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INNOVATION-INVESTMENT PROVISION OF REGIONAL ENVIRONMENTALLY SAFE DEVELOPMENT

Abstract. The purpose of the scientific publication is to analyze the dynamics of innovation and investment support for regional ecological development, to identify prospective ways to improve the financial incentives for innovative environmentally-oriented development of Ukrainian regions. The achievement of the purpose of environmentally sustainable development of the country and its regions requires an innovative approach, which essence is to introduce innovations aimed at accelerating quantitative and qualitative changes in the methods of management combined with the development and absorption of environmentally safe innovations, the development of the market for innovative environmental goods and services. The article emphasizes that the innovative eco-sustainable development is the main means of solving a wide range of problems in almost all spheres of life and characterizes the quality of the socio-economic system of the country as a whole and its regions. The article discusses the features of implementation of innovations and investment in the regional ecological development. It analyses the dynamics of innovation-investment support of regional ecological development based on calculations of innovation-scientific and investment indicators. This provided the basis for their rating assessment and identification of the interregional differentiation of administrative regions of Ukraine according to the indexes, which could be the basis for making managerial decisions on innovation and investment support for environmentally sustainable development, taking into account regional peculiarities. It is proved that for the activation of innovation and investment support for regional eco-sustainable development, it is necessary to determine its preconditions, taking into account the assessment of the possibilities of implementation of innovations and attraction of investments in the regions of Ukraine. Indices of innovation and investment support for environmentally safe development of the region are calculated on the basis of statistical data that have an enormous influence on their level and their grouping has been conducted according to qualitative features. A number of measures have been proposed to improve the financial incentives for innovative environmentally-oriented regional development.

***Keywords*:** innovation and investment projects, eco-sustainable development, environmental innovations, innovation activity, capital investments, financial sources.

JEL Classification Q56, R58, O31, G31

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ІННОВАЦІЙНО-ІНВЕСТИЦІЙНЕ ЗАБЕЗПЕЧЕННЯ РЕГІОНАЛЬНОГО ЕКОБЕЗПЕЧНОГО РОЗВИТКУ

Анотація. Метою наукової публікації є аналіз динаміки інноваційно-інвестиційного забезпечення регіонального екобезпечного розвитку, визначення перспективних шляхів поліпшення фінансового стимулювання інноваційного екологічно орієнтованого розвитку регіонів України. Досягнення мети екобезпечного розвитку країни та її регіонів потребує інноваційного підходу, який полягає в запровадженні інновацій, спрямованих на прискорення кількісних і якісних змін у способах господарювання, пов'язані з розробленням і засвоєнням екобезпечних нововведень, розвитком ринку інноваційних екологічних товарів і послуг. Акцентовано увагу на тому, що інноваційний екобезпечний розвиток — це основний засіб розв'язання широкого кола проблем майже в усіх сферах життєдіяльності й характеризує якість соціально-економічної системи країни загалом та її регіонів. Розкрито особливості інноваційно-інвестиційного забезпечення регіонального розвитку. Здійснено аналіз динаміки інноваційно-інвестиційного забезпечення регіонального екобезпечного розвитку на основі розрахунків інноваційно-наукового й інвестиційного індикаторів. Це дало підставу здійснити їхню рейтингову оцінку і виявити міжрегіональну диференціацію адміністративних областей України за цими індексами, що може бути покладено в основу ухвалення управлінських рішень щодо інноваційно-інвестиційного забезпечення екобезпечного розвитку з урахуванням регіональних особливостей. Доведено, що задля активізації інноваційно-інвестиційного забезпечення регіонального екобезпечного розвитку потрібно визначити його передумови, ураховуючи оцінку можливостей запровадження інновацій і залучення інвестицій у регіони України. Розраховано індекси інноваційного та інвестиційного забезпечення екобезпечного розвитку регіону на основі статистичних даних, які чинять найбільший вплив на їхній рівень, і проведено їх групування за якісними ознаками. Запропоновано низку заходів щодо поліпшення фінансового стимулювання інноваційного екологічно орієнтованого регіонального розвитку.

