

RESULTS

International experience demonstrates both the potential and limitations of helix innovation models in territorial development contexts, providing critical insights for Ukrainian territorial communities. The Berlin-Adlershof Science City in Germany exemplifies successful triple helix implementation in a well-resourced environment, where by 2016 the science and technology park hosted over 1,000 companies and scientific institutions, attracting 15,996 employees and 6,524 students. Success factors included sustained government financial support from project inception, establishment of WISTA as a public-private partnership entity managing park operations and technology centres, and long-term strategic planning fostering linkages among universities (Humboldt University), industry, and government structures (Alhowaily, 2021). However, even in this successful case, significant challenges emerged: stakeholder interactions remained resource-dependent, with Humboldt University's participation constrained by limited financial and recruitment capacities compared to industrial actors, and absence of an independent fusion organisation at the intersection of the three helices hindered autonomous operation (Taratori *et al.*, 2021). These limitations in a developed German context foreshadow even greater challenges in resource-constrained Ukrainian settings.

The Flottsund Bridge renovation project in Uppsala, Sweden, illustrates the critical importance of civil society integration from early planning stages. Originally designed following the triple helix model with collaboration among the Regional Development Office, academic researchers, and renewable energy technology developers, the project ultimately failed to achieve its innovation commercialisation objectives due to late and ineffective citizen engagement (Garcia-Teran & Skoglund, 2019). Open meetings intended for dialogue devolved into one-way communications, with residents feeling excluded from decision-making processes (Taratori *et al.*, 2021). This case underscores fundamental limitations of triple helix approaches that treat citizens merely as end-users rather than active co-creators, validating the necessity of quadruple helix frameworks incorporating civil society as a foundational pillar rather than a supplementary element – a lesson particularly relevant for Ukrainian communities where constitutional principles emphasise citizens as sovereignty bearers.

Analysis reveals significant limitations in directly applying the traditional triple helix model to Ukrainian territorial communities, validated by the challenges observed even in successful Western implementations like Berlin-Adlershof. Each element of the model operates under different paradigms compared to highly developed Western countries where the concept originated. Regarding universities, Western institutions represent financially robust entities providing not only educational services but engaging extensively in scientific and technical practices. They possess resources to attract foreign specialists with relevant expertise, significantly accelerating innovation development timelines, and to recruit students through merit-based selection supported by substantial scholarships (Miller *et al.*, 2016; Machado *et al.*, 2024). The resource asymmetries observed in Berlin-Adlershof, where even Humboldt University faced participation constraints, magnify exponentially in Ukrainian contexts. Ukrainian educational institutions, whilst maintaining strong academic traditions, operate under different systemic conditions. Rather than "university" as the sole innovation generator, the Ukrainian context requires considering "education" more broadly as the foundation encompassing secondary education, vocational training, higher education institutions, National Academy of Sciences establishments, research institutes, and other scientific organisations conducting fundamental and applied research.

The business component demonstrates even more pronounced differences. Western business evolved systematically over centuries, developing from small

entrepreneurial structures to transnational corporations, with founders often graduating from the same prestigious academic institutions (Todeva & Panayiotis, 2017). This historical continuity facilitated organic integration between education and business, with corporations investing in research activities and participating in educational institution governance boards (Hasche *et al.*, 2019). Ukrainian business remained relatively passive regarding personnel training and modern innovation development within domestic educational institutions, preferring to adopt foreign technologies. Economic difficulties and population decline, particularly in peripheral territories, resulted in closure of financially unsustainable rural schools and reduction of social infrastructure networks – challenges absent from successful Western triple helix implementations. Government structures in countries where the triple helix functions effectively, exemplified by the United States, demonstrate sophisticated integration between education, business, and policy-making. Elite institutions like Yale University (founded 1701, endowment 42 billion USD) and Harvard University (founded 1636, endowment 50 billion USD) have prepared numerous American presidents and political leaders (Stiglitz *et al.*, 2013). Ukrainian government institutions lack comparable historical experience and financial resources, failing to create conditions enabling highly educated youth to access prestigious institutions, establish institutional-level cooperation between business and universities, or position themselves as primary customers and promoters of innovations.

Given these structural limitations observed in Ukrainian contexts and validated by challenges encountered even in successful Western triple helix implementations, this research advocates implementing the quadruple helix model, incorporating civil society as the fourth element (Fig. 1). The Flottsund Bridge case demonstrated that excluding citizens from early planning stages undermines project success even in well-resourced Swedish contexts; this risk intensifies in Ukrainian communities where citizen engagement can compensate for governmental and business sector weaknesses. The Constitution of Ukraine (1996) established that "the bearer of sovereignty and the sole source of power in Ukraine is the people", making civil society's role fundamentally important and providing unique constitutional legitimacy absent in Western contexts where civil society functions as supplementary rather than foundational. Citizens simultaneously serve as primary creators, promoters, and users of innovations (Carayannis & Evangelos, 2016), positioning them as the determining element in the innovation development model.

