

Sustainable Development of the Baikal Natural Territory: Opportunities and Risks

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Abstract: The current strategies of socio-economic development of the regions located within the Baikal Natural Territory (BNT) are often based on economic priorities as a driver and the material basis for social and environmental goals achievements. A major challenge for the regional development is the balance between Lake Baikal preservation and improving the quality of life. The results of a comparative analysis of the factors of economic development and its pressure on environment of the region were analyzed in the study. The strengths and weaknesses, opportunities and risks of sustainable development of the region were identified and compared. A key role of preserving Lake Baikal as a factor of environmental stability, self-identification of the local population and the basis of economic development of the region, as well as the importance of regulating nature management taking into account the interests of the local population, is justified. Conclusions about the value of BNT for residents of adjacent territories based on the data of social surveys are drawn, and priorities for the strategy for sustainable development of the region are formulated.


1 INTRODUCTION

The complex of economic, social and environmental problems caused by extensive development of the regions within the boundaries of the Baikal Natural Territory (BNT) assumes developing an integrated approach to their solution in accordance to the concept of sustainable development (SD). Despite the controversial nature of the term and its weak representation in the legal field of the Russian Federation, the concept of SD defines development priorities both at the national and regional levels. Sustainability of region is the process suggested to improve the quality of human life within the limitations of the global environment (Jovovic et al., 2017). The preparation and publication in 2020 The Voluntary National Review of the progress made in the implementation of the 2030 Agenda for Sustainable Development (Voluntary national review..., 2020), in Russia became an important signal for the sphere of regional strategic planning to continue the work on implementation of SD

principles in practice. At the same time the Review considers the Sustainable Development Goals (SDG) mainly in the sectoral context, without reference to regional differences. Thus, the main document that defines the targets for the regional development as well as ways for their achievement today are regional strategies for socio-economic development. The compliance of all spheres of society life with the SD principles based on the comparison of long-term priorities with budget opportunities is the main principle of determining the long-term prospects in the strategies of socio-economic development of regions (Ilyina et al., 2015). This approach emphasizes the importance of achieving economic goals as a factor of the material basis for achieving social and environmental goals and corresponds to the principles of a “green” economy (Pakina, 2014). In this regard, the development of regional strategies for sustainable development and their implementation into practice is an urgent task, especially important for regions with a unique cultural and natural-ecological basis, such as the Baikal region.

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2 METHODOLOGY

The study of the problems and prospects of sustainable development requires an integrated approach. The presented study is based on the authors' field studies in the Irkutsk region and the Republic of Buryatia from 2017 to 2019, as well as statistical materials and strategic planning documents for the study region. Within expedition research, comprehensive geoecological studies were conducted, including sociological surveys of the local population, interviews with representatives of administrations, landscape and environmental studies. Comprehensive socio-ecological studies in the Irkutsk region were conducted with the authors' participation in the summer season of 2019, and in the Pribaikalsky and Severobaikalsky districts of Buryatia in 2017-2018. Due to massive development in the coastal waters of the lake Baikal filamentous algae (including *Spirogyra sp.*) the research was partly devoted to identification of the risk factors for aquatic ecosystems. Other part of research was focused on assessment of the impact of the regional economy on ecological condition of Lake Baikal and the BNT on the basis of statistical data and a comparative analysis of environmental, economic and social indicators of development, with the involvement of rating assessments. The conclusions on the socio-ecological significance of the Baikal area for the local population were based on sociological surveys results.

3 RESULTS

3.1 Indicators of the Baikal Natural Territory Regions Development

The Baikal Natural Territory is a strong example of a region developing under severe environmental restrictions. Three subjects of the Russian Federation are partly located within the borders of the BNT: Irkutsk Region, Republic of Buryatia and Zabaikalsky Krai. The total area of the BNT is 386 km², it also includes Lake Baikal and its catchment area within the borders of the Russian Federation, the water protection zone and the specially protected natural territories adjacent to the lake. The current structure of nature use and management at the BNT has formed under the specifics of economic activity and environmental restrictions determined by Federal Law No. 94-FZ of May 01, 1999 "On Protection of Lake Baikal" and the special legal status of Lake

Baikal as a unique water object included in the UNESCO list of World Natural Heritage Sites.

