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Monitoring Regional Development Based on "Green" Indicators

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Abstract:
The article presents the results of a study devoted to solving actual problems of implementing the concept of "green" development both at national and regional levels.

The indicators of "green" development developed by international organizations are considered as a methodological basis for the creation of systems of monitoring and analyzing the processes of economy "greening", preventing and reducing current negative impact on the environment, increasing the efficiency of resource use in the context of carbon regulation.

Assessment of the dynamics of the development of the Voronezh region has been carried out on the basis of selected indicators, and it has been concluded that the regional policy takes into account the necessary prerequisites for "green" growth, which determine the need to increase environmental, economic and social efficiency of activities, increasing the level of waste processing and reduce their producing.

Keywords: *"Green" development, factors, indicators, monitoring, evaluation.*

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1. Introduction

Key understanding of green economy is associated with low carbon emissions and efficient use of resources. In a green economy, income and employment growth is provided by public and private investment, reducing carbon emissions and pollution, increasing the efficiency of energy and resource use and preventing the loss of biodiversity and ecosystem services. The most famous supporters of the green economy are D. Korten, B. Faller, H. Daly, D. Meadows, J. Jacobs, R. Carson, E.F. Schumacher, R. Costanza, and P. Hawken who define it as an economy that is a dependent component of the natural environment within which it exists and it is a part of global ecosystem. In the OECD and UN documents, the term "green economy" and its derivatives have become key one in determining the directions of sustainable development (Medvedeva *et al.*, 2015; Albekov *et al.*, 2017; Epifanova *et al.*, 2017).

The relevance of the problems is due to a number of circumstances related to the approaches implemented in the authoritative international environmental rating of the economies of the world, such as Global Green Economy Index (Global Green ..., 2015), The Global Footprint Network (WWF Living Planet ..., 2014), the "Index of Environmental Sustainability" (Hsu *et al.*, 2016), as well as environmental and economic assessment of the Russian regions (Ecological and Economic Index ..., 2012). The study also relies on the "Environmental Doctrine of the Russian Federation", "Fundamentals of State Policy in the Field of Environmental Development of the Russian Federation for the Period to 2030". Scientific hypothesis is proposed in this paper that the indicators for monitoring the region's "green" development are designed to provide an information basis for assessing the changes of their dynamics, inform the general public about the actual results of the movement towards "green" growth in a clear and accessible form that can stimulate necessary changes in behavior of population.

2. Methodology

The methodology is based on reports from international governmental and non-governmental organizations, including the United Nations Food and Agriculture Organization (FAO), International Bank for Reconstruction and Development (IBRD) and World Wildlife Fund (WWF), as well as various research centers specializing in low-carbon development. The main source of data for indicators is primarily official statistics at national and regional levels. The authors also use systematic approach, logical research methods, abstract modeling method, forecasting, comparative analysis method, analogies.

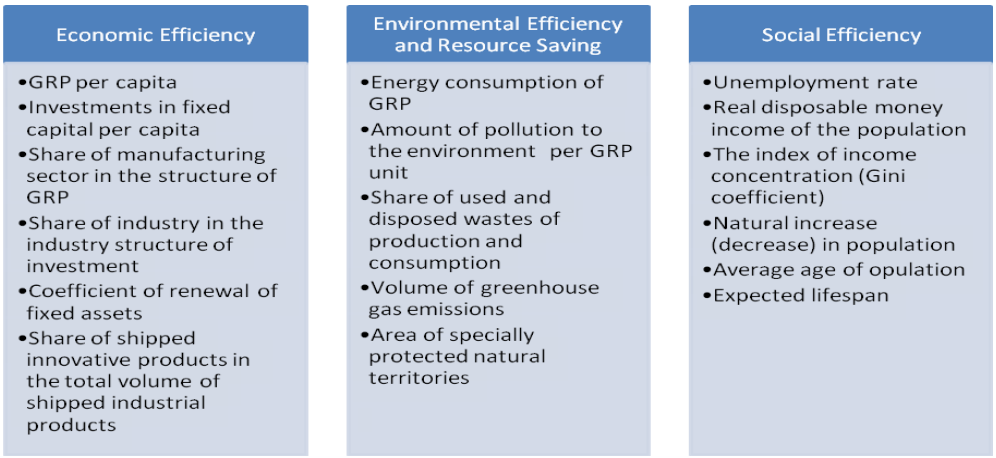
3. Results

The OECD reports "Green Growth Course: Monitoring Progress", "Indicators of green growth 2014" are devoted to solve the problem of monitoring the dynamics of

green growth. These reports identify four targets for moving to a low-carbon, resource-saving economy, preserving the natural resource base, improving the quality of people's lives, which should be accompanied by the introduction of appropriate policy measures and the use of economic opportunities. To assess the balance of green growth, six key indicators are proposed: carbon and material productivity, multidimensional productivity taking into account environmental needs, the index of natural resources, changes in land use and vegetation and the impact of air pollution on public health. The measurement methodology is based on the interaction of the economy, natural assets and policy instruments.

