

Assessment of the economic activity greening level and the green economy development directions

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Abstract. Sustainable development is a priority in a modern world. The essence of sustainable development is to ensure such economic growth that allows to preserve the natural environment for present and future generations. One of the effective tools for this is the development of green economy. The authors consider the problems of sustainable development and a green economy on the example of Russia. The purpose of the study: (1) to develop a method for assessing the development of a green economy based on a comparison of environmental and economic indicators; (2) to test this method on the materials of the Russian regions, to assess their economic activity greening level; (3) to offer recommendations for improving policies and regulation in the development of the green economy. In this study, in order to assess the level of ecologization of the regional economy, a method of assessing ecological and economic territorial development is used, based on the calculation of the integral index. This technique allows for a comparative analysis of Russian regions in terms of environmental and economic development. The authors give a comparative quantitative assessment of the level of greening of the Russian regions. On this basis, the priorities and directions of development of the green economy are proposed. It is recommended to use these proposals in the regulation of regional development in order to achieve the main goal – sustainable development. These recommendations do not reflect only the specifics of the Russian Federation, and therefore may also be applicable in the international practice.

1. Introduction

The green economy is a new global anti-crisis course for the global economy, with long-term strategic guidelines agreed internationally. So, Ferguson [1] analyzes the development of the concepts of green economy and green growth. This author notes that thanks to these ideas, the institutional transformation of the world economy has begun. Thanks to these innovations in regulatory policy, the socio-economic system is becoming environmentally sustainable. This allows us to overcome the inefficiency of existing socially and environmentally unstable models of economic growth.

An interesting article is the review by Ge and Zhi [2], which analyzes 53 literary sources (from 2002 to 2014) on the problems of the green economy in the context of its impact on employment. The authors revealed the positive impact of the green economy on employment and socio-economic development in most countries. But at the same time, a positive effect has not been identified in Spain. The authors



associated this with the institutional specifics of this country. From this we can conclude that there is a need for state support and stimulation of the development of the green economy.

At the same time, a more complete consideration of the institutional environment of a country is required. The authors insist that this area is not sufficiently explored. Therefore, there are many studies that consider the development of the green economy in some countries: the EU [3], China [4], Russia [5], Kazakhstan [6], etc. The analysis shows that green strategies of various countries of the world are directly related to both pressing environmental problems that are most relevant for the countries under consideration and the level of their socio-economic, technological and innovative development. The authors previously explored this relationship in the article "Problems of sustainable development worldwide and public policies for green economy" (2017) [7]. This study is based on the conceptual conclusions presented in this article, but expands them with new empirical data, as well as studying the situation at the regional level.

Thus, not only positive assessments of the green economy are encountered in the literature. A critical attitude to this phenomenon is also present. McAfee [8] analyzes efforts to integrate the green economy into market mechanisms. This integration has been explored in the global trade in ecosystem services. The author concludes that this trade is unlikely to reduce greenhouse gas emissions. Market contracts exclusively in this area are inefficient. Integrated solutions for sustainable development are required; trade in ecosystem services (as an element of the green economy) should be considered in conjunction with policies of economic growth and overcoming inequality. But these issues are not well understood.

Several researchers emphasize the need to study the green economy at the regional level. In regional studies, this topic remains poorly understood. Gibbs and O'Neill [9] write: "Although international agreements, such as the Paris Agreement on climate change, and nation states' policies are of key importance, there is also evidence that cities and regions can play an important role in driving forward change through experimentation and as locations for niche developments. However, to date, regional development research has had relatively little engagement with issues of the environment and sustainability". One can agree with these authors regarding the need, firstly, for a deeper study of the green economy in the framework of regional studies, and secondly, for combining studies of the green economy with research in politics, technology, social sciences, institutions, etc.

One of the effective responses to the challenges of the global economic transformation was formulated in 1992 in Rio de Janeiro at the World Conference on Development and the Environment. The countries of the world have developed and approved the concept of sustainable development. The essence of sustainable development is to ensure such economic growth, which makes it possible to harmonize the relationship "man – nature (environment)" and preserve the natural environment for present and future generations. Many countries of the world are already building their long-term programs within the framework of the concept of sustainable development. At the same time, an urgent task is to identify the main problems associated with urban development, energy, water, food and ecosystems, as well as the formation of principles and methods of state and supranational regulation of these processes.

