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Greening of regional policy as a factor of increasing the level of regional social and economic development in the Russian Federation

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***Abstract*—In modern conditions problems of sustainable development, preservation of the natural environment and simultaneous economic growth are still acute. At the same time, in the real practice of regional management, the priorities only of socio-economic development often dominate. The purpose of this study is theoretical and methodological substantiation of the content, tools and performance of greening regional policy to develop measures to improve the level of socio-economic development of regions**

Keywords—region, regional policy, sustainable development, environment, socio-economic development.

I. INTRODUCTION

In modern conditions problems of sustainable development, preservation of the natural environment and simultaneous economic growth are still acute. The problem of the sustainable development of the region as a goal of regional policy is elaborated in scientific researches of O.K. Tsapieva [1], L.V. Shchukina [2], O.V. Vilchinskoy, E.A. Khrabrova, E.A. Guseva [3], Yu.G. Neudakhina [4], A.V., Okuneva, D.A. Boronnikov [5], D.V., Novachenko, D.V., Malova [6] and others. The connection of regional environmental and socio-economic development is disclosed in the works of N.N. Yashalova [7], A. Yu. Davankova, N.L. Yatsukova [8], M.F. Zamyatina [9], LK Kazantseva, T.O. Tagaeva [10], A.A. Bashirova [11], P.V. Druzhinin, G.T. Shkiperova, O.V. Potasheva [12] and others.

At the same time, in the real practice of regional management, the priorities of socio-economic development dominate: the analysis of 63 current strategies of socio-economic development of regions in the Russian Federation shows that 12% of them lack focus on environmental development, 70% of strategies do not include target ecological indicators [13]. In this regard, it is relevant to justify the content of regional policy as a system of measures for the economic, social, environmental development of territories. The purpose of this study is theoretical and methodological substantiation of the content, tools and performance of greening regional policy to develop measures to improve the level of socio-economic development of regions.

II. METHODS

The theoretical and methodological basis of the research consisted of studies of scientists and specialists on regional policy and sustainable development. The study used a systematic approach, methods of analysis and synthesis, logical and econometric modeling, etc.

III. RESULTS

The study justified the need to refine the regional policy with an equivalent component - environmental goals, objectives measures, which ensures sustainable development. Moreover, each component of regional policies should be focused, among other things, on improving environmental processes:

1) an economic component whose goal is to increase GRP while focusing on the preservation of human and natural capital;

2) a social component that ensures the growth of the level and quality of and creates favorable environment and living conditions;

3) an environmental component which is aimed at self-healing of the natural systems.

The environmental component within the regional policy affects the socio-economic development of the region in several ways, which makes it possible to substantiate the content of the “greening of regional policy” process:

1) inclusion of environmental objectives in the regional policy priorities system;

2) implementation of the economic development policy based on taking into account environmental constraints on the anthropogenic load on the environment, increasing the share of high-tech industries in the structure of GRP, changing the structure of investments, the growth of "green" technologies and equipment use;

3) activation of the regional social policy through the creation of favorable living conditions.

At the same time, specific regional conditions (such as, natural, climatic and economic conditions, economic specialization, location of industrial production and resettlement of residents in the region, sociocultural environment) define both 1) the maximum possible results of the potential positive impact of environmental development on socio-economic development (“benchmark” parameters), 2) and the minimum allowable (“threshold”) parameters, below which destructive changes in socio-economic development are possible.

Analysis of the works on regional economy (T.E. Beydina [14], A.N. Bufetov [15], L.A. Valitova, V.L. Tambovtsev [16], A.S. Godhovykh [17], A.I. Ostroumov, O.F. Ostroumov [18], O.V. Sidorenko [19], EU [20]) made it possible to conclude that in the economic literature the assessment of regional policy does not typically include the environmental component. The complexity, and in some cases, the impossibility of assessing the effectiveness of regional policy with regard to its environmental component is connected with the absence or fragmentation of measures related to the solution of environmental problems in regional development programs and the lack of target environmental indicators. The high importance of evaluating the performance of greening of regional policy as the unity of the three components determined the need to focus on the performance of greening of regional policy as a degree of compliance of actual indicators of environmental and socio-economic development with “benchmark” (maximum possible, potentially achievable) indicators. In this regard, we developed our own methodology for assessing the performance of regional policy, taking into account the contribution of the environmental component and its impact on the overall indicators of regional socio-economic development (hereinafter - assessment of the greening of regional policy performance). The methodology also takes into account the specifics of environmental development assessment ([21], [22], [23], [24]).The main stages of the methodology are presented below.

