

Analysis of the Main Threats to the System of Sustainable Development and Planning of the Region in the Context of Ensuring the Economic Security of the State



Peter Lošonczi^{1*}, Igor Britchenko², Olena Sokolovska³

¹ Vice-Rector for Scientific Work and Educational Process, University of Security Management in Košice, Košice 04001, Slovakia

² Department of Finance, Higher School of Insurance and Finance, Sofia 1618, Bulgaria

³ Department of International Economic Relations, Central Ukrainian National Technical University, Kropyvnytskyi 25000, Ukraine

Corresponding Author Email: losonczi.peter.lector.usm@gmail.com

<https://doi.org/10.18280/ijstdp.170504>

ABSTRACT

Received: 8 July 2022

Accepted: 16 August 2022

Keywords:

sustainable development, security, region, planning, threats

The main purpose of the study is to identify and analyze the main threats to the system of sustainable development and planning of the region in terms of ensuring the economic security of the state. To do this, we applied a methodology that allows us to establish the dependence and connection between threats and to determine the level structure of measures to counter the negative impact of these threats on a particular region. The relevance of the study is given by the fact that the regions of Europe today are also suffering from military actions on the territory of Ukraine. As a result of the study, a multi-level matrix of the hierarchy of the negative impact of threats on the system of sustainable development and planning of the region was formed in the context of ensuring the economic security of the state. The use of this matrix is a relatively new and more effective way to determine the measure of the impact of certain phenomena. The study has limitations and they concern the selection of only one region therefore further research needs to expand and apply our matrix to more regions.

1. INTRODUCTION

The steady development of the processes of globalization is accompanied by warring processes of regionalization. The importance of interstate economic and political formations as subjects of relevant international relations is growing.

Creating a sustainable model of sustainable development and planning for the regions is the most significant lever that ensures the sustainable development of the economy.

The constancy of regional development and the planning process is largely determined by the pace, proportions, and methods of using natural resources, which, after passing through all phases of the reproduction cycle, turn into material goods designed to satisfy the specific needs of citizens. This is an unconditional axiom of the life of the population and the imperative of the resource-environmental strategy of regional development in the context of ensuring the security of the state.

The rational use of regulatory instruments allows the state to act as a mediator capable of balancing social, commercial, and national interests. At the same time, the importance of regions is growing, which become the basis for the implementation of long-term sustainable development goals that require the construction of an optimal institutional configuration to ensure effective interaction with the external environment. That is, the use of certain tools allows the state to form and ensure the stability of the environment in which the economic agents of the regions operate, stimulating the development of the latter. The described situation causes increased attention in the context of updating the issues of sustainable development and regional planning.

Today, global trends in the development of the world economy significantly affect the development of all countries of the world and regions, which is manifested in the opportunities for regions with highly competitive products to enter world markets. At the same time, the experience of European countries proves positive results in changing the institutional systems of states, abandoning the vertical management system in favor of decentralized management systems, which contributes to the sustainable development of regions.

The modern concept of sustainable development and regional planning involves ensuring the controllability of development processes. This goal is achieved through the use of modern technologies for modeling and forecasting socio-economic processes, as well as technical and administrative tools for regulating issues of ensuring the security of the state.

The main purpose of the study is to identify and analyze the main threats to the system of sustainable development and planning of the region in terms of ensuring the economic security of the state.

2. LITERATURE REVIEW

Today it is difficult to imagine the planning of the region without laying the groundwork for its sustainable development. Scientists [1-3] note that the range of interpersonal relationships throughout the history of human development is expanding, today the number of links in the chain of identity - family - clan - tribe - city - nation increases by one more link

- the planet, i.e. identity and citizenship have reached the level of the planet. Modern humanity is aware of itself as one family with a common destiny because we have no other home than the Earth, so global problems concern all the inhabitants of the planet and need a consolidated solution. The sustainable development of the region in this case is aimed at ensuring the socio-economic development of states without additional burden on the environment, which could have a devastating effect on our planet.

