Geospatial factors of the organization of sustainable forest management

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Abstract. The paper analyzes the importance of the geospatial factor in the development and transformation of the forest complex of the Soviet Union and the Russian Federation over the past century, as well as the conditions that ensure the implementation of the sustainable development of the country’s forest territories. Based on a detailed analysis of the factors affecting the sustainability of forest management in the country, the authors conclude that the geospatial characteristics of the territory used in forestry are a key factor. It is also emphasized that the successful consideration of the geospatial characteristics of forest areas has always been associated with the availability of labor resources that ensured the maximum use of the geospatial and environmental properties of the territory. Among the main reasons of modern problems in the development of forest management, there is a lack of the necessary territorial infrastructure, as well as information on the ecological state of forest areas. The paper indicates the need to form modern geographic information resources as the basis of the forest industry. It also shows that the implementation of the forest management system should be carried out in close connection with the land use and land management system as the basis for the sustainable development of the natural and ecological framework of the state, while digitalization, which is currently actively developing in the country, should be one of the key tools that will provide the forestry complex of the Russian Federation with reliable and operational information. The paper highlights the need to create a new legislative framework that allows regulating forestry on a conceptually new basis of forest management, based on the principles of environmental and economic balance, ensuring the sustainability of the development of this most important sector of the country, as well as the need to strengthen the role of the state in forest management on the basis of a planned system for regulating forest consumption, including strengthening control functions that prevent illegal trafficking in forest products and its theft. Based on the analysis of project documents and state programs, other justified recommendations and proposals are also given to solve a number of current problems of the Russian timber industry in the framework of the implementation of the Strategy for the Sustainable Development of Rural Territories of the Russian Federation for the Period until 2030.

1. Introduction
Forest resources are rightfully among the most important elements of the geographical environment, a permanent and necessary condition for the material life of civil society. Suitable and popular physical
and chemical properties of wood, valuable chemical composition, relative cheapness and ease of processing have ensured its extremely wide use in various sectors of the economy.

Forest plays a large role as a factor affecting the microclimate: it contributes to an increase in precipitation and air humidity, a decrease in evaporation of moisture and wind force, snow retention and uniform melting of snow, and also ensures the stability of the water regime of lowland and, in particular, mountain rivers. Forest also affects the level of groundwater, the mechanical and chemical composition of soils, thus actively participating in the formation of their fertility. Forest prevents soil erosion, fertile cover losses. Forest is also of significant importance as the growing place of many useful plants needed by humans and the habitat of the most valuable commercial animals and birds. The national economic importance of forest is strengthened by the fact that cut forest plantations under known conditions may endlessly resume; moreover, forests may be artificially grown where they have never been before.

The importance of forest in the historical development of society is quite high; at the same time, it varies at different stages of social development. The material conditions of the existence of primitive people were exclusively connected with forest. The maintenance of their life depended on wild fruits, labor activities were mainly limited to hunting, collecting fruits and nuts. The transition of society to agriculture sets the stage for forest decline. Forest prevented a farmer from spreading agriculture.

The development of large machinery, metalworking, glass, sawmill, pulp and paper industry and metallurgy led to the predatory extermination of forests. The development of large transport, i.e. the construction of railways, road surfaces and giant ships, led to the widespread use of wood and an even more predatory destruction of forests. Mining developed in the same direction. As a result, the forest area of the globe currently accounts for less than half of the area covered by the forest only a few hundred years ago. The result is deforestation of vast spaces, deterioration of geographical environment. But it is not just a quantitative reduction in forest resources. The predatory use of forests results in their qualitative change. From year to year, the average diameter of the log decreases and the defectiveness (i.e. the occurrence of rot, cracks and other vices on a growing tree) of the harvested wood increases; the specific gravity of young forest and overmatured stand is increasing.

2. Results

Let us turn to the analysis of the forestry industry of our country over the past century. During the nationalization of forests (decree of May 27, 1918), the concept of forest was considered as “a land area intended for growing wood, construction and timber”. The first Soviet Forest Code contrasted this definition with a new concept. Concerning the fact that “every tree plantation intended by nature for growing wood is a forest”, it added another formal moment – the separation of forests from lands of a different (i.e. agricultural) purpose. Thus, a link was established between forest management and land management, which was important.

In the Soviet times, significant funds were invested in forestry that made it possible to carry out forestry activities on a very large scale. At the same time, artificial logging and reforestation acquired a special scope. Back in 1924, the task was set to carry out reclamation and improve agriculture in direct connection with the practical involvement of the peasantry on the path of socio-economic development of the country.

