Indicators of the “green economy” as a tool for monitoring the regional economy

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Abstract. The paper draws attention to the need to measure a level of “green economy” for monitoring, which is part of the state regulation of the regional economy. The authors note the difficulties and problems in the formation of indicators, indices used for assessing a level of the “green economy” development. The paper proposes an approach for calculating the integral indicator, which can become an indicator of the regional economy, taking into account the contribution of economic, social, and environmental factors to achieving sustainable development.

1. Introduction

Evaluating the implementation of the green economy concept is a prerequisite for stimulating the sustainable environmental and economic development of regions. The economic potential of a region is “the totality of all resources within its borders, both those involved in the processes of social production and social development, and those that can be used to grow the economy and improve the quality of life of the population of a given territory” [1].

The development of territorial policies that would be aimed at achieving sustainable development should be based on reliable information on the availability of regional resources, existing disparities in their use and promising directions. In this context, the development of indicators of sustainable development in the regional programs will stimulate regional authorities to carry out economic reforms aimed at greening activities that will facilitate and accelerate the transition to a green economy [2].

The need to modernize the structure of the economy in order to ensure its sustainable development is considered as the most important task in the concept of a “green economy,” which is a model of the economy aimed at improving human well-being and ensuring social justice while significantly reducing environmental risks and degradation [3].

2. Materials and Methods

When justifying lines of transition to a green economy in Russia, one should assess the current level of its formation, differentiation, and development of the regions, which dictates the need to consider regional peculiarities in conducting such an assessment.

Therefore, it is necessary to substantiate the list of indicators evaluating the transition results to a green economy. This is due to the fact that there is no established system of indicators assessing the green economy, either in Russian or in foreign practice.
The development of sustainable development indicators is actively involved in such international structures as the UN, the World Bank, the OECD, etc. At present, almost all regions of the Russian Federation monitor economic, social and environmental activities, have positive experience in developing indicators of sustainable development, and observe the similarity of most assessment indicators.

As a rule, these indicators are calculated from the initial statistical data and allow to draw conclusions about the various changes occurring in the region.

The information base for the calculation of indicators of a “green” economy are the official data of the Federal State Statistics Service (Rosstat) and the territorial body of the Federal State Statistics Service for the Republic of Altai and the Altai Territory (Altaikraistat), as well as annual regional reports on the state and environment protection. Most of the indicators from the statistical compilations are reflected in absolute values, which does not always allow us to assess the real situation of sustainable development of the region.

When developing indicators, one should take into account that each region is individual, within the framework of a specific subject of the Russian Federation, it may be necessary to further develop some specific indicators taking into account geographical, economic, climatic and other features of the territory. It seems appropriate to split the indicators into three groups: indicators of economic development, indicators of social well-being, indicators of environmental development. Each group will have an equal number of indicators, and the weight of the groups will be proportional.

Proportionality is an essential tool for obtaining a balanced integral indicator that takes into account the level of economic and social development, as well as environmental well-being. Otherwise, when there is no balance in the set of indicators, the ratings derived from them give a distorted picture of the processes of implementing the green economy model in each specific region.

So, in the ecological rating of the All-Russian public organization “Green Patrol”, the Altai Republic ranked from 2nd to 4th place during 2008-2018. [6] The eco-economic index, which was formed once in 2012, shows the leadership of the Altai Republic in the ranking based on it [7]. And in the ranking of cities developed by the consulting company Ernst & Young, in 2013 the city of Gorno-Altaisk, which is the administrative center of the Republic of Altai, ranked second, giving primacy to the city of Moscow. At the same time, it is known that the Republic of Altai, by socio-economic indicators, belongs to regions with a low level of economic development. Thus, in the ranking of the socio-economic situation of the constituent entities of the Russian Federation according to the results of 2017, the Altai Republic ranks 82nd among 85 constituent entities of the Russian Federation (83rd place in 2016, and 82nd place in 2015).