The issue of sustainable development, of course, is supranational, global. At the same time, methods to achieve it have significant country specificity. This is determined by the peculiarities of the institutional environment of different countries [10-12]. In this article, the authors consider the problems of sustainable development and a green economy on the example of Russia.

The formation and development of a green economy in the Russian Federation has its own peculiarity, which is associated with a focus on the reproduction of ecological capital as an important structural element of the national wealth of the country and a system of social justice. Russia's development is based on the interests of sustainable development. The national goal is to form institutional mechanisms for accelerating economic growth without disrupting the natural course of reproduction of natural capital in the country.

The purpose of the study: (1) to develop a method for assessing the development of a green economy based on a comparison of environmental and economic indicators; (2) to test this method on the materials

of the Russian regions, to assess their economic activity greening level; (3) to offer recommendations for improving policies and regulation in the development of the green economy.

2. Materials and methods

When conducting the study, the provisions of federal laws, as well as other regulatory legal acts of the Russian Federation, which govern the issues of economic, environmental and social development, were used. The need to develop a set of measures to improve the environmental performance of the economy of the Russian Federation is conditioned by the requirements of federal legislation and the general trends of the state policy of the country of the last decades. The “Strategy of the environmental safety of the Russian Federation for the period up to 2025” is the basis for the formation and implementation of state policy in the field of ensuring environmental safety at the federal, regional, municipal and sectoral levels. The “Fundamentals of the State Policy on Environmental Development of the Russian Federation for the Period until 2030”, approved by the President of the Russian Federation on April 30, 2012, notes that the environmental situation in the Russian Federation is characterized by a high level of anthropogenic impact on the environment and significant environmental consequences of past economic activity.

At present, Russia has developed a national project “Ecology”, which includes national goals and strategic objectives for the environmental development of Russia until 2024. The author’s research considered the implementation tools of this national project, as well as indicators of its implementation. The global goal of the national project is to radically reduce the adverse impact on the environment by 2024. The project involves holding events in ten integrated areas.

The authors believe that the key direction of sustainable regional development in Russia is greening the economy [7,12]. The main direction of greening economic development in the constituent entities of the Russian Federation is the reduction of the environmental capacity of economic processes, which is possible due to the efficient use of natural resources, the reduction of pollution and industrial waste, the introduction of innovative resource-saving technologies, the development of knowledge-intensive activities.

The object of the research is the regions of the Central Federal District of the Russian Federation: Belgorod region, Bryansk region, Vladimir region, Voronezh region, Ivanovo region, Kaluga region, Kostroma region, Kursk region, Lipetsk region, Moscow region, Moscow city, Orel region, Ryazan region, Smolensk region, Tambov region, Tver region, Tula region, Yaroslavl’ region. During the study, we used data on indicators of economic and environmental development of these regions, available from official Russian statistics. The authors used the open data provided on the Rosstat website (www.gks.ru).

Sustainable development has received considerable attention in international and national research since the last third of the twentieth century, which is associated with an increase in anthropogenic pressure on the environment. There are many approaches to determining the level of greening the economy: using the integral index, the indicative method, the system of basic indicators, such as environmental intensity, ecological activity, resource productivity, and others [13-16].

In this study, in order to assess the level of ecologization of the regional economy, a method of assessing ecological and economic territorial development is used, based on the calculation of the integral index. This technique allows for a comparative analysis of Russian regions in terms of environmental and economic development. The process of conducting an integrated assessment of the level of greening of the regional economy consists of four stages.

At the first stage, 15 basic indicators characterizing the ecological and economic situation in the region are used to determine the integral indicator of the regional economy greening. In determining the indicators of the intensity of pollution, interregional differentiation is considered according to the vastness of the territory, the level of GRP, and the population size. The composition of the indicators used to calculate the index is shown in Table 1. These indicators are multidirectional. They describe both positive and negative impacts on the ecological and economic development of the territory.

Table 1. Indicators for calculating the integral indicator of greening the regional economy.

Number	Indicator
1	Emissions of pollutants into the air per unit of GRP
2	Emissions of pollutants into the air per capita
3	Formation of production and consumption waste per unit area
4	Formation of production and consumption per capita
5	Emissions of pollutants into the air
6	Discharge of polluted wastewater to surface water bodies per GRP unit
7	Generation of production and consumption waste per GRP unit
8	Discharge of polluted wastewater to surface water bodies per unit area
9	Discharge of polluted wastewater to surface water bodies per capita
10	Formation of production and consumption per capita
11	Gross regional product per capita
12	Innovative activity of organizations
13	Capital investment per capita
14	Percentage of forests and other wooded land
15	Degree of depreciation of fixed assets

Source: compiled by the authors.