***Ключові слова*:** інноваційно-інвестиційне забезпечення, екобезпечний розвиток, екологічні інновації, інноваційна активність, капітальні інвестиції, фінансове стимулювання.

Формул: 0; рис.: 3; табл.: 2; бібл.: 19.

Introduction. The balanced economic growth of the country is based, first of all, on the implementation of environmental innovations in the regions. The innovation-investment support for environmentally-oriented development of the region has now become extremely urgent. Under conditions of implementation of the Association Agreement between Ukraine and the European Union, the introduction of a mechanism for innovation and investment provision for the environmentally sustainable development of its regions becomes necessary. Therefore, it is necessary to develop theoretical and practical aspects in order to improve the innovation and investment support of environmentally sustainable development of the region.

Analysis of recent researches and publications. Theoretical, methodological and applied provisions of innovation-investment of regional development are demonstrated in the scientific works of Antoniuk L. L. [1], B. B. Boichenko [2], Danylyshyn B. M. [3], Dotsenko O. Yu. [4], Illyashenko S. M. [5], Sukhorukov A. I. [6]. The following scientists, such as Burkinsky B. V. [7], Kolomicheva O. V. [8], Kravtsev V. S. [9], Pavlikha N. V. [10], Semenyuk N. W. [11] have studed problems of environmentally safety of regional development. However, further research of the issue of innovation and investment support for regional ecological development is needed.

The purpose of the article is to analyze the dynamics of innovation and investment support for regional ecological development, to identify prospective ways to improve the financial incentives for innovative environmentally-oriented development of Ukrainian regions.

Research results. Innovative development involves the formation of a set of measures for the development and introduction of various innovations to business activities in the region. By contrast with it the innovation and investment support for environmentally-friendly development introduces innovations, which main objective is to ensure the environmental safety of the region.

The achievement of the purpose of environmentally sustainable development of the country and its regions requires an innovative approach, which essence is to introduce innovations aimed at accelerating quantitative and qualitative changes in the methods of management combined with the development and absorption of environmentally safe innovations, the development of the market for innovative environmental goods and services.

L. M. Granovska states that the aggravation of environmental problems in the country, which became equal to the socio-economic ones, requires ecologization of the processes of innovation development, which actualizes the problem of rationalizing the choice of trajectories of innovation growth of the national economy according to the criteria of economic efficiency and environmental safety [12].

Consequently, achieving the purpose of environmentally sustainable development of the country and its regions is impossible without innovation and investment support.

The process of environmentally sustainable development of the region involves the consistent introduction of new technology and new forms of organization of production, the adoption of managerial and other decisions that enable to increase the efficiency of using the natural resources of the region while preserving the natural environment and improving it at different levels of management, should be clearly stated and take its place in the structure of the regional innovation system [13].

Considering the ecologically oriented innovation development of the region, it can be argued that this is the process of activity of economic activities, which is aimed at introducing resource-saving and non-waste technologies in order to achieve social and ecological-economic effect. This is the process of creation, introduction and using of innovations related to changes in production technology and management methods in the direction of ensuring the environmental safety of the region.

Study of the region as a complex multi-level system requires the identification of factors that influence its development. Particular attention is paid to the identification of factors, their study and use in the analysis of innovation and investment support for regional ecological development, because today it is important to stimulate innovation activity in the regions of Ukraine.

In modern conditions, innovative eco-sustainable development is the main means of solving a wide range of problems in almost all spheres of life and characterizes the quality of the socio-economic system of the country as a whole and its regions. The complexity of this phenomenon excludes the possibility of assessing the ecological innovation of the region and its place among other regions through the analysis of individual indicators and the simple relationships between them. A limited set of indicators gives an incomplete or false vision of the region. Therefore, there is a need for a synthetic analysis of innovation processes in the regions and the carrying out of such an assessment, which reflects the real state and dynamics of changes [14].

