

Sustainable Forest Management as the Basis of Economic Growth of the Krasnoyarsk Territory

L.V. Brezinskaya

Engineering and Economics Institute
(EEI)

Reshetnev Siberian State University of Science and
Technology

Krasnoyarsk, Russia
brezinskaya@mail.ru

E.A. Khartanovich

Engineering and Economics Institute
(EEI)

Reshetnev Siberian State University of Science and
Technology

Krasnoyarsk, Russia
hartanovich.e.a@yandex.ru

Abstract—“Sustainable development” means the harmonious development of society with its natural environment and aims both meeting the needs of the present and ensuring future generations meeting their needs. The article reveals the aspects of sustainable forest management: environmental, economic, social and political and legal. The purpose of research is to substantiate the prospects and priorities of the development of the Krasnoyarsk territory forest complex on the basis of perpetual, sustainable forest management. The subject of the research is the development of the criterion system for assessing the sustainability of forest management. The criteria were developed taking into account the requirements of economic accessibility of forest resources, the balance of interests of the state and nature users, the integrated use of wood raw materials, the maintenance of acceptable sanitary conditions of forests. The following methods are used: statistical methods, comparisons methods, tabular methods. The level of rationality (efficiency) of forest management was studied in dynamics. The conclusion contains recommendations of improving the efficiency of the region forest complex.

Keywords: *sustainable development, forest management, research methods, financing, management, criterion system, recommendations, efficiency*

I. INTRODUCTION

Russia, being a country with significant forest potential, has currently relevant problems of conservation and use of forests [1]. At the same time, the restriction of trade and economic relations with Russia by a number of countries necessitates the search for directions of economic growth of the country's forest regions on the basis of compliance with the principles of sustainable development [2].

II. LITERATURE REVIEW AND RESEARCH METHODS

The modern concept of “sustainable development” is interpreted very broadly. The term was first used in 1972 at

the First Environment World Conference in Stockholm. It should be noted that the concept of “sustainable development” was translated from English as balanced development, that is, this way of development in a broad meaning meant the harmonious development of society with the natural environment, assumed both the satisfaction of the needs of the present and the provision of opportunities for future generations to meet their needs.

The UN conference on environment and development, held in Rio de Janeiro in 1992 and the World Summit on sustainable development (Johannesburg, 2002), developed the fundamental principles of environmental management and decided to adopt and implement sustainable development strategies by the states of the world.

This problem is global and is considered from different perspectives by many authors. Thus, Hrvoje Mikulcic, Xuebin Wang, Neven Duic, Raf Dewil believe that integration of energy, water and environmental systems is of great importance in the concept of sustainable development, since they represent the basic vital needs of humanity [3].

Jocelyn Fraser states that to advance the UN sustainable development goals, an economic management strategy is needed - “creating common value” for business [4].

According to Alana Corsi, Regina Negri Pagani, Joao Luiz Kovaleski, Vander Luiz da Silva, the sustainable development strategy should be aimed at achieving social development – improving health, quality of life and fighting poverty [5].

Ryan Wong points to the relationship between a sustainable development strategy and skilful coordination that is responsive and neutral [6].

Thus, the majority of authors reveal the content of the concept of “sustainable development” in several fundamental aspects: environmental, economic, social, political and legal.

The environmental aspect involves the preservation of the environment, the rational use of natural resources: the protection of the atmosphere, land, subsoil, forests, waters and their economical use, the introduction of environmentally friendly technologies, the complete disposal of waste.

Economic aspect includes reasonable state regulation of the economy, the optimal combination of different forms of ownership, developed commodity-money relations. This aspect is predetermined by economic availability of natural resources, observance of interest balance of the state and nature users.

Social aspect includes the fight against poverty, hunger, unemployment; getting education and affordable health services. With regard to the economy of nature management, this aspect is characterized by a focus on increasing income and employment in the natural resources industries.

Political and legal aspects include a complex of elements of the modern legal state: civil society, constitutional power, democracy, social justice, rational legislation, including tax.

A comprehensive approach to sustainable development was confirmed in the documents of the UN Summit on sustainable development (2015), as well as in the report of the UN development Programme (UNDP) on human development for 2019.