During collectivization, the practical connection of reclamation and protective forestry with the general political and economic events of the USSR was especially clearly revealed. The collective farm system, ending with small-scale agricultural production, with a parcel land use system, strip farming, land redistributions, etc., opened up the possibility of creating a wide network of field-protective plantations according to a single plan. As a result, in 1928-1929 about 800 hectares of forest belts were planted in our country, in 1929-1930 – 1600 hectares; in 1931-1932 under the conditions of the collective farm system annual plantations immediately increased to 9 thousand hectares; and they continued to grow in the future. By 1941, over 40 thousand collective farms began to create protection belts; in total, by this time more than 480 thousand hectares of field-protection forest belts had been planted.
Modern unsatisfactory condition of the forest complex of the country was caused by long-term preservation of a paradigm of pioneer extensive development of primary woods. The result of a shock therapy in destructive 1990s and acceptance of the Forest Code in 2006 in which the basic concepts of the forest industry disappeared and, first of all, a concept of forestry which provides rational use, protection, preservation and reproduction of woods that led to the degradation of forest fund.

For many years, the forest complex has not been a priority for the socio-economic development of the country, which accounted for more than a fifth of all the forest resources of the planet. In the international trade, the share of forest products in Russia is only less than 4%. Numerous meetings with federal authorities, the creation of various documents in the form of “road maps”, concepts of extended responsibility of manufacturers and importers, various projects, programs, etc., have drawn forest management in Russia into a deep crisis. Currently, the country, whose territory is almost 49% covered by forests, which is about 38.5% of the total forest resources of the world, does not know the true state and dynamics of its forests. The state in the field of accounting for forest resources, monitoring, state control in the forest complex remains extremely unsatisfactory to this day, especially for the implementation of the strategy for the transition to sustainable forest management. Extremely low forest productivity in the country, when the average increase does not exceed 1.3 m³/ha is not taken into account when developing strategies and other documents for the development of the forest complex of the Russian Federation and its constituent entities.

The Decree of the Government of the Russian Federation No. 1989-r of 20.09.2018 adopted the Strategy for the Development of the Forest Complex of the Russian Federation until 2030 [1]. Its updated version was approved by the Prime Minister M.V. Mishustin on 04.02.2021 [2]. This document proclaimed to increase the country’s forest cover by 3%, and tried to combine two components: economic and environmental, which, according to the authors of the document, will allow qualitatively restoring 100% of cut down or dead forest plantations by 2024, and the contribution of the forest industry to the economy should double to 1.14 trillion rubles. The document states that the planned measures will become possible in the conditions of digitalization and systematization of information on the forest industry, the development of modern mechanisms for reforestation of forest conservation, combating fires and the creation of forest nurseries, as well as supporting processing infrastructure and expanding the network of forest roads.

In fact, in the current conditions, we need a new Forest Code [3, 4], which should become a framework in the form of the foundations of the forest legislation of the Russian Federation, and the regions should develop their direct laws taking into account regional features. But the constituent entities of the Russian Federation urgently need modern operational unique technologies for remote assessment of forest resources of the regions, which would allow them to monitor changes in the volume of the forest fund in real time and have reliable information on the provision of territories with forest resources, which would form the basis for strategic planning documents for their use.

Currently, only according to expert data, more than 100 thousand forests have no exact borders, the volume of illegally harvested processed wood in the regions reaches 30-35 million m³ of lumber. Using an extensive model of forest management, the amount of economic damage caused by uncontrolled illegal deforestation and, mainly wild forests, in the country in 2020 alone amounted to more than 10 billion rubles, which is 9-10% more than in 2019.

To solve this problem, the constituent entities of the Russian Federation need to increase the effectiveness of state control over the use of forests at the regional level and understand that forest management (forest accounting) should become one of the priority tasks of the state regional policy, and an appropriate state information system should appear in the country.