Currently all regions of the BNT have long-term development strategies: the Strategy of socio-economic development of the Irkutsk Region for the period up to 2036 (adopted in 2020), the Strategy of socio-economic development of the Republic of Buryatia for the period up to 2035 (2019) and the Strategy of socio-economic development of the Zabaikalsky Krai for the period up to 2030 (2013). According to Federal Law No. 172-FZ "On Strategic Planning in the Russian Federation" of June 28, 2014 the strategy of socio-economic development of the subject of the Russian Federation is a strategic planning document that defines the priorities, goals and objectives of public administration at the level of the subject of the Russian Federation for the long term. The same law also states that the forecast of socio-economic development of the Russian Federation for the long term provides an assessment of the achieved level of socio-economic development and (in accordance to sustainable development goals) the definition of internal conditions of development of the subject of the Russian Federation for the long term, including the main indicators of demographic and technological development, environmental and natural resources. In fact, the law establishes the need to assess the results of the regional economy development, taking into account social and environmental indicators. Equally important is the indication of drivers and limitations of economic growth of the subject of the Russian Federation for the long term, which can be interpreted as a SWOT analysis.

The analysis of regional development strategies should be carried out taking into account a broader view of the strategic planning tasks, proposed, in particular, by experts of the intellectual business club "Baikal Strategies" (Baikal strategies, 2018). Considering regional development strategies as documents defining the strategic techniques for the creation an economy in harmony with the environment, the identification of "strengths" and "weaknesses" of the region in order to concentrate resources on the most competitive areas of development is necessary.

GRP analysis demonstrates that all the regions located at the BNT have positive dynamics of economic development, but relatively intensive growth is typical only for the Irkutsk Region (Fig. 1).

According to the Strategy of the Irkutsk Region this is one of the leading regions of the Siberian Federal District in terms of the most important macroeconomic indicators: gross regional product,

profitability of enterprises, tax return, investment in fixed assets, etc. (Strategy... to 2036). Numerous integrated assessments of the socio-economic development of the Irkutsk region, which is quite large in size, confirm that this region has resources for innovative development, including through the formation of clusters (Vikhoreva et al., 2019).

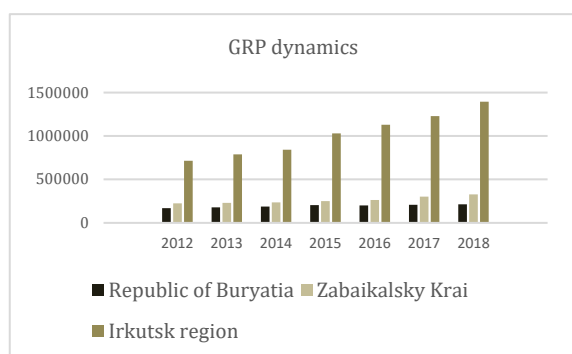


Figure 1: GRP dynamics of the regions within Baikal Natural Territory (mln. RR) (Source: Rosstat).

Comparison of socio-economic indicators of the BNT regions (Table. 1) also confirms that the Irkutsk region is a leader within the Baikal Natural Territory: it occupies leading positions in terms of average monthly nominal salary, volume of produced and shipped products, average per capita income, etc. (Regions of Russia, 2019).

Table 1: Socio-economic indicators of the Baikal Natural Territory regions development.