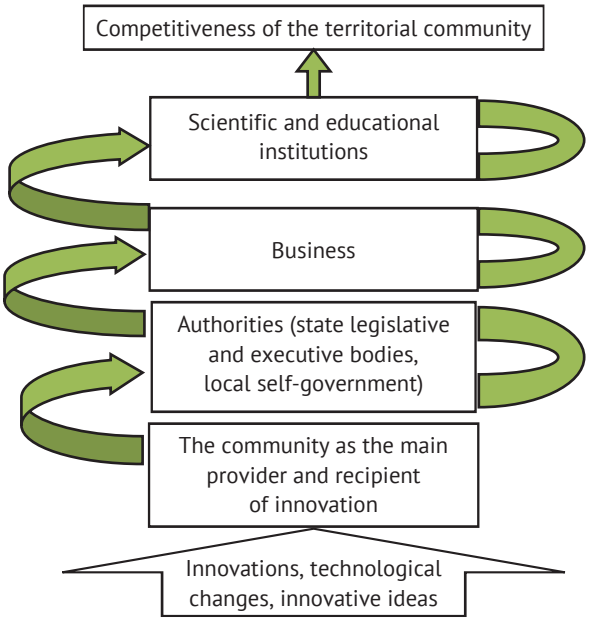

Figure 1. *The innovative foundations of the socioeconomic development of territorial communities*
Source: *compiled by the authors*

The innovation approach to territorial development must encompass not only traditional economic linkages but a broad spectrum of interactions among different territorial stakeholders: business, scientific institutions, educational establishments, public organiiations, and government bodies (Morawska *et al.*, 2024). These relationships manifest as industrial clusters, innovation ecosystems, enterprise networks, scientific-production complexes, and creative industries. Contemporary productive relations focus not exclusively on material goods production but also on knowledge generation, information processing, cultural value creation, and social innovations. The research proposes an integrated innovation model for socio-economic development of territorial communities based on systematic approaches and considering interconnections among different innovation types, stakeholders, and management levels. The model comprises five key components working in synergy (Fig. 2). The innovation strategy component includes long-term community development vision, strategic priorities, goals and objectives, indicator systems comprising specific key performance indicators (KPIs) such as: the number of newly registered startups per year (target: 5-10 per community annually); the volume of investment in research and development as a percentage of the community's budget (target: 2-3%); the number of joint university-business innovation projects implemented (target: at least 3 per year); the proportion of residents engaged in innovation-related

educational programmes (target: 10% of working-age population); and the number of patents and intellectual property objects registered by community-based entities (target: 2-5 per year), and monitoring mechanisms. Critical elements involve identifying unique competitive advantages and their purposeful development. Strategy formulation requires comprehensive auditing of community potential, including human resources, material-technical base, financial capabilities, and distinctive territorial advantages.

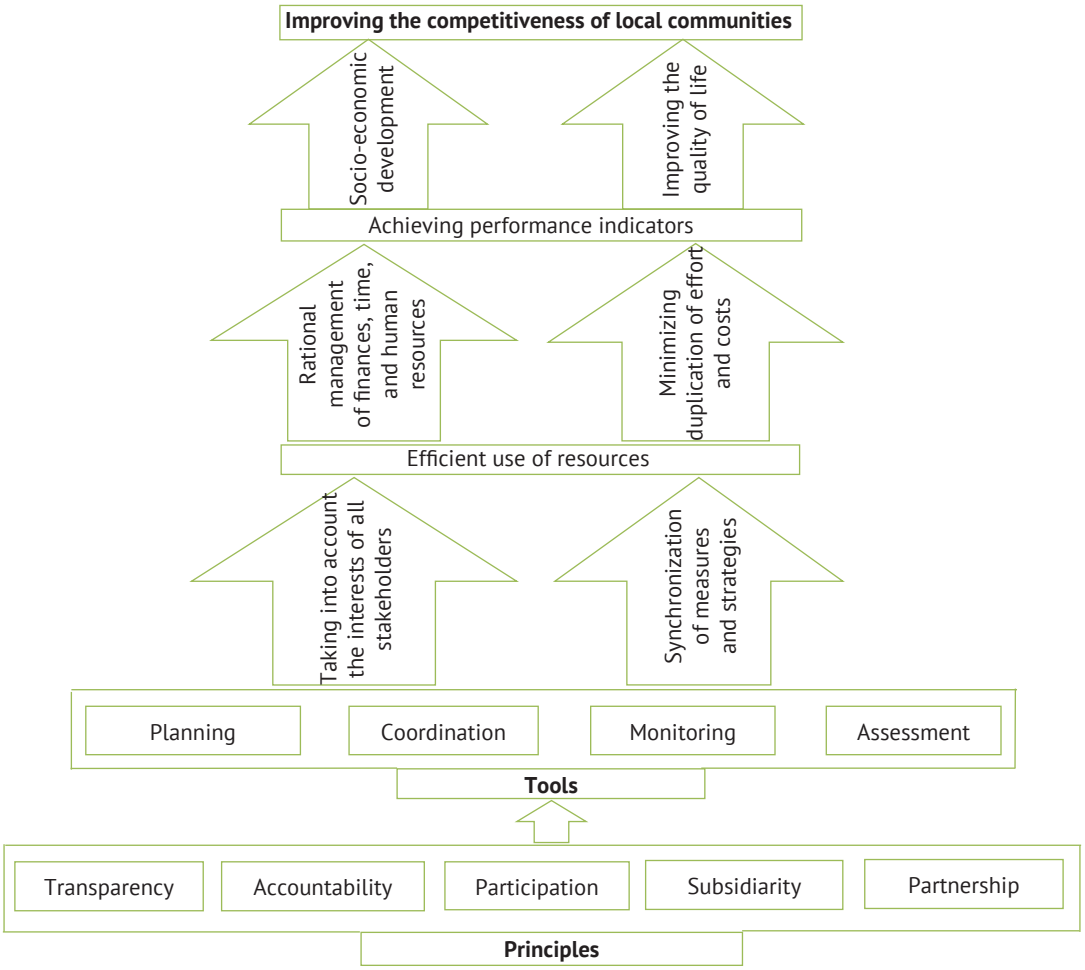

Figure 2. *The principles of implementing the mechanism for the socio-economic development of territorial communities based on innovation*

Source: *compiled by the authors*

The innovation ecosystem encompasses the network of interactions among community functioning participants: government bodies, business, educational and scientific institutions, public organisations, and citizens. Effective implementation requires establishing cooperation platforms as permanently operating structures ensuring coordination of different actors' activities, information exchange, and joint project planning and implementation. These platforms function both in traditional forms (councils, commissions, working groups) and digital formats (online platforms, mobile applications). Innovation infrastructure includes physical and virtual resources necessary for innovation development and implementation: business incubators, coworking spaces, technology parks, administrative service centres, digital platforms, and communication and information systems. Development involves creating territorial competence centres specialising in developing unique sectoral skills and knowledge, where each community concentrates efforts on 2-3 key directions best corresponding to its natural, historical, and human resources.

