UDC 504:37.03
JEL Classification: F10, E23

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REGIONAL ENERGY ECO-INNOVATION SECTOR AS A DRIVER OF POST-WAR DEVELOPMENT OF UKRAINE'S ECONOMY

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Consolidation with European social, economic and environmental programs in the framework of Ukraine's integration into the European energy space has become extremely important given the growing threats to energy security and should become the basis for postwar greening of regional and national innovation systems in the context of decrabicization, carbon Alternative Energy Sources. With the use of empirical and theoretical methods, a retrospective and generalization of Ukraine's rankings and global world innovation rankings was conducted. Applying the method of comparing the regions of the country by the level of innovation of enterprises and extrapolating these results to the share of such enterprises in the total number of industrial entities in the regions helped to identify their lack of correlation and emphasize the lack of stable dependence of industrial development and innovation. The article contains a number of methods: general, special and interdisciplinary, which allowed to screen areas for the most favorable development of the postwar economy, taking into account the synergistic component of regional development and achieve the goal of the study. The aim of the article is to analyze the innovative component of regional and national economic development for the implementation of decarbonization and energy green transition in Ukraine; substantiation of the world's leading imperatives and national directions of effective post-war integration into relevant European programs. An analysis of Ukraine's rating status in several international indices of environmental efficiency and innovation activity of regions was shown, which showed the lack of correlation between regions of Ukraine, which actualizes the search for the most effective drivers of economic development for Ukraine's postwar development models. At the same time, it is the consolidation of efforts of national stakeholders of innovative development of the country with relevant European institutions, in particular, in the direction of greening regional economic systems, will ensure postwar development of innovative regions and industries, which in turn will be drivers of related territories and industries, while ensuring a synergistic effect.

Keywords: decentralization, regional economy, eco-innovation, energy security, local level, post-war development.

DOI: 10.32434/2415-3974-2022-15-1-8-19

Introduction and problem statement

The new strategic plan of the European Union Green Deal [1], announced in 2019, has become a new stage of development that transforms public consciousness, and its implementation results in fundamental and ambitious goals to address pressing climate and environmental issues. The central elements of the Green Deal were decarbonization, minimization of carbon emissions, the transition to alternative energy sources. They are the basis for fundamental transformational transitions, regulatory adaptation, implementation of protection

mechanisms. This European program also has a political platform – it is a response to the challenges of global climate pollution, and the positioning of the European Union as a leader in sectoral environmental initiatives.

Ukraine, in accordance with the strategic (constitutionally enshrined) course towards full membership in the EU and international commitments, has formed the Concept of «green» energy transition until 2050 [2]. At the same time, the large-scale process of global support for Ukraine in the military conflict opens up prospects for balanced measures to transform its own energy market and overall economic integration into the EU, as national integration intentions coincide with European resource opportunities .

Ukraine's energy market, as one of the largest European energy markets, needs «green» transformation, decarbonisation, while ensuring the energy security of the state. The study of the article actualizes the existing resource and innovation trends in the greening of national and regional ecosystems, in particular, in the energy sector of Ukraine's economy.

Analysis and research of publications

The last decade has been marked by a significant interest of world scientific circles in aspects of combating climate change and greening national economic systems. For example, Nicole J. van den Berg, Andries F. Hof, and Heleen L. van Soest have studied the implications of different approaches to effort sharing for national carbon budgets and emission trajectories [3]. The study of the impact of environmental and energy aspects on economic development in the studies of P. Olchak, J. Kader, V. Koval [4] allowed to consider aspects of regional financial subsidies of sectoral programs. Scientific works on the study of the ecological component of regional innovation systems [5] illustrate that in a decentralized model of government in Ukraine, the formation of effective management policies for regional environmental innovation will be one of the important endogenous factors to achieve sustainable development.

Sectoral energy efficiency measures and the investment component for their implementation and industrial «green» transformation on the way to decarbonisation have shown that they are the keys to achieving energy independence of communities and a competitive economy [6].

Legal and regulatory aspects of greening, compliance with regulatory regulation of processes [7] allowed to substantiate recommendations for standardization, in particular, the movement of energy cooperation in Ukraine, improving the effectiveness of energy efficiency policies and energy security.

However, there is some lack of research on regional eco-innovation, decarbonisation and the impact of decentralization processes on energy efficiency, taking into account the postwar challenges of the relevant structural policy and significant changes in identifying leading industry drivers for Ukraine's effective development. It is considered necessary to systematize and single out one's own integrated model of decarbonization in modern Ukrainian conditions.

