Security of Sustainable Development in the Post-Pandemic Crisis on the Basis of an Inclusive Circular Economy

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Abstract: The study involves the formation of a modern paradigm of sustainable development security in a post-pandemic crisis period, based on an inclusive circular economy. The research is aimed to address the fundamental problem of strengthening the sustainable development security to overcome the effects of the post-pandemic crisis at the micro, meso, and macro levels on the basis of the sustainable, ecological, carbon-neutral economy, in the context of the importance and interdependence of each component in the process of the socio-ecological-economic rise of society. The results of the study will be the development of the theoretical and methodological basis of an inclusive circular economy, scientific and practical justification of approaches to overcoming the effects of the post-pandemic crisis by developing a mechanism to strengthen sustainable development security, and recommendations for possible threats to state food security in the post-pandemic period. The goal of this scientific research is theoretical and methodological substantiation of the formation of an inclusive circular economy and forecasting the capacity of the organic market in Ukraine for economic growth, social justice, environmental management.

Key words: sustainable development security, post-pandemic crisis, inclusive growth, circular economy, state food security, challenges, and threats.

JEL: Q01, Q500, Q56, Q57, R580

Introduction

At present, there are no works that comprehensively addresses the issues of sustainable development in an inclusive circular economy to overcome the effects of the post-pandemic crisis as an integral part of strategies for economic growth, employment

growth and strengthening of the competitiveness of the countries, regions and individual entities, not just environmental problems. The problem to be solved by the project is the need to form a modern paradigm of circular thinking in order to implement a sustainable, environmentally friendly, carbon-neutral economy and develop the mechanism to overcome the effects of the postpandemic crisis based on strengthening the sustainable development security on the basis of inclusiveness, in conditions of imbalances, structural disparities, social, gender and economic inequality, and environmental issues in response to challenges and threats to state food security. The project provides theoretical and methodological justification for the formation of an inclusive circular economy and the forecast of the capacity of the organic market in Ukraine for economic growth, social justice and environmental management. The use of a comprehensive and system-synergetic approach to the formation of a modern paradigm for the formation of an inclusive circular economy and strengthening the sustainable development security to overcome the post-pandemic crisis will allow for the first time in science:

- to assess the risks of the instability of political processes, national macroeconomic imbalances, structural disparities, social, gender, economic inequality, and environmental issues, in response to challenges and threats to national security;
- to develop a methodology for sustainable development security in the post-pandemic crisis, built on the principles of an inclusive circular economy; which is a modern, non-informational paradigm of the spatial organization of social relations, built on the principles of complexity, interdisciplinarity, synergetics, inclusiveness, closed-cycle;
- to improve the conceptual foundations for the formation of sustainable development security and its strengthening at the micro, meso, and macro levels on the basis of inclusive growth, which see the implementation of basic principles of overcoming and avoiding challenges, threats, risks and dangers, the weakness of national security systems within the framework of adequate models of sustainable development with the maximum involvement of society members in the development of social products and ensuring a fair distribution of benefits;
- to form methodological approaches to assessing the security of sustainable development, which are based on the need to achieve inclusive growth, namely involvement in solving development problems of all segments of the population,

entrepreneurship, ensuring equal opportunities for personal development, fair distribution of the received goods, reduction of the population differentiation based on incomes and improvement of the environment quality;

- to forecast the capacity of the organic market in Ukraine as a condition for the transition to a sustainable model of inclusive growth.

Theoretical premises

The spread of COVID-19 coronavirus has revealed the low readiness of many countries to respond to the threats of a large-scale pandemic, demonstrated the imperfection of national sustainable development programs, as well as significant vulnerabilities in various areas due to the pandemic crisis. This determines the urgency of the task of developing and implementing a mechanism for sustainable development security strengthening in order to overcome the consequences of the post-pandemic crisis. The main goal is to form the ability of society and the state to withstand threats of various origins, quickly adapt to changes in the security environment and maintain sustainable functioning, as well as quickly recover from the pandemic crisis to the desired balance.

In this context, the main priority is the synthesis of economic development, inclusive growth, social welfare, and environmental security – the formation and development of a circular economy, which creates new and unprecedented opportunities to increase wealth and prosperity and is the main engine for achieving UN 2030 and sustainable development goals. According to the E. McArthur Foundation, the circular economy will be able to bring more than 1 trillion USD annual income by 2025 and ensure world GDP growth of 7%. The inclusive circular economy is an innovative operational model of sustainable development in a post-pandemic crisis, which provides maximum involvement of the population and business in sustainable development processes in compliance with the principles of greening and resource conservation. With this type of development, value creation is organized in such a way that the outputs of one chain become inputs for another, reducing dependence on new types of raw materials. The production is carried out without excessive consumption of fossil fuels and natural resources.