Indicators	Irkutsk region	Zabaikalsky Krai	Republic of Buryatia
Total area, thousand km ²	774,8	431,5	351,3
Population, thousand people	2404,2	1100	984,5
Average nominal salary per month, RR	42 647	40 740	36 047
Volume of produced and shipped products (total), billion RR	1255,788	169,777	121,6
Mining industry, %	48,1	63,8	23,0
Manufacturing industries, %	40,9	14,0	54,0
Average per capita income per month, RR	24 434	23 992	24 081
Unemployment rate, %	7,5	10,2	9,3
Retail trade turnover per capita, RR	144 951	154 257	180 022

3.2 Opportunities and Risks for the Development of BNT Regions

The possibilities of combining socio-economic and environmental interests are poorly used in modern development programs, while in the course of complex assessments socio-economic indicators should be supplemented with environmental ones. From this point of view, the Human Development Index (HDI), which takes into account the difference in the level and quality of life can be considered. According to (Human Development Report..., 2016), Moscow (0.952), St. Petersburg (0.935), the KhMAO and the Tyumen Region (0.908) for a number of years remain the leaders of the HDI rating among the regions of Russia. The Jewish Autonomous Region (0.801), the Chechen Republic (0.800), and the Republic of Tyva (0.786) are still lagging behind. Among the regions of BNT only Irkutsk region is located in the middle of the list with the indicator 0,865. Two other regions have low positions, close to the end of the list: 0,826 for Republic of Buryatia and 0,822 for Zabaykalsky Krai. This values confirms the data mentioned above: ignoring the environmental consequences of economic growth creates the illusion of relative prosperity in the Irkutsk region, whereas the real situation in all BNT regions is featured by high degree of environmental risk, that worsen over time.

Such conclusions can be confirmed by the results of a study conducted by the rating agency "RAEX-Analytics" (Investment risk..., 2019). Among the investment risks in the Irkutsk region the main one is an environmental risk, the value of which exceeds the national average, the second one is a management risk, which is also high. According to the rating data 2017 Irkutsk region belongs to the regions with the average potential and moderate risk (2B), whereas the Republic of Buryatia is the region with low potential and moderate risk (3B1) and Zabaykalsky Krai belongs to the regions with low potential and high risk (3C1). The regions retained similar positions in 2018-2019. At the same time, a comparably high management risk (along with criminal one) is typical for the Republic of Buryatia, while for the Zabaykalsky Krai, environmental and economic risks come to the forefront.

Dynamics of environmental pollution within the boundaries of the BNT in the period from 2005 to 2017 shows that the scale of the impact remained quite high even after the closure of the Baikal Pulp and Paper Mill (BPPM) in 2013. Despite a significant reduction of the total volume of discharges from this plant, there is a periodic increase in the discharge of

pollutants, and wastewater treatment is not provided to the level of permissible discharges for petroleum products, surfactants, chlorides and some other substances (Zengina et al., 2020; State report..., 2018). Extremely dangerous environmental risk factor for Lake Baikal – about 6 million tons of sludge waste (lignin), located at the shore line and requiring disposal (Table 2).

Table 2: Dynamics of environmental impact within the boundaries of the BPT.

Region	Risk sources localization	2005	2017
Atmospheric air emissions from stationary sources, thousand tons			
Irkutsk region	Irkutsk city	49,3	74,8
	Baikalsk city	5,5	0,4
	Sludyanka city	2,7	1,3
Republic of Buryatia	Severobaikalsk city	4,4	2,6
	Ulan-Ude city	30,3	28,9
Discharges to surface water bodies, mln m ³			
Irkutsk region	Baikalsk city	36,7	1,3
	Sludyanka city	1,7	0,9
Republic of Buryatia	Ulan-Ude city	40,7	20,6
	Gusinoozersk city	264,4	491,3
Waste generation, thousand tons			
Irkutsk region	BPPM	121,6	4,4
	Sludyanka city	139,0	247,5
Republic of Buryatia	Severobaikalsk city	18,6	н.д.
	Ulan-Ude city	275,6	285,8

During the period air emissions increased in Irkutsk, discharges to water bodies in Gusinoozersk city almost doubled, and the amount of waste increased in Sludyanka and Ulan-Ude. The impact of atmospheric emissions from the Irkutsk region on the BNT has increased. But the biggest concern is probably related to the increasing volume of discharges in the lake at the Severobaikalsky district of Buryatia (State report..., 2018). The result of the impact was, in particular, the spread of *Spirogyra algae* in the lake's water area, which seriously threatens the ecosystem of Lake Baikal (Zengina et al, 2020). Such important indicator as the share of the population living in particularly polluted cities (% of the total population of the regions) also remains very high. There are 8 cities with a registered level of pollution above 10 MPC in the Irkutsk region, and 2 cities in each of two other regions (Nikonorov et al., 2019).