The aim of the article

The aim of the article is to analyze the innovative component of regional and national economic development for the implementation of decarbonization and energy green transition in Ukraine; substantiation of the world's leading imperatives and national directions of effective post-war integration into relevant European programs.

Presenting main material

The conditions for the post-war recovery of Ukraine's economy will require the implementation of effective and rapid measures with a synergistic effect, which would solve a number of problems in key sectors of the economy. While giving unconditional preference to military and civil protection, it should be noted that real progress has been made in those foreign policy and economic processes between Ukraine and the EU that have been developed for several years and were considered only potential development scenarios.

At the end of February 2022, the Ukrainian power system was disconnected from the power systems of Belarus and Russia in a test format and connected to the ENTSO-E continental European power grid. The preparatory integration process lasted for 6 years and had a financial confirmation of 700 million euros of investment. Ukraine has opportunities for crisis assistance from Europe, which is extremely important in wartime. In addition to technology, Ukraine can count on financial assistance from European partners to rebuild war-torn infrastructure, and foreign partners have already stated their readiness to provide at least € 100 billion from the EU and $ 32.5 billion from the USA [8]. Targeted investments should be directed to the most profitable and environmentally friendly industries, which can become drivers of post-war economic recovery.

Recent years in Ukraine have been marked by several projects aimed at reducing the harmful economic impact on the environment, in particular, projects to green Ukraine's energy sector in the

context of the Green Deal in the EU. Ukraine's implementation of the Green Deal principles in its own legal and economic environment, especially given European opportunities and the desire to integrate Ukraine in most areas in connection with Russia's military actions, will be an indisputable catalyst for economic modernization. Measures will be especially urgent and appropriate in the context of the reconstruction of enterprises and infrastructure after the end of hostilities.

The preconditions for the problems of depletion of natural resources and environmental pollution are identical, and the ecological footprint of society exceeds the planet's ability to regenerate by about 25% since the 60s of last century [9]. EU member states, using economic methods to achieve environmental security, have the opportunity to implement strategic environmental goals of sustainable development, which helps to approximate economic methods of regulating environmental problems. At the same time, there is currently no unified approach to economic levers in environmental management in the EU, each country independently determines the appropriate instruments and approaches to environmental regulation in the energy sector.

The implementation of the European experience in Ukraine, in particular, the mechanism of environmental taxation, is a difficult process given the comparability of European and Ukrainian approaches to taxation. Namely: in the EU, the vast majority of the object of taxation are energy resources, vehicles, certain groups of goods, and the main principle is indirect taxation. In Ukraine, the object of taxation is the volume of emissions with harmful effects on the environment, and the established rent for the use of natural resources is a fiscal rather than an eco-incentive tool.

Despite a significant number of state efforts in the direction of greening and transition to a low-carbon economy, the quality and speed of economic transformation cannot be called satisfactory, as evidenced by relevant indicators. Thus, according to the International Environmental Performance Index (EPI-2020), out of 180 countries on the basis of ranking according to 32 criteria, Ukraine in 2020 took 60th place (Table 1). In 2020, the top five were Denmark, Luxembourg, Switzerland, the United Kingdom, and France, countries where sustainable development programs are successful and stable.

Important in the context of the study is the Global Innovation Index (GII) – 2021, based on 80 indicators of resource availability and innovation results, for 131 countries. According to GII-2021,

Table 1
Ranking of countries in the world by the index of environmental performance (EPI) [10]

Country	Rank	Epi score	10-year change
Denmark	1	82.5	7.3
Luxembourg	2	82.3	11.6
Switzerland	3	81.5	8.6
United	4	81.3	9.0
France	5	80.0	5.8
Argentina	54	52.2	5
Brazil	55	51.2	4.9
Bahrain	56	51	17.3
Ecuador	56	51	3.9
Russia	58	50.5	3.9
Venezuela	59	50.3	-0.5
Ukraine	60	49.5	0.7
Uruguay	61	49.1	1

Switzerland took 1st place, Great Britain – 4th place, Denmark – 6th place, France – 11th place, Luxembourg – 18th place. Ukraine is on the 49th position in this rating. That is, the correlation between innovation and environmental efficiency of the state is unconditional.

According to the GII, Ukraine has improved only 3 indicators in 2021: creativity, scientific knowledge, human capital and research (Fig. 1).