At the second stage of the study, one of the references, having the best criterion value - maximal or minimal – is selected from the set of regions under consideration (further, this value is taken as 1). Then a comparative analysis of the leading region with other regions is carried out according to the following formulas:

$$ln_i^n = \frac{Y_i^n}{Y_{max}^n} \quad (1)$$

or

$$ln_i^n = \frac{Y_{min}^n}{Y_i^n} \quad (2)$$

where Y_i^n – the value of the n -th baseline for the i -th region; Y_{max}^n, Y_{min}^n – the best maximum value or the minimum value of the n -th baseline; ln_i^n – assessment of the level of development of the i -th region in relation to the leading region of the n -th indicator.

At the third stage, the arithmetic mean value of the indices of the basic indicators for each region under study is calculated, by the results of which the regions are ranked according to the degree of decrease.

At the fourth stage, the results are interpreted. The rating of regions in terms of greening is considered, regions with different levels of ecological and economic development are distinguished (extremely low, low, medium, above average, high – Table 2).

At the fifth stage, considers the reasons for the situation. In this case, qualitative analysis methods are used.

Table 2. Indicators for calculating the integral indicator of greening the regional economy.

Level	Indicator value range
extremely low	[0.0; 0.2)
low	[0.2; 0.4)
medium	[0.4; 0.6)
above average	[0.6; 0.8)
high	[0.8; 1.0)

Source: compiled by the authors.

3. Results and discussion

The results of an integrated assessment of the level of greening of the regions of the Central Federal District of the Russian Federation from 2007 to 2017 presented in Table 3.

Table 3. The results of an integrated assessment of the greening of the regions of the Central Federal District.

The subject of the Russian Federation	Integral index value (place in the ranking)		Characteristics of the regional level of sustainability of ecological and economic development		
	2007	2017	2007	2017	Change index
Belgorod region	0.351 (12)	0.314 (13)	Low	Low	-0.037
Bryansk region	0.271 (7)	0.260 (18)	Low	Low	-0.011
Vladimir region	0.359 (10)	0.371 (8)	Low	Low	0.012
Voronezh region	0.401 (6)	0.347 (9)	Low	Low	-0.054
Ivanovo region	0.353 (11)	0.328 (12)	Low	Low	-0.025
Kaluga region	0.493 (1)	0.455 (2)	Medium	Medium	-0.038
Kostroma region	0.319 (14)	0.378 (6)	Low	Low	0.059
Kursk region	0.379 (8)	0.284 (17)	Low	Low	-0.095
Lipetsk region	0.231 (18)	0.344 (10)	Low	Low	0.113
Moscow region	0.485 (2)	0.431 (3)	Medium	Medium	-0.054
Oryol region	0.437 (5)	0.375 (7)	Medium	Low	-0.062
Ryazan region	0.337 (13)	0.299 (15)	Low	Low	-0.038
Smolensk region	0.384 (7)	0.311 (14)	Low	Low	-0.073
Tambov region	0.373 (9)	0.341 (11)	Low	Low	-0.032
Tver region	0.465 (3)	0.412 (4)	Medium	Low	-0.053
Tula region	0.314 (15)	0.287 (16)	Low	Low	-0.027
Yaroslavl' region	0.272 (16)	0.595 (1)	Low	Medium	0.323
Moscow city	0.454 (4)	0.387 (5)	Medium	Low	-0.067