The components of regional innovation development include: natural resource potential of the region; labor potential of the region; innovation potential of the region; financial and investment potentials of the region [15].

The system of innovation processes management includes the system of regulation of the scientific-technical and innovation sphere of the region, the system of development of innovation infrastructure, which is aimed at increasing the effectiveness of the use of existing innovation potential and the creation of efficient regional structures [16, p. 83]. Thus, innovative support is formed by data of the development of science and innovation. In particular, to the indicators reflecting the level of development of science, belong the number of organizations that carried out research and development, the number of workers involved in the implementation of research and development, and the number of researchers who have the appropriate education. The development of innovations is characterized by the number of industrial enterprises that carry out innovative activities and the volume of new technological processes introduced at industrial enterprises.

Investment provision for the environmentally safe development of the region is characterized by indicators such as the volume of capital investments realized in the region, as well as the costs of protection and rational use of natural resources (in terms of current and capital costs) and the financing of innovation and research activities (in particular, the costs of innovation activities and carrying out of scientific research and development).

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For the intensifing of innovation and investment support of regional eco-sustainable development, it is necessary to determine its preconditions, taking into account the assessment of the possibilities of introducing innovations and attracting investments to the regions of Ukraine. Such preconditions are characteristic of innovation-scientific potential, as well as the level of investment support.

The advancement of these preconditions is a determining factor in real changes in the structure of the region's economy, increasing of its competitiveness and quality of life of the population.

Evaluating of the scientific potential of the regions, it should be noted that over the period 2015—2019, the number of organizations that carried out research and development in the Donetsk, Lugansk and Transcarpathian regions significantly decreased, however, positive dynamics is observed in the Kherson, Ternopil and Zaporizhzhia regions. During 2019, 950 organizations performed scientific research and development in Ukraine, 42,9% of which belonged to the state sector of the economy, 43,1% to entrepreneurship, and 14% to higher education. About a third of the total number of scientific organizations is located in Kyiv, 14,6% in Kharkiv, 7,3% in Lviv, 6,0% in Dnipropetrovsk and 5,4% in Odesa regions [17].

The number of employees involved in research and development in Ukraine in 2019 amounted to 79262 people, which is 10% less than in 2018. 44,5% of doctors of science and doctors of philosophy (candidates of sciences), who carried out research and development, worked in organizations of the state sector of the economy, 17,5% — higher education, 38% — entrepreneurship sector. The largest number of scientists who carried out research and development in terms of education during 2018-2019, was in Kharkiv, Dnipropetrovsk, Lviv, Odessa regions and Kyiv.

The main indicators of the evaluation of innovation support for environmentally sustainable development are the innovative activity of enterprises as a share of those who introduced innovations to the total number of controlled industrial enterprises in the region, the total amount of expenses for innovation activities by regions, as well as their structure, introduction of new technological processes at industrial enterprises by region, the number of names of introduced innovative types of products at industrial enterprises by regions, distribution in environmental protection innovations by regions of Ukraine. As a result of the analysis of these indicators, corresponding conclusions can be made regarding the innovative provision of environmentally sustainable development of the regions of Ukraine.

Unfortunately, the process of introducing of innovations into production in the regions of Ukraine is slow and insignificant. According to the State Statistics Service of Ukraine [18], in 2019 the share of enterprises engaged in innovations amounted to 15,8%, which is 3,1% less than in 2016 (*Table 1*). This indicates a positive trend towards increasing the number of innovative enterprises in the regions of Ukraine.

Table 1

Innovative activity of industrial enterprises according to the directions of innovations for 2015—2019

Indicators	2015	2016	2017	2018	2019
Share of enterprises engaged in innovations,%	17,36	18,9	16,2	16,4	15,8
including spending money on domestic scientific research, million UAH	1834,1	2063,8	1941,3	2706,2	2449,9
external scientific research, million UAH	205,4	394,0	228,5	502,6	469,0
Purchase of machinery, equipment and software, UAH million	11141,3	19829,0	5898,8	8291,3	10185,1
acquisition of other external knowledge, UAH million	84,9	64,2	21,8	46,1	37,5
Other, million UAH	548,0	878,4	10271,1	633,9	1079,4

Source: compiled by author according to the data [18].