At the same time, the problems of technological equipment of forest enterprises in the regions are quite acute; there is a lack of funding for the purchase of new equipment and facilities. The problems of forest waste disposal are also urgent, which pollutes the environment, leads to fires, non-rational use of resources and economic damage. This impact urgently needs to be minimized, modern environmental landfills, sorting and recycling facilities should be built, and a normal mechanism on secondary and raw materials resources should be developed.
3. Discussion

Summing up the above, it should be noted that Russia does not have a clear plan for the restoration of forest resources, qualitative inventory is not carried out once every 5 years as expected, but from time to time, and as a result the information on the volumes of harvesting and wood turnover varies significantly at the level of the regions, Rosstat, Ministry of Natural Resources, Ministry of Industry and Trade. Today, almost 85% of the total forest stock turned out to be at the threshold of an uncontrolled zone, information on 60% of forests has not been updated for more than 20 years. Within the framework of the current Forest Code [3], part of the forest management work (forestry design, determination of forest categories) is assigned to the competence of the federal center, and almost all the powers, including forest taxation, during which the quantitative and qualitative characteristics of forest resources are assessed, are transferred to the regions, including state control. Taxing should be carried out every 10 years on the entire area of the forest fund, but due to the lack of funding today, almost 1 billion hectares of forests do not have reliable information.

It is necessary to avoid unsystematic taxing and, finally, to determine where forest management should be carried out as a matter of priority and what type of taxing should be chosen. But what are the guarantees that a tenant, who took the plot for 49 years, will do the taxing honestly, without saving his funds and not benefiting for himself, and will also be responsible and guard the forest from possible fires, take care of reforestation and, in a decent form, return the forest plot to the state after the deadline.

The strategy for the development of the forest complex of the Russian Federation should be closely linked with the scientifically based strategies for the development of the forest complex of the constituent entities of the Russian Federation, with the development of regional forest plans for the future, in terms of forest accounting (forest regulation), forest management and forest economy.

Areas covered with forests and, as noted earlier, largely forming the natural-climatic and soil characteristics of the human habitat should become the real basis for the adaptive-landscape management system [5].

The Russia’s forest development strategy should take into account the biosphere use of forests for sustainable forest management, agricultural and fisheries use of forests and the framework for sustainable forest management, including, above all, road and forest infrastructure.

According to calculations conducted by the PART (Program Assessment Rating Tool), a quantitative assessment of the effectiveness of the targeted road development programs in the Russian regions shows that we almost lack effective programs, only 8% can be considered moderately effective, 64% are adequate and about 28% are simply ineffective.

There is a need to develop and deploy methods, including the method to assess the absorbing ability of the Russian woods, normative documents of the environmental-economic assessment of forest resources corresponding to real social and economic conditions and regional rules of use, protection, preservation and restoration of the woods.

Moreover, it is necessary to make extensive and active use of modern geo-information technologies that enable online collection of geo-environmental data on forest areas for monitoring purposes [6], as well as to use innovative technologies for analysis and processing of obtained data, as is currently being done for a number of land management activities to assess the suitability of arable land for various crops [7].

The strategies for the development of forest complexes of regions should be considered as part of the Strategies for sustainable socio-economic development of the constituent entities of the Russian Federation with the definition of the main strategic directions and objectives for the development of the regional forest complex using foreign experience in forest management (USA), forest regulation (Finland), forest planning (UK), ensuring the continuous development of the forest industry (Sweden), etc. [8, 9].

In the current crisis, the country’s forest industry, as well as part of other sectors of the Russian national economy should expand the range of its products and services, reorient markets, and develop
new industries in order to increase its efficiency. Diversification of the forestry sector should become one of the key directions of its development [10].

This will require the experienced professional personnel in the field of forest management, the creation of a unified information base, the organization of strategic planning, and, of course, the ability of the federal center to engage in a productive dialogue with regions, enterprises and organizations of forestry, scientific and social organizations in the field of forest policy and practice, as well as the application of indicators for assessing the effectiveness of activities of senior officials of the constituent entities of the Russian Federation and the activities of executive authorities of the constituent entities of the Russian Federation, approved by the Decree of the President of the Russian Federation No. 68 of February 4, 2021.

4. Conclusion

The paper made it possible to particularly consider the following recommendations and proposals of the authors, the justification of which is given earlier:

- there is a need to create a new legislative framework to regulate forestry on a conceptually new forest management basis following the principles of ecological and economic balance, ensuring the sustainability of the development of this important sector of the country;
- the role of the state in forest management should be strengthened on the basis of a planned forest management system, including the strengthening of control functions to prevent illegal trafficking and theft of forest products;
- the implementation of the system of forest management and regulation should be carried out in close connection with the system of land use and land management as the basis for the sustainable development of the natural and ecological framework of the state;
- the digitalization, which is currently actively developing in the country, should become one of the first tools that will provide the forestry complex of the Russian Federation with reliable and operational information as the basis for managing this most important sector of the country.

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