Innovation culture encompasses the system of values, norms, and attitudes promoting innovation generation and implementation. This requires special training programmes, experience exchange mechanisms, and systematic efforts to develop entrepreneurial thinking among the population. Practical implementation includes organising educational seminars and trainings

on innovation entrepreneurship, digital literacy, and participation in public initiatives. The innovation management system covers structures, processes, and instruments ensuring planning, coordination, implementation, and evaluation of innovation projects. Essential elements include creating specialised departments or development agencies responsible for innovation activities in the community, establishing procedures for assessing and selecting innovation initiatives, and forming special innovation development funds financed from various sources including state programmes, donor funds, and community internal reserves. Successful implementation requires a systematic algorithm encompassing twelve sequential stages, each building upon previous achievements whilst maintaining flexibility for adaptation to changing conditions (Fig. 3).

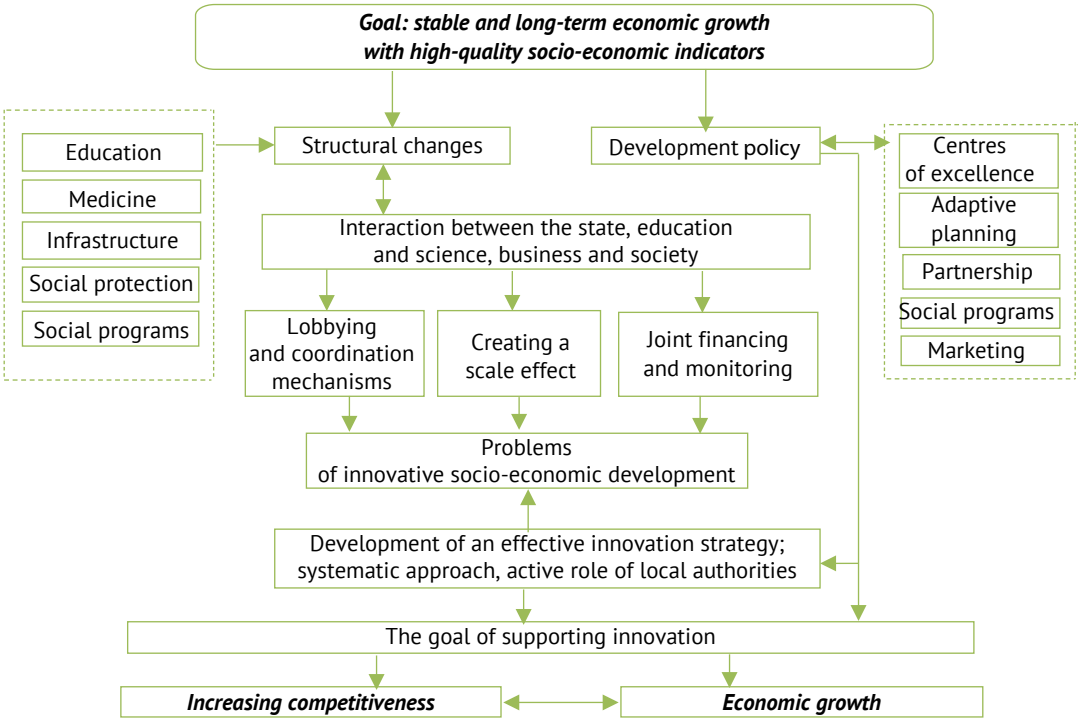

Figure 3. *Strategy for enhancing the competitiveness of local communities based on innovation*
Source: *compiled by the authors*

Stage one involves conducting comprehensive diagnostics of the territorial community's innovation potential, including analysis of available resources, infrastructure, human capital, and existing innovation practices. This stage encompasses SWOT analysis of the innovation environment, identification of key stakeholders, and determination of baseline competitive advantages, with particular attention to assessing readiness levels among local government, business, and civil society for innovation transformations. A SWOT analysis of the innovation environment of territorial communities in the Black Sea Economic Region, conducted as part of this diagnostic stage, is presented in Table 1. The analysis reveals that whilst the region possesses significant structural advantages – including its strategic coastal location, established higher education institutions, and an active civil society sector – these are counterbalanced by persistent weaknesses such as insufficient university-business linkages, underdeveloped innovation infrastructure, and limited local budget autonomy. At the same time, the growing availability of international reconstruction funding represents tangible opportunities, whilst ongoing armed conflict and widening intra-regional disparities between big cities and peripheral communities remain critical threats requiring strategic attention. Stage two focuses on formulating strategic vision for community innovation development considering global trends and national priorities. The strategic planning process must base itself on participatory principles, engaging broad circles of interested parties including business representatives, scientific community, public organisations, and active residents. The outcome should clearly define long-term innovation development goals and main directions for their achievement. Stage three develops a detailed implementation plan with specific tasks, execution timelines, necessary resources, and success indicators. The plan includes creating institutional

architecture supporting innovation activities, particularly forming specialised structural subdivisions within local self-government bodies, establishing advisory councils on innovations, and developing partnership networks. An important plan component involves designing stimulus and support systems for innovation initiatives, including financial mechanisms, tax preferences, and administrative services.