So, the first rule for calculating the integral indicator characterizing the movement of a region to a green economy model is to use a number of indicators that are indicators of social, environmental, and economic development. In fact, this consists of indicator blocks, each of which includes a number of indicators. The second rule is that the three blocks should have the same weight, which ensures the equivalence of all three areas of the regional economy. The equal value of the three blocks of indicators does not mean an equal number of indicators in the block. The composition of the indicators by which the region can be assessed and analyzed should reflect the level of environmental friendliness of the economy and the social benefits derived from the introduction of the green economy model. The third rule concerns the set of indicators themselves. In our opinion, indicators should be informative, reflect the most important factors and development trends of the green economy. The number of indicators should not be excessive, which makes it possible to identify the main factors and obstacles in development, among which are the use of dirty productions, the low quality of life of the population, and the weak economic potential.

3. Results

The basic rules that must be followed when assessing a “green economy” represents methodological approaches to developing indicators that allow monitoring, and on its basis one should understand the real processes of greening economic processes and make the necessary management decisions. Table 1
presents the indicators included in the integral indicator, as well as the weight values of one or another indicator and unit of measurement.

For calculating the integral indicator and comparability of data, it is necessary that the indicators are to be measured as a percentage, i.e. a fraction indicator. This solves the problem of data comparability, and it is the most common technique for integrating estimated parameters [4].

In this way, the analyzed indicators either represent a share indicator (N4, N5, N7, N8, N9), or they are found by dividing by the same average indicator (all other indicators).

The average is either the average for Russia or for the Siberian Federal District. This allows one to assess the performance of the region in comparison with other levels of the territorial organization of the economy, or with other regions in general. Comparing the indicator for the region with the average Russian or the average for the federal district, we use the reference approach.

The comparison with the reference (threshold) value is as follows:

$$ n_{ij} = \frac{N_{ij}}{N_0} $$

(1)

where $n_{ij}$ – a normalized indicator, obtained as a result of comparison with the reference (threshold) value, which is the average value; $N_{ij}$ – an initial indicator characterizing a certain aspect of the socio-economic or environmental development of a region, for example, GRP per capita in the region; $N_0$ – a reference value of the indicator with which the initial indicator characterizing a certain aspect of the socio-economic or environmental development of the region is compared, for example, the average value of GRP per capita on average in Russia.

Moreover, if the indicator is a negative factor in the socio-economic development of the region (for example, unemployment), then the average value should be divided by the value of the indicator for the region.

$$ n_{ij} = \frac{N_0}{N_{ij}} $$

(2)

**Table 1.** Indicators of the integral indicator of a “green economy” at the regional level.

| Indicators                                                                 | Units | Designation | Weighted indicator |
|---------------------------------------------------------------------------|-------|-------------|--------------------|
| **Economic indicators**                                                   |       |             |                    |
| 1. GRP per capita in the region to the average GRP per capita             | %     | N1          | 0.10               |
| 2. Capital investment per capita to average investment per capita         | %     | N2          | 0.7                |
| 3. A capital-labor ratio in the region to the average capital-labor ratio| %     | N3          | 0.07               |
| 4. A share of “green industries” in the region's GRP                      | %     | N4          | 0.09               |
| Total (block)                                                            |       |             | 0.33               |
| **Environmental performance**                                            |       |             |                    |
| 5. A proportion of recycled waste in the production and consumption waste | %     | N5          | 0.07               |
| 6. Energy intensity of regional GRP                                       | %     | N6          | 0.07               |
| 7. A share of specially protected natural areas (SPNA) in the total area of the region | %     | N7          | 0.06               |
| 8. A reforestation ratio for the five previous years of observation       | %     | N8          | 0.06               |
| 9. A share of electricity generated by alternative sources                | %     | N9          | 0.08               |
| Total (block)                                                            |       |             | 0.34               |
| **Social indicators**                                                    |       |             |                    |
| 10. A ratio of cash income per capita per month in the region to the average value | %     | N10         | 0.09               |
| 11. A ratio of average unemployment to unemployment in the region         | %     | N11         | 0.09               |
Table 2 presents the integral indicator of the developed “green economy” in the Altai Republic, calculated over a number of years.