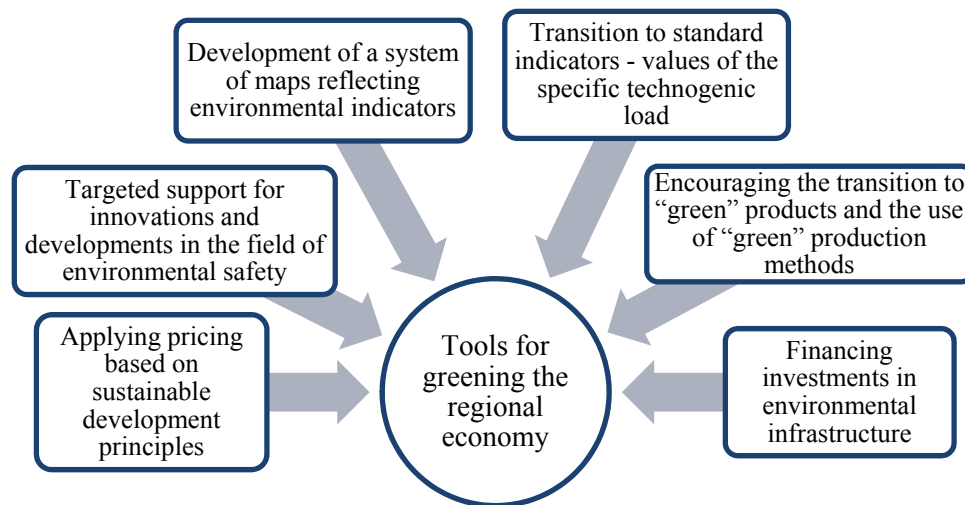
Note: Characteristics of the regional level of sustainability of ecological and economic development: Low – 0.1-0.4; The average is 0.4-0.7; High - 0.7-1.0. Source: calculated by the authors according to Rosstat data.

During the considered time in the rating of ecologization of the regional economy, positive dynamics of ecological and economic development are observed in Vladimir, Kostroma, Lipetsk, and Yaroslavl' regions. This demonstrates the successful implementation of the concept of sustainable development at the regional level. De-ecologization of economic activities (Belgorod, Bryansk, Voronezh, Ivanovo, Kursk, Moscow, Ryazan, Smolensk, Tambov, Tula regions, and Moscow city) has been identified in most regions. It requires the immediate development and implementation of a set of incentives for the transition to an ecologically oriented or green economy.

The obtained quantitative estimates indicate a low level of environmental friendliness of the economy of the Russian regions. At the same time, it is important to emphasize that in most of the studied regions of the Central Federal District, the rating is “Low” and (less often) “Medium”. The dynamics of

development is negative. The obtained author's estimates agree with the data obtained by other authors [17,18].

The analysis made suggests that in Russia the green economy has not yet become the prevailing economic model. Therefore, one of the most important goals of the regional policy for the subsequent periods will be the gradual reduction of the level of risk and man-made pressure, the improvement of the ecological parameters of the territory and the social conditions of life of the individuals and society. Positive shifts in this direction will simultaneously determine the levels of increasing the economic security of the regions and the country. The main instruments for greening the economy to achieve the sustainable development of regions are presented in figure 1.



Source: compiled by the authors.

Figure 1. Tools for greening the regional economy.

The development of green economy-oriented sectors of economic activity will allow Russian regions to reduce sectoral imbalances leading to their economic inequality. Several authors indicate a significant influence of the environmental factor on the differentiation of Russian regions by the level of socio-economic development. We agree with these estimates. Our studies show that the development of a green economy can help align territorial asymmetries [19-21]. But this requires special measures of state policy.

Analyzing the information presented both in national and international documents and in research publications of materials one can single out a number of priorities in the field of the formation and stimulation of a green economy. We have developed a proprietary approach for solving basic environmental problems and ensuring sustainable economic development. The main directions of green economic activity are structured and systematized (figure 2). These areas can be a structural basis for the development and implementation of relevant government policies.

In our opinion, four main priorities for the development of green economy should be distinguished: (1) Activities for the disposal and safe processing of pollutants, the weakening and neutralization of other harmful effects of human activities on the environment; (2) Development of methods for the beneficial use of those substances that are currently recognized as polluting, not only in the framework of recycling, but also in the framework of the development of new industries and types of economic activity; (3) Modification of existing technologies, aimed at reducing their harmful effects on the environment; (4) Impact on population and business to form more environmentally responsible behaviours [7].