In the current conditions of the post-pandemic crisis, the introduction of the concept of an inclusive circular economy is important, because it: can be a stimulus for economic

recovery without the application of tough measures; takes into account the diversification of the economy; focuses on the problems of social injustice and ecology; contributes to employment growth. Today, the issues of counteracting possible threats to sustainable development and national security, in general, are intensifying. This raises the question of a comprehensive study of the formation of a modern paradigm of sustainable development security and the development of a mechanism for its strengthening in a post-pandemic crisis based on a circular economy and inclusive growth. This will contribute to equitable opportunities for economic actors, equality of human capital, the ecological state of the environment, social protection, food, and environmental security.

The works of foreign and domestic scientists on the circular economy, sustainable development and inclusive growth are devoted to the following issues: the development of the preconditions for the formation of the circular economy was considered (Heshmati A. [1], Preston F. [2]); analysis of the achievement of goals, objectives, trends, problems and prospects of sustainable development (Chasek P. S., Wagner L. M., Leone F., Lebada A. M., Risse N. [3], Kravtsiv V., Pavlov V. [4], Pavlikha N. [5–9], Skorokhod I. [10-12]); financial aspects of sustainable development (Karlin M., Prots N. [13], Kovshun N. [14]); the role of the concept of inclusive development in achieving the goals of economic growth, social welfare and ecological balance (Gupta J., Vegelin C. [15]); inclusive growth is seen as a concept that provides fair opportunities and equality for economic actors, accompanied by the benefits to each sector of the economy and different segments of society (Ranieri R., Ramos Raquel Almeida [16]); integrated assessment of inclusive development at the national and local levels (Yemelianenko L. M., Petiukh V. M., Dzenzeliuk K. V. [17], Tsymbaliuk I. [18-21]).

H. Brundland defines sustainable development as development that meets the needs of today, but does not jeopardize the ability of future generations to meet their own needs. At the same time, sustainable development is not a preserved state of harmony, but a dynamic process of change, in which the scale of resource exploitation, investment direction, technical development orientation and institutional changes are consistent with current and future needs [22].

V. Burkinskiy, V. Stepanov, S. Kharichkov's sustainable development of the ecological and economic system determines the ability of this system to withstand change, caused by external and internal influences in economic and environmental subsystems, as well as the ability to maintain a certain dynamic equilibrium [23].

Carrez D., Van Leeuwen P. define a closed-loop economy or circular economy as a model of economic development that is based on the recovery and rational consumption of resources and is an alternative to the traditional, linear economy [24].

Sergienko L.V. describes the circular economy as an approach based on the recycling of almost any commodity. By developing and further implementing innovative business models, it will be possible to ensure that technical and biological materials continue to actively "participate" in the economy, and that valuable reserves and natural resources are preserved [25].

In contrast to existing research, there is currently virtually no work that comprehensively addresses the issues of sustainable development security in an inclusive circular economy to overcome the effects of the post-pandemic crisis as an integral part of economic growth, employment and competitiveness strategies, not just environmental problems.

Methodology

The methodology of sustainable development security research in the post-pandemic crisis, built on the principles of an inclusive circular economy, is based on the development of the informal paradigm of social, environmental and economic change to meet human needs, improve the quality of life in wealth, equality and socio-ecological-economic, information, geoeconomic and geopolitical security. Scientific substantiation of the theory and methodology, development of conceptual bases of its strengthening at micro, meso and macro level on the basis of inclusive circular economy in the post-pandemic crisis will be based on regularities (human-centric development, availability and fair use of resources, development of open stationary systems, progress), ecological stability, natural-historical, economic laws of human system formations) and principles (complexity, interdisciplinarity, synergetics, inclusiveness, closed cycle). Their goal is to use the existing and potential opportunities to ensure social, economic, and environmental security, as well as improve the quality of life of present and future generations.

The object of research is the processes of forming and strengthening the sustainable development security in order to overcome the consequences of the post-pandemic crisis on the basis of an inclusive circular economy.

The subject of the research is the theoretical and methodological bases of forming an inclusive circular economy and strengthening the sustainable development security in order to overcome the consequences of the post-pandemic crisis.