Stage 1. Determination of regions for assessment in accordance with the criteria: 1) similar climatic conditions (regions of one federal district), which determines relatively homogeneous maximum and minimum characteristics of the effectiveness of greening; 2) a high level of economic development (GRP per capita is above the average in the federal district); 3) similar industry specialization (the share of mining and processing industries in the structure of GRP is 30% or more).

Stage 2. Definition of assessment indicators. In order to test the methodology only one natural environment (atmospheric air) was used. However, the concept of the methodology allows to include indicators of any number of natural environments. In this study, the following blocks of indicators were formed:

1) indicators of environmental development (Block A): 1) volume of investments in fixed assets for the protection of atmospheric air,% of GRP, 2) productivity of pollutant emissions from stationary sources into the atmosphere, billion rubles of GRP per thousand tons of emissions, 3) proportion of the population living in cities with low levels of air pollution,%;

2) indicators of economic development greening (Block B): 1) share of high-tech industries in the GRP,%, 2) total share of the main polluting industries in the GRP,%, 3) depreciation of fixed assets,%;

3) indicators of social development greening (Block C): disease incidence rates of the population are largely due to the level of air pollution - 1) respiratory diseases, 2) cancer, 3) anomalies and malformations.

Stage 3. Calculation of relative indices (KPIi) to form a single measurement scale (KPIi index value = 100% corresponds to the maximum possible, potentially achievable "benchmark" indicator value, and KPIi = 0% corresponds to the minimum acceptable "threshold" value). Indicators of blocks A, B, C were normalized:

$$KPI_i = \frac{|x_{actual} - x_{treshold}|}{|x_{benchmark} - x_{treshold}|} \times 100\% , \quad (1)$$

where KPI_i is the KPI index of the i-th indicator of assessment in the reporting period; 0%<KPI<100%; X_actual is the actual value of the i-th private assessment indicator in the reporting period; X_benchmark is the “benchmark” value of the i-th indicator, characterizes the potentially achievable, maximum possible parameters of the greening results (in this study the best value for the evaluated RF subjects in the reporting period was used); X_treshold is the “threshold” value of the i-th indicator, reflects the minimum acceptable characteristics of greening (in this study the worst value for the estimated regions in the reporting period was used).

Stage 4. Calculation of performance indices for each of the components of regional policy (KPIj comp) and the integral index of the greening of regional policy performance (KPI reg pol):

$$\mathrm{KPI}_{j\ comp} = \sum_{i=1}^{n} w_i * KPI_i , \quad (2)$$

where KPI_(j comp) is the KPI index for the j-th regional policy component in the reporting period; 0%<KPI_(j comp)<100%; KPI_i is the KPI index of the i-th indicator; w_i is the weight of the KPI index of the i-th indicator for assessing the j-th component of regional policy in the KPIj comp index of the j-th regional policy component; 0<w_i<1; ∑_[w_i]=1; the weights of KPIi indexes of assessment indicators in the KPIj comp index for each component of regional policy were taken equal.

$$\mathrm{KPI}_{reg\ pol} = \sum_{j=1}^{n} w_j * KPI_{j\ comp} , \quad (3)$$

where KPI_(reg pol) is the integral KPI index of the greening of regional policy performance in the reporting period; 0%<KPI_(reg pol)<100%; KPI_(j comp) is the KPI index for the j-th regional policy component in the reporting period; 0%<KPI_(j comp)<100%; w_j is the weight of the KPIj comp index of the j-th component of regional policy in the integral KPI index of the greening of regional policy performance KPI reg pol; 0<w_j<1; ∑_[w_j]=1; the weights of KPIj comp indexes were taken equal.

Accordingly, the closer the value of the integral KPI_(reg pol) index to the value of “100%”, the higher the performance of the regional policy greening.

