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Comparative evaluation of “green” development of the Russian regions

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Abstract. The article presents the results of the study of regional problems of the concept of "green" development. The analyzed statistical indicators allowed drawing a conclusion about the reduction of environmental costs in the regions of Russia and the share of organizations that implement innovations in order to improve environmental safety. It is revealed that insufficiently effective environmental protection investment policy at the regional level negatively affects the expansion of environmental innovation.

1. Introduction

The objectives of green development are to reduce the carbon intensity of the economy and increase its resource efficiency by increasing environmental efficiency and resource productivity, conserving natural resources, improving environmental aspects of quality of life, and exploiting economic opportunities and selecting appropriate policies.

New OECD report [1] notes that some countries have progress in more efficient use of natural resources and services related to the environment, but the pace of this progress is clearly insufficient. Since 2000, Denmark, Estonia, Great Britain, Italy and the Slovak Republic have achieved the greatest success. A characteristic problem is that there is no balanced progress on all the indicators of green growth. Only several countries manage to improve performance in several fields.

Ralf Fux offers eco-cities and green building as an alternative economic model focused on environmental sustainability, that is, the development of cities and entire regions in a system for reducing polluting emissions and the development of energy-saving technologies [2].

According to the “factor five” technology (E. Weizsäcker, K. Hargrore and M. Smith), such infrastructure development is needed that would allow fivefold reduction in the amount of energy and



resources consumed without harming income growth [3]. Conflicting tendencies revealed by Meadows D. and Randers J., threaten to turn into the factors that largely determine future life [4]. I. Glazyrina, L. Faleychik and I. Zabelina, in the context of "green economy" concept (as a result of an analysis of the spatial distribution of transaction costs, taking into account regional features of environmental management), conclude, that they are highly heterogeneous ones [5]. M. Egorova, M. Pluzhnic and P. Glik describe global green development trends in economic terms and for society in general [6].

W. Richard, studied the economic policies of countries, formulates that the majority of countries are aimed at increasing the values of economic indicators, but none of the indicators can properly assess the real standard of living and well-being of citizens [7]. Modernization of the classical economy into a "green" economy has become such a quality transition (Runciman B.) [8].

There are different trajectories of the transition to a "green economy" depending on the achieved level of development of the country. Developed countries defined the transition to a green economy as an increase in job development and competitiveness. Developing countries are focused on addressing issues related to poverty and sustainable development planning. A group of BRICS countries (Brazil, Russia, India, China and South Africa) choose a strategy for the efficient use of natural resources (M. Cato, L. Golub) [9]. Environmentally friendly production, which focuses on technologies related to forests and soils, is considered the unifying goal for all countries, since these natural resources are highly replicable and renewable. Such a reorientation in technology may make it possible to take into account the impact of technology on climate and the acceleration of job growth. [10]. M. Egorova explores the decarbonization process of global technologies. Renewable resources can be used in future and after depletion of the world's reserves of major sources of carbon energy [11].

Based on global experience, the green economy stimulates regional development, promotes social stability and allows improving the economic potential by creating jobs in their sectors. The methodological basis of the study is the reports of international governmental and non-governmental organizations, as well as various research centers specializing in low-carbon development. The official database of the Federal State Statistics Service acts as an information base to assess the effectiveness of the implementation of the principles of "green" economy in the national and regional policies.

The analysis of "green" indicators enables us to trace the dynamics of structural changes in the regions, identify barriers that impede the transition to a low-carbon economy in the context of Russian macro-regions.

2. Experimental part

Currently, the Russian Federation is making significant efforts to restructure on the principles of "green" economy. For this purpose, a relevant legislative base is being created [12-14]. However, the peculiarity of the Russian economy lies in the significant differences in the climatic and resource potential, the level of socio-economic development, institutional conditions, innovation and investment activity of the regions. On average, the environmental intensity of the Russian economy is 2-3 times higher than in developed countries. This is due both to climatic features, and to a certain technical backwardness in mining and manufacturing sectors, large reserves of fossil fuels, traditional technologies of power and heat engineering, structural imbalances in the regional and sectoral aspects. The task to reduce greenhouse gas emissions has only recently received priority state status.