Table 1. *SWOT Analysis of the innovation environment of territorial communities in the Black Sea economic region of Ukraine*

Strengths	Weaknesses
➥ Strategic location on the Black Sea coast enabling cross-border trade, logistics, and access to EU and Near East markets; ➥ Presence of higher education institutions with R&D potential; ➥ Diverse natural and agricultural resources creating niches for agro-innovation and eco-tourism; ➥ Active civil society organisations and NGO sector engaged in community development; ➥ Decentralisation reform expanding local self-governance authority and financial resources; ➥ Established port infrastructure in Odesa and Mykolaiv providing logistical foundation for trade-oriented innovation clusters; ➥ Rich cultural and historical heritage offering comparative advantage for creative industries and cultural tourism innovation; ➥ Presence of vocational training institutions and secondary specialised schools forming a pipeline for technically skilled workforce	➥ Significant population decline and brain drain, especially from peripheral communities; ➥ Limited financial autonomy of local budgets and weak investment climate; ➥ Insufficient university-business linkages; low business investment in R&D and innovation; ➥ Underdeveloped innovation infrastructure (absence of technology parks, incubators); ➥ Low digital literacy and innovation culture among the general population; ➥ Fragmented governance and insufficient inter-community coordination, limiting the scale of jointly implemented innovation initiatives; ➥ Weak intellectual property protection mechanisms and limited awareness of patent procedures among local innovators and entrepreneurs; ➥ Absence of systematic monitoring and evaluation frameworks for innovation policy effectiveness at the community level
Opportunities	**Threats**
➥ Access to international reconstruction and innovation funding (EU, USAID, World Bank) supporting post-war recovery; ➥ Ukraine's EU accession process driving alignment with European innovation policies and standards; ➥ Growing national interest in smart specialisation and cluster development as tools for regional competitiveness; ➥ Digital transformation initiatives providing opportunities for e-governance and remote innovation collaboration; ➥ Post-war return migration creating a potential entrepreneurial workforce; ➥ Reconstruction-driven demand for innovative construction materials, energy-efficient technologies, and smart urban planning solutions; ➥ Expansion of remote work and distributed innovation models reducing geographic disadvantages of peripheral communities; ➥ Potential to develop renewable energy projects (wind and solar) along the Black Sea coast, attracting green technology investment	➥ Ongoing armed conflict causing infrastructure destruction, population displacement, and economic instability; ➥ Risk of continued brain drain and loss of skilled human capital essential for innovation ecosystems; ➥ Widening disparities between large urban centre and peripheral communities in access to resources and innovation support; ➥ Institutional instability and frequent changes in regulatory environment reducing investor confidence; ➥ Limited administrative capacity of small communities to design and implement complex innovation strategies without external support; ➥ Dependence on centralised state funding with high vulnerability to budget cuts and shifting national priorities during wartime; ➥ Cybersecurity threats and risks of digital infrastructure attacks undermining e-governance and innovation platform operations; ➥ Growing competition from other regions and countries for international grant funding and qualified innovation personnel

Source: *compiled by the authors*

Stage four establishes innovation infrastructure encompassing physical, informational, and institutional components. Physical infrastructure involves creating technology parks, business incubators, coworking spaces, and technology transfer centres. Informational infrastructure must ensure access to modern digital technologies, high-speed internet, and specialised information resources. Institutional infrastructure includes forming networks of organisations providing consulting, educational, and financial services to innovators and entrepreneurs. Stage five develops human capital as the primary driver of innovation activity. This process includes education system modernisation considering innovation economy needs, developing continuous learning and qualification improvement programmes, and creating mechanisms for attracting and retaining talented specialists within community territory. Particular attention requires forming entrepreneurial culture and developing innovation thinking skills among the population through educational programmes, trainings, and mentoring initiatives.

Stage six activates research activities at the territorial level through creating local research centres, supporting applied research oriented toward solving specific community problems, and developing partnership relations with academic institutions. An important component involves forming systems for ordering research work from local self-government bodies and local enterprises, ensuring demand for innovation developments and stimulating their practical implementation. Stage seven creates favourable regulatory environment for innovation activities through improving local

normative acts, simplifying administrative procedures for enterprises conducting innovation activities, and establishing mechanisms for rapid response to innovators' needs. This stage also includes developing monitoring and evaluation systems for regulatory policy effectiveness with possibilities for prompt adjustments upon identifying deficiencies or emergence of new challenges. Stage eight develops financial support for innovation activities through diversifying financing sources, including budgetary funds, private investments, grant financing, and crowdfunding. Particular attention requires creating local innovation support funds, developing microcrediting for startups, and attracting business angels and venture investors. An important component involves forming guarantee and insurance systems for innovation projects to reduce investor risks. Stage nine advances innovation commercialisation systems through creating technology transfer centres, patent agencies, intellectual property consulting services, and marketing agencies specialising in innovation product promotion. This stage also envisions forming cooperation networks between developers and potential innovation consumers, including organising exhibitions, conferences, and business meetings.

Stage ten integrates the territorial community into regional, national, and international innovation networks through participation in joint projects, experience exchange, engagement in international cooperation programmes, and creating partnership relations with other innovation territories. This facilitates access to new knowledge, technologies, and sales markets, significantly enhancing local innovation competitiveness. Stage eleven establishes monitoring and evaluation systems for innovation strategy effectiveness through developing key indicators, regular analysis of achieved results, and strategy correction corresponding to external environment changes. The monitoring system must include both quantitative indicators and qualitative measures reflecting social and ecological aspects of innovation development. Stage twelve institutionalises innovation activities through consolidating achieved results in local strategic documents, creating permanently operating innovation support mechanisms, and forming continuous improvement culture. This ensures sustainability of territorial community innovation development and its capacity to adapt to future challenges and opportunities.