Stage 5. Classification and ranking of regions according to the level of greening of regional policy performance:

Group I: “Regions with low level of performance”: KPI_(reg pol) = [0; 33%];

Group II: “Regions with medium level of performance”: KPI_(reg pol) = [34; 66%];

Group II: “Regions with high level of performance”: KPI_(reg pol) = [67; 100%].

Stage 6. Determination of the degree of performance unevenness of the greening of regional policy with the calculation of the standard deviation:

$$\sigma_{KPI_n} = \sqrt{\frac{1}{l}\sum_{m=1}^{l}(KPI_{n_m} - \overline{KPI}_n)^2}\ , \qquad (4)$$

where σ_(KPI_n) is the degree of performance unevenness of the n-th KPI index; KPI_(n_m) is the n-th KPI index for the m-th region, which can be: 1) the private KPI index of the i-th assessment indicator (KPIi), 2) the KPI index for the j-th component of regional policy (KPIj comp), 3) the integral performance index of greening of regional policy (KPIreg pol); (KPI)¯_n is the arithmetic average value of the n-th KPI index of the estimated regions in the reporting period.

Stage 7. Decomposition of indicators for assessing the performance of the environmental component on the sectoral and municipal levels.

Stage 8. Forecasting socio-economic and environmental indicators provided 1) maintaining current trends and 2) activation of environmental processes of regional policy.

The assessment of the greening of regional policy performance was carried out for the regions of the Volga Federal District (hereinafter - VFD): Republic of Bashkortostan, Republic of Tatarstan, Perm Krai, Nizhny Novgorod Region, Orenburg Region, Samara Region, which meet the criteria of homogeneity. Calculations were based on 2010–2015 data. (Table. 1).

TABLE I. GREENING OF REGIONAL POLICY PERFORMANCE (KPI_(REG POL)), VFD REGIONS, %, 2010–2015

Region	2010	2011	2012	2013	2014	2015	Δ KPI (%)
1	*3*	*4*	*5*	*6*	*7*	*8*	*= 8/3*
Rep. of Bashkortostan	50.1	64.0	62.0	75.0	57.3	68.5	137.0
Rep. of Tatarstan	76.0	65.7	70.7	61.1	69.5	80.4	106.0
Perm Krai	23.0	32.4	33.1	33.2	24.8	26.6	116.0
Nizhny Novgorod Region	59.3	58.7	55.5	53.8	55.3	67.3	113.0
Orenburg Region	35.7	37.8	35.2	39,.0	35.3	47.9	134.0
Samara Region	33.7	34.4	34.9	33.2	40.9	31.2	93.0

Source: author's calculations

The increase in performance in all the considered regions except the Samara region is obvious, which can be connected with the revitalization of environmental development processes and the growth of its influence on the socio-economic development of the regions. Nevertheless, reserves of growth in the greening of regional policy performance remain, the benchmark parameters are not achieved. The most problematic economic indicators are: depreciation of fixed assets and the share of polluting industries in the GRP (especially in Perm Krai, Orenburg Region); the most problematic social indicators are the incidence of diseases of the respiratory organs, the presence of anomalies and malformations (the highest rates in the Perm Krai, Samara Region, Nizhny Novgorod Region). The VFD regions were ranked according to the level of performance of the regional policy greening (Table. 2).

TABLE II. RATING AND CLASSIFICATION THE VFD REGIONS IN TERMS OF THE PERFORMANCE OF REGIONAL POLICY GREENING

Region	2010		2015	
	Place	*Performance*	*Place*	*Performance*
Rep. of Tatarstan	I	high (76.0%)	I	high (80.4%)
Rep. of Bashkortostan	III	medium (50.1%)	II	high (68.5%)
Nizhny Novgorod Region	II	medium (59.3%)	III	high (67.3%)
Orenburg Region	IV	medium (35.7%)	IV	medium (47.9%)
Samara Region	V	medium (33.7%)	V	low (31.2%)
Perm Krai	VI	low (23.0%)	VI	low (26.6%)

Source: author's calculations

Regions that are problematic in terms of regional policy greening include Perm Krai (which stably occupies the last place in the rating) and the Samara region (the level of performance for the period under review of which decreased from “medium” to “low”). For Perm Krai it is particularly related with low economic (share of polluting industries in GRP, depreciation of fixed assets), social (incidence of respiratory diseases, anomalies and malformations), environmental (volume of investments in air protection, pollutant emission efficiency, population living in cities with low pollution) indicators of regional policy components.

