UDC 330.341.1:332.1:005.21
DOI: https://doi.org/10.32782/1814-1161/2025-1-21

Bielousov Yaroslav
Candidate of Economic Sciences, Associate Professor,
Associate Professor of the Department of Light Industry Technologies,
Volodymyr Dahl East Ukrainian National University
ORCID: https://orcid.org/0000-0002-5830-7553

Wu Qian
Postgraduate,
Volodymyr Dahl East Ukrainian National University

Бєлоусов Я.І.
кандидат економічних наук, доцент,
доцент кафедри технологій легкої промисловості,
Східноукраїнський національний університет ім. В. Даля

Wu Qian
аспірант,
Східноукраїнський національний університет ім. В. Даля

METHODOLOGICAL APPROACH TO THE DEVELOPMENT OF INNOVATION POTENTIAL OF REGIONAL ECONOMIC SYSTEMS

МЕТОДИЧНИЙ ПІДХІД ДО РОЗВИТКУ ІННОВАЦІЙНОГО ПОТЕНЦІАЛУ РЕГІОНАЛЬНИХ ЕКОНОМІЧНИХ СИСТЕМ

The article reveals the conceptual and practical foundations for developing a methodological approach to the enhancement of the innovation potential of regional economic systems (RES) in the context of digital transformation, globalization, and intensifying interregional competition. It highlights that innovation potential is an integrated attribute encompassing scientific, technological, educational, institutional, human, infrastructural, and financial components. A critical analysis of current approaches to interpreting the essence of innovation potential is conducted, including resource-based, functional, processual, institutional, and network approaches. The study demonstrates that most existing methodologies are fragmented and fail to provide a systemic vision for the development of innovation potential at the regional level. The author substantiates a methodological approach based on systemic analysis of structural components of RES innovation potential and proposes a model of interaction among key innovation actors in accordance with the «quadruple» and «quintuple helix» concepts. The main hypothesis asserts that sustainable development of innovation potential is feasible only if all its components function in a balanced manner, while effective management requires typologizing regions and evaluating their capacity for innovation-driven collaboration. The article presents a structural model of RES potential, illustrating its position within the overall system of regional economic potential, and defines a set of criteria for quantitative and qualitative assessment of innovation development. The practical significance of the developed approach lies in providing tools for designing smart specialization strategies, fostering innovation breakthroughs, and improving the efficiency of cross-sectoral cooperation. Special attention is given to leveraging special economic zones, cluster structures, and virtual enterprises as mechanisms for strengthening innovation potential. The article outlines further research directions, including the development of digital indicators for innovation potential monitoring, creation of regional roadmaps for innovation-driven development in Ukraine, and practical testing of the proposed methodology.

Keywords: *innovation potential, regional economic systems, methodological approach, digital transformation, smart specialization.*

У статті розкрито концептуальні та прикладні засади формування методичного підходу до розвитку інноваційного потенціалу регіональних економічних систем (РЕС) в умовах цифрової трансформації, глобалізації та посилення міжрегіональної конкуренції. Зазначено, що інноваційний потенціал є інтегрованою характеристикою, яка включає науковий, технологічний, освітній, інституційний, кадровий, інфраструктурний та фінансовий компоненти. Проведено критичний аналіз сучасних підходів до трактування сутності інноваційного потенціалу, зокрема ресурсного, функціонального, процесного, інституціо-

нального та мережевого. Доведено, що більшість існуючих методик мають фрагментарний характер і не забезпечують системного бачення розвитку інноваційного потенціалу на регіональному рівні. У межах дослідження автором обґрунтовано методичний підхід, заснований на системному аналізі структурних елементів інноваційного потенціалу РЕС, а також запропоновано модель взаємодії ключових суб'єктів інноваційної діяльності відповідно до концепцій «четверної» та «п'ятикратної спіралі». Основною гіпотезою є твердження про те, що сталий розвиток інноваційного потенціалу можливий за умови збалансованого функціонування всіх його компонентів, а ефективне управління потенціалом має ґрунтуватися на типологізації регіонів та їх спроможності до інноваційної взаємодії. Стаття містить структурну модель потенціалу РЕС, що демонструє його місце в загальній системі регіонального економічного потенціалу, а також систему критеріїв для кількісної та якісної оцінки рівня інноваційного розвитку. Зазначено практичне значення розробленого підходу, який полягає у створенні інструментарію для формування регіональних стратегій смарт-спеціалізації, забезпечення інноваційного прориву та підвищення ефективності міжсекторної взаємодії. Окрему увагу приділено можливостям використання спеціальних економічних зон, кластерних структур і віртуальних підприємств як механізмів посилення інноваційного потенціалу. Представлено перспективи подальших досліджень, серед яких – розробка цифрових індикаторів моніторингу інноваційного потенціалу, створення дорожніх карт інноваційного розвитку регіонів України та апробація методики на практиці.