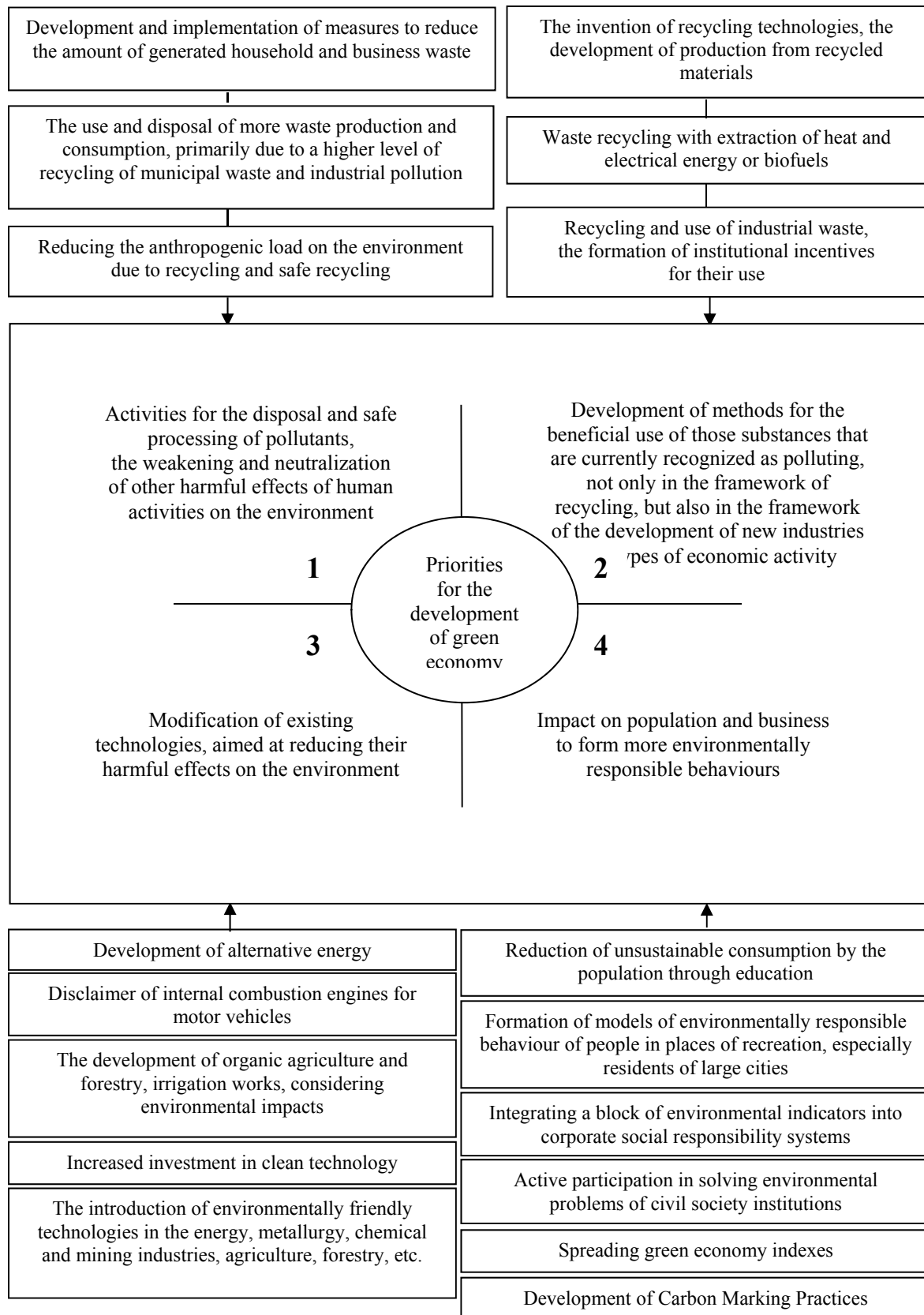


Figure 2. Priorities for the development of a green economy [7].

Work in these areas should be organized comprehensively. Because these areas are interconnected. At the same time, their selection in strategic documents of public administration (Strategies, Programs, Concepts, etc.) allows you to apply program methods to sustainable development management. Given the shortage of resources experienced by the Russian regions, program methods allow achieving the set goals in a timely manner with a minimum budget. It is recommended to take into account the priorities and directions presented in Figure 2 when improving policies and regulation in the development of the green economy in Russian regions.

4. Conclusion

Environmental problems are global. Sustainable development and the development of a green economy are in the common interest of mankind. The development of a green economy in Russia (especially on regional level) is still at a low level. Therefore, it is necessary to activate the state policy in this area. The proposed priorities and directions for the development of a green economy should be key vectors for regional development in order to achieve the main objective - sustainable development. These priority areas do not reflect the specifics of the development of the Russian Federation specifically, and therefore may also be applicable in international practice.