Regarding types of economic activity, during 2018—2019 the highest share of innovative enterprises was in information and telecommunication enterprises (23,8%), manufacturing (19,8%), financial and insurance activities (24,6%), and activities in the field of architecture and engineering (17,8%).

At the same time, the higher share of enterprises with technological innovations was recorded among enterprises of the processing industry (17,3%), electricity, gas, steam and air conditioning supply (13,5%), as well as enterprises engaged in activities in the spheres architecture and engineering, scientific research and development, advertising activity — 11,8%; with non-technological innovations — among enterprises of financial and insurance activity (21,2%), information and telecommunications (16,5%), manufacturing industry (14,3%).

In 2019, the highest level of innovation activity was observed at the enterprises of Ternopil (29,9%), Kharkiv (27,1%) and Mykolayiv (23,2%) (*Fig. 1*). Among the regions the share of innovative enterprises above the average in Ukraine was in Kharkiv, Ternopil, Mykolayiv, Zaporozhye, Ivano-Frankivsk, Odessa, Lviv, Kherson regions and Kyiv.

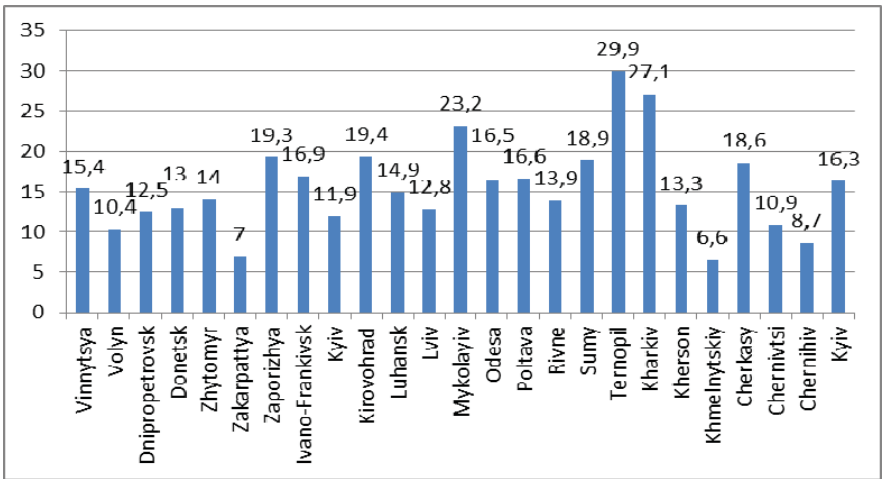

Fig. 1. **Distribution of innovative enterprises in 2019 by regions,** %

Source: compiled by the author according to the data [17].

The statistics show that the number of new technological processes in Ukraine for 2018—2019 has increased almost threefold. This is due to the implementation of a significant number of innovative projects related to the introduction of new production technologies, which are financed from European funds. The number of low-waste, resource-saving processes increased by 28% over the study period. The largest number of such processes was implemented in Lviv, Zaporozhye, Ternopil oblasts and Kyiv [17].

The level of investment support in the regions of Ukraine is characterized by indicators such as the use of capital investment; expenditure on protection and rational use of natural resources; financing of innovation and scientific activity. The development of capital investments by types of assets for 2012—2016 is reflected in *Table 2*.