For example, Krishtanova et al. [4] also considered the features of the economic and sustainable development of the region, but they were aimed at the negative impact of threats due to COVID-19. They considered certain features of the sustainable economic development of the region and the measures chosen by the governments of the leading countries of the world to overcome the negative consequences of the COVID-19 pandemic. This will make it possible to form a real vision of the possible course of economic processes that will directly affect the level of the socio-cultural life of the population of certain regions. However, we believe that today, COVID-19 is not the biggest threat and problem in most regions of Europe. The impact of hostilities in the center of Europe, on the territory of Ukraine, is the greatest threat and danger today.

In modern studies of scientists [5, 6], real figures and examples have already been given that military operations on the territory of Ukraine have a great impact on a number of elements of sustainable development in most European countries. In this regard, the factor of war on the territory of Ukraine is considered to be influential in the context of this study.

We agree with the opinion of these authors that the war on the territory of Ukraine has a significant impact on the sustainable development of all European countries. Living in Slovakia, our region has already begun transformational changes in its own sustainable development strategy, taking into account the influx of migrants and socio-economic and military assistance to Ukraine.

Most scientists [7, 8] note the fact of the relevance of the study of sustainable development and planning of the region. Noting this that planning is the basis for the effective socio-economic development of the regions, a tool for the formation and implementation of the strategic goals of the socio-economic development of the region. They also note the importance of finding new methods to counter threats to sustainable development and planning in the regions. We agree with this opinion, which is why we chose this research topic.

Scientists Bohnsack and Kolk [9] and Kates et al. [10] are increasingly going into the question of what this sustainable development of the region is. It is argued that ensuring sustainable development is one of the main priorities, which implies the effectiveness of business activities. This is due to the fact that it is the constancy of activity that provides a number of advantages, such as increasing the level of organizational management and social responsibility, new market opportunities and the growth of investment attractiveness, innovation in production and management processes, minimizing risks and reducing costs, as well as creating favorable conditions for developing future generations through the rational distribution and use of resources. In our opinion, the sustainable development of the region is when there is no or minimal negative impact of threats.

According to Vertakova and Plotnikov [11], the process of ensuring sustainable development. In their opinion, sustainable development is not always a positive phenomenon, since it can set certain rigid boundaries and goals that are not always possible to implement and achieve, which will push the economic system and the management apparatus to take risky actions, which in the future may negatively affect the overall condition. economic security of the country.

As noted by Kačerauskas [12] and Balkytė and Peleckis [13], modern technologies and resources are needed for sustainable development. Without innovation, it is difficult to talk about it.

Summing up the review of scientific and practical literature, we can see that there is scientific interest in this topic. The sustainable development of the region is considered in different ways and even in the context of a certain period. It can be both pre-COVID and post-COVID. Undoubtedly, the COVID-19 pandemic has become a significant threat to modern sustainable development in the developed world, and despite the fact that the impact of other threats is currently predominant. We see that today the number of threats is growing and they are intensifying due to hostilities right in the center of Europe, on the territory of Ukraine. This fundamentally changes the sustainable development planning system of any neighboring region.

3. METHODOLOGY

The methodology of our study includes several methods aimed at achieving the goal. First of all, these are theoretical methods for analyzing scientific and practical information regarding the problem on the subject of research.

Also, the mathematical method of graph theory and the method of comparative ordering were applied to determine the level and types of measures to counter the main threats to the system of sustainable development and planning of the region in terms of ensuring the economic security of the state.

Graph theory and the method of comparative ordering has the following advantages: universality, reliability, speed, efficiency.

The main difference between graph theory and other well-known decision-making methods is that in graph theory there are special proven effective algorithms for finding optimal solutions depending on various situations.

For clarity and a better understanding of the application of the methodological approach we have chosen, we will choose one of the regions of Slovakia, namely the Košice Region. The experience of our authors on the sustainable development of this region and through the use of the method of questioning colleagues at work, who are also involved in planning the sustainable development of the Košice Region, were able to form the most negative threats to the development of this region today (Table 1).

Thus, the selection criteria implied the choice of those people who were better acquainted with the problems of this study in the immediate environment for the authors. At the time of the study, this criterion was sufficient, given the significant experience of the people who formed the list of negative threats to the sustainable development of the region. It is planned to expand these criteria in the future. Today's choice of threats is a demonstration of our theoretical and methodological approach.

