

# “Green Economy” Indicators as A Foundation for The Development of The Regional Economy

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**Abstract:** *The subject of the research in this paper is the indicators of a “green economy” and their dynamics (using the case study of one of the territorial entities of the Russian Federation - the Altai Republic) acting as an information foundation for assessing the level of the region’s development and working out measures to introduce a “green economy” model. The aim of the study is to develop guidelines for the region on the development of a “green economy” model based on the evaluation of indicators. After analyzing various tools for assessing the level of “green” initiatives of a regional socio-economic system, the researchers demonstrate inefficiency of using integrated indicators and aggregates often used for regional ecological and economic ratings. Only cumulative evidence of economic, social, and environmental development in dynamics will most fully reflect the features of the development of a “green economy” in this territorial entity of the Russian Federation. The authors propose an approach which uses a system of indicators that ensure the development of guidelines for the implementation of a “green economy” model at the regional level.*

**Index Terms:** *economic indicators, green economy, greening regional economic development, solar energy.*

## I. INTRODUCTION

Climate change, environmental degradation in the world, a high demand for natural resources - all these challenges make many countries look for new ways of their economic development. As an alternative model of economic growth, researchers have worked out the concept of transition to a “green economy.” This concept can be viewed as a response to global financial, environmental, climate, and social crises [1, 2].

Much attention in modern foreign literature on a “green economy” is paid to the transition to a low-carbon economy, which can reduce negative effects of global warming; a closed cycle of using material resources due to waste disposal and recycling; an equal opportunity society through build-up of human capital; and other aspects [3].

The issues of a “green economy” have been discussed in the world for many decades and are getting more relevant every year. The UN announced 2010-2020 as a decade of a “green economy.” Many countries in the world are

transforming their economies according to the principles of a “green” course as the only path to sustainable development. Some countries considered leaders of “green” economic development are the European Union, the USA, and Japan.

The report of the United Nations Environment Program (UNEP) entitled “Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication”, published in 2011, is considered vital for implementing a “green economy” [4] addressed to governments and public authorities of various countries.

The main point of this report is the need for:

- awareness of the value of natural capital;
- investment in natural capital;
- poverty alleviation;
- job creation and increased social justice;
- use of renewable energy and low-carbon technologies;
- efficient use of resources and energy, creation of sustainable cities (eco-cities) with “green” technologies.

Most countries of the modern world, including Russia, adhere to the traditional model of economic growth called a “brown economy,” which uses a growing amount of hydrocarbons. Although the concept of a “green economy” is approved by most countries of the world, including Russia, its practical implementation is still insignificant. This is due to many factors, primarily, the need for significant financial investments in changing technologies at the initial stage and restructuring economic relations in the field of environmental management [5].

In Russia, the transition to a “green economy” is complicated by the fact that the level of development of the regions is extremely heterogeneous. Thus, the coefficient of expansion for the gross regional product per capita made up 54.5 in 2016. Under these conditions, the transition to a “green economy” model should take into account regional peculiarities.

The aim of this study is to work out guidelines for the implementation of a “green economy” model in one of the territorial entities of the Russian Federation - the Altai Republic based on the evaluation of indicators that assess the environmental friendliness of the socio-economic system. The object of the research is a system of indicators characterizing the level of compliance of the regional economy with the model of a “green economy.” The subject of the research is the information capabilities of “green economy” indicators for the development of effective measures to introduce the “green economy” model in the Altai Republic.

## II. METHODS



The first approach of the study is the development of theoretical guidelines for monitoring the introduction of a green economy in the region, allowing you to answer the question: is the region developing in accordance with the green economy model or not. Theoretical statements include a set of indicators that testify to the introduction of a green economy model in the region and how to interpret them. These indicators are economic, social, environmental in nature (this will require the use of statistical research methods). But at the same time they should give an opportunity to assess the impact of economic (industrial, investment) activities on the environment and social development; environment to economic and social efficiency through the resource intensity of the economy and the efficient use of resources. The proposed approach forces the authors of the project to use not only the analysis of the research object, but also the synthesis, which gives the new result to the researchers. It is expressed in the logical connection of individual elements of the green economy (production, nature, people), united in a single working economic model.