In 1995, the Russian Government adopted the "Concept of transition of the Russian Federation to a model of sustainable development", which gave a picture of the ecological and economic situation of the country, set out some General principles and directions of Russia's transition to a model of sustainable development. The principal in the Russian Concept was the correlation of the processes of improving people's quality of life and socio-economic development with the limits of the economic capacity of the biosphere. It should be noted that the main component of the biosphere used in the economic activities of the company is vegetation. At the same time, the forest, as an element of the geographical landscape, consisting of a set of woody, shrub, herbaceous plants, animals and microorganisms, is important not only for the biosphere as a whole, but also for society. In this regard, the use of forests, forest-covered areas should ensure the preservation of biosystems, in terms of their natural functions, in other words, for the sustainable development of biological systems, the process of forest management should also be sustainable.

The concept of "sustainable forest management" for Russian and foreign science is not new. The first mention of it can be found in foreign literature and forest legislation of a number of countries of the XVII century [7].

In Russian science, the term stability relative to the forest, was first applied by G. F. Morozov [7]. Morozov G. F. emphasized the importance of "natural stability of plantations" and "independence of the forest in its development". He called the principle of sustainability of plantations and the principle of forest independence the "guiding principles" of forestry, and the desire to create and preserve these properties of the forest was "the Central point of all forestry policy".

The draft General Declaration of the Helsinki Ministerial Conference on the protection of forests (1995) defined "Sustainable forest management means the management and forest use and forest areas in a manner and intensity that ensures their biological diversity, productivity, renewable capacity, viability and the ability to perform, now and in the future, relevant environmental, economic and social functions at the local, national and global levels, without prejudice to other ecosystems". The document goes on to state that "forest resources and forest areas must be used in a sustainable manner to meet the social, environmental, cultural and spiritual needs of present and future generations of mankind". Therefore, sustainable forest management is the main objective of the forest management system.

At the UN conference (1992), being mentioned above, the objectives of sustainable forest management were formulated: "Forest resources and forest lands should be maintained and used in a sustainable manner to meet the social, economic, environmental, social and spiritual needs of present and future generations" [8]. That is, the sustainable development of this natural environment means continuous, sustainable forest management, as well as the stability of the functioning of enterprises of the forest complex. These fundamental provisions are reflected in the documents of the International agreement on forests adopted in 2007 by the General Assembly; the XXV world Congress "Research and Cooperation in the Field of Forests for Sustainable Development" in 2019.

Sustainable forest management involves meeting certain criteria. Since the early 1990s, there have been several international processes and initiatives related to the development of these criteria as a tool for determining the sustainability of forest management and measuring its progress. In Europe, a set of criteria and indicators was developed in 1998 by FOREST EUROPE, a former Ministerial conference on the protection of forests in Europe (MCPFE) [9].

The Russian Federation has developed principles and criteria for sustainable forest management and forest management, each of which is evaluated by a set of indicators characterizing it [10].

We propose to assess the sustainability of forest management using indicators, the choice of which was carried out taking into account generally accepted requirements: they should be measurable, interpretable; comparable at the regional level; based on statistical data; reflect the dynamics; have an analytical nature, theoretical justification and the possibility of inclusion in forecasting [11]. Assumptions were used in the calculations "ceteris paribus".

We considered sustainability issues in relation to the use of forest resources of the Krasnoyarsk territory. The study of the level of forest management sustainability in the region with the help of general scientific methods (analysis, comparison, synthesis, generalization), statistical methods and tabular methods revealed the direction of its economic growth.

III. RESULTS AND DISCUSSION

The object of research is the Krasnoyarsk region which is the first in the Russian Federation in total volume of woods. The forest fund of the region has a number of features. Most of the forests, except for a small area of the South, grows in unfavorable climatic conditions of cold and moderately cold climate, the main forest-forming species is larch, the forests of the region are boreal, a significant proportion of "economically inaccessible" mountain forests. Over the past five years, the area of land covered with forest vegetation has increased due to the growth of soft-leaved forests with a decrease in the area and stocks of conifers, which indicates a negative trend in the forest fund of the region [12].

Assessment of the level of forest management in the region was carried out with the help of indicators given in the table and calculated on the basis of state and industry statistics [13; 14].