Table 1. Threats and their mathematical identifier

Mathematical identifier	Threat	Mathematical identifier	Threat
q ₁	Low competitiveness of the region	q ₂	Location next to military actions in Ukraine
q ₃	Low digitization in the region	q ₄	A large influx of emigrants from Ukraine
q ₅	Low investment attractiveness	q ₆	The purchasing power of the population of the region
q ₇		q ₇	Low tourist attraction

We understand that not all threats have been taken into account; however, to demonstrate the application of the proposed methodological approach and its theoretical effectiveness at present, we believe this will be sufficient.

For a better understanding and display of the results, we will set the appropriate mathematical identifiers for each threat through a mathematical convention. Let, according to the methodology, the totality of the threats we have identified to the system of sustainable development and planning of the region in the conditions of ensuring the economic security of the state will be: $Q = \{q_1, q_2, q_3, q_4, q_5, q_6, q_7\}$.

Of course, it is impossible to throw all possible resources at all of them and provide an appropriate response to minimize the negative impact at the same time. It should be hierarchically put to the solution of this issue and therefore the application of the proposed methodological approach. Its results will be presented later in the text.

The methodology we have chosen provides for step-by-step modeling of the hierarchical ordering of the negative impact of threats on the system of sustainable development and

planning of the region through the identification of the main threats with the determination of the relationship and calculation of the level that a particular threat may have using the hierarchical method.

4. RESULTS OF RESEARCH

So, the first stage of the results of our study will be the formation of a 7x7 dependence matrix. All of its binary elements must respect what happened (1):

$$\text{Binary element } q_{ij} = 1, \text{ if } i \text{ affects } j; 0 \text{ if not} \quad (1)$$

The 7x7 dependence matrix of binary elements (threats) is presented in Table 2.

Taking into account the results obtained in the binary matrix presented above, we can present a model of links between the identified threats to sustainable development and regional planning in terms of ensuring economic security (Figure 1).

Table 2. Dependency matrix of identified threats to sustainable development and planning Košice region

q _{ij}	Threat q ₁	Threat q ₂	Threat q ₃	Threat q ₄	Threat q ₅	Threat q ₆	Threat q ₇
Threat q ₁	0	1	0	0	0	0	0
Threat q ₂	0	0	0	0	0	0	0
Threat q ₃	1	1	0	0	0	0	0
Threat q ₄	1	0	1	0	1	0	1
Threat q ₅	0	1	1	0	0	0	1
Threat q ₆	1	1	0	1	1	0	1
Threat q ₇	1	0	1	0	0	0	0

Table 3. Reach matrix of identified threats to sustainable development and planning Košice region

q _{ij}	Threat q ₁	Threat q ₂	Threat q ₃	Threat q ₄	Threat q ₅	Threat q ₆	Threat q ₇
Threat q ₁	1	1	0	0	0	0	0
Threat q ₂	0	1	0	0	0	0	0
Threat q ₃	1	1	1	0	0	0	0
Threat q ₄	1	1	1	0	1	0	1
Threat q ₅	1	1	1	0	1	0	1
Threat q ₆	1	1	1	1	1	1	1
Threat q ₇	1	1	1	0	0	0	1

Table 4. Iterative-calculation table to form the level of the hierarchy of threats to sustainable development and planning of the Košice Region

q _{ij}	T(q _i)	P(q _i)	R(q _i)
Threat q ₁	1, 2	1, 3,4,5,6,7	1
Threat q ₂	2	1,2,3,4,5,6,7	2
Threat q ₃	1,2,3	3, 4,5,6, 7	3
Threat q ₄	1,2,3,4,5,7	4,6	4
Threat q ₅	1,2,3,5,7	4, 5,6	5
Threat q ₆	1, 2, 3,4,5,6,7	6	6
Threat q ₇	1,2,3,7	4,5,6,7	7

Now it should be noted that if according to Figure 1, there is a path that can bring from q_i to q_j, then we can talk about the reach of such a threat and we mathematically identify it as a threat T(q_i). If according to Figure 1, the arrows indicate some kind of dependence of one threat to another, then this already indicates that the threat affects the threat in a certain way, with which such an arrow directs. We mathematically identify this as P(q_i).