The second approach of the study is the analysis of existing methods and tools that form the totality of the norms of "green production" established in the Republic of Altai. The establishment of such norms occurs at the level of international, national and regional levels. The object of this study is the regional level. Regional rule-making is mainly manifested in the state programs of the region. It is in them that the development benchmarks are expressed and methods for their achievement are proposed. In this regard, the analysis of existing methods and tools that form the totality of the norms of "green production" will be carried out on the materials of the state programs of the Altai Republic.

Currently, 13 state programs have been adopted in the region. The purpose of this study will require an analysis of government programs and subprogrammes that establish requirements for environmental management, waste management, energy development, investment activities, support for the competitiveness of individual industries, the formation of regional and local markets.

The analysis of state programs was carried out in accordance with the logic - the compliance of the main program parameters (goals, objectives, activities, resources, performance evaluation) with the principles of a green economy.

To achieve the key objective of the project - recommendations on the development of mechanisms for introducing a green economy for the Altai Republic with the starting conditions achieved - the following methods were used: 1) justification of the gradual adjustment of state programs for compliance with the principles of green economy and green production; 2) proposals for the transformation of state support for individual industries and business entities; 3) proposals for changing the system of state and municipal procurement; 4) proposals for certification of production; 5) proposals for the development of an information and training system to raise awareness of green economy issues.

With a variety of approaches to the explanation of economic mechanisms, the team of authors used a functional

approach. According to him, an economic mechanism is a combination of elements, forms, methods, methods, rules, management procedures and decision-making. Therefore, recommendations on the development of mechanisms for introducing a green economy for the Altai Republic are of a substantive nature, expressed in proposals for the transformation of state programs and subprogrammes.

Each region has its own initial conditions for the development of a "green economy." In this regard, researchers are interested in assessing the level of a "green economy" in the regions of the Russian Federation, as a result of which various greening indexes of the territorial entities of the Russian Federation have been developed and are being used, the most famous of which are the following:

1) environmental rating of regions developed by the All-Russian Public Organization "Green Patrol" [6];

2) ecological and economic index of the regions developed with the support of WWF Russia, RIA "Novosti," the All-Russian Public Organization Russian "Geographical Society" [7].

There is also experience in forming an environmental rating among cities in Russia developed by the consulting company "Ernst & Young" for the Ministry of Natural Resources of the Russian Federation taking into account the recommendations of the OECD (Organization for Economic Cooperation and Development) [8].

The proposed indicators are designed as aggregated based on the integration of a number of indicators reflecting economic, industrial, engineering/technological, environmental, institutional, and social components. The indicators differ in the composition of constituents and methods of their processing, however, what they have in common is an attempt to comprehensively assess the development of the region including the economic potential, the degree of degradation of natural resources, and the level of human capital.

The ecological index of regions is characterized by a regular approach since its measurement takes place four times a year. The second rating was developed once within the framework of the grant project. Despite the differences in the methodology for calculating both indices, the Altai Republic occupies a leading position in both ratings. Thus, in the ecological rating of the All-Russian Public Organization "Green Patrol," the Altai Republic ranked from 2nd to 4th place during 2008-2018.

The Ecological and Economic Index of 2012 shows the Altai Republic as the leader in its ranking. As for the ranking of cities developed by the consulting company "Ernst & Young" in 2013, the city of Gorno-Altai, which is the administrative center of the Altai Republic, took second place with the city of Moscow in first place.

Do the above ratings mean that the Altai Republic is the region most conforming to the green economy model? Objective findings show that it is not so. The Altai Republic is one of the highly subsidized regions of Russia (the level of financial assistance from the federal budget has ranged from 65 to 78% over the last 10 years), whose population has average per capita incomes



of 58.5% of the national average, and 25.7% of the maximum value [9].