The total share of the population exposed to such pollution is approximately the same in the Irkutsk Region and the Republic of Buryatia (over 45%). The current environmental situation in the region confirms the insufficiency of management decisions

focused solely on the limitations of economic development as a factor of anthropogenic pressure.

Current system of environmental management does not reduce environmental risks within the BNT boundaries and also does not contribute to improving the quality of life. A comparison of economic development opportunities and environmental risks on the BNT (sort of SWOT analysis) shows its strengths and weaknesses. The presence of the unique natural object Lake Baikal in the region contributes not only to recreation development, but also serves the largest source of fresh water and a reservoir of biodiversity. Together with a high resource potential of BNT and its border position to the Asia-Pacific countries, in particular sustained economic ties with Mongolia and China, these factors can be considered as strengths of the region, providing a high growth potential. In turn, unsustainable use of resources, threatening recession of economic development and geographical location caused high rates on air and rail transportation, environmental restrictions on upcoming activities, high capital costs, lack of infrastructure and high energy intensity of production are threats to development.

It should be noted that among the weaknesses of environmental management at the BNT are mainly institutional and infrastructural factors, which must be taken into account in further planning. To stimulate socio-economic development of the region it is necessary to develop special mechanisms similar to proposed in the sub-program "Protection of Lake Baikal and the Baikal Natural Territory" within the framework of the approved Federal target program "Ecology and Natural Resources of Russia" (2012-2020). Ten indicators were selected to assess the conformity of development to major environmental requirements: reduction in the share of the BNT area subjected to high and extremely high pollution, reductions of discharges of polluted wastewater, share BNT covered by the state environmental monitoring, etc. (Kirillov et al., 2016). Recognition of the complex ecological and economic nature of the development problems at the level of strategic documents (programs, plans) is a very important condition for the transition to indicators that take into account the environmental situation. Clear identification of the problem in the development programs is also a condition of appropriate funding. Along with this the consideration of the region as a single object of management contributes to environmental management optimization and development of the Baikal Natural Territory on the basis of environmental priorities (Gagarinova et al., 2018).

4 DISCUSSION

Socio-cultural factors play a very special role in developing the strategy of sustainable development of the Baikal Natural Territory – a region that is unique in many respects. The thesis about the determining role of culture does not require additional explanation: it is known that the development of the same institutions gives different results depending on socio-cultural ground (Auzan, 2017), and culture is a significant factor in determining the future social development (Nasibulina, 2020). In this regard, legal restrictions on the use of natural resources aimed at preserving the unique ecosystem and sustainable development of the territory, must be adjusted to take into account the interests of the local population. The current economic activity does not contribute to improving the standard of living in the BNT regions and restrictions only increase the economic risks of the regional development.

Development of the same institutions gives different results depending on their socio-cultural background (Auzan, 2017), so the effectiveness of the development plans implementation increases with a competent definition of values, and the likelihood of contradictions and risks is significantly reducing. In strategic planning it is necessary to take into account not only economic indicators, but also historical features of the region, its socio-cultural traditions and value orientations of society.

The preservation of Lake Baikal for present and future generations is a strategic goal and the basis for sustainable development of the Baikal region. The history of economic activity shows that it is impossible to solve the problems of strategic development exclusively by economic approaches. The sacred image of Lake Baikal, intrinsic for the culture of the local population, has always formed a careful attitude to nature and contributed to the consolidation of strong environmental restrictions in the practice of nature use management. However, the balance of restrictive measures and incentives for economic development was gradually replaced by a ban on many forms of economic activity, which became more acute at the turn of the XX and XXI centuries.