The methodological bases of the research are based on the need to achieve sustainable development security on the basis of circular economy and inclusive growth, namely to involve in solving problems of development of all segments of the population, intensification of entrepreneurial activity, fair distribution of benefits, reduction of income differentiation and increase environmental quality. It is planned to adequately assess the existing contradictions, identify destructive trends and causal links, prerequisites, and factors for the formation of sustainable development security and its strengthening at the micro, meso, and macro levels in a post-pandemic crisis.

The analysis of the consequences of the post-pandemic crisis and the preconditions for the formation of an inclusive circular economy and their impact on the sustainable development security on the socio-economic-ecological system is carried out using diagnostic methods, scenario methods, target trees; socio-ecological and economic analysis; diagnostic, morphological, matrix, network, cybernetic methods.

The use of special research methods (abstract-logical, system-structural, computational constructive, comparative and factor analysis, economic-statistical averages and relative values, observation, graphical, cartographic, index, multidimensional analysis; forecasting and software management) will develop and apply methodological approaches to a comprehensive assessment of sustainable development security in a post-pandemic crisis on the basis of an inclusive circular economy, which, in contrast to existing ones, will be based on indicators that characterize these objects as socio-ecological-economic systems; and also allow to determine the factors of their inclusive growth, to substantiate conceptual approaches to the formation of an inclusive circular economy and strengthening the sustainable development security at the micro, meso, and macro levels.

Results

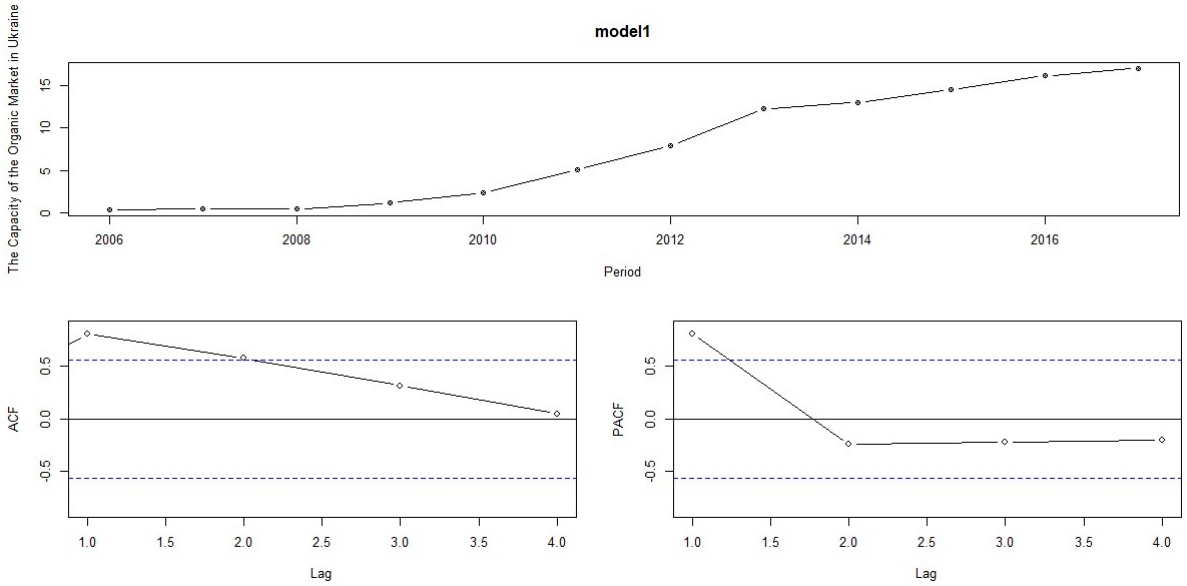
The key target of the closed-loop economic growth is to accelerate the changeover to an inclusive development permanent model. The state food security, the provision of population with environmentally friendly food in order to preserve human health and

to improve the well-being of society, form sustainable development security in the context of a post-pandemic crisis on the basis of an inclusive closed-loop economy. Organically pure products guarantee this safety. Therefore, we have calculated a model predicting the capacity of the organic market in Ukraine.