TABLE I. TABLE INDICATORS OF FOREST MANAGEMENT SUSTAINABILITY IN THE KRASNOYARSK REGION

Names of Indicators	2014 year	Rate of change in comparison with the previous year, %		
		2015	2016	2017
The volume of finished products, rubles / 1 cubic m ³	1530	98	100	96
The level of use of the estimated cutting area, %	18.7	109	113	124
Forestry and logging: Balanced financial result, million rubles	-2968	60	55	119
Investments (forestry), million rubles	152.71	111	470	81
The proportion of unprofitable logging enterprises, %	69.2	56	130.0	92
Total stock, mln. m ³	11728	99.8	99.4	99.7
Forest cover, %	45.2	100	99.8	100
Reforestation, thousand ha	51.8	97.3	105.4	119.2
Forest land covered by fires, ha	153996	17.3	778	266
Share in value added (hunting, forestry and agriculture), %	3.8	100	103	100

This table shows that the level of forest management sustainability in the region is low, and in dynamics it decreases in most indicators. The current situation is explained by the fact that the forest industry is characterized by crisis phenomena, which are the result of both objective and subjective reasons.

The degree of use of the calculated cutting area, which is one of the fundamental concepts of the forest management system and determines the maximum available amount of rational use of wood resources, according to official statistics in the region is low [14]. The actual volume of logging is much higher, which is due to another urgent problem of the forest industry - illegal logging, which is also a common problem for many countries [15; 16; 17; 18; 19]. According to official statistics, the volume of detected illegal logging in the country

and the region is about 1%. According to various studies, this figure is much higher. The World Bank estimates the volume of illegal procurement in Russia in the amount of 20 % of the total. This is due to the fact that there are no problems with the sale of stolen goods. All illegal logging is detected "at the stump", that is, forest inspectors record illegal logging after cutting trees. In such conditions violators, as a rule, can't be found as process of preparation of wood being fast enough. It should also be recognized that the appropriate staff for the implementation of these functions in the forestry sector is not enough, and the average salary of workers in the industry is much lower in relation to other activities. Taking into account illegal logging, the level of forest use is about 40%.

The main problem of forestry and trouble in the world is forest fires, which cover not only accustomed to this cataclysm of nature of the country: Portugal, Brazil and Greece, but also, for example, Northern Sweden [20; 21; 22; 23]. The cause is called global warming [24; 25]. But the main cause of fire in most cases is the "human factor", including uncontrolled burning of dry grass for agricultural production [26]. In the Siberian taiga, including the Krasnoyarsk territory (primarily in reserve forests), a significant proportion of fires occur from lightning during dry thunderstorms. The area of dead plantations from forest fires in Russia exceeds the annual area of cutting [27]. In many forest areas of the region, the area of forest land covered by fires exceeds the annual cutting by 2-5%. The basis for making recommendations to minimize the damage caused by fires is to determine the actual amount of damage. According to the current instructions, the losses of forestry are not determined in full. They include the burnt and damaged wood, the estimated rates of the payment for the right of use of forest fund and losses from the reduction of beneficial functions of forests.

Russia and, accordingly the Krasnoyarsk region are characterized by a very low level of integrated use of forests. The consumption of finished products from one m³ of raw materials is significantly lower in comparison with developed countries, and in dynamics in some periods it grows due to a significant volume of primary wood processing, sawn timber production 64-72% [14]. Deep processing of wood in the region is practically absent, we observe the low level of processing of wood waste and low-value wood. For today, in the region as a whole, there is practically no market for waste in the form of sawdust, so huge volumes of sawn mass remain unclaimed. The accumulation of wood waste leads to a deterioration of the environmental situation and the risk of fires in the forests of the region. In this regard, two negative facts should be noted. Bankruptcy and closure of the only pulp and paper mill in 2014 and changes in the implementation of one of the investment projects, which originally provided for the production of bleached coniferous Kraft pulp, Kraft liner. Currently, the project involves only sawmill production. This factor largely determines the unprofitability of logging enterprises. The strategic direction of the development of the forest complex should be the creation of new production facilities for deep chemical-mechanical processing of wood, pulp production, expansion of the product range, introduction of modern technologies of reforestation and forest management, development of research and development in the

field of creating new technologies and obtaining innovative products.

From the above it follows that the forest complex of the region faces problems of various kinds. Some of them are caused by the peculiarities of the industry and the state of use of forests, that is, by the nature itself, and such a way, the reasons are objective. Other difficulties relate to management by public authorities and are as follows.