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At the same time, Ukraine has worsened its place in the category of Lower middle-income countries, declining in comparison with 2020. In addition, according to the annual Bloomberg Innovation Index, Ukraine's place in the Bloomberg Innovation Index in 2018-2021 is only deteriorating and is determined by the following indicators (Table 2).

Thus, the innovative transformation of the post-war economy is a necessary way to restore the destroyed infrastructure and industrial facilities of Ukraine, increase the inflow of investment and new

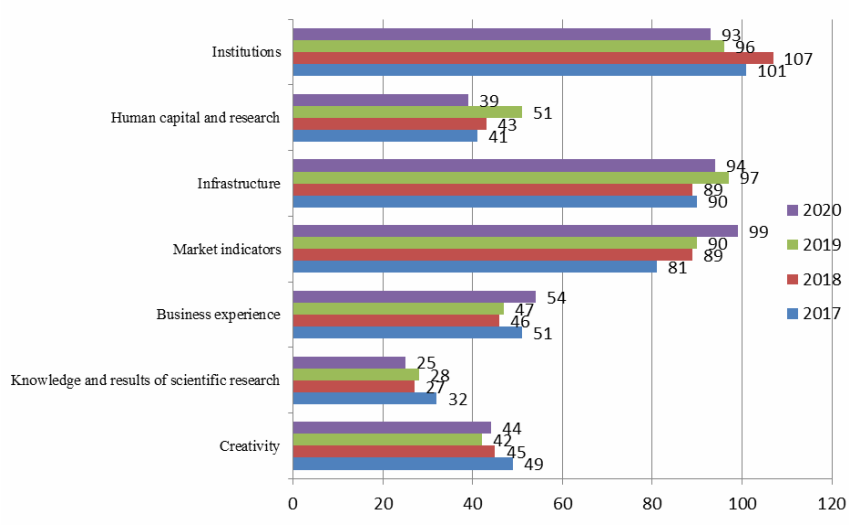

Fig. 1. Dynamics of GII indices for Ukraine for 2017-2020 [11]

Table 2

Ukraine's place in the Bloomberg Innovation Index in 2018-2021 [12]

Years	General index	Intensity of research and development (costs of R & D on in relation to GDP)	Productivity	The penetration of high-tech logics (share of innovative companies in total enterprises)	Concentration of researchers (number of scientists per 1 million inhabi-tants)	Value-added production (added value production in relation to GDP)	The effectiveness of higher education (the share of freelance graduates in the total number of educational graduates institutions)	Patent activity
2018	46	47	50	32	46	48	21	27
2019	53	54	60	37	46	58	28	35
2020	56	57	57	35	49	57	48	36
2021	58	59	59	34	46	55	45	35

jobs, develop small and medium-sized businesses, participate in global joint European and global projects.

Scientists of the Institute of Industrial Economics [13], as well as other scientific schools of Ukraine, determine the innovative development of the region by a number of interrelated factors that activate each other in the implementation of innovations, including:

– continuous and sustainable growth of the socio-economic level of the region, which is based on innovative entrepreneurial activity, smart specialization of the region, a significant level of competitiveness, adaptation to market changes, flexible response to infrastructure challenges and political conditions,

– constant self-development on the basis of constant growth of social needs of the region, which must be ensured by constant commercialization of innovations, as a consequence - the formation of new social needs of higher quality and the cyclical nature of further innovative development,

– causal relationships, which are reflected in the interaction and motivation of regional development stakeholders.

However, statistics on industrial activity by regions of Ukraine, shows the differentiation of regions by the number of such enterprises and the existing features of regional innovation development [14]. For the period 2018-2020, the statistics among the regions of Ukraine regarding the number of innovatively active industrial enterprises is as follows (Table 3).

There is a steady growth of innovative enterprises over the past three years in Vinnytsia, Poltava, Cherkasy, Ternopil regions, which are mostly agricultural, which is another argument for the focus of investment in the energy cooperative

Table 3

Regions of Ukraine by number of innovation-active enterprises [14]