Ключові слова: *інноваційний потенціал, регіональні економічні системи, методичний підхід, цифрова трансформація, смарт-спеціалізація.*

Formulation of the problem. In the current context of dynamic development of the global economy and intensification of digital transformations, the innovation potential of regional economic systems is becoming a determining factor in increasing their competitiveness, sustainability and ability to adapt to uncertainty. At the same time, Ukraine has an uneven spatial distribution of innovation resources, poor integration of regions into the national innovation system, and an insufficient level of innovation support infrastructure, which hinders the formation of an effective environment for innovation at the local level. The problem is exacerbated by the lack of a comprehensive, scientifically based methodological approach to the development of innovation potential that would take into account industry specifics, typological features of regions, their level of institutional maturity, digital transformation, and the potential for stakeholder interaction. Existing methodologies are generally focused on quantifying certain aspects of innovation potential and do not provide a holistic view of its development in a systemic way. Therefore, there is an urgent need to develop a methodological approach that would allow to identify strategic directions for the development of the innovation potential of regional economic systems, to form adaptive models of innovative growth and to ensure effective management of innovation resources at the regional level.

Analysis of recent achievements and publications. In recent years, considerable attention has been paid to the formation and methodology of developing the innovation potential of regional economic systems, with research covering both Ukrainian practice and global conceptual approaches. Ukrainian scholars, such as Dergaliuk and Tulchynska (2023), emphasise the need for a comprehensive assessment of the potential of regions based on the integration of quantitative indicators and typological properties, taking into account spatial and infrastructural factors. In particular, Perepeliukova (2023) explores the essence of digital hubs, incubators, and electronic infrastructure as key elements of the potential-forming space of regions. Dergaliuk (2022) also highlights the principles of strategic management of regional potential with an emphasis on the interaction of science, business, government, and civil society. As for foreign studies, Gaspar and Osawa (2022) emphasise the role of 'related diversity' and spatial interaction of regions in stimulating innovative development, while Tedesco & Ramos Soria (2023) investigate grassroots innovations as an important factor in the formation of innovation ecosystems. In addition, the introduction of quadruple/quintuple helix models provides a holistic approach to analysing the interaction of key actors in regional innovation systems.

Given the gap between the need for a holistic methodological approach and the fragmentation of existing practices, **the purpose of this article is** to substantiate a universal methodological approach to the development of the innovation potential of regional economic systems.

Presentation of the main material. In the existing theories of economic development the main criterion for the growth and development of economic systems are innovations with the allocation of the main source of development of regional economic systems and economic entities of the regional economy – innovation potential. The category «innovation potential» has been actively used in scientific and economic literature since the late 1970s - since the beginning of the development of innovation and innovation activity.

The main provisions of innovative development are presented in the stated directions: growth of innovative activity of economic entities, increase in intellectual capital, multiple growth of innovative products production, growth of R&D, training of specialists for innovative activity, etc.; the provision of innovative potential of economic entities is stated for the first time.

The regional economic system is represented by a set of interrelated and interacting economic entities and their elements with regard to the issues

of production, consumption, distribution, exchange of resources and products (services) [4].

The main component of the region's development is its economic potential, which reflects its economic independence and self-sufficiency. This category represents the result of the use of accumulated resources, opportunities of the region and is the basis for its further growth and development.

The term 'potential' is used by various sciences that have their own subject and their own research methodology, which allows us to form scientific, economic, technological and other aspects of this concept, its content and essence.