In 2007, Russia adopted a new Forest Code. Federal powers to plan and organize the industry were transferred to the level of the Federation Subjects, which received appropriate funding, as well as the property of Federal forestry and territorial bodies of the Federal Forestry Agency. It was assumed that such a measure would increase the efficiency of industry management. In this regard, it should be noted the constant changes in forest legislation over the past 30 years, although it is well known that any industry must operate with a stable legislative framework, as in the conditions of often and sharply changing legislation it is impossible to ensure a permanent, continuous forest management, and planning long-term business involves great risks.

As a result of the reforms, the number of forestry workers has decreased almost tenfold. One forestry worker in the multi-forest Siberian Federal district accounts for 244.5 thousand hectares. With such "standards" it is very difficult to effectively fight pests and forest fires, because, for example, the protection of forests from fires has always been based on the principles of early detection and subsequent elimination in the initial stage of development. Therefore, we consider it expedient to amend the forest code and transfer the functions of forest management from the regional to the Federal level, since most budgets of the subjects of the Russian Federation are deficient and subsidized. This applies, in particular, to the regions of Siberia and the Far East, where most of the country's forest resources are concentrated.

IV. CONCLUSION

In conclusion, in order to achieve sustainable forest management, it is necessary to address the following challenges:

- to increase using of the allowable volume of wood withdrawal, to create conditions for rational and integrated use of forests while preserving their ecological functions and biological diversity;
- to provide the conditions of investment attractiveness for the creation of new forest products for processing;
- improve the system of forest management;
- to reduce losses of the forest complex from fires, harmful organisms and illegal logging.

These strategic directions involve the presence of vertically integrated production and technological chains, effective forest management and reforestation, deep processing of wood, developed transport logistics, scientific, engineering and personnel support.

The implementation of the designated areas of development of the forest complex of the Krasnoyarsk territory will ensure the conservation and rational use of forest resources of the region, and, consequently, the growth of the regional economy.

REFERENCES

- [1] O. Ikonnikova, A. Gorkin, and V. Petrik, "Sustainable forest development: problems and prospects", Proceedings of the international conference on trends of technologies and innovations in economic and social studies 2017, AEBMR-Advances in Economics Business and Management Research, vol. 38, pp. 241–245.
- [2] E. A. Khartanovich, "Prerequisites for the creation of peat bioenergy clusters (on the example of Siberia)", Financial economics, All-Russian Scientific and Analytical Journal, Moscow, 2018, no. 7 (part 15), pp. 1879–1882.
- [3] Hrvoje Mikulčić, Xuebin Wang, Neven Duić, and Raf Dewil, "Environmental problems arising from the sustainable development of energy, water and environment system", Journal of Environmental Management, In press, corrected proof, art. 109666.
- [4] Jocelyn Fraser, "Creating shared value as a business strategy for mining to advance the United Nations Sustainable Development Goals", The Extractive Industries and Society, July 2019, vol. 6, issue 3, pp. 788–791.
- [5] A. Corsi, R. Negri Pagani, J. L. Kovaleski, and V. L. da Silva, "Technology transfer for sustainable development: Social impacts depicted and some other answers to a few questions", Journal of Cleaner Production, 1 February 2020, vol. 245, art. 118522.
- [6] R. Wong, "What makes a good coordinator for implementing the Sustainable Development Goals?", Journal of Cleaner Production, 20 November 2019, vol. 238, art. 117928.
- [7] V. Zakharov, "Sustainable forest management – a child of the need for pristine forest", Forest Newsletter, 2000, Moscow, no. 14, pp. 3–5.
- [8] J. M. Diaz-Sarachaga, D. Jato-Espino, B. Alsulami, and D. Castro-Fresno, "Evaluation of existing sustainable infrastructure rating systems for their application in developing countries", Ecological Indicators, December 2016, vol. 71, pp. 491–502.
- [9] T. Baycheva-Merger and B. Wolfslehner, "Evaluating the implementation of the Pan-European Criteria and indicators for sustainable forest management – A SWOT analysis", Ecological Indicators, January 2016, vol. 60, pp. 1192–1199.
- [10] "On the Approval of Criteria and Indicators for Sustainable Forest Management of the Russian Federation", Reference Legal System "Consultant Plus", Order of the Federal Forestry Service of Russia dated 05.02.1998, no. 21.
- [11] M. Kravchenko, D. CA. Pigosso, and T. C. McAloone, "Towards the ex-ante sustainability screening of circular economy initiatives in manufacturing companies: Consolidation of leading sustainability-related performance indicators", Journal of Cleaner Production, 20 December 2019, vol. 241, art. 118318.
- [12] L. V. Brezinskaya, E. E. Moiseeva, and E. V. Potekhina, "Economic problems of forest complex development in Krasnoyarsk region and their solution", Financial economics, All-Russian Scientific and Analytical Journal, Moscow, 2019, no. 2 (part 7), pp. 696–699.
- [13] "Russian regions. Socio-economic indicators", Moscow: Rosstat, 2017, 1402 p.
- [14] "Development of the forest complex of the Krasnoyarsk region for 2019-2021": the order of the government of Krasnoyarsk region of September 25 [Electronic resource], Consultant Plus, 2018, no. 735-p, art. 39.
- [15] A. Maryudi, "Choosing timber legality verification as a policy instrument to combat illegal logging in Indonesia", Forest Policy and Economics, July 2016, vol. 68, pp. 99–104.