Regions	2018	2019	2020	+/– 2020/2019	+/– 2019/2018
Crimea	…	…	…	…	…
Vinnytsia	25	28	31	3	3
Volyn	14	11	12	1	–3
Dnipropetrovsk	71	64	75	11	–7
Donetsk	23	27	24	–3	4
Zhytomyr	19	24	15	–9	5
Transcarpathian	12	9	10	1	–3
Zaporizhzhia	36	47	41	–6	11
Ivano-Frankivsk	28	22	28	6	–6
Kyiv	54	41	56	15	–13
Kirovohrad	26	20	20	0	–6
Luhansk	5	11	10	–1	6
Lviv	44	44	60	16	0
Mykolayiv	14	22	14	–8	8
Odesa	25	33	30	–3	8
Poltava	30	32	35	3	2
Rivne	8	20	19	–1	12
Sumy	25	23	23	0	–2
Ternopil	20	29	35	6	9
Kharkiv	119	116	96	–20	–3
Kherson	14	13	14	1	–1
Khmelnytsky	11	10	15	5	–1
Cherkasy	29	30	31	1	1
Chernivtsi	9	7	13	6	–2
Chernihiv	15	11	22	11	–4
Cities				0	0
Kyiv	101	88	79	–9	–13
Sevastopol	…	…	…	…	…

sector based on biofuels.

However, the absolute number of innovation-active industrial entities in the region does not correlate with the level of regional innovation development, the real situation can be represented by the relative share of innovation-active industrial enterprises in the region. An effective indicator of the environmental friendliness of regional economic systems is an integrated indicator of the effectiveness of environmental management, calculated using a linear function according to the formula:

$$I = \sum_{i=1}^{3} c_i \cdot I_i, \quad (1)$$

where I_i is the integrated ecological characteristic; c_i - weights of integrated indicators.

The integrated indicator of the effectiveness of environmental management allows to give a comprehensive assessment from the standpoint of compliance with the objectives based on integrated environmental characteristics, calculated by groups of indicators.

Undoubtedly, the most significant level of innovation in regional development is reflected in the indicators of sales of innovative products, because they form the gross regional product and are a reflection of the end result of innovation.

At the same time, the situation in Kyiv is steadily ahead of these indicators in terms of regions. In addition, the analysis of the current study allows us to state that innovative products by region did not determine the regional sales volume, and, as a consequence, was not a crucial component of gross regional product.

The impact of state regulation on the process of decarbonisation / adaptation in the region is now also significant. At the same time, the state plays the role of facilitator in the initial stages of regional development, later, transferring these functions to the relevant institutions of innovative development.

The state and public authorities are among the stakeholders in the processes of decarbonisation and adaptation, and assessing the feasibility and possible consequences of their regulation requires the creation of hybrid model complexes that combine modeling of energy, economy and investment in technologies and areas.

We can talk about two groups of models for different stakeholders: the first group assesses the scale of climate impact and adaptation scenarios, and the second looks at how to resist climate change itself (decarbonisation scenarios). At the same time, each group of stakeholders is concerned about the relevant aspects of the activity (Table 4).

Approaches to modeling different sectors of the economy are universal, but due to the focus of research on energy issues, we will consider modeling tools focused on the energy sector. Such models can be divided into two major categories: top-down and bottom-up (Figure 2, Table 5), as well as integrated related models.

The difference in approaches to decarbonization models has stimulated the emergence of hybrid approaches that combine the technological clarity of upward models with microeconomic realism and macroeconomic feedback from downward models. Linking models is achieved through iterations with feedback between models.

Currently, in the EU countries in the energy sectors are implemented as integrated models of decarbonization: PRIMES, GAINS, GLOBIOM-G4M, PROMETHEUS, CAPRI, POLES and others. These integrated models have a variety of

Table 4

The main stakeholders of the decarbonization process

Stakeholder	A question answered by a related model complex
National regulators and central executive bodies	How and with what speed to decarbonize the economy as efficiently as possible for the country
Regulators at the international level	How and when most countries in the world will be able to achieve the goals of the Paris Agreement [15]
Financial sector	What are the possible consequences of the complete cessation of funding for carbon-intensive projects
Business community	How to decarbonise a company as effectively as possible? How to adapt the Company's real assets to climate change?
National climate organizations and climate activists (public organizations, grant communities)	What are the possible consequences for the world in the event of non-acceptance of mitigation (attempts to counter) climate change
Population	How will decarbonisation / adaptation methods affect incomes, health and living standards?