Table 2

Development of capital investment by sources of financing for 2015—2019*

Indicators	2015	2016	2017	2018	2019
Total, UAH thousands	6523889	8770028	10139119	10435246	9580610
including at the expense of the state budget, % of comm. volume in Ukraine	115403 *1,8*	282743 *3,2*	414228 *4,1*	597312 *5,7*	953727 *10,0*
funds from local budgets	438091	586436	967964	1217327	1368882
% of comm. volume in Ukraine	*6,7*	*6,7*	*9,6*	*11,7*	*14,3*
own funds of enterprises and organizations	2914889	3752813	5092977	6917375	5951110
% of comm. volume in Ukraine	*44,7*	*42,8*	*50,2*	*66,3*	*62,1*
bank loans and other loans	205121	511124	703410	625348	415274
% of comm. volume in Ukraine	*3,1*	*5,8*	*6,9*	*6,0*	*4,3*
funds of the population for housing construction	2448008	3400011	2755667	924385	736812
% of comm. volume in Ukraine	*37,5*	*38,8*	*27,2*	*8,8*	*7,7*
other sources of funding	402377	236901	204873	153499	154805
% of comm. volume in Ukraine	*6,2*	*2,7*	*2,0*	*1,5*	*1,6*

* Data are given without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the Zone of anti-terrorist operation.

Source: compiled by the author according to the data [18].

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The dynamics of development of capital investments by sources of financing for the period of 2015—2019 does not have a positive upward trend. If to analyze the structure of capital investments by sources of financing, the largest share of investments falls on own funds of enterprises and funds from local budgets. The share of financing at the bank loans and other loans in 2019 has decreased significantly.

The analysis of the volume of capital investments and current expenses for environmental protection for the period of 2015—2019, in the context of the regions of Ukraine, suggests that the most active regions of Ukraine in this context are Kyiv, Kyiv and Dnipropetrovsk regions. Zaporizhzhya and Kharkiv regions also marked a significant amount. Conversely, Kherson, Luhansk and Zhytomyr regions belong to regions that demonstrate relatively low levels of capital investment and current environmental costs.

Among the problems related to the formation of investment potential of the regions are: corruption; non-effective retirement of budget funds; significant barriers to the implementation of environmental projects; insufficiency of state guarantees regarding the enlightenment of inventions; reducing the number of foreign investors; insufficient use of foreign experience in attracting investment [19]. The attraction of financial resoources is very important for ensuring sustainable regional ecological development. In such a situatuion, the foreigne investions are of special interest as a means of non-inflationary financing.

The basis of the analysis of innovation and investment support for the environmentally sustainable development of the regions of Ukraine for 2019 is the implementation of a rating assessment of Ukraine's regions by innovation-scientific and investment indices.

Having calculated the group indicators, as well as their relative values and normalized indicators, we received an innovation-scientific index and investment index by regions of Ukraine. Describing the innovation and scientific index of Ukraine regions development for 2019, it should be noted that the highest index was found in Kyiv, Kharkiv, Sumy and Ternopil regions (*Fig. 2*).