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References

- [1] Ferguson P 2015 The green economy agenda: business as usual or transformational discourse? *Environmental Politics* **24(1)** 17 DOI 10.1080/09644016.2014.919748
- [2] Ge Y and Zhi Q 2016 Literature review: The green economy, clean energy policy and employment. *Energy Procedia* **88** 257 DOI 10.1016/j.egypro.2016.06.159
- [3] Lavrinenko O, Ignatjeva S, Ohotina A, Rybalkin O and Lazdans D 2019 The role of green economy in sustainable development (case study: the EU states) *Entrepreneurship and Sustainability Issues* **6(3)** 1113
- [4] Bi X and Liu P 2019 Research on the Influence of Environmental Regulation on the Efficiency of Green Economy in China. *IOP Conf. Ser.: Earth and Environm. Sci.* **252(4)** 042014
- [5] Vukovic N, Pobedinsky V, Mityagin S, Drozhzhin A and Mingaleva Z 2019 A study on green economy indicators and modeling: Russian context. *Sustainability*. **11(17)** 4629
- [6] Dabyltayeva N and Rakhymzha G 2019 The green economy development path: overview of economic policy priorities. *J. of Security and Sustainability Issues* **8(4)** 643 DOI 10.9770/jssi.2019.8.4(8)
- [7] Vertakova Y and Plotnikov V 2017 Problems of sustainable development worldwide and public policies for green economy. *Economic Annals-XXI* **166(7-8)** 4 DOI 10.21003/ea.V166-01
- [8] McAfee K 2016 Green economy and carbon markets for conservation and development: a critical view. *Int. Environm. Agreements: Politics, Law and Economics* **16(3)** 333
- [9] Gibbs D and O'Neill K 2017 Future green economies and regional development: a research agenda. *Regional Studies*. **51(1)** 161 DOI 10.1080/00343404.2016.1255719
- [10] Bodrunov S and Plotnikov V 2017 Institutional structures influence on the technological development of the economic system. *Proc. of the 30th Int. Business Information Management Association Conf. IBIMA 2017 - Vision 2020: Sustainable Economic development. Innovation Management. and Global Growth* (Spain, Madrid) pp. 2658–2665
- [11] Daniel S J, Cieslewicz J K and Pourjalali H 2012 The Impact of National Economic Culture and Country-Level Institutional Environment on Corporate Governance Practices: Theory and Empirical Evidence. *Management Int. Review* **52(3)** 365

- [12] Vertakova Y, Larionov V and Kondratova E 2017 Accounting of environmental imperatives in the public regulation of sustainable energetics development. *Proceedings of the 29th International Business Information Management Association Conference - Education Excellence and Innovation Management through Vision 2020: From Regional Development Sustainability to Global Economic Growth* (Austria, Vienna) pp. 1982–1994
- [13] Apergis N and Payne JE 2012 Renewable and non-renewable energy consumption-growth nexus: evidence from a panel error correction model. *Energy Economics* **34** 733 DOI 10.1016/j.eneco.2011.04.007
- [14] EaP GREEN 2016 *Measuring The Green Transformation Of The Economy: Guide For EU Eastern Partnership Countries*. Paris, available at: http://www.green-economie-seap.org/resources/EaP%20GREEN_GGI%20Guide_clean_ENG_FINAL.pdf
- [15] Sullivan D 1971 A Single Index of Mortality and Morbidity. *HSMHA Health Reports* **86** 347-354
- [16] United Nations 2009 *Eco-efficiency Indicators: Measuring Resource-use Efficiency and the Impact of Economic Activities on the Environment*. United Nations publication, available at: <https://sustainabledevelopment.un.org/content/documents/785eco.pdf>
- [17] Alexandrova V D 2019 Sustainable development as base for circular economy. *Int. J. of Humanities and Natural Sci.* **5-1** 98 DOI 10.24411/2500-1000-2019-10869
- [18] Center for Environmental Policy of Russia 2007 *Towards Sustainable Development of Russia* [in Russian – Na puti k ustoychivomu razvitiyu Rossii]. Moscow, available at: http://www.ecopolity.ru/upload/File/Bull_36ru.pdf
- [19] Kurbanov A, Gurieva L K, Novoselov S N, Gorkusha O A, Novoselova N N and Kovalenko A A 2016 Features Sub-Regional localities in the Structural-Level organization of the economic system. *Int. Review of Management and Marketing* **6(1)** 287
- [20] Sazonov S P, Fedotova G V and Sazonov V E 2018 Formation of the concept of sustainable development of territory in the worsening ecological conditions. *Espacios*. **39(12)** 7
- [21] Vasilevska D and Rivza B 2018 Green entrepreneurship as a factor of sustainable economic development in baltic states. *Int. Multidisciplinary Scientific GeoConf. Surveying Geology and Mining Ecology Management*. **18(53)** 423

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