Intensive anthropogenic impact on the Lake Baikal started relatively recently, at the beginning of the twentieth century. Prior to this, the impact of economic activity was limited by fishing, the use of wood as fuel and building materials, and an available land plowing. The impact on the ecosystems of the lake significantly increased in the second half of the twentieth century, when the Irkutsk hydroelectric

power station and the Baikal Pulp and Paper Mill (BPPM) were built. The construction of the Baikal-Amur Mainline and the active development of mineral deposits have led to an unprecedented increase of the load on the lake and coastal landscapes. The completion of the Baikal Harbor project in the beginning of XXI century could improve the situation (Kirillov et al., 2020).

During the expeditions in the summer season of 2018-2019, sociological surveys were conducted in a number of localities in the Irkutsk region (Irkutsk, Angarsk, Baikalsk and Slyudyanka). The total number of respondents was 62. The main task of surveys was to identify opinions about the importance of the ecosystems of Lake Baikal and their natural resource potential for the local population and tourists. Most of the respondents (89%) believe that Lake Baikal can be called the basis of life of the local population. At the same time, the resource interest of Lake Baikal and the surrounding area are primarily represented in terms of recreation, not commercial or economic activities: most respondents use Lake Baikal for recreation, while only 10% of respondents use natural objects for work and additional earnings. Almost all respondents noted the problems of waste disposal and chemical contamination of the lake due to untreated wastewater discharges among the main environmental problems. Then the problems of deforestation and forest fires were mentioned, trampling of natural landscapes as a result of recreation, etc. About 3/4 of respondents believe that these problems are caused equally by human and legislative and administrative factors. The conclusion on the necessity to protect Lake Baikal and the surrounding area is based on opinion of 81% of respondents which believe that the protection regime should be strengthened, and 78% are ready to participate in measures to strengthen the protection, including financially, for example to transfer part of their funds to support environmental activities. As a result of the preliminary assessment, the cost of existence amounted to 682.5 million rubles per year (Zengina et al., 2020).

The conducted research shows that the strategy for the sustainable development of the BNT regions should be based on all important aspects of the life of the local population: economic, environmental, ethno-cultural, geopolitical, etc. The following sequence in the implementation of “green” principles in the strategies can be suggested: 1) identification of alternative solutions to environmental problems; 2) formation of institutional prerequisites for the development of low-waste and resource-saving technologies; 3) fixing the priority of direct

environmental measures, taking into account the socio-cultural specifics of the region. To implement these and other measures, in our opinion, a new socio-ecological and economic policy is needed at the municipal and regional levels of government. Such a policy can be based on a Strategy for sustainable development of the BNT, similar to the “Strategy-2035” for the regions of the Russian Arctic. Considering the global, national and regional significance of the Baikal region, the main ideas of the strategy can be based on the same principles.

Among them - the introduction of a special economic regime that promotes the transition to a “cycling” economy and the creation of new and modernization of existing industrial productions, the development of high-tech industries, etc.; providing investors with state support when they make capital investments in transport, energy and engineering infrastructure necessary for the implementation of new investment projects; development and implementation of a program of state support for the traditional economic activities of small-numbered peoples, provision of state support to projects for the creation and modernization of fish processing complexes, fish-breeding and greenhouse enterprises, livestock complexes, and many others.

5 CONCLUSIONS

Strategies for the long-term socio-economic development of the Irkutsk Region, Zabaikalsky Krai and the Republic of Buryatia determine priorities, taking into account the achievement of social, economic and environmental goals. However, the economic goals often considering as basic, providing a material basis for achieving related goals. The case of the Baikal region shows that taking into account socio-cultural and environmental factors of development can be considered as a more effective option.

Sustainable development has been defined in a variety of ways, but in practice it has three dimensions. These are the economic, environmental and social dimensions (Jovovic et al, 2017). Numerous restrictions aimed just to reduce impact of economic activities on ecosystems, that do not meet the interests of the local population, did not bring the desired result. Modern development strategies should be based on the goals of preserving ecosystems for the benefit of the population. Environmental well-being progressively became an important factor of the quality of life, the ecological culture of the population increases. Implementation of two priorities (ecology

and culture) into strategic development documents forms at all levels from global to regional and local communities is the basis for the achievement of the Sustainable Development Goals.

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