| Block indicator                      | 2013 | 2014 | 2015 | 2016 | 2017 | Growth rates in 2017/2013 |
|--------------------------------------|------|------|------|------|------|--------------------------|
| Summary indicator                    | 0.560| 0.574| 0.605| 0.560| 0.603| 107.7%                   |
| Block of economic indicators         | 0.135| 0.146| 0.144| 0.145| 0.142| 104.8%                   |
| Environmental performance block      | 0.149| 0.152| 0.185| 0.141| 0.179| 119.9%                   |
| Social indicators block              | 0.275| 0.276| 0.276| 0.275| 0.282| 102.5%                   |

We see that the obtained values are less than one, which means the lag in the level of development of the “green economy” in comparison with the average Russian value. A large contribution to the final indicator made a social unit, and this was due to investment in education and life expectancy at birth. “Ecology” and “economy: make about the same contribution, with a slight lag in the economic block. Over the past five years, the value of the final indicator has increased, and the reason for this was the increased greening of the regional economy.

4. Discussion
Discussion questions of the conducted research are the method of reference comparison of individual indicators, the weight values of individual indicators, and the set of indicators themselves. On the one hand, the correlation of actual regional indicators with the average Russian value allows us to conduct a comparative analysis and designate a development vector. On the other hand, the development strategies of the region, thus defined, do not take into account the specifics of the territory. The weight values of the region in this study are set so that the weights of the indicators are approximately the same. At the same time, the authors understand that the proposed weights can be changed taking into account the significance of each indicator. Finally, the set of indicators themselves can also be changed. However, our position is that the number of indicators should not be too large; otherwise, the calculated indicator will not be suitable for making decisions regarding the regulation of the regional economy.

5. Conclusion
A “green economy” is such a model, which is formed with the active participation of the federal state and local government. The process of monitoring is one of the essential elements in building a “green economy”. The monitoring tools should be based on indicators, including on integral ones. They take into account various aspects of sustainable development: economic, environmental and social spheres. The calculation of integral indicators is associated with various difficulties of a methodological, methodical, informational nature. Their solution is to create such monitoring tools that would reveal the strengths and weaknesses of the region, searching for mechanisms for ensuring a balanced development and making effective management decisions.

6. Acknowledgment
The study was carried out with the support of the RFBR, the project “Formation of mechanisms for the introduction of a green economy model at the regional level” (No. 18-410-040001).
References

[1] Varavin E V, and Kozlova M V 2018 Evaluation of the development of a green economy in the region. On the example of the Republic of Kazakhstan Economy of the Region 14(4) pp 1282-1297

[2] Bobylev S, and Perelet R 2013 Sustainable development and green economy in Russia: current situation, problems and prospects (Russian-German Bureau of Environmental Information)

[3] Bina O 2013 The green economy and sustainable development: an uneasy balance? Environment and Planning C: Government and Policy 31 pp 1023-1047

[4] Yashalova N N 2014 Development of green economy indicators at the regional level National Interests: Priorities and Security 40(277) pp 26-34

[5] Zakharova T V 2015 Green economy and sustainable development of Russia: contradictions and prospects Bulletin of Tomsk State University (Economy) 2(30) pp 116-126

[6] Ecological rating of the Russian regions 2018 Available at: http://www.greenpatrol.ru (10.03.2019)

[7] Bobylev S N, Minakov V S, Solovyova S V, and Tretyakov V V 2012 An ecological-economic index of regions of the Russian Federation: methods and indicators for calculation Available at: https://wwf.ru/upload/iblock/dc8/index.pdf (Accessed 05.03.2019)

[8] Mityakov E S, and Kornilov D A 2011 On the choice of weights when finding integral indicators of economic dynamics Works NSTU n.a. R.E. Alekseeva pp 289-294