In economic research there are different approaches to the definition of the economic potential of the region and RPS, their forming elements. In addition, scientists define the relationship between economic and innovation potentials in different ways. The main approaches to the definition of the essence and content of the economic potential of the region are presented:

– resource approach, which reveals the totality of resources available in the region;

– functional approach, in which the economic potential is determined by the totality of capabilities of the branches of the economy to fulfil their own functions;

– approach, in which the economic potential is presented as a characteristic of the economic power, competitive superiority of the region and the state;

– approach, which characterises the economic potential by the results of economic and production relations of the sub-unit.

Hence, it follows that the economic potential of RES represents the complex capabilities of the system under study to carry out reproductive activities, which are realised by using the regional resource base. Economic potential is an integrated system of interrelated and interacting potentials: production, scientific, technological, resource, commercial, managerial, organisational, financial, investment and other potentials that characterise the capabilities of the RES in a particular area of activity and form potential directions for achieving the set goal.

The production and technological potentials of the region are considered by researchers as potentials included in the RPS, which represent the presence of a set of production factors: production resources and sources of their replenishment, means of production (fixed assets), enterprise personnel, material stocks, intangible assets, products, etc., which are used to realise the goals of the region's economic entities [5].

At present, the main factors in the activities of economic entities of the region and the country are information, knowledge, innovations, intellectual property, scientific and technological progress, which are the elements of the innovation potential of RES taking into account their abilities, capabilities and readiness to generate, diffuse and implement innovative ideas.

Before carrying out theoretical research of the category «innovation potential», it is necessary, in our opinion, to present the content of RES innovation activity.

The category «innovation» (Latin innovare) means the use of something new and is represented by many definitions, which indicates the multifaceted, multidimensional and multidisciplinary nature of this concept. In its content, innovation is a commercialised innovation in various spheres of activity based on scientific achievements.

The category «innovation activity» in scientific usage began to be used in the twentieth century and describes «activities (scientific, technological, organisational, investment and commercial), which are aimed at the development and implementation of innovative projects, as well as the development of the infrastructure of this activity» [1]. Consequently, innovation activity includes a set of activities aimed at implementing innovation processes that integrate science, production, resources, education and investment for the formation and implementation of innovation [4].

The process approach substantiates the fact that the technological mode determines economic growth, and scientific and technological progress (STP) is formed by external conditions. According to the theoretical developments of J. Schumpeter, new technologies form the potential for economic development only in the next wave of the business cycle [2].

The term «innovation potential» was first introduced by K. Freeman in the framework of the study of wave theory, where the scientist suggested that innovations are the basis for the creation of production-economic and organisational-social potentials of society [4]. His research was continued by G. Mensch, distinguishing basic (improving) innovations and pseudo-innovations that have an impact on the formation and development of production technologies [2]. It follows from G. Mensch's scientific developments that a new basis is formed at the last stage of the previous technological cycle (basis), and the innovation potential required for its development is formed in the middle of the previous cycle. Based on this, G. Mensch expressed the assumption that the basis of innovation potential is technological potential.

Thus, within the framework of the process approach, the basis for further research on innovation potential was created. Note that this approach did not consider the mechanisms of diffusion, transfer and commercialisation of innovations, which determine the basis for its development.

The next approach in the study of innovation is the functional approach, which investigates the impact of the market on the innovation activity of economic subjects of the RES, as well as the processes of state regulation of innovation. The functional approach applies 2 hypotheses:

– hypothesis based on the priority of market demand in innovation activity, representing the subject that innovations are based not on scientific research, but on market demand for innovative products. This hypothesis implies that economic (market) factors

determine innovation activity [3]. The disadvantage of the hypothesis is the dependence of innovation on market demand, and innovation activity is determined by the resource and economic capabilities of society for its implementation;

– hypothesis of 'technological breakthrough', reflecting the fact that the basis of economic development is technological patterns, and NTP is reflected in the growth of the number of inventions [2]. It follows from this hypothesis that the basis of modern society is technological patterns, and NTP reflects the number of inventions and developments relative to the previous period.