The practical application of the OECD green development indicators began in 2011, when the Netherlands published its first report with indicators of green growth. Soon this initiative was supported by the Czech Republic, Germany, Denmark, Slovenia, the Slovak Republic and the Republic of Korea, which prepared reports with indicators of green development on the basis of OECD methodology adapted to national conditions. The set of OECD indicators is not final and completed yet, some of the indicators are not fully measurable or measurable with varying degrees of quality. To assess the potential of the territory in the transition to a green economy, we have identified priorities for economic efficiency, environmental efficiency and resource saving, social efficiency. Control over the process of movement along low-carbon trajectory is suggested by the corresponding indicators (Figure 1).

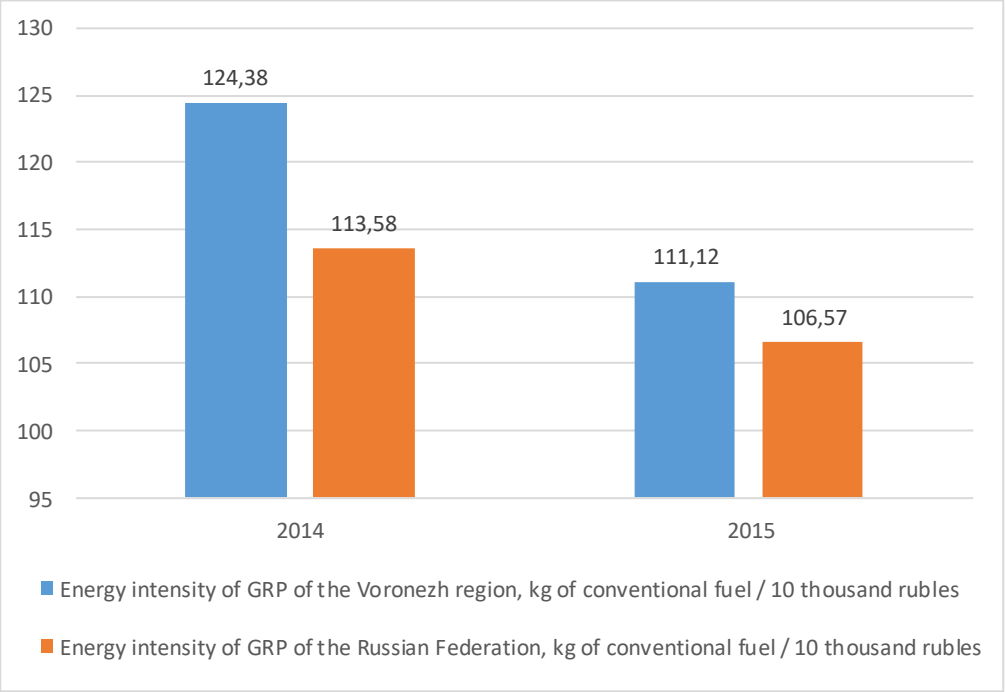
Figure 1. *The main indicators of green growth monitoring of the region*



These indicators are universal and applicable for different regions and allow us to analyze the success rate of implementation of green growth policy. The urgency of the problem of rational use of the natural resource potential and preservation of natural environment of the Voronezh region as a single complex is determined by the state of its resources, as well as by intensity of environmental situation in the territories with intensive industrial and other economic activities. One of the indicators of sustainability of green growth is a combination of positive dynamics of

the indicator "Gross Regional Product (GRP) per capita" and negative dynamics of the indicator "Energy Intensity of GRP". It should be noted that production of GRP per capita in the Voronezh region is 79.5% of the average per capita gross regional product in the whole of Russia, and GRP energy intensity is higher than national average one, although it has been declining in recent years (Figure 2).