Based on the results presented above, we should also construct a 7x7 reach matrix for our multiplying q (Table 3).

The cross-section of threats mathematically identified as T(q_i) and P(q_i) form a subset (2):

$$R(q_i) = T(q_i) \cap P(q_i) \quad (2)$$

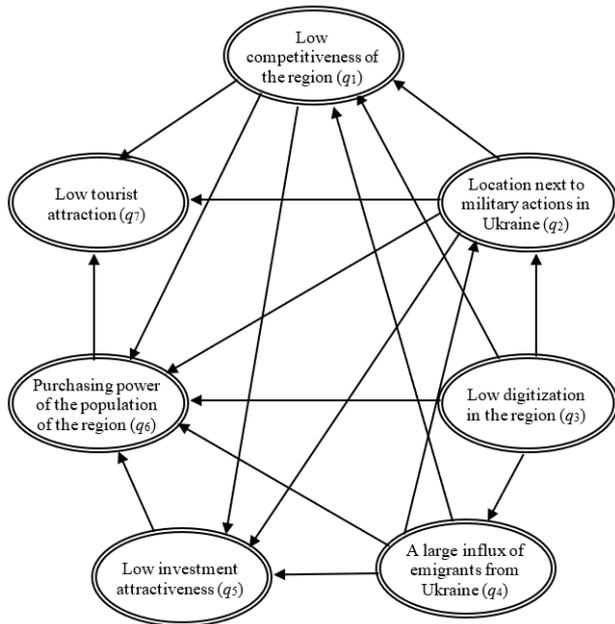


Figure 1. The model of connections between the identified threats to sustainable development and regional planning in terms of ensuring economic security

The remaining vertices that are not reached from any set of vertices q and will form one of the levels of threats to the sustainable development and planning of the region. In this case, the following requirement (3) must be met:

$$R(q_i) = P(q_i) \quad (3)$$

Therefore, the next step is to build an iterative-calculation table to form the level of the hierarchy of threats to sustainable development and planning of the Košice Region (Table 4).

We fill in the rows according to reachable vertices, predecessor vertices, and those where the equality condition is satisfied. Therefore, the lowest level will pose a threat q_6 (Purchasing power of the population of the region). This threat is difficult to resolve immediately and therefore has a more strategic response. In our opinion, for the selected region, it has the lowest level of negative impact. Row 6 is extracted from the table and thus we get Table 5.

Table 5. Iterative-calculation table to form the level of the hierarchy of threats to sustainable development and planning of the Košice Region

q_{ij}	$T(q_i)$	$P(q_i)$	$R(q_i)$
Threat q_1	1, 2	1, 3, 4, 5, 7	1
Threat q_2	2	1, 2, 3, 4, 5, 7	2
Threat q_3	1, 2, 3	3, 4, 5, 7	3
Threat q_4	1, 2, 3, 4, 5, 7	4	4
Threat q_5	1, 2, 3, 5, 7	4, 5	5
Threat q_7	1, 2, 3, 7	4, 5, 7	7

From Table 5, equality is for threat q_4 (A large influx of emigrants from Ukraine). This threat has a number of points that can negatively affect the social condition of the region and, as a result, its sustainable development, however, in the context of hostilities on the territory of Ukraine, this problem must be accepted for the time being and postponed for a

strategic decision and understanding to treat the problem of emigration to the region through such a military crisis. It is extracted and thus we get a new Table 6.

Table 6. Iterative-calculation table to form the level of the hierarchy of threats to sustainable development and planning of the Košice Region

q_{ij}	$T(q_i)$	$P(q_i)$	$R(q_i)$
Threat q_1	1, 2	1, 3, 5, 7	1
Threat q_2	2	1, 2, 3, 5, 7	2
Threat q_3	1, 2, 3	3, 5, 7	3
Threat q_5	1, 2, 3, 5, 7	4, 5	5
Threat q_7	1, 2, 3, 7	5, 7	7

Therefore, equality holds for q_5 (Low investment attractiveness). This threat already requires more tactical measures to develop business and reduce the tax burden. As a result of hostilities on the territory of Ukraine, a significant number of businesses that can work remotely (IT sphere) will look for new European regions for themselves. This should be used to counter the threats of low investment attractiveness. Removing this threat, we get Table 7.