Models like AR (Auto Regression), MA (Moving Average), and ARIMA (Autoregressive Integrated Moving Average) of several types have been used to create a model predicting the capacity of the organic market in Ukraine and forecasting values for 2019-2021. The analyzed period is from 2006 up to 2017. The smallest value of the AIC criterion, which evaluates errors beyond the selective foresight, is the parameter for the model type selection among others of various classes. The criterion for choosing a model of different classes is the indicator of the smallest error between the predicted and real values of the organic market capacity in 2018. The analysis area is the R programming language. Importing, preparing data and installing the necessary packages are previous steps before creating models.

The autocorrelation function is the correlation of the function value in the *t* period with the function value in the *t-k* period, taking into account the cumulative effects of changes for all the successive periods when to shift the value in the last period. The ACF value for the organic market capacity (depicted in Fig. 1) is slowly falling. The partial autocorrelation function is the correlation of the function value in the *t* period with the function value in the *t-k* period, taking into account the direct effect of the change when to shift the value in the last ones. The PACF function value (shown in Fig. 1) goes beyond the average value range only at the first point.

Figure 1. The Capacity of the Organic Market in Ukraine, the Autocorrelation and the Partial Autocorrelation Functions



Source: own elaboration

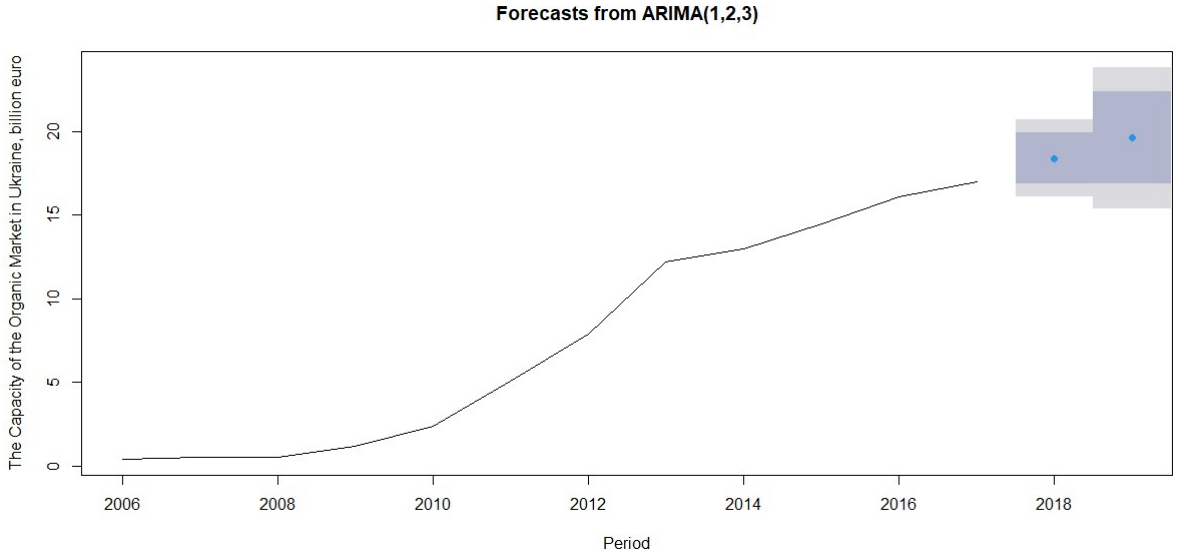
We used all three model types to forecast the organic market capacity and have determined that the ARIMA model, used for the non-stationary time series, is the most accurate. The equations (1, 2, 3) of the ARIMA model will have the following form:

(1) $$y_t = 0{,}4920y_{t-1} - 1{,}0254\varepsilon_{t-1} + 0.3466\varepsilon_{t-2} - 0{,}3212\varepsilon_{t-3}$$

The model constructed herein forecasts the value of the organic market capacity in Ukraine in 2018 and 2019. Graphically, the ARIMA functions (1, 2, 3) are shown in Fig. 2.

The real value of the capacity of the organic market in Ukraine is 20 billion Euro. According to Table 1 small, discrepancies between the points predicted and real values is found using the model ARIMA (0,1,0).