Further, the research of innovation potential was supplemented by the institutional approach, which is represented by the works of foreign scientists. In their works, the prerequisites for the formation of the institutional approach are economic progress and the processes of increasing complexity of economic systems due to the change of institutions, technologies, organisations and products, based on institutional and evolutionary economic theories [3].

The institutional approach in the theory of innovation includes 3 areas of research:

– concept of technological patterns – reflects the technological evolution of the economy, basic technological processes and factors influencing the formation of new technological patterns [5];

– theory of innovation diffusion – reflects the impact of technological systems on the growth rate of the economy, diffusion of innovation, the theory of growth poles, technological competition [2];

– the concept of national innovation systems (NIS) – reflects the economic relations of subjects of innovation activity that create innovation potential, as well as the degree of interaction between the elements of this system [1].

A number of researchers combine innovation potential with scientific, educational, intellectual, technical, creative and information potentials and analyse innovation activity within these potentials [3].

Some researchers define innovation potential as the possibility, readiness and ability of the economic system to carry out innovation activity, reflecting in their works that the possibility is the potential prerequisites and conditions for the implementation of innovation activity, readiness is the availability of resource base, innovation reserves and their sufficiency for innovative developments, ability is the presence of organisational structure and elements that allow to produce and implement innovations.

The author's hypothesis of the study, reflecting the development of innovation potential of RPS, is the presentation of signs of the aggregate stability of the functioning of its elements, and the condition of the effectiveness of the system development will be formed due to the stability of the overall development of the elements of innovation potential.

The methodological approach to the development of innovation potential is presented in Fig. 1.

The methodological approach to the development of innovation potential of RES provides a balance in the implementation of innovation processes between its elements, and as a consequence – stabilization and development of elements of RES, characterised by the sustainability of its functioning. In this case, the balance and growth of innovation potential indicators lead to the consolidation of RPS activities, which, in turn, transforms the regional space, in particular through regional and interregional diffusion of innovations.

The directions for the development of RPS innovation potential are also the creation of ecological balance in the region, limitation and optimisation of the activity of production activities polluting the natural environment in order to preserve natural resources and the quality of life of the region's population through the application of innovative resource-saving technologies that not only maintain production rates, but also increase the degree of their development.

The place of innovation potential in the complex of RPS potentials is presented in Fig. 2.

Theoretical approaches to the content, essence and methodological support of innovation potential assessment are reflected in the works of various scientists from different international schools and scientific organisations, such as: the Organisation for Economic Co-operation and Development (OECD), the European Commission for Innovation, the Industrial Development Organisation at the United Nations (UNICTAD), research centres of the World Bank and other structures.

Based on the research of various scientists of the category «innovation potential», the author carried out a systematisation of methodological approaches to the study of the essence and content of innovation potential (Fig. 3).

The methodology of approaches to the study of the category 'innovation potential' is supplemented by the author with the network approach, due to the fact that at the current stage of innovation development the integration of activities is used, including clustering, creation of network and virtual enterprises. In this case, the innovation potential is represented by integration effects, which imply the consolidation of innovation activities and innovation capabilities, additional use of resources and technologies for the development of innovation. In addition, the author proposes additional use of opportunities of special economic zones (SEZ) and territories of advanced development (TOR) in the institutional approach.

Among other things, territorial-industrial complexes are widely used, which provide additional opportunities for the development of innovation potential by increasing capital investment in the assets of enterprises.

Conclusions. The study has shown that innovation potential is one of the key determinants of sustainable socio-economic growth of regions in the current conditions of digitalisation, globalisation and growing competition. At the same time, the existing regional policy in Ukraine does not sufficiently take into account the complexity and multicomponent nature of this phenomenon, which leads to fragmentation and inconsistency of management decisions. The absence of a holistic methodological