To determine the degree of unevenness in the greening of regional policy performance, the standard deviations of KPI indexes were determined (Table. 3).

TABLE III. UNEVENNESS DEGREE OF THE PERFORMANCE INDICATORS OF REGIONAL POLICY GREENING, VFD REGIONS, %

Unevenness degree of the performance indicators (σ_{KPI_n})	2010	2011	2012	2013	2014	2015	Δ σ_{KPI_n}
Regional policy greening, including:	5.1	5.5	3.8	5.6	5.3	7.8	↑
economic development greening	12.8	10.2	10.4	10.3	10.9	10.5	↓
social development greening	7.6	10.5	6.1	12.0	9.3	9.3	↑
environmental component, including:	2.9	4.3	4.4	6.8	6.5	11.1	↑
volume of investments in fixed assets for the protection of atmospheric air	12.9	13.9	13.4	14.8	14.5	17.0	↑

productivity of pollutant emissions from stationary sources into the atmosphere	14.0	13.8	13.4	13.7	13.6	13.5	↓
proportion of the population living in cities with low levels of air pollution	13.1	13.3	13.1	13.1	14.3	16.0	↑

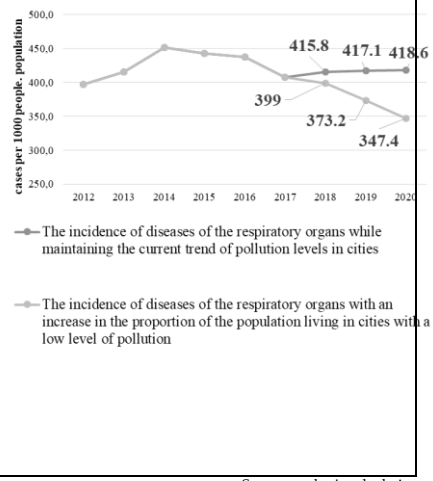
Source: author's calculations

Based on the data in the Table 4, it was concluded that there is an increase in the gap in the levels of greening of regional policy performance among regions, which is associated with an increase in the unevenness of the volume of investments in the protection of atmospheric air in fixed capital and the level of air pollution in settlements. Shifts in solving air quality problems and improving the environmental friendliness of the equipment used are obvious in the Republics of Bashkortostan and Tatarstan, the Orenburg and Nizhny Novgorod regions. Meanwhile, insufficient activity is observed in other regions (Perm Krai, Samara Region). These changes are indirectly reflected in the growth of the uneven greening of social development (in particular, the increase in the gaps in the values of morbidity indicators of the population).

Using the example of Perm Krai, which occupies the last position in the rating of greening of regional policy performance, the values of regional indicators of environmental development were decomposed and the limitations of greening processes were revealed. Limitations are associated with the development of the following economic activities: transport and communications, production and distribution of electricity, gas and water, mining. The main limiting factors for the greening of these industries are: depreciation of fixed assets and outdated technological processes (for example, flaring of associated petroleum gas (APG) in flare units). The decomposition of the indicator "Proportion of population living in cities with low pollution levels" allowed identifying the most problematic cities: Perm (39% of the region population), Berezniki (5%), Solikamsk (3%), Krasnokamsk (2%), Lysva (2%). The limiting factors of the environmental development of these territories are high concentration of industrial enterprises (especially enterprises of the chemical and petrochemical industry, metallurgy and power generation) and growth of pollutant emissions into the atmosphere from road transport.

Forecast of socio-economic and environmental indicators on the example of Perm Krai was also accomplished. The forecast was built for the medium term based on econometric modeling in two versions: 1) provided maintaining the current development trends and 2) provided improving the performance of the environmental component of regional policy. In each econometric model, one of the explanatory factors was consistently changed while maintaining the fixed values of the others: the value of the environmental indicator changed in accordance with the trend identified over the period 2010-2015; the value of the environmental indicator improved by an amount consistent with the best practices of regional development (Table. 4). The values of best practices were obtained on the basis of the analysis of indicators of estimated VFD regions for the period 2010–2015.