Figure 2. The Model of the Autoregressive Integrated Moving Average ARIMA (1,2, 3) for the Organic Market Capacity



Source: own elaboration

Table 1. Forecast Values of the Organic Market Capacity in Ukraine Based on MA, AR and ARIMA Models (2018)

Year	MA (4)					AR (3)				
	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2018	15.55	13.73	17.37	21,14	18.33	17.15	15.83	18.47	15.14	19.17

Source: own elaboration

Table Continuation

Year	ARIMA(1,2,3)					ARIMA(0,1,0)				
	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2018	18.41	16.90	19.92	16.01	20.72	18.51	16.85	20.17	15.97	21.05

Source: own elaboration

ARIMA (1, 2, 3) was chosen for the forecasting as the most optimal. According to two criteria, the present model is in the second place of efficiency among four others and, taken

in totality of the analysis, the most effective among them. In 2019, the capacity of the organic market was 19.63 billion euros, in 2020 – 20.9 billion euros, and in 2021 – 22.190 bilion euros. Interval and point values concerning the forecasts are given in Table. 2.

Table 2. Forecast Values of the Organic Market Capacity in Ukraine Based on the ARIMA (1, 2, 3) Models (2019-2021)

Year	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2019	19.6261	16.8617	22.3906	15.3983	23.8540
2020	20.899	16.6006	25.1932	14.3263	27.4675
2021	22.1950	16.4019	27.9877	13.3353	31.0543

Source: own elaboration

Thus, models like AR (Auto Regression), MA (Moving Average), and ARIMA (Autoregressive Integrated Moving Average) allow to fully describ the regularity between the time and volume of the organic market capacity in Ukraine and getting an adequate forecast for it. Therefore, if the volume indicator of the organic market in Ukraine continues to be confirmed, then this market will rapidly develop.

Conclusions, recommendations

Most of the research on the circular economy that has been conducted so far focuses primarily on the business model of improving resource efficiency. Scientists emphasize the reuse of materials, as well as the creation of added value through services and intelligent solutions; the need to introduce circular models to reduce the utilization of energy and materials in society in order to achieve environmental safety. The main advantages of the results that will be obtained over the existing ones are the solution to a complex scientific and practical problem of overcoming the consequences of the post-pandemic crisis by strengthening the sustainable development security at micro, meso, and macro levels on the basis of an inclusive circular economy in the process of socio-ecological and economic uplift of the territory. This requires a reorientation of economic and environmental thinking, the creation of fundamentally new mechanisms for sustainable development of spatial socio-economic-ecological systems aimed at ensuring a high quality of life, state food security, acceptable quality of the environment, human development in general.

The study showed that Ukraine has an important potential for the production of organic products, their export and placement on the domestic market. Organic farming is characterized by positive dynamics of increasing production. The development of the organic market will contribute to the improvement of the economic, social and environmental situation in Ukraine, the improvement of the health of the population and the sustainable development of the country as a whole.

Useful and valuable methodological developments of the project will be the development of algorithms and recommendations for overcoming the effects of the post-pandemic crisis and strengthening the sustainable development security on the basis of an inclusive circular economy; recommendations on counteracting potential threats, the security of sustainable development and national security in general. Scientific-practical and applied results of the study will be aimed at solving three main tasks: ensuring the development of energy and resource-saving economy while improving the environmental situation and addressing a number of social issues, especially poverty reduction, as one of the priority goals of inclusive growth.

References

HESHMATI, A. (2015). Review of the circular economy and its implementation. Available at: http://entreprenorskapsforum.se/wpontent/uploads/2015/12/CircularEconomy _webb.pdf.

PRESTON, F. (2012). A Global Redesign? Shaping the Circular Economy Energy, Environment and Resource Governance. Vol. 02. 20 p. Available at: https://www.biblioteca.fundacionicbc.edu.ar/images/d/d7/Bp0312_preston.pdf

CHASEK, P.S., WAGNER, L.M., LEONE, F., LEBADA, A.-M. and RISSE, N. (2016). Getting to 2030: Negotiating the Post-2015 Sustainable Development Agenda. RECIEL 25(1): 5-14.

PAVLIKHA, N. V., KRAVTSIV, V.S., PAVLOV, V.I. (2005). Conceptual bases of development of the program of use and protection of natural resource potential of the region.Regional economy. IRD NAS of Ukraine. Lviv. № 1. P. 107–115.

PAVLIKHA, N.V. (2005). Conceptual principles of management of sustainable development of spatial systems: Preprint. Lutsk: Nadstyria. 60 p.

PAVLIKHA, N.V. (2006). Management of sustainable development of spatial systems: theory, methodology, experience: monograph. Wolin. state Univ. Lesya Ukrainka, Ternopil. state econ. University, Institute of Region. dosl. NAS of Ukraine Lutsk: Volyn. reg. print. 380 p.