The main indicator of the level of environmental protection is the ratio of expenditures on environmental protection and GDP. As for GDP, the value of environmental costs decreased from 0.8% of GDP in 2010 to 0.7% in 2017 [15]. Environmental protection costs are now mainly directed towards maintaining the quality of the environment. There is an unstable dynamics of the index of the physical volume of environmental expenditures for the subjects of the Russian Federation. At the same time growing irreversible changes in the environment require large costs (Table 1).

Table 1. Index of physical volume of environmental expenditures in the Federal districts of the Russian Federation, in % to the previous year, in comparable prices.

	2014	2015	2016	2017
Russian Federation	105.9	92.5	92.8	102.7
Central Federal District	99.5	98.5	98.2	102.0
Northwestern Federal District	110.0	79.5	113.4	93.2
Southern Federal District	119.4	103.4	71.9	94.3
North Caucasus Federal District	97.3	102.0	106.2	89.1
Volga Federal district	115.1	78.5	82.2	100.1
Urals Federal District	99.9	101.9	101.3	102.5
Siberian Federal District	103.1	92.2	95.3	108.7
Eastern Federal District	99.6	94.1	86.4	125.1

The volume of investments in fixed assets aimed at environmental protection and rational use of natural resources in Russia for the period 2010-2017 has increased 1.7 times. The total investment amounted to 152 996 million of rubles at the end of 2017 against 89 094 million rubles in 2010 [15]. Thus, the share of capital expenditures for environmental purposes is increasing in the total amount of environmental expenditures (Table 2).

Table 2. Investments in fixed assets aimed at environmental protection and rational use of natural resources in the Russian Federation, million rubles.

	2010	2011	2012	2013	2014	2015	2016	2017
Total	89 094	95 662	116 543	123 807	158 636	151 788	139 677	152 996
Whereof								
Water resources	46 025	46 610	52 420	59 505	76 315	78 962	67 469	65 863
Atmospheric air	26 127	27 882	34 626	41 196	55 587	40 120	40 340	59 827
Lands	9 340	13 785	19 888	13 802	14 540	15 703	12 228	10 174

At the same time, the innovative orientation of investments related to environmental protection and the rational use of natural resources is of great importance. Currently, there is no definitively agreed list of indicators either in Russia or in foreign countries that assess the rates and proportions of “green” progressivity of economy changes. The key environmental and economic indicators, used in this work, are indicators of eco-innovations.

1) The share of organizations that carried out eco-innovation in the reporting year, among all the surveyed organizations;

2) The share of organizations that implement innovations improving environmental safety in the production process, among all the surveyed organizations;

3) The share of organizations, implementing innovations, which ensure the increase of environmental safety as a result of the consumer's use of innovative products, works, among all the surveyed organizations;

4) Special costs associated with innovations, million rubles.

The negative trend is the fact that the share of organizations engaged in environmental innovation both in Russia as a whole and in the context of Federal districts has been steadily decreasing in the period of 2010-2017 (Table 3) [16].

Table 3. Specific weight of organizations that carried out environmental innovations in the reporting year, in the total number of surveyed organizations by federal districts of the Russian Federation, %.

	2010	2011	2012	2013	2014	2015	2017
Russian Federation	4.7	5.7	2.7	1.5	1.6	1.6	1.1
Central Federal District	4.3	5.6	3.0	1.6	1.7	1.7	1.3
Northwestern Federal District	3.4	5.5	1.9	1.5	1.6	1.6	1.3
Southern Federal District	3.2	3.6	2.0	0.9	1.3	1.2	0.7
North Caucasus Federal District	3.3	3.1	1.6	0.7	0.8	0.8	0.6
Volga Federal district	6.9	7.5	3.2	1.8	1.7	1.8	1.3
Urals Federal District	5.6	6.5	3.0	1.6	1.8	1.8	1.2
Siberian Federal District	4.2	4.8	2.2	1.3	1.3	1.2	1.0
Eastern Federal District	4.1	4.6	2.9	1.6	1.5	1.3	0.6

When determining the share of organizations that implemented innovations improving environmental safety in the production process, the following parameters are taken into account: reduction of material costs for the production of a unit of goods, works, services; reduction of energy costs for production of a unit of goods, works, services; reducing the emission of carbon dioxide (CO₂) into the atmosphere; replacement of raw materials for materials which are safe or less dangerous ones; reduction of environmental pollution (air, land, water and noise reduction); recycling of production, water or materials wastes (Table 4). Since 2017, monitoring has included data on the conservation and reproduction of natural resources used by agriculture [16].