TABLE IV. FRAGMENT OF THE FORECAST OF SOCIO-ECONOMIC AND ENVIRONMENTAL INDICATORS, PERM KRAI, 2018–2020

The forecast of the incidence of respiratory diseases			
Model	***2018***	***2019***	***2020***
$\hat{Y}$=-515.59$\hat{X}$+656.78	***Preservation of current trends in urban pollution***		
	415.8	417.1	418.6
	Growth in the proportion of the population living in cities with low pollution (5% per year)		
	399.0	373.2	347.4
$\hat{Y}$ is the dependent factor is the incidence of respiratory diseases in the population in Perm Krai, cases per 1000 people. population; $\hat{X}$ is the explanatory factor is the share of the population of Perm Krai living in cities with a low level of pollution,%. Adjusted (normalized) coefficient of determination: 0.812			

Source: author's calculations

The obtained forecast data allow to draw the following conclusions:

1) an increase in the proportion of the population living in cities with a low level of pollution by 5% per year ensures an annual decrease in the incidence of respiratory diseases on the average by 25.8 cases per 1000 population;

2) an increase in the volume of investments in fixed assets for air protection (% of GRP) by 0.01% per year ensures an annual decrease in the growth rate of the incidence of respiratory diseases in the population by an average of 0.28%.

3) the use of modern equipment and technologies (reduction of depreciation of fixed assets by 5% per year), the prevalence of high-tech industries in the economy (a 1% per year increase in the share of high-tech industries in GRP) ensures an annual increase in the use of resources and emissions productivity pollutants by an average of 1.42 billion rubles. GRP / thous. tons of pollutants.

Thus, a more dynamic change in socio-economic indicators is possible while activating the solution of environmental problems.

Based on the analysis of Strategies and development programs, regional tax legislation of estimated VFD regions the tools of an environmental development used in the practice of regional policy were systematized: 1)

"environmental" tax benefits; 2) the formation of environmental goals and objectives (the inclusion of relevant indicators in the regional development strategy, the development of specialized programs for environmental protection and greening of the economy, improving the quality of atmospheric air in the territory of human settlements); 3) institutional tools related to the development of public institutions that ensure publicity of the greening process.

Analysis of the regional policy of the VFD regions showed a lack of activity in the application of environmental transport tax benefits and regional programs for the protection of atmospheric air and the creation of favorable living conditions in the settlements. In particular, during the period of 2006–2012 in Perm Krai not a single program aimed at environmental development was implemented, as well as, no mechanism of greening of regional policy was created. The current program for the protection of the environment does not contain measures to reduce emissions of pollutants into the atmosphere, there are no statutory instruments to stimulate greener production.

The directions for improving the greening of regional policy performance and the level of socio-economic development of Perm Krai were proposed:

1) To legalize "environmental" profit tax benefits (for enterprises that modernize production, apply "green" technologies, reduce the share of APG burned in flares) and "environmental" transportation tax benefits (for owners of vehicles of high ecological class).

2) To develop a mechanism of the use of investment tax credits related to projects of the environmental modernization of equipment and technological processes.

3) To make changes to the state regional program on environmental protection: to approve goals and target indicators in the field of air protection, as well as a list of investment environmental projects.

4) To develop a program for upgrading the infrastructure of populated areas: transfer industrial enterprises beyond the line of populated areas using industrial parks; design sanitary protection zones of enterprises (hereinafter - SPZ); resettle the population living in the SPZ territory; "green" the landscape of settlements; rationalize their transport infrastructure.

5) Introduce into the practice of regional management a mechanism for regular assessment of the effectiveness of regional policy greening.

IV. Conclusion

Thus, the expediency of the inclusion of the environmental component in the regional policy structure was justified; the content of the process of regional policy greening was described; the author's methodical approach to assessing the regional policy greening performance was elaborated; classification of the VFD region according to the level of regional policy greening performance was proposed; positive changes in social and economic indicators while the intensification of regional policy measures to address environmental problems had been identified; by the example of Perm Krai environmentally problematic industries and municipalities were identified; recommendations to improve the regional policy greening performance were developed. The developed theoretical and methodological provisions recommendations can make a real contribution to the development of regional policy, ensure sustainable development and increase the level of socio-economic development of regions.

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