The short-term perspective (1-2 years) aims to create fundamental foundations of the integrated innovation model through simultaneous development of all key components. Initial efforts focus on comprehensive audit of community potential, establishing coordination councils for innovation development, creating basic physical and virtual resources for supporting innovation activities, and organising educational programmes for population capacity building. This period emphasises implementing 2-3 demonstration projects simultaneously engaging all innovation model components, serving as success stories motivating further resident participation in innovation processes. The long-term perspective (5-10 years) directs efforts toward full-scale implementation of the integrated innovation model ensuring systematic territorial community transformation. The innovation strategy evolves into a dynamic strategic management system based on continuous monitoring of external environment changes and automatic priority adjustment. Created analytical centres grow into foresight research centres focusing on future development scenario forecasting rather than retrospective analysis. Strategic decisions utilise big data and complex analytical models ensuring high planning accuracy.

The innovation ecosystem in strategic perspective transforms into a sustainable cooperation network spanning multiple territorial communities and integrating into national and international innovation networks. Cooperation platforms acquire inter-regional character, ensuring resource, knowledge, and best practice exchange among different territories. Within the economic region, joint research centres, inter-community investment funds, and mutual learning systems emerge, enabling the community to become an active centre for diffusion of innovation solutions and technologies to other regions and countries. Innovation infrastructure evolves into comprehensive technology parks, business incubators, and technology transfer centres, with territorial competence centres integrating educational, scientific, and production activities, ensuring preparation of highly qualified personnel at regional and national levels. The created network of specialised laboratories and research centres serves multiple regions' needs. Innovation culture becomes an integral part of community residents' thinking, with small and medium businesses forming foundations for further innovation activities and job creation. Participatory budgeting of innovations significantly expands, with bonus systems for stimulating innovation more broadly integrated into various aspects of public life. The innovation management system evolves into professional territorial development services applying modern project management methods for optimising decision-making processes. Multi-level coordination systems ensure coherence of actions at local, regional, and national levels, facilitating integration of economic efficiency, social justice, and ecological responsibility through interaction of all five innovation model components,

ensuring sustainable competitiveness and high quality of life for residents in long-term perspective.

Considering common characteristics among territorial communities in the Black Sea economic region, ensuring coordination of their innovation development proves essential. This realises through creating inter-territorial innovation alliances uniting communities around joint development projects, formed according to geographic, sectoral, or thematic principles and directed toward solving common challenges or implementing large-scale initiatives. Alliance advantages include possibilities for joint project financing, enhanced social engagement, coordinated efforts for innovation commercialisation, and lobbying common interests at higher management levels, creating scale effects for small territorial communities. The social component of the innovation strategy for ensuring competitiveness implements through loyalty programme systems stimulating resident participation in community innovation projects, aligned with the Presidential Decree of Ukraine No. 487/2021 (2021). Citizens may receive benefits or bonuses for participating in solving local problems, implementing rationalisation proposals, and innovation activities, usable for obtaining discounts on utilities, participating in educational programmes, or purchasing local goods and services. This system integrates with participatory innovation budgeting principles, where portions of community budget funds direct toward financing projects selected by residents through public voting systems, ensuring openness and government accountability to the public. The marketing aspect of the proposed innovation strategy includes creating territorial innovation brands based on unique community characteristics and achievements (Oleksiuk *et al.*, 2021). Each territory develops its own identification system for innovation products and services created or improved within its territory, integrating with the "innovation tourism" concept. The latter envisions attracting external parties to participate in territorial innovation projects through volunteer and grant programmes, participation in scientific research, and testing new products and services, creating additional opportunities for innovation financing and forming positive community image.

Lobbying common interests at higher management levels represents a strategic mechanism for resource and influence consolidation, enabling small territorial communities to achieve synergetic scale effects in innovation development and competitiveness contexts. This approach must base itself on network governance concepts envisioning formation of horizontal and vertical linkages among different government levels and civil society (Vasiuk & Haievska, 2023). Small territorial communities with individually limited resources and political influence achieve significantly greater effectiveness through creating coalitions and alliances, alongside public control over management decision adoption and implementation. Lobbying effectiveness increases through developing comprehensive communication strategies including preparing analytical materials, presentations, and proposals demonstrating potential advantages of developing and implementing innovation goods and services for entire regions or the state. Important aspects include engaging scientists, educators, enterprises, and public organisations, providing additional legitimacy and scientific substantiation to initiatives advanced by government bodies and local self-government, alongside creating favourable normative-legal environments stimulating small and medium business development, innovations and entrepreneurship, strengthening leadership potential in communities, and preparing qualified specialists capable of effectively representing alliance interests at various government levels.

DISCUSSION

The findings of this research reveal fundamental systemic differences between innovation ecosystems in developed Western economies and Ukrainian territorial communities, necessitating conceptual adaptation rather than direct model transfer. While Western innovation models have evolved within stable institutional environments characterised by mature market mechanisms, well-established financial infrastructure, and robust regulatory frameworks, Ukrainian territorial communities operate under fundamentally different conditions. These conditions are shaped by ongoing institutional transformation, significant resource constraints, limited administrative capacity at the local level, and the unprecedented challenges posed by wartime realities. The divergence manifests across multiple critical dimensions of ecosystem architecture, including stakeholder capabilities and roles, resource availability and allocation mechanisms, governance structures and decision-making processes, innovation culture and entrepreneurial mindset, as well as patterns of inter-institutional collaboration. Consequently, successful innovation development in Ukrainian contexts requires not merely adjusting implementation parameters of Western frameworks, but reimagining their foundational assumptions to account for specific local capabilities, institutional peculiarities, historical development trajectories, and the unique governance structure emerging from decentralisation reforms.