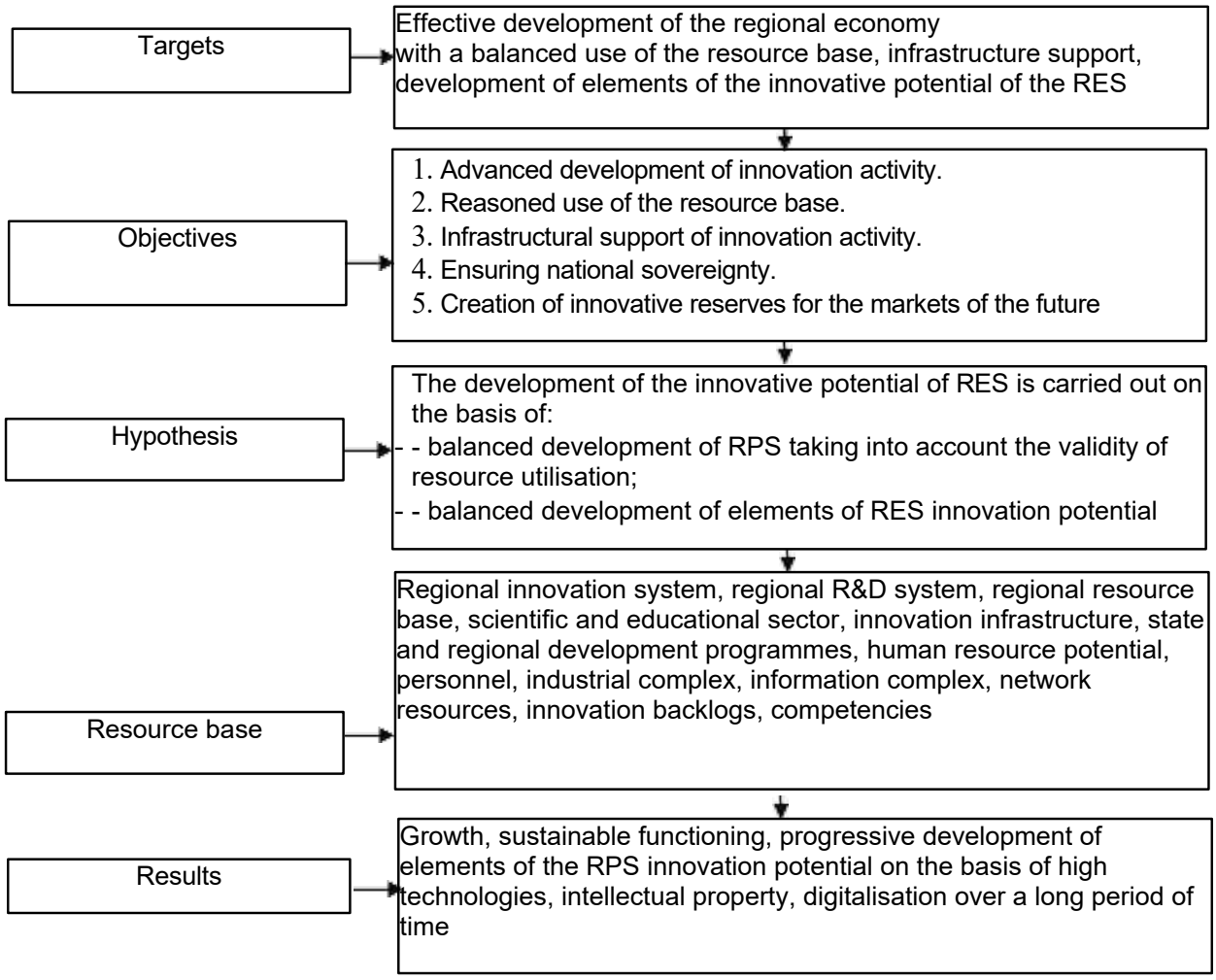

Fig. 1. Methodological approach to the development of RPS innovation potential

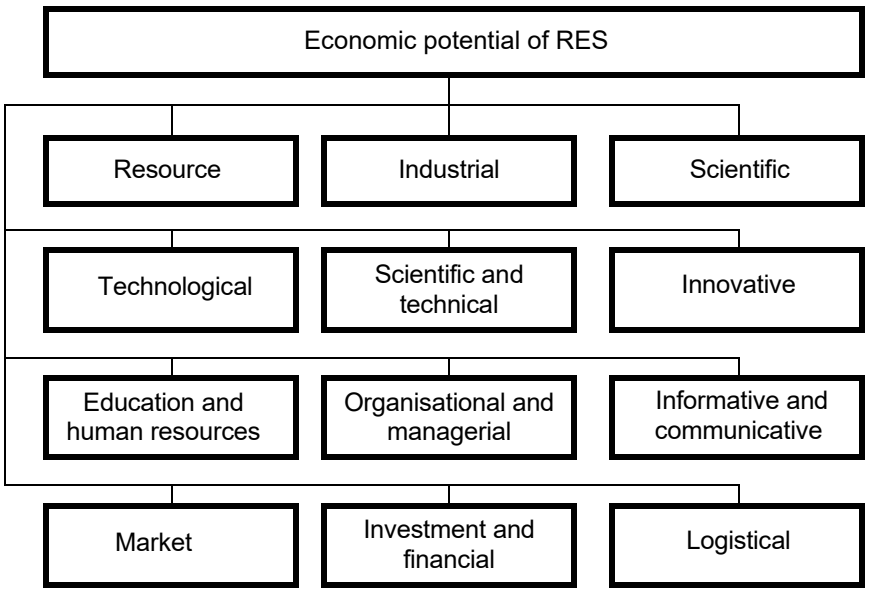

Fig. 2. The place of innovation