PAVLIKHA, N.V. (2004). Resource-ecological strategy of sustainable development of regions.Economic revival of Russia: Periodical scientific publication. SPb, Vol 2. P. 62–64.

PAVLIKHA, N.V.(2005). Principles and mechanisms of spatial arrangement of the network of centers of economic activity of the region. Mechanisms of economic regulation.Vol. 2. P. 179–188.

PAVLIKHA, N.V. (2005). Multidisciplinary nature of the problems of sustainable spatial development of regions: a review of scientific approaches Problems of rational use of socio-economic and natural resource

potential of the region: financial policy and investment. "Integration and Innovative Transformation" Series. Rivne: NUVGP. Issue. XI. № 1. P. 106–122.

SKOROKHOD, I. (2018). European Union Ecological Security Ensuring. International and National Security: collective monograph. Kyiv: Hordon. Pp. 226-240.

SKOROKHOD, I. (2018). Innovative green development funding of Ukrainian Regions in the context of European integration. Studia i Materialy «Miscellanea Oeconomicae» 2/2018–1, Rozwój zrównoważony – aspekty ekonomiczne, społeczne i środowiskowo–techniczne w wymiarach globalnym, krajowym i regionalnym. Poland. Kielce. Pp. 55-66.

SKOROKHOD, I.S (2020). Development of the market for environmental goods and services in terms of European integration: monograph. Lutsk: Vezha-Druk. 384 p.

KARLIN, M.I., TSYMBALIUK, I.O., PROTS, N.V. (2018). Features tax reform and mechanism ofhiding taxes in Ukraine. Financial and credit activity: problems of theory and practice. Vol. 1 No. 24. Pp. 123–130. DOI: https://doi.org/10.18371/fcaptp.v1i24.128327

PAVLIKHA, N. V., TSYMBALIUK, I. O., KOVSHUN, N. E., KOTSAN, L. M. (2018). Conceptual Transformation Principles Of The Income Regulation System In Ukraine. Financial and credit activity: problems of theory and practice. Vol. 2 (25). P. 317–324. DOI: https://doi.org/10.18371/fcaptp.v2i25.136837

GUPTA, J., VEGELIN, C. (2016). Sustainable development goals and inclusive development International Environmental Agreements: Politics, Law and Economics, Vol. 16(3). P 33-448. Available at: https://link.springer.com/article/10.1007/s10784-016-9323-z (accessed 25 November 2020).

RANIERI, R.,RAMOS, R. A. (March 2013). Inclusive Growth: Building up a Concept (PDF). Working Paper. 104. Brazil: International Policy Centre for Inclusive Growth. ISSN 1812-108X. Retrieved 13 January 2015.

YEMELYANENKO, L.M., PETYUKH, V.M., DZENZELYUK, K.V. (2019). Integral assessment of inclusive development in Ukraine at the national and local levels. Economy and state. Vol. 6. Pp. 4–10. Available at: www.economy.in.ua/index.php?op=1&z=4339&i=0

TSYMBALYUK, I.O. (2019). The mechanism of management of inclusive development of the region in the conditions of financial decentralization. Business navigator. Vol. 6.1 (56). Pp. 16–21.

TSYMBALYUK, I.O. (2019). Inclusive development of the region in terms of financial decentralization: theory, methodology, practice: monograph. Lutsk: Vezha-Druk. 340 p.

TSYMBALYUK, I.O. (2019). The essence and components of the fiscal space of inclusive development of regions. Entrepreneurship and innovation. Vol. 10. Pp. 166–172.

21TSYMBALYUK, I.O. (2019). Conceptual principles of inclusive development of the region in terms of financial decentralization. Innovative economy. Vol. 5–6. Pp. 125–133.

BRUNDLAND, H. (1987). Our Common Future: International Commission on Environment and Development, Oksford Yuniversiti Press.

BURKINSKIY, V.B., STEPANOV, V.N., KHARICHKOV, S.K. (2005). Economic and ecological basis of regional nature management and development. Odesa: Feniks, 2005. 575 p.

CARREZ, D., VAN LEEUWEN, P. (2015). Closing the loop of the circular economy. Biconsortium. № 38. Pp. 34–35. Available at: https://biconsortium.eu/sites/biconsortium.eu/files/downloads/European_Files_september2015_38.pdf.

SERGIENKO, L.V. (2016). Directions of reforming the state policy in providing circular economy in the context of international cooperation. Investments: practice and experience. № 23. Pp. 100–110.