According to the authors of this paper, integrated indicators assessing the ecological and economic state of the regions of the Russian Federation in the last decade do not fully assess the region's readiness to transition to a "green economy" model or to develop guidelines for the development of the economy on the principles of sustainable development. Other researchers also adhere to this position [10-12]

The research methodology included the identification of components of integrated indicators of the ecological and economic development of the Altai Republic and their assessment in terms of their impact on the total ecological and economic potential. The methodology also included the formation of a system of statistical indicators that more fully reflect the processes of transition of the regional economy to a "green economy" model, and create the information foundation for the development of regulatory measures stimulating the regional economy to greening and advancing social development.

### III. RESULTS

In the world practice of evaluating the greening of an economy, various indicators of a "green economy" have been developed. At the world level, the most well-known indicators of a "green economy" are the Environmentally Adjusted Net Domestic Product, the domestic savings indicator, and the Ecological Sustainability Index. Most methodological approaches agree [13] that in studying the dynamics to assess the level of transition of a particular region to a "green economy," it is necessary to consider three sets of indicators: economic, environmental, and social. There were no exceptions in developing the integrated indicators mentioned above to assess the level of greening of Russian regions.

The ecological rating developed by the All-Russian Public Organization "Green Patrol" is based on the aggregation of three indices: environmental, socio-ecological, and industrial-ecological, each of which includes seven indicators assessed on a scale from (-1) to (+1). The sources of information are "relevant messages, publications or documents that describe the state of objects and processes as well as situations, activities, and events in the field of ecology and environmental protection online" [14] The Altai Republic from 2008 through 2018 has consistently received high marks on the index of environmental and socio-ecological aspects reflecting such development directions as:

- the level of air pollution,
- the state of natural waters,
- the state of land resources,
- the number and area of specially protected areas,
- the state of all biological resources of the region,
- climate change,
- operating efficiency of state bodies of executive and legislative power in the field of environmental protection and improvement,
- the number and degree of activity of local environmental NGOs,
- implementation by regional authorities of Russian legislation regulations in the spheres of forest, water, land,

waste management, air protection, biological resources, etc.,

- the level of environmental education.

In spite of relatively high assessments of social and environmental development, the region is rated lowly in such areas as:

- the level of industrial production development,
- the amount of municipal solid waste generated in the region and the degree of further processing or disposal,
- the active development of modern environmental technology policies and practices in the treatment of industrial waste,
- the level of practical industrial implementation of modern environmentally friendly technologies,
- the implementation of new environmental business projects to address environmental damage caused while doing business, charitable projects, etc.

Attention is drawn to the lack of indicators characterizing the social development of society through the value of human capital and characterizing the level of technological development through the environmental capacity of the gross regional product (GRP). Both of these assessment areas reflect the reorientation processes of a regional economy shifting from the traditional "brown economy" to a "green economy" model.

Thus, the environmental rating from the "Green Patrol" introduces the public to the ecological results of the region and does not allow identifying the region's readiness for the transition to a "green economy," whose essential elements are the reduction of poverty of the population, and the effective use of resources using "green" technologies, according to the United Nations Environment Program "Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication." It should also be noted that the initiators of the "Green Patrol" project emphasize that the purposes of developing those environmental ratings are, first of all, to raise awareness of the state of the environment for the general public and to stimulate regional authorities towards environmental protection activities.

The second rating is compiled on the basis of the ecological-economic index calculated in 2012 by the World Wildlife Fund (WWF) of Russia and the RIA "Novosti" newswire with the support of the All-Russian Public Organization, "Russian Geographical Society," based on methodology proposed by a team of authors headed by Doctor of Economics, Professor at Moscow State University, S.N. Bobylev. In our opinion, it is more informative, because it was developed initially to assess the level of sustainable development of an economy based on the Adjusted Net Savings Index methodology developed by the World Bank [15]. The index is based on the gross fixed capital formation indicator, which is adjusted for changes in natural and human capital.

The index itself is calculated according to the following formula:



$$IANS = \frac{GS - IM - ENR - DFEP + BEHC + CEP + RT}{GRP} * 100\%$$

IM stands for fixed investment capital of the “Mining Industry;”

ENR stands for environmental depletion;

DFEP stands for financial costs of environmental pollution;

BEHC stands for budget expenditures for human capital;

CEP stands for expenses of environmental protection;

RT stands for the assessment of protected areas;

GRP stands for gross regional product.