Responding to these contextual specificities, the results of this study present an integrated innovation

model for the socio-economic development of territorial communities in Ukraine's Black Sea Economic Region, encompassing five synergistic components – innovation strategy, ecosystem, infrastructure, culture, and management – implemented through a twelve-stage algorithm with short- and long-term perspectives. This model extends the quadruple helix framework by integrating civil society as a foundational element, overcoming structural asymmetries in the Ukrainian context compared to Western triple helix examples (Fritsch & Wyrwich, 2021), such as resource constraints in education, business passivity, and governmental integration gaps observed in cases like Berlin-Adlershof and Flottsund Bridge. Unlike traditional approaches, it emphasises inter-territorial alliances, loyalty programs aligned with national civil society strategies, and marketing through innovation brands, promoting resilience amid wartime disruptions and decentralisation (Roman & Fellnhofer, 2022; Stephens, 2025).

The centrality of civil society in this adapted framework finds strong empirical support in recent scholarship. P. González-Martinez *et al*. (2023) and highlighted that civil society acts as a fundamental mediator in regional innovation systems, shaping the effectiveness of science, technology, and innovation policies. Their findings confirmed that greater citizen involvement and strong human capital significantly enhance innovation outcomes, highlighting the influential role of local governments and communities in fostering sustainable development. Building upon these theoretical foundations, several recent studies have validated and extended elements of the proposed approach. O. Kushnerov *et al*. (2025) applied the Quadruple Helix to form target indices for 1,469 territorial communities in Ukraine, training a neural network on socio-economic and security data. Results demonstrated high synergy efficiency among government, business, science, and civil society, validating ecosystem and monitoring (stage 11) with predictive accuracy. This work considers this approach valid for management digitalisation, but differ with sequential 12-stage algorithm adapted to wartime realities, as opposed to their neural network model.

Expanding the theoretical scope further, Kravchenko (2025) substantiated Triple/Quadruple/Quintuple Helix as the foundation for community innovation development, analysing their applicability to decentralisation. The author noted that the Quintuple Helix integrates an ecological dimension, validating innovation culture and long-term perspective (5-10 years). This aligns with stakeholder emphasis, but this work expands it with practical alliances and loyalty programs, addressing gaps in their theoretical base. E. Samara *et al*. (2023) applied a system dynamics approach to the development of a Regional Innovation System (RIS). Their methodology highlights the importance of viewing RIS as a complex, interconnected structure composed of multiple subsystems and measurable factors, where innovation emerges from dynamic interactions among institutions and policies. This systemic perspective aligns with current approach to building an innovation model: both emphasised that competitiveness and regional development cannot be explained by isolated actions, but require an integrated framework that captures the interdependencies between government, business, academia, and society.

Geographic specificity also emerges as a critical consideration in model adaptation. M. Cybulska (2024) tested spiral cooperation within the dualism of centre and periphery, finding that peripheral municipalities value state-business ties most for growth. This peripheral orientation corresponds to the proposed individual regional consideration of the Black Sea economic region (stage 1), which expands in successive stages absent from their analysis. Furthermore, Ukrainian scholarship on network governance provides conceptual alignment. N. Vasiuk & L. Haievska (2023) examined the essence of network management as horizontal coordination among state, business, NGOs, and citizens, highlighted public authorities' role in facilitating trust and resource exchange. Unlike their purely theoretical approach lacking practical implementation frameworks, current model innovates with a 12-stage algorithm integrated into the quadruple helix for territorial communities, tailored to wartime realities and Black Sea decentralisation, while extending their ideas through concrete innovation infrastructure and loyalty mechanisms.

Translating these theoretical insights into practical application, the quadruple helix approach addresses concrete challenges in Ukrainian communities. Government capacity limitations can be compensated through active civil society engagement in innovation identification, priority setting, and implementation monitoring. Business sector passivity may be overcome through citizen initiatives, social entrepreneurship, and cooperative models. Educational institution resource constraints can be supplemented through community-based learning initiatives and knowledge-sharing platforms. The research provides actionable frameworks for territorial community leaders and policymakers. The integrated model and implementation algorithm offer concrete guidance moving beyond abstract discourse to specific operational steps. Recognition that successful strategies require cultural transformation alongside institutional change informs capacity-building priorities. Inter-territorial cooperation mechanisms demonstrate that resource-constrained communities can enhance

competitiveness through strategic alliances, challenging deficit-focused narratives and highlighting opportunities for collective action and mutual benefit. These results contribute to emerging scholarly discourse on context-specific innovation model development in transition economies, particularly those experiencing simultaneous challenges of structural transformation, decentralisation reform, and geopolitical disruption.

CONCLUSIONS

This research demonstrated that implementing innovation strategies for ensuring territorial community competitiveness represents a complex multi-stage process requiring systematic approaches and coordinated efforts from all interested parties. The proposed integrated innovation model responds to systemic gaps through five synergistic components. The innovation strategy component ensured alignment between territorial aspirations and available resources through comprehensive auditing. The innovation ecosystem addressed coordination failures through permanent cooperation platforms functioning in traditional and digital formats. Innovation infrastructure through territorial competence centres represents strategic response to resource scarcity, with communities concentrating on key directions rather than attempting comprehensive coverage. Innovation culture development addresses fundamental challenges that institutional changes prove insufficient without corresponding shifts in values and attitudes. The innovation management system provides operational structures for planning, coordination, and evaluation.