- [16] D. Alemagi and R. A. Kozak, "Illegal logging in Cameroon: Causes and the path forward", *Forest Policy and Economics*, October 2010, vol. 12, issue 8, pp. 554–561.
- [17] T. C. Khai, N. Mizoue, T. Kajisa, T. Ota, and S. Yoshida, "Stand structure, composition and illegal logging in selectively logged production forests of Myanmar: Comparison of two compartments subject to different cutting frequency", *Global Ecology and Conservation*, July 2016, vol. 7, pp. 132–140.
- [18] V. H. Gutierrez-Velez and Kenneth MacDicken, "Quantifying the direct social and governmental costs of illegal logging in the Bolivian, Brazilian, and Peruvian Amazon", *Forest Policy and Economics*, February 2008, vol. 10, issue 4, pp. 248–256.
- [19] S. Petrova, "Contesting forest neoliberalization: Recombinant geographies of "illegal" logging in the Balkans", *Geoforum*, August 2014, vol. 55, pp. 13–21.
- [20] Pedro Henrique Santos Mota, Samuel José Silva Soares da Rocha, Nero Lemos Martins de Castro, Gustavo Eduardo Marcatti, and Alexandre Rosa dos Santos, "Forest fire hazard zoning in Mato Grosso State, Brazil", *Land Use Policy*, November 2019, vol. 88, art. 104206.
- [21] K. Eckerberg and M. Buizer, "Promises and dilemmas in forest fire management decision-making: Exploring conditions for community engagement in Australia and Sweden", *Forest Policy and Economics*, July 2017, vol. 80, pp. 133–140.
- [22] N. Efthimiou, E. Psomiadis, and P. Panagos, "Fire severity and soil erosion susceptibility mapping using multi-temporal Earth Observation data: The case of Mati fatal wildfire in Eastern Attica, Greece", *CATENA*, In press, corrected proof, art. 104320.
- [23] F. Ferreira-Leite, N. Ganho, A. Bento-Gonçalves, and F. Botelho, "Iberian atmospheric dynamics and large forest fires in mainland Portugal", *Agricultural and Forest Meteorology*, December 2017, vol. 247, pp. 551–559.
- [24] R. Prăvălie, "Major perturbations in the Earth's forest ecosystems. Possible implications for global warming", *Earth-Science Reviews*, October 2018, vol. 185, pp. 544–571.
- [25] D. McKenzie, D. L. Peterson, and J. J. Littell, "Chapter 15 Global Warming and Stress Complexes in Forests of Western North America", *Developments in Environmental Science*, 2008, vol. 8, pp. 319–337.
- [26] Opha Pauline Dube, "Challenges of wildland fire management in Botswana: Towards a community inclusive fire management approach", *Weather and Climate Extremes*, September 2013, vol. 1, pp. 26–41.
- [27] V. V. Furyaev, P. A. Tsvetkov, I. V. Furyaev, and L. P. Zlobin, "Conditions for the onset and spread of fires in forest regions of the Krasnoyarsk Territory", *Coniferous boreal zone, Krasnoyarsk*, 2017, vol. 35, issue 1-2, pp. 64–74.