As noted above, according to the calculated eco-economic index and the subsequent rating of regions, the Altai Republic ranked first leaving behind Moscow (30th place), St. Petersburg (41st), Novosibirsk region (45th place), the Republic of Tatarstan (53rd place), and other regions. The reasons for such a high assessment of the sustainability of development are the following:

- the low value of the GRP, which led to an increase in the GRP ratio of adjusted net savings per ruble;
- little damage from environmental pollution due to low industrial production;
- a high proportion of protected areas in the total area of the region;
- high reserves of wood due to a high level of forest cover and a large area of protected forests.

Therefore, the analysis of the second rating shows the reason for a high sustainability development index of the Altai Republic, which is due to the peculiarities of the region’s territory. Those include a low level of development of industrial production facilities and of mineral extraction, which, in turn, is due to the inaccessibility of the majority of the Altai Republic, and a unique protected nature complex preserving biodiversity and requiring careful treatment. As the authors of the rating rightly point out, GRP cannot be an exhaustive indicator of the development of a region with which to judge the vector of its development.

Since the term “green economy” includes two components, ignoring the economic component will give rise to opinions that the greening of an economy should be achieved by reducing the gross product.

The evaluation of indicators that take into account the level of environmental development of the Russian regions suggests that integrated aggregates do not provide complete information on the readiness of a particular region for transition to a “green economy” in order to effectively develop its implementation. In some cases, as has happened with the Altai Republic, the calculated integrated indicators may give erroneous information and supposed well-being in a model of transition to a “green economy.”

Thus, the transition to a “green” pathway is individual for each region and depends on its initial potential. There is no single model for a “green economy,” but there are many forms of local specific activities of a “green economy.” It is possible to choose a development pathway for each region for the most effective realization of its individual economic opportunities taking into account its initial potential (natural, technological, investment, personnel, etc.).

Based on the foregoing, there arises a need to find a limited number of universal indicators of social, economic, and environmental blocs, as well as specific indicators of a “green economy” reflecting the level and dynamics of the green rating of a particular region. Universal “green economy” indicators will make it possible to track the level and dynamics of transition to a “green economy” of the regions of Russia as a whole, to compare Russian regions, and to find weak points and strong points of growth. Specific indicators will allow taking into account the individual characteristics of the region, as well as its resource and natural potential.

A system of “green economy” indicators at the regional level will ensure the effective assessment of the transition level of a particular region to a “green” pathway and will allow periodic monitoring in order to analyze positive or negative dynamics. When developing “green economy” indicators, one should be guided by such basic principles as the availability of statistical indicators over a number of years, informative and equivalent consideration of the obtained indicators, and a limited number of developed indicators [16].

Sources of informational data for calculating “green economy” indicators were the official data of the Federal State Statistics Service (Rosstat), the territorial body of the Federal State Statistics Service for the Altai Territory and the Altai Republic (Altaikraystat), and annual regional reports on the state and on environmental protection.

Usually, the majority of indicators from statistical compilations are reflected in absolute values, which does not always allow us to assess the real situation of the region’s sustainable development. That is why, when developing “green economy” indicators, relative indicators were also included.

The “theme or problem indicator” was selected as a basis for the development of a system of “green economy” indicators for the Altai Republic. This option assumes that a specific issue has its own indicator. Usually, within such an approach, three types of indicators are applicable: economic, social, and environmental [17].

The topic of transition of Russian regions to a “green economy” combines issues of economic development, environmental safety, and the quality of life of the population. The rational use of natural resources for present and future generations is one of the basic principles of a “green economy.” In this regard, in order to develop the necessary system of indicators, we systematize the indicators in three blocs: indicators of economic development, indicators of the state of the environment and of resource conservation, and indicators of social well-being.

Since each region is individual, within the framework of a specific territorial entity of the Russian Federation, some specific indicators may require further development taking into account geographical, economic, climatic, or other features of the territory. For example, for the Altai



Republic, considering, among other things, its tourist-recreational and agricultural specializations, the selected indicators were the contribution of tourism as a percentage of the region's GRP and the portion of organic agriculture in overall agricultural production.