Implementation success requires adaptive strategic planning based on continuous monitoring and flexible priority adjustment, particularly relevant given current challenges facing Ukraine. Inter-territorial collaboration through innovation alliances creates synergistic effects, enabling resource sharing, experience exchange, and coordinated advocacy at higher governance levels. The twelve-stage implementation algorithm provides practical guidance from initial diagnostics through institutionalisation, ensuring systematic progress whilst maintaining flexibility for local adaptation. Short-term and long-term perspectives outline concrete pathways from establishing foundational elements to achieving full-scale transformation into innovation-driven communities. The proposed approach ensures comprehensive solutions for innovation development challenges through combining strategic planning, institutional building, and practical implementation of specific measures. This enables territorial communities not merely to adapt to contemporary challenges but to form their own competitive advantages based on innovation potential and effective utilisation of available resources, ultimately contributing to enhanced quality of life and sustainable development in the Black Sea Economic Region. Future research should examine conflict management mechanisms among stakeholders, relationships between innovation strategy and social equity outcomes, and comparative studies in other post-socialist economies. Quantitative metrics need refinement beyond economic indicators to capture social, cultural, and environmental dimensions.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Alhowaily, A. (2016). Berlin-Adlershof science and technology park and valley of technology. In *Proceedings sustainable mega projects (chance-change-challenge) conference* (pp. 3-5). Belfast: Queen's University Belfast.

[2] Carayannis, E., & Evangelos, G. (2016). Quadruple innovation helix and smart specialization: Knowledge production and national competitiveness. *Foresight and STI Governance*, 10, 31-42. doi: 10.17323/1995-459x.2016.1.31.42.

[3] Chornyi, R., Venger, V., Kushnirenko, O., & Chorna, N. (2025). Innovation and industrial development of Ukrainian regions: Prospects and limitations. *Economy of Ukraine*, 68(2), 3-27. doi: 10.15407/economyukr.2025.02.003.

[4] Constitution of Ukraine. (1996, June). Retrieved from http://zakon5.rada.gov.ua/laws/show/254%D0%BA/96-%D0%B2%D1%80.

[5] Cybulska, M., Mantey, D., & Dziemianowicz, W. (2024). The quadruple helix versus barriers to local development: The example of "dual municipalities". *Quaestiones Geographicae*, 43(4), 169-178. doi: 10.14746/quageo-2024-0035.

[6] Fidanoski, F., Simeonovski, K., Kaftandzieva, T., Ranga, M., Dana, L.-P., Davidovic, M., Ziolo, M., & Sergi, B.S. (2022). The triple helix in developed countries: When knowledge meets innovation? *Heliyon*, 8(8), article number e10168. doi: 10.1016/j.heliyon.2022.e10168.

[7] Fritsch, M., & Wyrwich, M. (2021). Does successful innovation require large urban areas? Germany as a counterexample. *Economic Geography*, 97(3), 284-308. doi: 10.1080/00130095.2021.1920391.
[8] Garcia-Teran, J., & Skoglund, A. (2019). A processual approach for the quadruple helix model: The case of a regional project in Uppsala. *Journal of the Knowledge Economy*, 10, 1272-1296. doi: 10.1007/s13132-018-0521-5.
[9] Gavkalova, N., Avedyan, L., Akimov, O., Akimova, L., & Belyavtseva, V. (2023). The effectiveness of the development of territories in the state regional system politicians. *Financial and Credit Activity: Problems of Theory and Practice*, 4(51), 333-344. doi: 10.55643/fcaptp.4.51.2023.4116.
[10] González-Martinez, P., García-Pérez-De-Lema, D., Castillo-Vergara, M., & Bent Hansen, P. (2023). Determinants and performance of the quadruple helix model and the mediating role of civil society. *Technology in Society*, 75, article number 102358. doi: 10.1016/j.techsoc.2023.102358
[11] Hasche, N., Höglund, L., & Linton, G. (2019). Quadruple helix as a network of relationships: Creating value within a Swedish regional innovation system. *Journal of Small Business and Entrepreneurship*, 32(6), 523-544. doi: 10.1080/08276331.2019.1643134.
[12] Kravchenko, D., & Salun, M. (2025). Helix models as a methodological basis for organizational and economic support of innovative entrepreneurship. *Economy and Society*, 76, 1-4. doi: 10.32782/2524-0072/2025-76-48.
[13] Kushnerov, O., Pohasii, S., Melenti, Ye., Sevriukova, Ye., & Rykov, D. (2025). A multi-task neural network for simultaneous regression and classification of regional security and quality of life indices in Ukraine. *Advanced Information Systems*, 9(4), 89-99. doi: 10.20998/2522-9052.2025.4.12.
[14] Machado, H.P.V., Sartori, R., & Rosa, P.F.M. (2024). Beyond the triple helix model: Scientific production on the quadruple and quintuple helix. *Journal of the Knowledge Economy*, 16, 5758-5791. doi: 10.1007/s13132-024-02026-4.
[15] Marques, P., & Morgan, K. (2021). Innovation without regional development? The complex interplay of innovation, institutions, and development. *Economic Geography*, 97(5), 475-496. doi: 10.1080/00130095.2021.1972801.
[16] Miller, K., McAdam, R., Moffett, S., Alexander, A., & Puthusserry, P. (2016). Knowledge transfer in university quadruple helix ecosystems: An absorptive capacity perspective. *R&D Management*, 46(2), 383-399. doi: 10.1111/radm.12182.
[17] Morawska, J., Mrozowska, S., Młynkowiak-Stawarz, A., Beben, R., Kozłowski, A., & Carayannis, E. (2024). The missing helix thread in innovation ecosystems: A study of co-opetition, coevolution and cospecialization between university and civil society. *IEEE Transactions on Engineering Management*, 71, 14339-14349. doi: 10.1109/TEM.2024.3450516.
[18] Oleksiuk, H.V., Popadynets, N.M., & Samotii, N.S. (2021). Management of territorial communities based on territorial marketing: Theoretical and methodological aspects. *Regional Economy*, 3, 15-27.
[19] Presidential Decree of Ukraine No. 487/2021 "On the National Strategy for Promoting Civil Society Development in Ukraine for 2021-2026". (2021, September). Retrieved from https://zakon.rada.gov.ua/laws/show/487/2021#Text.
[20] Roman, M., & Fellnhofer, K. (2022). Facilitating the participation of civil society in regional planning: Implementing quadruple helix model in Finnish regions. *Land Use Policy*, 112, article number 105864. doi: 10.1016/j.landusepol.2021.105864.
[21] Samara, E., Kilintzis, P., Katsoras, E., Martnidis, G., & Kosti, P. (2024). A system dynamics approach for the development of a regional innovation system. *Journal of Innovation and Entrepreneurship*, 13, article number 26. doi: 10.1186/s13731-024-00385-5.
[22] Stephens, R.J.S. (2025). Quadruple helix co-creation and cities: Behavioral and institutional changes in innovation capacities and cultures. *Cities*, 157, article number 105579. doi: 10.1016/j.cities.2024.105579.
[23] Stiglitz, J.E., Lin, J.Y., & Monga, C. (2013). *The rejuvenation of industrial policy*. Washington: The World Bank.
[24] Taratori, R., Rodriguez-Fiscal, P., Pacho, M.A., Koutra, S., Pareja-Eastaway, M., & Thomas, D. (2021). Unveiling the evolution of innovation ecosystems: An analysis of triple, quadruple, and quintuple helix model innovation systems in European case studies. *Sustainability*, 13(4), article number 7582. doi: 10.3390/su13147582.
[25] Todeva, E., & Panayiotis, K. (2017). Regional entrepreneurship and innovation management: Actors, helices and consensus space. *Management Dynamics in the Knowledge Economy*, 5(1), 57-76.
[26] Tomashuk, I., & Tomashuk, I. (2023). Strategic foundations of innovative development of territorial communities. *Economy and Society*, 57, 1-14. doi: 10.32782/2524-0072/2023-57-81
[27] Vasiuk, N., & Haievska, L. (2023). Mechanisms of the network of government, in the operations of public authorities: Essence of concepts. *Public Administartion Aspects*, 11(2), 17-23. doi: 10.15421/152314.