Source: compiled by the author

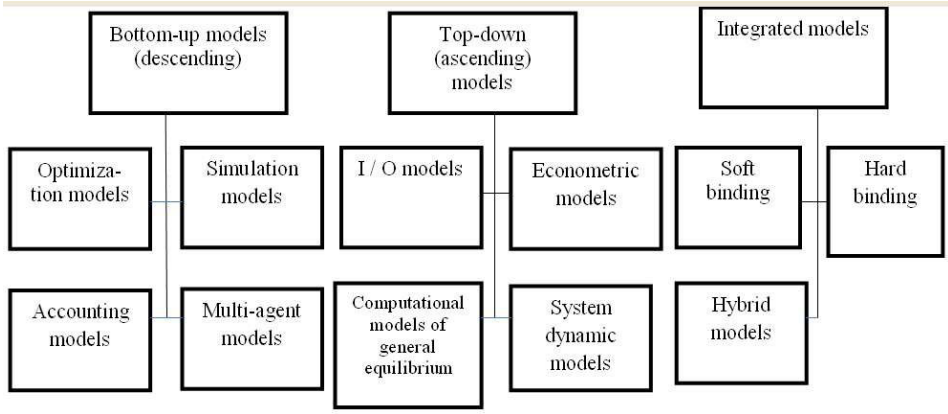

Fig. 2. Classification of decarbonization models focused on the energy sector

Source: compiled by the author

targets in methodology, time horizons, sectoral coverage and input-output data.

Analysis of the possible application of models of decarbonization of Ukraine's economy in the projected postwar period of development makes it possible to state the need for an integrated approach and the use of hybrid models. After all, rigid bonding models will not be suitable for modeling in crisis and force majeure conditions, which are the conditions for the recovery of an economy destroyed by hostilities. Soft binding often creates noise in the form of differences between the results of energy flow models, prices and technologies within a single region. Noise control is difficult because most useful sets of common measurement points are non-exclusive.

Applied models of decarbonization of energy-intensive sectors. Recently, Ukraine has been implementing a sectoral model of regional development and fair transformation. The concept of the State Target Program for Fair Transformation of Coal Regions of Ukraine until 2030, approved by the Cabinet of Ministers of Ukraine dated 22.09.2021 № 1024, interprets «fair transformation» as a «model of regional development that provides a decent life and sufficient income for all residents. including employees who will be affected by the process of abandonment of fossil fuels (liquidation of production facilities, closure of coal mining enterprises, etc.) «[16]. A national feature in this area is environmentally harmful coal energy. Ukraine has historically formed socio-economic clusters around the coal regions – Donetsk, Luhansk, Dnipropetrovsk, Lviv-Volyn and Transcarpathian basins. In the framework of «fair transformation», the share of coal energy should be gradually reduced on the basis of the formation of an appropriate alternative to this type of economic activity, for example, on the basis of relevant industry experience of China, the Czech Republic, Germany and Poland.

Table 5

Advantages and disadvantages of decarbonization models

Type of decarbonization model	Functional and structural features	Disadvantages and shortcomings
Descending models	Downward models are commonly used by economists and government agencies. These models focus on aggregating macroeconomic sectors. They are usually characterized by a simplified presentation of components and therefore do not fit the definition of sectoral policy. Their scope is to assess the impact of energy and climate policy on socio-economic sectors, such as social growth, social welfare, employment, etc. A top-down approach may also take into account interdependence between sectors or countries	– the eastern models lack technological details, they are limited to modeling financial policy instruments, – have methodological limitations. The parameters of elasticity and autonomous efficiency in descending models are estimated on the basis of empirical data. Even if the confidence intervals of these estimation parameters are narrow, these values obtained from past experience may be invalid in the future.
Rising models	The ascending approach is to develop engineering models with a detailed description of the technological aspects of the energy system and how it may develop in the future, which allows to determine sectoral policies. Energy demand is usually set exogenously, and models analyze how this energy demand should be met at minimal cost. However, the bottom-up approach does not take into account the link between the energy system and macroeconomic sectors, thus ignoring the impact on these sectors.	– traditional ascending models describe technology, but realistically reflect the economic decisions made by enterprises and consumers when choosing technologies, and do not reflect the potential feedback of macroeconomic equilibrium,

Source: compiled by the author

It is worth noting both the objective (regulatory) and local subjective nature of the difficulties with the transition to a decentralized electricity market in Ukraine. The situation in Ukraine requires urgent action at the highest levels of government. Thus, the Government of Ukraine has announced the creation of four revival funds – respectively for the restoration of property and infrastructure, economic transformation, debt service and repayment, support for affected businesses. We believe that the proposed Funds combine two trends – national – to obtain funds for development through the relevant state institution, and European - to obtain funding through the relevant Fund.

There are negative (neutral) trends in the development of local alternative energy, energy cooperation, provoked by the instability of the regulatory environment, passivity of the business environment, ignorance of the population about the benefits of the green energy market. At the same time, developed agriculture in Ukraine should become the basis for the development of bioenergy.