For the Altai Republic, designated "green economy" indicators will be calculated and trends will be described regarding economic, environmental, and social interests. To highlight aspects of the formation of a "green economy" model, the indicators are also divided into general and specific.

The general indicators reflect basic socio-economic and environmental conditions for the region's development, including per capita GRP, the volume of investments, the capital-to-labor ratio, the average per capita income of the population, levels of poverty and health, investment in human capital, the level of absence of air pollutants, access to clean

potable water, and the nature of forest management. General indicators should be evaluated in comparison with average values across Russia, the comparison of which is of significant importance.

Specific indicators are determined by enviro-geographical and socio-economic features of the region, which allow us to identify developmental factors characteristic of the Altai Republic. The comparison of specific indicators with average Russian values is not appropriate. Specific indicators are determined based on expert opinions and knowledge about the peculiarities of the region. Among those indicators, the authors include the volume of investment in environmental activities, investment in alternative energy sources, the share of tourism and agriculture in GRP, and per capita investment in education. A list of common and specific indicators, as well as their values over a number of years, appear in Tables 1 to 3.

**Table 1.** Indicators of the Transition of the Altai Republic to a "Green Economy:" Ecological Bloc

	2013	2014	2015	2016	2017
<i>General indicators</i>					
1.1 The share of protected areas to the total area of the region, %	25,0	25,0	25,0	26,0	26,0
1.2 The proportion of reservoirs with good water quality, %	15,1	14,9	14,6	16,8	15,3
1.3 Captured and neutralized pollutants from stationary sources of pollution as a percentage of the total amount of pollutants derived from all stationary sources of contamination.	19,0	17,8	18,1	19,7	21,8
1.4 The ratio of reforestation to the area of primary logging, %	65,8	63,2	112,1	67,8	129,8
1.5 The proportion of recovered and neutralized waste production and consumption, %	31	35	39	25	25
<i>Specific indicators</i>					
1.6 Pollutants emitted into the atmosphere - total, thousand tons	9,2	8,1	8,2	7,1	7,2
1.7 Investment in fixed assets to protect the environment and rational use of natural resources, mln. rub.	86,1	116,3	78,2	217,8	231,6
1.8 Investment in renewable energy sources, mln. rub.	570	500	450	1500	500
1.9 Renewable energy power, total MW	41,63	51,63	56,63	61,63	71,63
1.9.1 Hydropower capacity, MW	36,0	36,0	36,0	36,0	36,0
1.9.2 Wind power capacity, MW	0,63	0,63	0,63	0,63	0,63
1.9.3 Capacity of solar power plants, MW	5	15	20	25	35
1.10 The share of renewable energy in the total amount of final energy consumption in the region, %	1	2	3	4	5

\*The source: Federal State Statistic Service.

Let us analyze the values of the selected indicators. The environmental bloc demonstrates positive trends in the ecological and economic development of the region in terms of general as well as specific indicators. Most indicators of the

ecological bloc indicate the importance and effectiveness of environmental policy in the



Altai Republic.

The Altai Republic traditionally has a high proportion of protected natural areas (PA), which is an important condition for the transition to a “green economy.” Currently, the value of this indicator, 26%, is higher than the level recommended by the United Nations Economic Commission for Europe (at least 10 to 15%) and the Concept of Long-Term Socio-Economic Development of the Russian Federation until 2020 approved by the Government of the Russian Federation (at least 10% of the region’s area).

The Altai Republic is a multi-forest region of the Russian Federation. The forested areas cover about 70% of the territory of the republic. Thanks to the important role of forest ecosystem services, an increase in the area of restoration work is observed in the region from year to year. The recovery factor, calculated as the ratio of reforestation area to the area of deforested and dead forests, has doubled over 5 years and now exceeds 100%, because of a compensation process for insufficient reforestation typical of the region until 2015. Emission of pollutants into the atmosphere is being reduced, the proportion of captured and neutralized pollutants is increasing, and the volume of environmental investment is growing. The proportion of reservoirs with good water quality

is consistently high. All of this results from the environmental policy pursued by regional authorities and in compliance with the environmental legislation of the Russian Federation.