[28] Zarichniak, A., Tokareva, V., Poliova, N., Mykolaichuk, M., Grechanyk, B., & Podibka, V. (2025). Models of regions' innovative development: International experience and prospects for Ukraine within the sustainability paradigm. *Grassroots Journal of Natural Resources*, 8(2), 591-613. doi: 10.33002/nr2581.6853.080228.

Стратегія підвищення конкурентності територіальних громад Причорноморського економічного району на інноваційних засадах

Людмила Мельник
Доктор економічних наук, професор
Уманський національний університет
20300, вул. Інститутська, 1, м. Умань, Україна
https://orcid.org/0000-0003-2498-5556
Геннадій Ніколенко
Аспірант
Уманський національний університет
20300, вул. Інститутська, 1, м. Умань, Україна
https://orcid.org/0009-0000-9316-866X
Віталій Сторожук
Аспірант
Уманський національний університет
20300, вул. Інститутська, 1, м. Умань, Україна
https://orcid.org/0009-0005-3883-7636

Анотація. Сучасний економічний розвиток, що характеризується прискореною глобалізацією, цифровізацією та трансформацією соціальних відносин, ставить перед територіальними громадами нові виклики, водночас відкриваючи можливості для їх інноваційного розвитку, що робить критично важливим розроблення адаптованих стратегій підвищення конкурентоспроможності в умовах реформи децентралізації та структурних трансформацій в Україні. Метою статті було розроблення інноваційної стратегії для підвищення конкурентоспроможності територіальних громад у Причорноморському економічному районі. Проаналізовано обмеження традиційної моделі «потрійної спіралі» («університет-уряд-бізнес») для українських умов та обґрунтовує необхідність впровадження підходу «четверної спіралі», що включає громадянське суспільство як ключовий елемент. У дослідженні запропоновано інтегровану інноваційну модель, що складається з п'яти основних компонентів: інноваційної стратегії, інноваційної екосистеми, інноваційної інфраструктури, інноваційної культури та системи управління інноваціями. Представлено комплексний алгоритм реалізації інноваційної стратегії, що охоплює 12 послідовних етапів від комплексної діагностики до інституціоналізації інноваційної діяльності. Особлива увага приділена розвитку територіальних центрів компетенції, механізмів адаптивного стратегічного планування та міжтериторіальних інноваційних альянсів на основі державно-приватного партнерства. У статті викладено конкретні пропозиції щодо реалізації інноваційної стратегії в короткостроковій (1-2 роки) та довгостроковій (5-10 років) перспективі з урахуванням унікальних характеристик територіальних громад району. Результати дослідження підтвердили, що для успішної реалізації необхідна систематична координація між зацікавленими сторонами, лідерство з боку органів місцевого самоврядування та гнучке реагування на зміни в зовнішньому середовищі. Запропонований підхід забезпечує комплексні рішення для викликів у сфері інноваційного розвитку шляхом інтеграції стратегічного планування, інституційного розвитку та практичної реалізації конкретних заходів

Ключові слова: конкурентоспроможність; інноваційна стратегія; інноваційна екосистема; модель «четверної спіралі» інноваційного розвитку; стратегічне планування