Table 4. The share of organizations that implemented innovations ensuring environmental safety in the production of goods, works, services, in the Federal districts of the Russian Federation (as a percentage of the total number of organizations that carried out environmental innovations).

	2010	2011	2012	2013	2014	2015	2017
Russian Federation	47.7	48.0	52.5	55.5	53.2	51.8	47.7
Central Federal District	52.5	49.9	53.9	56.6	51.9	52.9	50.3
Northwestern Federal District	48.4	47.8	52.8	55.8	53.75	44.8	45.1
Southern Federal District	40.4	45.7	54.5	58.05	49.0	53.8	55.1
North Caucasus Federal District	51.4	54.4	55.9	60.4	59.3	66.7	56.7
Volga Federal district	49.1	48.7	53.9	56.4	56.7	54.7	45.2
Urals Federal District	42.5	45.8	51.3	57.6	57.2	54.2	52.3
Siberian Federal District	42.5	44.8	49.6	52.3	51.5	48.2	42.1
Eastern Federal District	46.5	47.4	43.9	46.3	43.6	44.9	45.9

The main parameters of the dynamics analysis of the share of organizations that implemented innovations improving environmental safety in the process of consumption of goods are: reducing energy consumption or energy losses; reducing environmental pollution; improving the possibilities of secondary processing (recycling) of goods after use (Table 5) [16].

Table 5. The share of organizations that implemented innovations improving environmental safety as a result of the consumer's use of innovative goods, works, services, in the Federal districts of the Russian Federation (as a percentage of the total number of organizations that carried out environmental. innovations).

	2010	2011	2012	2013	2014	2015	2017
Russian Federation	39.6	40.1	46.7	50.5	48.3	47.6	44.9
Central Federal District	43.6	41.3	46.3	52.2	46.9	47.5	48.4
Northwestern Federal District	40.1	40.9	44.8	51.7	46.5	44.8	41.2
Southern Federal District	32.0	35	47.8	54.8	43.7	49.3	52.8
North Caucasus Federal District	41.0	45.1	49.0	54.2	44.4	77.8	53.3
Volga Federal District	42.0	40.9	48.8	50.0	47.7	45.8	40.5
Urals Federal District	33.0	35.3	46.5	52.6	57.4	54.0	47.7
Siberian Federal District	35.2	39.5	45.2	41.4	50.0	44.1	42.9
Eastern Federal District	38.4	44.7	43.9	53.7	49.0	48.5	43.8

Special expenses related to environmental innovations in the Russian Federation from 2015 to 2017 decreased for 9 641.2 million rubles (from 21 979.2 million to 12 338 million rubles). The share of special expenses related to environmental innovations amounted to 1.9% in the total amount of environmental costs. The structure of special costs related to environmental innovations in 2017 for Federal districts is shown in Figure 1 [16].