potential in the complex of RES potentials

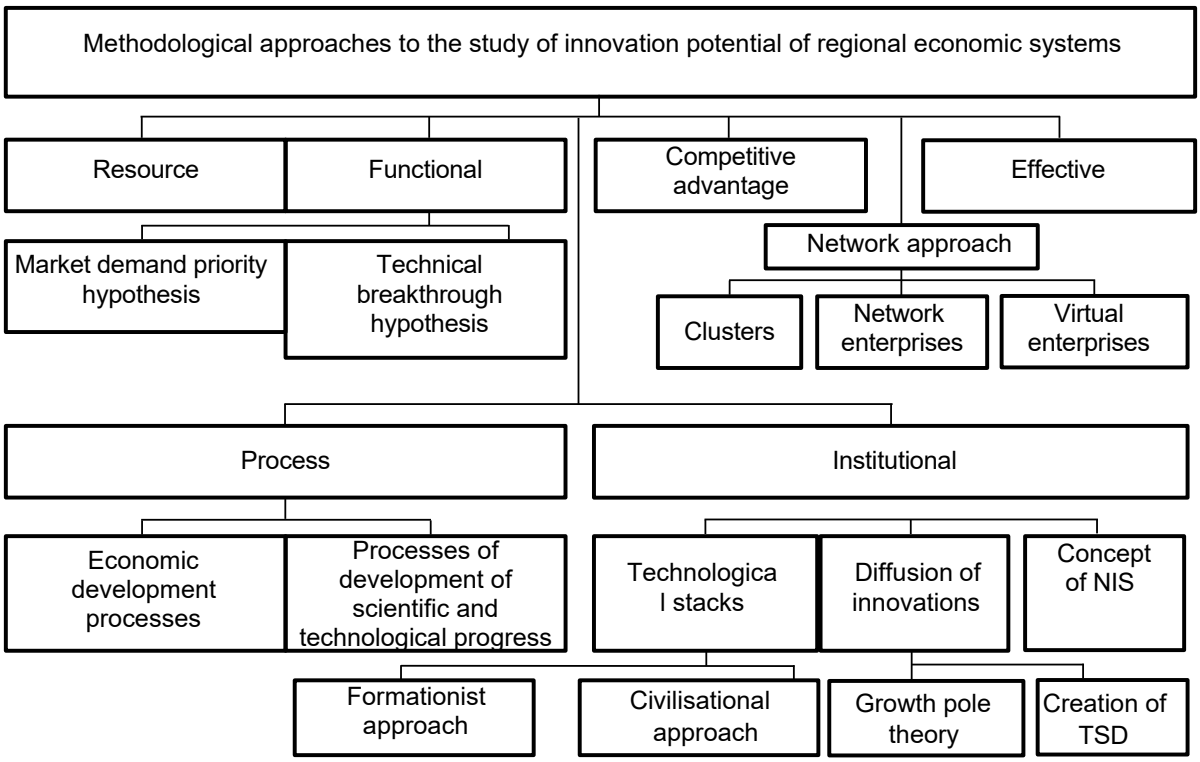

Fig. 3. Systematisation of methodological approaches to the study of the category «innovation potential»