Table 7. Iterative-calculation table to form the level of the hierarchy of threats to sustainable development and planning of the Košice Region

q_{ij}	$T(q_i)$	$P(q_i)$	$R(q_i)$
Threat q_1	1, 2	1, 3, 7	1
Threat q_2	2	1, 2, 3, 7	2
Threat q_3	1, 2, 3	3, 7	3
Threat q_7	1, 2, 3, 7	7	7

Equality is fulfilled for element q_7 (Low tourist attraction) and means that tactical measures are needed for the development of tourism, hotel and restaurant complex. Košice Region is a picturesque area with great prospects for the development of mountain tourism. This should be used. Extracting q_7 , leads to the formation of Table 8.

Table 8. Iterative-calculation table to form the level of the hierarchy of threats to sustainable development and planning of the Košice Region

q_{ij}	$T(q_i)$	$P(q_i)$	$R(q_i)$
Threat q_1	1, 2	1, 3	1
Threat q_2	2	1, 2, 3	2
Threat q_3	1, 2, 3	3	3

Taking into account further calculations, we came to the conclusion that the highest level of threat is the element q_2 (Location next to military actions in Ukraine) and it should be noted that it is the same for many regions of Eastern and Central Europe.

So, based on the results of the calculations, we will form a multi-level matrix of the hierarchy of the negative impact of threats on sustainable development and planning of the region we have chosen (Figure 2).

Thus, it is the threat that is most dangerous today and requires prompt countermeasures. We recommend for Košice Region to focus on smart technologies for managing the region. Simplify as much as possible the tourist threshold for entering the region and open its doors to all migrants from Ukraine.

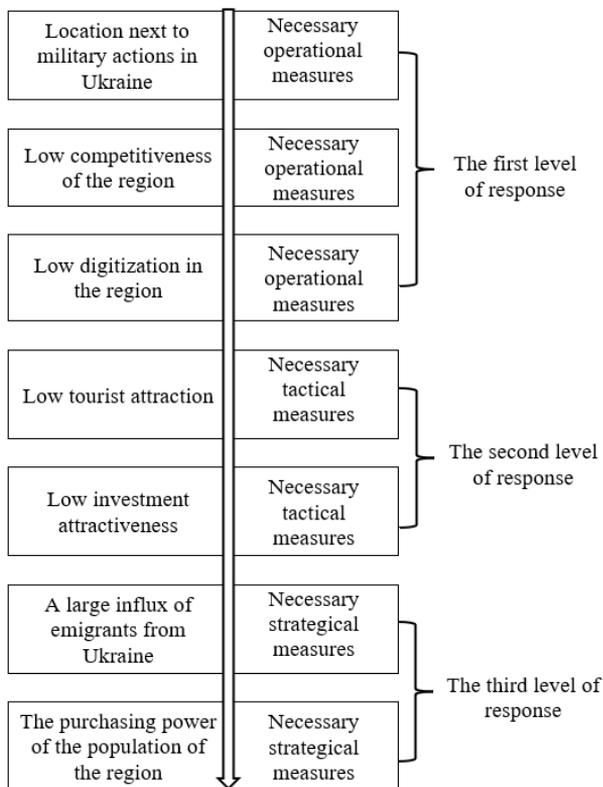


Figure 2. The multi-level matrix of the hierarchy of the negative impact of threats to the system of sustainable development and planning of the Košice Region

5. DISCUSSIONS

Discussing the results of our mathematical and methodological analysis, we can observe the intensification of scientific attention to the problems of sustainable development and regional planning through the use of such methods. As an example, some scientists [14, 15] strive to form a model of economic and social sustainable development of the region in a pandemic or already post-pandemic. We live today in new realities when the pandemic has become not the biggest danger. The war on the territory of Ukraine, almost in the center of Europe itself, is what is relevant today.