One of the environmental indicators, the proportion of recovered and neutralized waste, shows that the situation with the recovery and disposal of waste is getting worse. The reduction is due to an increase in waste from consumption, above all, and not from an increase in waste production. This situation occurs due to the growing number of tourists and the lack of waste recycling facilities, which are known to require large investments.

The implementing of special investment projects resulted in an increase in the capacity of renewable energy sources (1.7 times across five years) due to the use of solar energy, and, as a result, an increase in the share of renewable energy sources in the total final energy consumption. Although this share is small and makes up only 5%, considering the region’s energy shortage, the implementation of investment projects for the construction of solar power plants have become significant projects for the economy of the Altai Republic.

**Table 2.** Indicators of Transition of the Altai Republic to a “Green Economy”: Economic Bloc

	2013	2014	2015	2016	2017
<i>General indicators</i>					
2.1 The ratio of GRP per capita in the region to the average across Russia, %	41,9	45,5	43,8	45,2	-
2.2 The ratio of investments in fixed assets per capita in the region to the average across Russia, %	59,9	68,6	59,9	57,8	55,4
2.3 The capital to labor ratio in the region to the average across Russia, %.	49,2	51,5	60,1	59,1	58,3
<i>Specific indicators</i>					
2.4 Contribution of tourism to the region's GRP, %	1,5	1,5	1,5	1,6	-
2.5 The share of agriculture in the region's GRP, %	17,5	16,3	16,9	18,1	-

\*The source: Federal State Statistic Service.

The analysis of the economic bloc shows that the region’s GRP per capita is less than half that of the average Russian value. This fact indicates a low production potential of the regional economy and low labor productivity. At the same time, we see that the GRP per capita is growing faster than in Russia as a whole. Although the increase has the nature of a medium-term trend, it has triggered positive factors of economic growth. One of these factors is the capital-to-labor ratio. We see that in comparison with the average across Russia, this indicator is growing significantly.

The volume of investment per capita is decreasing; if the trend remains unchanged, this will lead to a reduction in the future of the capital-to-labor ratio and, consequently, to a decrease in the growth rate of the GRP.

In this context, the relative immutability of the contribution of tourism to the region’s GRP indicates a slight slowdown in growth that was characteristic of the Altai Republic in the first

decade of the 20th century. The lack of growth in tourism as a portion of the GRP along with an increase in the numbers of tourists in the region from 1.45 million in 2013 to 2.05 million in 2017 is especially alarming. This suggests a possible shadow turnaround in the tourism business as well as the creation of low added value in the industry. Tourism is one of the powerful factors of “green economic growth.” The lack of growth in the contribution of tourism to GRP indicates the absence of structural changes in the regional economy leading towards a “green economy”.

It is worth noting, however, that almost one-fifth of the region’s GRP is accumulated in the agricultural sector. For more than half a century, agriculture has been considered a dominant branch of the economy in the Altai Republic, and the region’s economy is considered to be



monostructural. The contribution of agriculture to the regional economy is important for the transition to a “green economy” model, since the adoption of a law on organic agriculture and organic products in the near future will ensure

that products grown in the region are environmentally friendly [18]. Thus, the competitiveness of the regional economy will increase due to its greening.

**Table 3.** Indicators of Transition of the Altai Republic to a “Green Economy”: Social Bloc

	2013	2014	2015	2016	2017
<i>General indicators</i>					
3.1 The ratio of the average per capita cash income of the population per month in the region to the average across Russia, %	56,9	61,7	59,9	58,0	58,6
3.2 The proportion of the population with cash incomes below the minimum subsistence level, %	20,9	20,7	24,3	25,9	25,1
3.3 Population growth (or decline), as a % of the previous year	100,48	101,42	100,47	100,93	100,46
3.4 The ratio of unemployment to the average across Russia, %	209	200	173	218	231
3.5 Life expectancy at birth	67,34	67,76	68,44	70,13	71,15
<i>Specific indicators</i>					
3.6 Investment in education for 1 person, ths. Rub.	2,22	2,19	2,10	2,03	2,29
3.7 Percentage of employed persons with higher education	29,5	27,5	29,4	28,6	30,4

\*The source: Federal State Statistic Service.