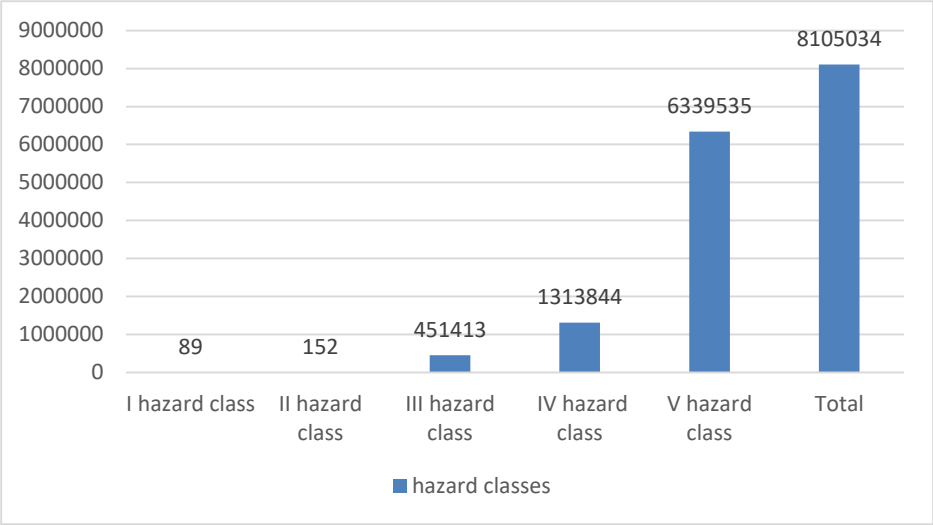
***Figure 2**. Energy intensity of GRP in Voronezh Region and the Russian Federation*



Reducing the consumption of natural fuel and refined products through energy-saving technologies with the growth in GRP production causes a reduction in the amount of pollution that enters the environment per GRP unit. The main sources of waste production in the Voronezh region are enterprises of machine building, electric power industry, chemical industry, livestock and industry for processing agricultural raw materials. They account for 4/5 of the total output of industrial products. The largest contribution to the formation of practically non-hazardous and low-risk (IV-V hazard classes), but large-tonnage waste, the amount of formation of which amounts to 99% of the total waste generated in the region, is made by the enterprises of the livestock complex, sugar industry, plant processing enterprise, including production of vegetable oil. These wastes constitute the largest part of the recycled waste. The number of generated production and consumption wastes in 2016 (according to federal state statistical observation) is shown in Figure 3.

The large amount of waste that accumulates in the environment creates dangerous situation, often causing serious consequences for human health and environment. The indicator shows the environmental friendliness of used technologies, the nature of the economy, the effectiveness of the waste management system, the quality of the environment (indirectly), the impact of the economy on public health (indirectly), and the environmental hazard of production.

Figure 3. *Generated waste of production and consumption in the Voronezh Region in 2016*



Increasing level of waste treatment and disposal is an essential aspect of green growth. In Russian statistics, the data on pollutants and greenhouse gases are fully reflected, but regional data are available only for pollutants; from stationary sources since 2000, from road and rail transport since 2012. The work on data collection on greenhouse gas emissions, measures for their reduction and voluntary inventory at the regional level has begun in the spring of 2017. In 2008-2016, in general, emissions of pollutants from stationary sources in Russia decreased by 13.7%, however, in the Voronezh region in 2016, compared to last year, they increased by 5.04% (Figure 4).

A huge potential for the transition to a "green" economy is modernization, associated with radical technological renovation of the entire material base of the economy. Old equipment is not able to ensure the efficient use of natural resources and leads to an increase in environmental pollution. Mass aging of production assets leads to an increase in the number of environmental accidents and disasters. Old equipment is weakly replaced with a new one due to insufficient investment. The coefficient of renewal of fixed assets in the Voronezh region has declined recent years and in 2016 it was 7.8%, which is below the national average and the Central Federal District.

Such a situation makes transition to a new technological level and spread of progressive resource-saving technologies extremely difficult (Figure 5).

Figure 4. *Dynamics of emissions of polluting substances into the atmospheric air from stationary sources of the Voronezh region, thousand tons*