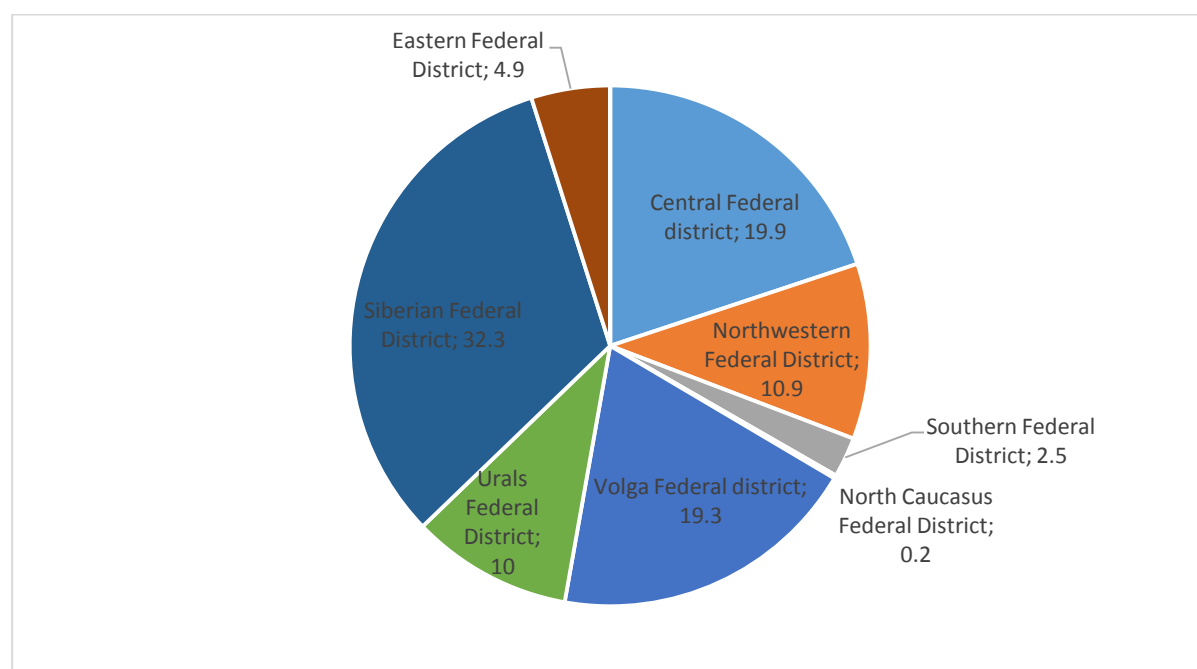


Figure 1. Distribution of special costs associated with environmental innovation by the Federal districts in 2017, %.

As it can be seen in Figure 1, the largest share of special costs associated with environmental innovation in the all-Russian volume of costs falls on the Volga Federal district (19.3%), the Siberian Federal District (32.3%), the Central Federal district (19.9%), the lowest costs are in the North Caucasus Federal district (0.2%) and the Southern Federal district (2.5%).

3. Results

According to the results of the study, the following problems are identified that require solutions in the construction of a "green" economy in the regions of Russia:

1. The current level of environmental protection financing (0.7% of GDP) does not meet the objectives of environmental security and development of "green" economy, while European countries are directed to environmental targets of 4-6% of GDP.

2. The level of environmental costs ensures the maintenance of the achieved environmental quality and is characterized by unstable dynamics in the Russian Federation and its subjects. While global trends require consolidation of efforts and means directed by the state to protect the environment, as well as ensuring the most efficient use of the territory potential of natural resource.

3. The development of a "green" economy depends on environmental innovations, which can reduce the negative impact of man on the environment while improving the quality of life. Ecological innovations, replacing traditional environmental protection technologies, increase investment attractiveness of environmental projects. Negative dynamics of organizations engaged in environmental innovation has been identified in the Russian Federation and its regions. There was almost 3 times reduction of such organizations in the period from 2010 to 2017. Special costs associated with environmental innovation have decreased and amounted to 1.9% of the total environmental costs.

4. Discussion

The main direction of growth of ecological efficiency of the Russian economy is reduction of specific indicators of the use of natural resources per unit of GDP, and also development of "green" innovative technologies and the market of ecological services. At the present stage, ensuring the optimal value of environmental costs taking into account global trends, the pace of economic development and environmental protection is an important problem for Russia and its regions. At the same time, a significant share of investments should be directed to the implementation of environmental innovations that contribute to the reduction of the impact on the environment, increasing its resistance to the growing burden on the part of society, more efficient and rational use of natural resources.

5. Conclusion

Thus, it can be concluded that the following activities in the interests of the development of a "green" economy at present time should be made. First, the cost of environmental protection at the regional level should be increased. Secondly, specific indicators of the use of natural resources per unit of GDP through environmental innovation should be reduced. Third, the set of instruments of state policy to support organizations engaged in environmental innovation, alignment of regional levels at special environmental costs should be improved.

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