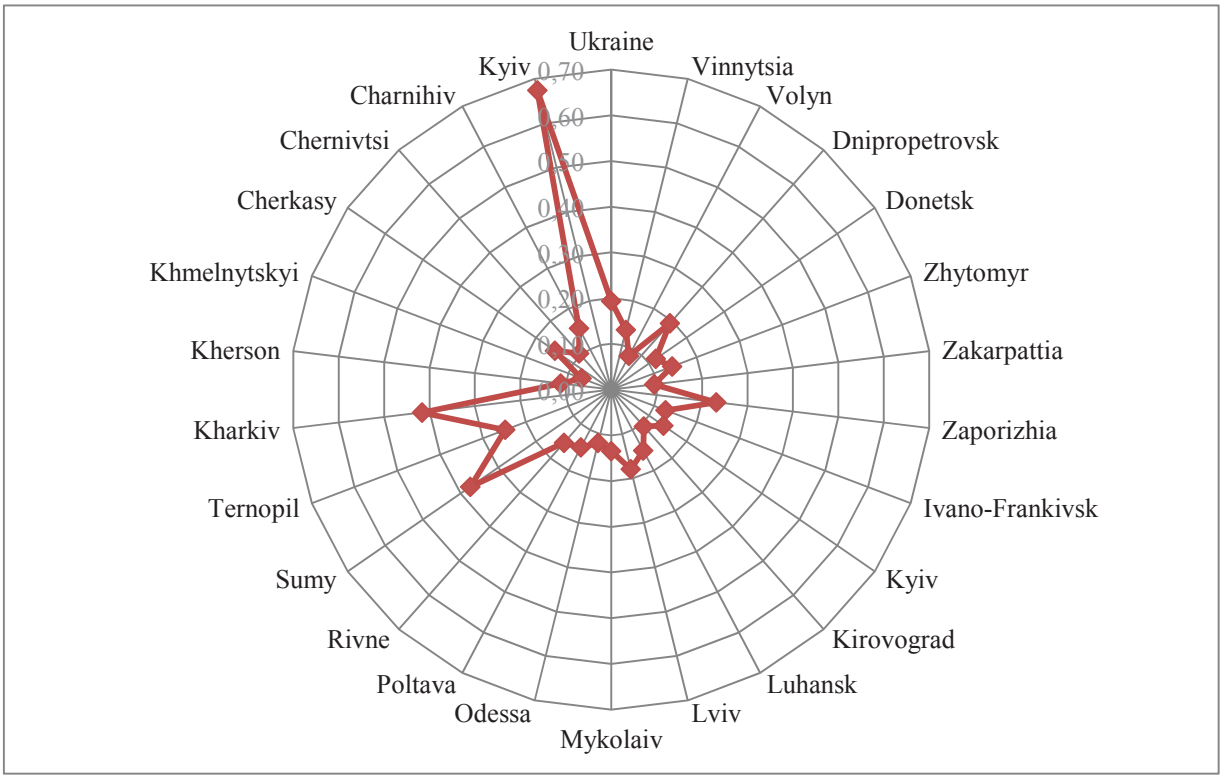

Fig. 2. **Innovative-scientific index of Ukraine's regions development in 2019**
Source: compiled by the author.

The lowest rates are in Volyn and Kmelnytskiy regions. It should be noted that the main source of financing innovative activity is the own funds of enterprises. The share of funds from the

state and local budgets in support of innovation projects is insignificant, and the volume of credit resources has decreased. The reason for this is the instability of the banking system and high lending rates. Describing the level of innovation and scientific development of regions of Ukraine by a partial index, in 2019 we observe the unevenness of this indicator. In particular, the most favorable innovation environment was formed in Kyiv, but most regions have low significance of the innovation-scientific index.

The main factors hindering the innovation and scientific development of the regions of Ukraine should include: reducing of the amount of public funding for innovation, deficite of own funds of business entities, a significant amount of investment in innovation, long payback period, deficite of customers funds, imperfection of the legislative framework, deficite of skilled personnel, underdeveloped innovative infrastructure, which serves as a mediation between producers and consumers of innovations.

The analysis of investment development of regions of Ukraine by the index for 2019 showed that the most favorable investment climate is in Kyiv, Dnipropetrovsk and Kyiv regions. The worst indicators for this indicator were in Kmelnytskiy and Odesa regions. Investment index of Ukraine's regions development in 2019 is graphically represented in *Fig. 3*.