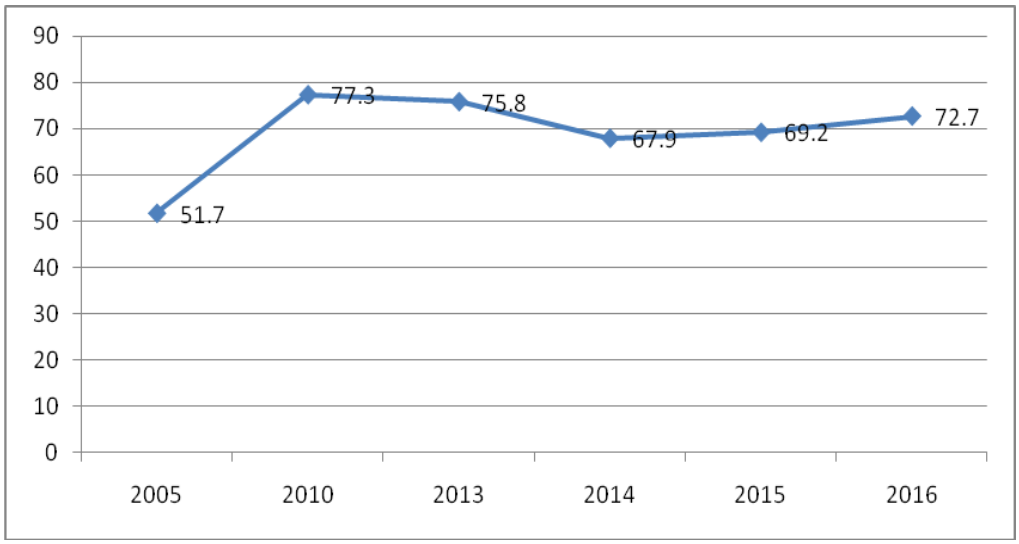
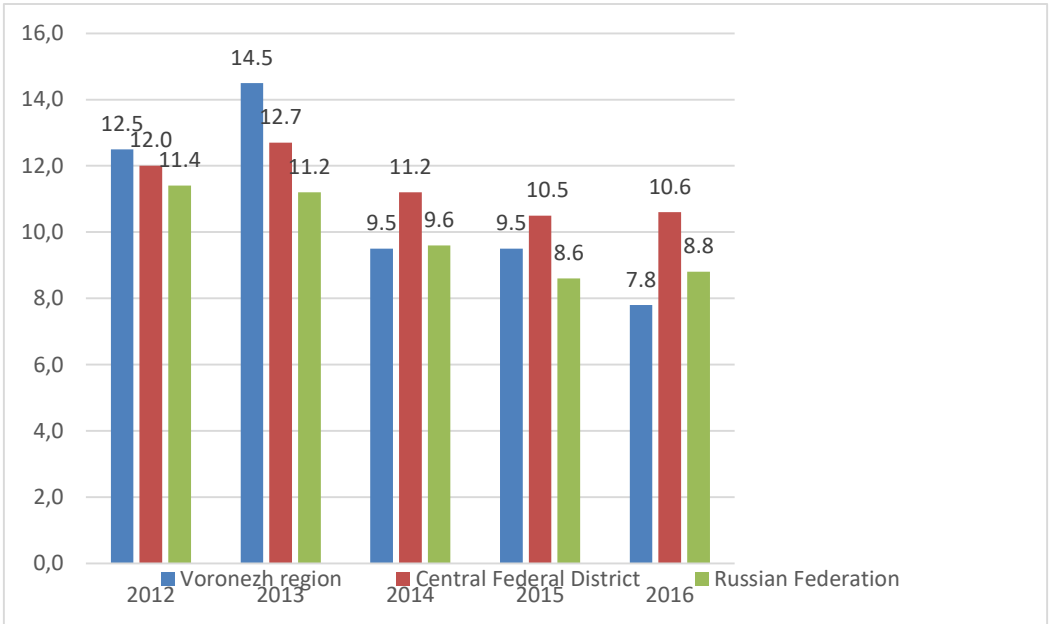


Figure 5*. Coefficient of renewal of fixed assets*



In the Voronezh region, special attention is paid to environmental protection and the rational use of natural resources. The network of specially protected natural areas of the Voronezh region of federal, regional and local significance is characterized by 218 objects. Despite the tense macroeconomic situation, the situation in the labor market is characterized as a stable one. In 2016, the minimum parameters of unemployment for the whole period of observations were preserved. Unemployment rate in the full labor market for the third consecutive year remains at the level of the successful 2014 and it is 4.5% (on average in the Russian Federation - 5.5%). There has been an increase in population in the region in the last three years. Positive dynamics is ensured by a decrease in overall mortality, preservation of the achieved level of fertility and migration growth, which completely compensates natural decline in population.

The life expectancy at birth increased by almost 5 months in 2016 and amounted to 72.08 years. The achieved level of life expectancy in the Voronezh region exceeded the average level in the Russian Federation (71.87 years) and was higher than in most of the country's subjects. Voronezh region ranks 25-th place in the national rating for this indicator.

4. Discussion

Thus, the proposed hypothesis that it is necessary to focus more on the results of monitoring "green" growth in the construction of regional policy, as this contributes to higher labor productivity, reducing waste generation and energy consumption, consolidating efforts and funds channeled by state to protect the environment, and ensuring the most effective use of natural and resource potential of the territory, has been proved during the research. Innovative and investment activity is stimulated, creating new jobs, redistributing labor resources in various sectors of the regional economy. The market receives new impulses, developing the demand for "green" technologies, goods and services.

5. Conclusion

The results of the research have showed that modern model of social and economic development of the country and its regions requires further efforts to develop adequate indicators of "green" development that take into account economic, social and environmental components in a balanced way. Transition of Russian regions to a "green" economy unites issues of economic development, environmental safety and life quality of the population. The regional policy of the Voronezh region takes into account the necessary prerequisites for a "green" growth. Monitoring of "green" indicators allows following the dynamics of structural transformations, it serves as a basis for further analysis of the barriers that prevent transition to a low-carbon economy. The developed system of measuring the processes of green transformation of the economy broadens the possibilities for building a coherent regional policy of “green” growth.

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