Unfortunately, the energy cooperative movement in Ukraine at the beginning of development. The properties of flexibility and variability of the cooperative organizational and legal form determine the convenience of its use. Thus, an energy cooperative can unite energy producers or consumers, or act in both roles at the same time – to produce and consume energy (ie a consumer cooperative), or to accumulate (aggregate) energy from other producers. The models represented in the study, using the apparatus of mathematical logic, can be interpreted as follows: in order to achieve the goals of developing mechanisms for the implementation of renewable energy at the regional and local levels (Development of mechanisms for the implementation of renewable energy at the regional and local levels), gradually implement an applied set of ten organizational and economic, fiscal, institutional and regulatory measures (Table 6).

These measures belong to many methods of effective stimulation of investment inflow to renewable green energy (Methods of effective stimulation of investment inflow to renewable green energy). In this case, the formalization of the conceptual and analytical model of integrated support mechanisms for the implementation of renewable energy, has the following form, given in formula (2)

Table 6

Correspondence of measures of mechanisms to support renewable energy and their formalized presentation

The name of the event	The essence of the event	Formalized view in formula (2)
Adoption of laws regulating the conditions for access to energy systems for installations on renewable energy sources (RES)	Adoption of laws regulating the conditions of access to energy systems For the transition to renewable energy sources (RES)	Law^{en}
Establishment of special guaranteed tariffs for the purchase of electricity produced from RES, as well as obligations for energy networks to purchase this electricity	Establishment of special guaranteed tariffs for the purchase of electricity produced from RES, as well as obligations for energy networks to buy this energy	Es^{tar}
Establishment of a mandatory share of electricity produced from RES in the balance of electricity sold by power grids	Establishment of a mandatory share of electricity generated from RES in the balance of electricity sales of power grids	Es^{mand}
Financing of research activities leading to a reduction in the cost of renewable energy	Funding of research activities that will reduce the cost of RES	Fin^{res}
Establishment of state and other institutions to promote renewable energy and implement special programs and demonstrate projects	Establishment of state institutions for the promotion of RES, implementation of special projects	Es^{state}
Preferential loans for the purchase of renewable energy equipment and partial return on investment for consumers	Preferential loans for the purchase of RES equipment and partial return on investment for consumers	$Loans^{pref}$
Accelerated depreciation of RES equipment	Accelerated depreciation of RES equipment	Dep^{ac}
Organization of public support and the introduction of voluntary forms of support, such as the purchase of Green Energy by consumers, as well as the transparency of information on the share of clean electricity in the balance of energy networks	Organization of public support and introduction of voluntary forms of support, such as consumer purchases of "Green Energy", as well as transparency of information on the share of clean electricity in the balance of energy networks	Pub^{sup}
Subsidizing investments in renewable energy	Subsidizing investments in RES	Inv^{sub}
Tax exemption and reduction of tax rates	Exemption from taxes and reduction of tax rates	Tax^{ex}

$$Dev^{renenergy} \approx \{Law^{en} \cup Es^{tar} \cup Es^{mand} \cup Fin^{res} \cup Es^{state} \cup Loans^{pref} \cup Dep^{ac} \cup Pub^{sup} \cup Inv^{sub} \cup Tax^{ex}\} \in METHOD^{green\ energy}, \quad (2)$$

where $Dev^{renenergy}$ – achieving the goals of developing mechanisms for the implementation of renewable energy at the regional and local levels; $METHOD^{green\ energy}$ – many methods of effective stimulation of investment inflow to renewable green energy. Other definitions of the formula – in table 6.

Some of the measures to stimulate the mechanisms of renewable energy have already begun to be implemented in real conditions in Ukraine. For example, the announced start of tax reform will certainly contribute to the effective implementation of the proposed conceptual and analytical model. In addition, the revolutionary step of connecting the Ukrainian energy system to the European ENTSO-E system will ensure the stable operation of the Ukrainian energy system in wartime, and in the postwar period – the development of generation and energy investment [17].

Conclusions and prospects of the study

So, summarizing the results of the study, we note that the European experience of socio-economic development demonstrates a systematic and

integrated approach, including state-of-the-art measures to achieve climate-neutral Europe. Recent events: consideration of Ukraine's application for EU accession under the accelerated procedure, development of Ukraine after the military conflict require non-standard solutions to improve the regulation of energy security and nature management.