Interesting and similar is the study by Kryshchanovych et al. [16], where they also, through mathematical modeling methods, were aimed at sustainable development for the regions of the EU country, but there was an emphasis on the economic component. As the authors note in their study, increasing attention is being paid to the circular economy as a new socio-economic paradigm for optimizing the use of resources for the sustainable development of the region. Today, the regions where people live, work, consume and manage play a fundamental role in a country's transition to a circular economy, as they are at the center of key decisions that determine economic growth, social welfare, and environmental benefits. We agree with this vision, but our study shifts the focus to modeling the negative impact of threats.

Our study has a number of differences, and they consist, first of all, in the fact that we noted the narrowing of the study area. We do not seek to cover the maximum number of problem regions or the problems of the whole state. We are only interested in individual territories and socio-economic

systems. In many works [17-19] one can meet the identified threats to the economic and sustainable development of the region, but practically the news will show how it is possible to streamline measures to counter these threats.

Discussing the results, according to the subject of the study, the authors tried to present scientific novelty by forming a multi-level matrix of the hierarchy of the negative impact of threats on the system of sustainable development and planning of the region was formed in the context of ensuring the economic security of the state.

6. CONCLUSIONS

Summing up, it should be noted that today, in the conditions of administrative and territorial reform, there is a need to use planning as a peculiar form of state management.

Based on the results of the study, we have formed a multi-level matrix of the hierarchy of the negative impact of threats to the system of sustainable development and planning of the region in the context of ensuring the economic security of the state. The study has limitations and they concern the selection of only one region therefore further research needs to expand and apply our matrix to more regions.

We emphasized the problems and threats that hinder sustainable development and planning in the regions of Europe, but in summary, we can give several main recommendations for the regional development of Slovakia: attraction of investments in the territory; development of small and medium-sized businesses; infrastructure development for business development; increasing the innovative potential of the local economy; increasing competitiveness of newly formed communities; development of tourism; improvement of communal infrastructure; improving the landscaping of the territory; development of information technologies and electronic governance; establishment of subregional cooperation. Therefore, planning today consists in the formation and implementation of a strategy for the sustainable development of the region on the basis of continuous control and assessment of changes occurring in its activity, in order to support the ability of the territory of the region to survive and ensure its effective functioning in the conditions of a changing external environment. The search for new ways of stabilizing regional sustainable development and increasing the competitiveness of territorial production is becoming more and more urgent.

The war on the territory of Ukraine had a strong impact on neighboring regions, and therefore further research should also focus on the Ukrainian crisis.

REFERENCES

- [1] Tvaronavičienė, A. (2012). The possibilities to use public procurement as one of the instruments of implementation of sustainable development concept in republic of Lithuania. *Business: Theory and Practice*, 13(3): 197-207. <https://doi.org/10.3846/btp.2012.21>
- [2] Lapinskienė, G., Peleckis, K. (2009). Impact of sustainable development indicators on economic growth: Baltic countries in the context of developed Europe. *Business: Theory and Practice*, 10(2): 107-117. <https://doi.org/10.3846/1648-0627.2009.10.107-117>
- [3] Lapinskienė, G., Tvaronavičienė, M. (2009). Sustainable