The social development indicators demonstrate conflicting trends. Firstly, we observe low average per capita incomes of the population, which lag behind the average Russian values. At the same time, the unemployment rate in the Altai Republic exceeds Russia’s as a whole by more than 2 times. The share of the population with incomes below the subsistence minimum is increasing. Due to a low level of production, the region belongs to labor-surplus regions; this leads to increased unemployment and a high proportion of poor people.

Despite this fact, the population growth rates are positive. Over the five years analyzed, the population has increased by 3.8%, which is significant, since over the same period, the population as a whole of the Russian Federation has increased by 2.2%. Population growth against the background of rising unemployment and poverty can be explained by the demographic policy of the Russian Federation Government to stimulate population growth, to which the regions with a low GRP turned out to be the most sensitive.

The increase in life expectancy is an indicator associated with long-term factors. The fact that life expectancy in the Altai Republic is growing is the result of positive trends in the aggregate, such as improving the health care system, increasing real incomes of the population, reducing alcoholism of the population, popularizing sports and a healthy lifestyle, and improving the environment.

Specific indicators are related to the structure of employment in the region and the characteristics of vocational education. The region is considered to have a small population and to be predominantly agrarian with a poorly developed innovation infrastructure. There is one higher educational institution and a number of secondary specialized educational institutions in the region, which predominantly supply the regional labor market. Therefore, to compare the

region in terms of the population’s educational level with the average across Russia is not correct.

At the same time, we see a very large proportion of the employed population who have completed higher education, which is explained by local employment peculiarities. The employed population in the Altai Republic works mainly in educational institutions, public health, state and municipal authorities, and law enforcement agencies. That makes up about one third of all employees involved in branches of the regional economy.

Education expenditures are current in nature. We concluded this through examining the volume of investment in education per capita, which is extremely and consistently small, and amounts to about 2,300 rubles per person per year.

#### IV. DISCUSSIONS

The analysis of “green economy” indicators of the Altai Republic, proposed by the authors, indicate that this unique region in terms of biodiversity is characterized by a low level of economic and social development.

The implementation of sustainable environmental and economic development ideas is constrained in the Altai Republic for a number of reasons: a low level of production and entrepreneurial potential expressed as a small portion of GRP, investment, the level of capital-to-labor ratio, and the share of tourism in GRP as tourist numbers increase.

Despite certain negative indicators of the socio-economic development of the Altai Republic, there is also a significant number of favorable factors.

1. Conditions for the development of organic agricultural production.

The introduction of organic standards and mechanisms for tracking the



origin of agricultural raw materials will allow local agricultural producers to reach a new institutional level and receive additional income by producing environmentally friendly products.

## 2. Conditions for the development of eco-tourism.

Eco-oriented tourism consists of a whole “bundle” of various types of tourism, such as ethno-tourism, rural tourism, health tourism, sports tourism, etc. The availability of natural resources as well as the development of a tourism infrastructure, including the digitalization of the economy, will increase the incomes of entrepreneurs working in the field of environmental tourism, and, therefore, create additional incentives to preserve the ecological balance of tourist areas.

## 3. Development of alternative energy through renewable energy sources.

The last factor is especially important since the region is energy deficient, and a low level and high cost of electricity generation create restrictions for the development of the economy [19-20].

An important step towards a “green economy” is the formation of a renewable energy cluster in the Altai Republic. It was in the Altai Republic that the first solar power station in Russia was commissioned (the village of Kosh-Agach, 2014). Today there are five solar power plants in the republic with a total capacity of 40 MW. One of them is unique within Russia; its design allows capturing light even in cloudy weather. The opening of solar power plants increases the environmental sustainability of the Altai Republic. In the future, by 2020, solar electricity will supply all of the needs of the republic. The work of solar stations can significantly reduce carbon dioxide emissions into the atmosphere.

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