In the regions of Ukraine at the beginning of 2022, innovative products, unfortunately, have not yet been a significant component of such indicators as GRP (gross regional product) and gross sales. At the same time, the state's involvement in the management of innovation processes in the region and their facilitation have a significant impact on the level of innovative regional development.

The environmental goal of achieving a carbon-neutral level of the economy, decarbonization of energy-intensive industries, involves the introduction of balanced and effective approaches to coordinating financial investments in relevant segments, formation of legal and regulatory framework, use of available resource potential and integration prospects, state environmental facilitation. For example, the decarbonisation of green energy to alternative energy sources can have significant financial implications for households. At the same time, the negative consequences of effective state measures of regional greening, as well as decentralization, can be a positive vector for the development of communities and territories.

The comparative analysis of decarbonization models conducted in the article allowed to systematize its advantages and disadvantages, on the basis of which, in turn, state the methodological gap in approaches. These factors are the basis for the development of a hybrid integrated approach to energy decarbonisation policy in Ukraine, which would combine existing models and have a national orientation, taking into account the force majeure circumstances of the recovery of Ukraine's war-torn economy. This course of events is actualized by the peculiarities of Ukraine's integration into the European energy system and the prospects of accession to the EU under the accelerated procedure.

For Ukraine in the postwar period, the most effective way to develop the destroyed economy will be the development of innovation-active regions and industries, which, in turn, will be drivers of development of related territories and industries, while ensuring synergies. The transition to an environmentally friendly, green economy is a multi-layered process and will not be quick and painless. Thus, given the global trends in the framework of the green energy transition, it is important to consider planning the development of innovation-active industries and regions of the state.

At the same time, taking into account the legal and infrastructural preconditions typical for Ukraine, namely: social and economic weight of the coal industry; comparative cheapness and significant share of nuclear energy; obstacles and shortcomings in the way of decentralization of the electricity market; negative trends in the development of renewable energy; asymmetry in the distribution of energy resources at the regional level; initial position in the development of the energy cooperation movement, but also a strong agricultural sector as a basis for the development of bioenergy, it is possible to state the available resource potential for creating a synergetic impact in various sectors of Ukraine's economy.

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Received 27.03.2022.

РЕГІОНАЛЬНИЙ ЕНЕРГЕТИЧНИЙ ЕКО-ІННОВАЦІЙНИЙ СЕКТОР ЯК ДРАЙВЕР ПОВОЄННОГО РОЗВИТКУ ЕКОНОМІКИ УКРАЇНИ

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Консолідація з європейськими соціальними, економічними та екологічними програмами у рамках інтеграції України у європейський енергетичний простір набула надзвичайної актуальності з огляду на підвищення загроз енергетичної безпеки та повинна стати базовою основою для повоєнної екологізації регіональних і національної інноваційної системи у контексті декрабонізації, мінімізації вуглецевих викидів, переходу на альтернативні джерела енергії. Із застосуванням емпіричних і теоретичних методів здійсненні ретроспектива та узагальнення ранжування України і глобальних світових інноваційних рейтингах. Застосування методу порівняння регіонів країни за рівнем інноваційності підприємств та екстраполяція цих результатів на показники питомої ваги таких підприємств у загальній кількості промислових суб'єктів у регіонах допомогло виявити відсутність їх кореляції та наголосити на відсутності стабільної залежності рівня промислового розвитку та рівня інноваційної активності. Стаття містить низку методів: загальнонаукових, спеціальних і міждисциплінарних, що дозволили провести скрініг напрямів для найсприятливого розвитку повоєнної економіки, з урахуванням синергетичної складової регіонального розвитку та досягти мети дослідження. Метою статті є аналіз інноваційної складової регіонального та національного економічного розвитку задля здійснення декарбонізації та енергетичного зеленого переходу в Україні; обґрунтування провідних світових імперативів і національних напрямів ефективної повоєнної інтеграції у відповідні європейські програми. Проведено аналіз рейтингового статусу України у декількох міжнародних індексах з екологічної ефективності та інноваційної активності регіонів, що показав відсутність кореляційної залежності між регіонами України, що актуалізує пошуки найефективніших драйверів економічного розвитку для моделей повоєнного розвитку України. В той же час, саме консолідація зусиль національних стейкхолдерів інноваційного розвитку країни з відповідними європейськими інститутами, зокрема, у напрямі екологізації регіональних економічних систем, дозволить забезпечити повоєнний розвиток інноваційно-активних регіонів та галузей, які, в свою чергу, стануть драйверами розвитку пов'язаних територій та галузей, забезпечуючи при цьому синергетичний ефект.