approach to the development of innovation potential hinders the efficient use of resources, slows down the integration of regions into national and international innovation networks, and increases socio-economic inequality. Based on the analysis, the article substantiates the need for a multi-level approach to the development of innovation potential, which combines quantitative and qualitative assessment methods, takes into account the typological features of regions, the level of infrastructure development, institutional capacity and digital transformation. A methodological approach based on a systematic analysis of the structural components of innovation potential (scientific, technical, intellectual, human, financial, infrastructure), as well as on a model of interaction between key actors of innovation activity in accordance with the quadruple and quintuple helix concepts, is proposed. The results of the study confirmed the feasibility of typologising regions by levels of innovation potential in order to form adaptive strategies for innovation development, taking into account spatial spillover effects, innovation clusters, local initiatives and the potential for innovation transfer. The proposed methodological approach allows to form a toolkit for managing innovation potential, focused on ensuring smart specialisation of regions, increasing the efficiency of resource use and strengthening the position of regions in the national innovation ecosystem.

The practical significance of the developed approach lies in its ability to ensure the adoption of sound management decisions on regional development, support for innovation infrastructure, and intensification of partnership between science, business, government, and society. Prospects for further research include the development of digital indicators for monitoring innovation potential, the formation of regional roadmaps for innovation development, and testing the proposed methodology on the example of specific regions of Ukraine.

References:

1. Dergaliuk, M. S., & Tultchynska, S. O. (2023). Methodical approaches to assessing the potential for regional innovation development. *Ekonomika ta derzhava*, (2), 35–41. DOI: https://doi.org/10.32702/2306-6806.2023.2.35
2. Perepelyukova, O. V. (2023). Spatial and functional model of innovation potential of regions. *Visnyk sotsialno-ekonomichnykh doslidzhen*, 2(85), 128–135. DOI: https://doi.org/10.33763/SEJ2023.02.128
3. Dergaliuk, M. S. (2022). Management of regional innovation potential in the system of ensuring smart specialisation. *Ekonomika i orhanizatsiia upravlinnia*, 3(47), 22–29. DOI: https://doi.org/10.31558/2307-2318.2022.3.3
4. Gaspar, J., & Osawa, M. (2022). Innovation and spatial relatedness in regional economies: An empirical approach. *arXiv preprint*, arXiv:2212.14475. URL: https://arxiv.org/abs/2212.14475
5. Tedesco, L., & Ramos Soria, M. (2023). Measuring grassroots innovation potential in regional ecosystems of Latin America. *arXiv preprint*, arXiv:2401.06163. DOI: https://doi.org/https://arxiv.org/abs/2401.06163

Бібліографічний список:

1. Дергалюк М. С., Тульчинська С. О. Методичні підходи до оцінювання потенціалу інноваційного розвитку регіонів. *Економіка та держава*. 2023. № 2. С. 35–41. DOI: 10.32702/2306-6806.2023.2.35

2. Перепелюкова О. В. Просторово-функціональна модель інноваційного потенціалу регіонів. *Вісник соціально-економічних досліджень*. 2023. № 2(85). С. 128–135. DOI: https://doi.org/10.33763/SEJ2023.02.128
3. Дергалюк М. С. Управління інноваційним потенціалом регіонів у системі забезпечення смарт-спеціалізації. *Економіка і організація управління*. 2022. № 3(47). С. 22–29. DOI: https://doi.org/ 10.31558/2307-2318.2022.3.3
4. Gaspar, J., & Osawa, M. (2022). Innovation and spatial relatedness in regional economies: An empirical approach. *arXiv preprint*, arXiv:2212.14475. URL: https://arxiv.org/abs/2212.14475
5. Tedesco, L., & Ramos Soria, M. (2023). Measuring grassroots innovation potential in regional ecosystems of Latin America. *arXiv preprint*, arXiv:2401.06163. URL: https://arxiv.org/abs/2401.06163