- development across central and eastern Europe: key factors driving the economic growth of the countries. *Business: Theory and Practice*, 10(3): 204-213. <https://doi.org/10.3846/1648-0627.2009.10.204-213>
- [4] Kryshchanovych, M., Antonova, L., Filippova, V., Dombrowska, S., Pidlisna, T. (2022). Influence of COVID-19 on the functional device of state governance of economic growth of countries in the context of ensuring security. *International Journal of Safety and Security Engineering*, 12(2): 193-199. <https://doi.org/10.18280/ijssse.120207>
- [5] Krupa, O., Krupa, V., Dydiv, I., Horpynchenko, O., Kovalenko, S., (2022) Economic consequences of the impact of war on labor resources and tourism in terms of ensuring economic security. *International Journal of Computer Science and Network Security*, 22(7): 117-122. http://paper.ijcsns.org/07_book/202207/20220715.pdf.
- [6] Kopytko, M., Grabar, N., Storozhuk, N., Yuliia Borutska, Doroshenko, T. (2022). Influence of negative factors of war: Economic, legal, regional and environmental aspects. *International Journal of Computer Science and Network Security*, 22(6): 13-18. <https://doi.org/10.22937/IJCSNS.2022.22.6.3>
- [7] Kryshchanovych, S., Gutsulyak, V., Huzii, I., Helzhynska, T., Shepichak, V. (2021). Modeling the process of risk management response to the negative impact of risks as the basis for ensuring economic security. *Business, Management and Economics Engineering*, 19(2): 289-302. <https://doi.org/10.3846/bmee.2021.14798>
- [8] Baumgartner, R.J., Rauter, R. (2017) Strategic perspectives of corporate sustainability management to develop a sustainable organization. *Journal of Cleaner Production*, 140(1): 81-92. <https://doi.org/10.1016/j.jclepro.2016.04.146>
- [9] Bohnsack, R., Kolk, A. (2014) Business models for sustainable technologies: Exploring business model evolution in the case of electric vehicles. *Research Policy*, 43(2): 284-300. <https://doi.org/10.1016/j.respol.2013.10.014>
- [10] Kates, R.W., Parris, T.M., Leiserowitz, A.A. (2012) What is sustainable development? Goals, indicators, values, and practice. *Environment: Science and Policy for Sustainable Development*, 47(3): 8-21. <https://doi.org/10.1080/00139157.2005.10524444>
- [11] Vertakova, Y., Plotnikov, V. (2017). Problems of sustainable development worldwide and public policies for green economy. *Economic Annals-XXI*, 166: 4-10. <https://doi.org/10.21003/ea.V166-01>
- [12] Kačerauskas, T. (2012). Creative economy and technologies: Social, legal and communicative issues. *Journal of Business Economics and Management*, 13(1): 71-80. <https://doi.org/10.3846/16111699.2011.620151>
- [13] Balkytė, A., Peleckis, K. (2010). Mapping the future sustainable competitiveness resources: Aspects of forests ownership. *Journal of Business Economics and Management*, 11(4): 630-651. <https://doi.org/10.3846/jbem.2010.31>
- [14] Kravchenko, T., Borschch, H., Gotsuliak, V., Nahornyi, V., Hanba, O., Husak, T. (2022). Social Responsibility of the Government in the Conditions of the Global Pandemic Crisis. *Postmodern Openings*, 13(1): 468-480. <https://doi.org/10.18662/po/13.1/408>
- [15] Marhasova, V., Tulchynska, S., Popelo, O., Garafonova, O., Yaroshenko, I., Semykhulyna, I. (2022). Modeling the harmony of economic development of regions in the context of sustainable development. *International Journal of Sustainable Development and Planning*, 17(2): 441-448. <https://doi.org/10.18280/ijstdp.170209>
- [16] Kryshchanovych, M., Filippova, V., Huba, M., Kartashova, O., Molnar, O. (2020). Evaluation of the implementation of the circular economy in EU countries in the context of sustainable development. *Business: Theory and Practice*, 21(2): 704-712. <https://doi.org/10.3846/btp.2020.12482>
- [17] Melnikas, B. (2019). Sustainable social development, economic growth and technological breakthroughs: creativity and creative change. *Creativity Studies*, 12(2): 301-314. <https://doi.org/10.3846/cs.2019.10335>
- [18] Tvaronavičienė, M., Lankauskienė, T. (2013). The impact of production factors and economic structures on economic development. *Business: Theory and Practice*, 14(1): 5-16. <https://doi.org/10.3846/btp.2013.01>
- [19] Nikonenko, U., Shtets, T., Kalinin, A., Dorosh, I., Sokolik, L. (2022). Assessing the policy of attracting investments in the main sectors of the economy in the context of introducing aspects of industry 4.0. *International Journal of Sustainable Development and Planning*, 17(2): 497-505. <https://doi.org/10.18280/ijstdp.170214>