Ключові слова: децентралізація, регіональна економіка, екоінновації, енергетична безпека, місцевий рівень, післявоєнний розвиток.

РЕГИОНАЛЬНЫЙ ЭНЕРГЕТИЧЕСКИЙ ЭКО-ИННОВАЦИОННЫЙ СЕКТОР КАК ДРАЙВЕР ПОСЛЕВОЕННОГО РАЗВИТИЯ ЭКОНОМИКИ УКРАИНЫ

Бородина О.А.

Консолидация с европейскими социальными, экономическими и экологическими программами в рамках интеграции Украины в европейское энергетическое пространство приобрела чрезвычайную актуальность ввиду повышения угроз энергетической безопасности и должна стать базовой основой для послевоенной экологизации региональных и национальной инновационной системы в контексте декарбонизации, минимизации углерода, альтернативные источники энергии С применением эмпирических и теоретических методов проведены ретроспектива и обобщение ранжирования Украины и глобальных мировых инновационных рейтингов. Применение метода сравнения регионов страны по уровню инновационности предприятий и экстраполяция этих результатов на показатели удельного веса таких предприятий в общем количестве промышленных субъектов в регионах помогло выявить отсутствие их корреляции и отметить отсутствие стабильной зависимости уровня промышленного развития и уровня инновационной активности. Статья содержит ряд методов – общенаучных, специальных и междисциплинарных – которые позволили провести скрининг направлений для благоприятного развития послевоенной экономики, с учетом синергической составляющей регионального развития и цели исследования. Целью статьи является анализ инновационной составляющей регионального и национального экономического развития для декарбонизации и энергетического зеленого перехода в Украине; обоснование ведущих мировых императивов и национальных направлений эффективной послевоенной интеграции в европейские программы. Проведен анализ рейтингового статуса Украины в нескольких международных индексах по экологической эффективности и инновационной активности регионов, что показало отсутствие корреляционной зависимости между регионами Украины, что актуализирует поиски наиболее эффективных драйверов экономического развития для моделей послевоенного развития Украины. В то же время именно консолидация усилий национальных стейкхолдеров инновационного развития страны с соответствующими европейскими институтами, в частности, в направлении экологизации региональных экономических систем, позволит обеспечить послевоенное развитие инновационно-активных регионов и отраслей, которые, в свою очередь, станут драйверами развития связанных территорий и отраслей, обеспечивая синергетический эффект.

Ключевые слова: децентрализация, региональная экономика, экоинновации, энергетическая безопасность, местный уровень, послевоенное развитие.

REGIONAL ENERGY ECO-INNOVATION SECTOR AS A DRIVER OF POST-WAR DEVELOPMENT OF UKRAINE'S ECONOMY

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Consolidation with European social, economic and environmental programs in the framework of Ukraine's integration into the European energy space has become extremely important given the growing threats to energy security and should become the basis for postwar greening of regional and national innovation systems in the context of decrabicization, carbon Alternative Energy Sources. With the use of empirical and theoretical methods, a retrospective and generalization of Ukraine's rankings and global world innovation rankings was conducted. Applying the method of comparing the regions of the country by the level of innovation of enterprises and extrapolating these results to the share of such enterprises in the total number of industrial entities in the regions helped to identify their lack of correlation and emphasize the lack of stable dependence of industrial development and innovation. The article contains a number of methods: general, special and interdisciplinary, which allowed to screen areas for the most favorable development of the postwar economy, taking into account the synergistic component of regional development and achieve the goal of the study. The aim of the article is to analyze the innovative component of regional and national economic development for the implementation of decarbonization and energy green transition in Ukraine; substantiation of the world's leading imperatives and national directions of effective post-war integration into relevant European programs. An analysis of Ukraine's rating status in several international indices of environmental efficiency and innovation activity of regions was shown, which showed the lack of correlation between regions of Ukraine, which actualizes the search for the most effective drivers of economic development for Ukraine's postwar development models. At the same time, it is the consolidation of efforts of national stakeholders of innovative development of the country with relevant European institutions, in particular, in the direction of greening regional economic systems, will ensure postwar development of innovative regions and industries, which in turn will be drivers of related territories and industries, while ensuring a synergistic effect.

Keywords: decentralization, regional economy, eco-innovation, energy security, local level, post-war development.

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