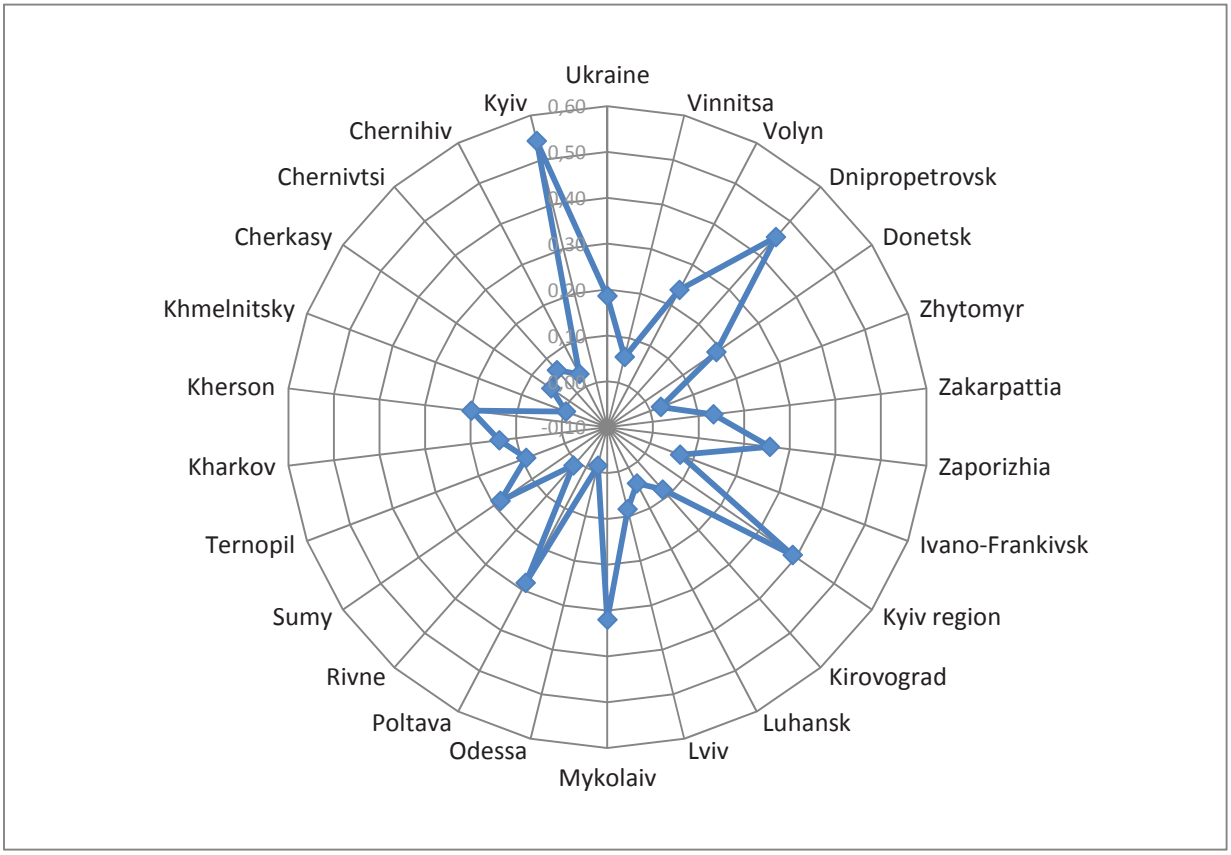

Fig. 3. **Investment index of Ukraine's regions development in 2019**
Source: compiled by the author.

Analyzing the investment index of Ukraine's regions in 2019, it should be noted that its level is quite low in most regions. This is due to the crisis in the economic and political environment of the country, because of corruption, the instability of the legal and political environment, bureaucratic barriers, a tight tax system, high inflation, low level of state support for investment and underdevelopment of investment infrastructure.

For the purpose of improving the financial incentives for innovative environmentally-oriented development of regions of Ukraine, it is necessary: to increase the total amount of investments into environmental innovations from different sources of financing; to attraction of

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venture capital; to increase the participation of industrial enterprises in environmental projects and programs funded by the EU structural funds; to provide support to the development of ecologically oriented small and medium business by the state; to create additional trust funds for investing in the modernization of environmental technologies; to form clusters for the increasing of the attraction of environmental innovations and the competitiveness of Ukrainian regions.

Conclusions. Thus, the analysis of innovation and investment support for environmentally safe development has provided the basis for determining the asymmetry of its components and the main problems in the innovation and investment sector that are characteristic of all regions of Ukraine. The activation of innovation and investment processes will contribute not only to the ecological and economic efficiency of enterprises, but also to ensure sustainable and balanced economic growth of the regions as a whole.

Prospects for further researches in this area include the integral assessment for innovative eco-sustainable development of the regions of Ukraine and the development of an measures to improve the financial incentives for innovative environmentally-oriented regional development.

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