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THE PROBLEM OF CADASTRAL APPRAISAL OF FOREST LANDS TAKING INTO ACCOUNT THE INFRASTRUCTURE OF THE FORESTRY FUND

Vasilii F. KOVYAZIN, Aleksei Yu. ROMANCHIKOV
Saint-Petersburg Mining University, Saint-Petersburg, Russia

Forest lands are the main means of production in the forest sector. For the most territories in the Russian Federation there are established methods of cadastral appraisal, but not for the forest regions taking up 2/3 of the country's area. In 2002 Russian Government made an attempt to solve this problem and recommended a method of cadastral appraisal for the lands of the forestry fund. However, the method did not find practical application and was dismissed in 2010, and no substitution followed. In each subject of the Russian Federation private appraisers offer their own options of forest land valuation, but their results differ significantly even for the lands with comparable species of wood, productivity, site quality and age composition of the stand. Moreover, valuation organizations do not take into account forest infrastructure.

Authors propose a universal method suitable for the entire territory of the country, which will allow to calculate specific cadastral value of the forest lands taking into account taxation indices of the wood stands growing there. The method is suitable not only for the objective cadastral valuation of the forest lands – reasonable rental payments will provide an opportunity to develop transport infrastructure in the forestry fund, especially forest roads and bridges, and to make timely arrangements for plant maintenance, forest protection and reproduction, which will have a significant influence on social and economic development of forest regions in Russia.

Key words: forest lands, cadastral appraisal, taxation indices, forestry infrastructure, evaluation method, federal valuation standard, appraisers

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Introduction. Lands of the Russian forestry fund occupy an area of 1,172 million hectares, which amounts to 64.7 % of the total area of the country. It is three times greater than the area of agricultural lands and 40 times greater than the water reserve lands of Russia. Efficient management of the forest territories plays an important role in the country's economy in general and in the development of certain regions in particular [20]. This is especially relevant for regions with high forest land percentage located close to foreign sales markets, e.g. Republic of Karelia, Leningrad Oblast, Zabaykalsky Krai etc.

One of the key aspects of forest management is the state cadastral appraisal of the forest lands which allows to define a fair level of rental payments and forest taxes and to differentiate forest lands according to their productivity [21]. Besides, objective cadastral valuation will provide an opportunity to develop infrastructure in the forestry fund and to make timely arrangements for plant maintenance, forest protection and reproduction. Currently the lands of the forestry fund have a weak infrastructure, which includes underdeveloped or altogether absent forest roads, bridges, fire-water ponds, lookout points, fire separation lines, hydraulic architecture for land reclamation, areas for camping and recreation [5, 6].

Transport infrastructure of the forest territories is a system of special logging and all-purpose roads, specialized transport and logistics centers, roadside repair and service stations and an integrated information management system [17]. A distinctive feature of transport infrastructure development in the forest regions is the use of territorial and industrial approaches that take into account both the interests of transportation carriers – the users of forest roads, and those of progressive social and economic development of the region. The territorial approach encompasses the following elements: all-purpose forest roads, specialized transport and logistics centers, roadside repair and service stations, which all influence social and economic development of the forest territories. In-



dustrial approach focuses on the system of specialized logging roads, which affect the operation of the regional wood-cutting sector.

Operational coordination of the elements of transport infrastructure is performed basing on an integrated information management system. The use of the systematic principle as one of the main characteristics of regional forest infrastructure implies complementary dependence between separate transport facilities aimed at reaching a synergy effect from their combined use.

Method and research results. Currently in Russia there is no universal method of state cadastral appraisal of the forest lands, although their area covers 64.7 % of the country's territory and forest resources play a critically important role in the state's economy. According to authors' opinion, the reasons behind the absence of a universal method of state cadastral appraisal are the following [21]. Firstly, many economic indicators of the logging process are unknown, as they are neither estimated by the landholders nor published in the open sources. Secondly, the growing stocks of the forest land have different taxation indices and age composition, hence the main felling is solely performed for mature plants, which constitute only a part of the entire forestry fund; if the wood is not ripe enough, it is not included in the main felling. Thirdly, forest resources are not limited to wood only, they also include mushrooms, berries, medical herbs, gum etc., which should also be taken into account in the process of cadastral valuation [18]. Fourthly, if forest lands already have an infrastructure, it can reduce logistic costs of the forest produce.

In 1998 the Federal Law N 135-FZ «Concerning Valuation Activities in the Russian Federation» [9] was introduced, which still regulates state cadastral appraisal of the lands. According to this Law, the state delegates its authority to value forest lands to the appraisers who must be members of a self-regulatory organization. Appraisers must perform their functions under current legislation and particularly in accordance with federal valuation standards (FSO) [12-14]. E.g., according to FSO-2, cadastral valuation of specific real estate items by means of mass or individual assessment implies determination of its market value, specified and confirmed by appropriate legislative act, and cadastral value defined by the appraiser is used, for instance, for taxation purposes [13].

The standard FSO-4 is dedicated solely to cadastral value. Interestingly, in paragraph 4 the Ministry of Economic Development states that cadastral value should be determined not only for real estate items present in the open market, but also for the objects whose market is limited or altogether absent [13]. As cadastral value in its essence is identical to the market value, the appraiser is supposed to determine the market value for the objects that do not have a market at all, which sounds slightly absurd.

Paragraph 9 of the FSO-4 gives the appraiser a free hand in the choice of valuation approaches, methods and means provided that those are justified. Because of this the universality of the method is lost. Hence, the situation is possible when adjacent forest lands characterized by similar vegetation, productivity and age composition, are valued using different methods, and the results differ significantly despite the homogenous conditions and quality classes of the lands [13].

Due to the fact that forestry fund lands are owned by the state and cannot be bought or sold in the open market, the need for their cadastral valuation and the progress rates are somewhat lower as compared to those of other land categories. In the Data Fund of State Cadastral Appraisal the authors have found only 10 reports on forest land cadastral appraisal: in Tver, Omsk, Irkutsk, Ryazan, Nizny Novgorod, Rostov, Kaliningrad, Sakhalin Oblasts, Yamal-Nenets Autonomous Okrug and Perm Krai [16]. Due to the absence of any methodological guidelines, all the appraisers used their own individual strategies but stopped at the income approach, which is only rational: comparative approach is inapplicable as there is no market and no comparable objects; neither will the cost approach provide adequate results – remote regions associated with greater expenses will have higher



value, whereas the quality of their resources might be inferior to the lands with existing infrastructure, which is obviously wrong.

According to the previous, already inactive Forest Code (1997) [5], there was an obligation to change the category of lands in case of infrastructure development, which became an obstacle in the development of forest facilities. From the position of rental lease, the presence of infrastructure in the forest lands is a critical factor; however, it has no effect on the cadastral valuation. Currently operating Forest Code (2007) [6] permits to cut the wood stand of any age for the creation of forest and logging infrastructure, as well as for construction, reconstruction and exploitation of economic objects not related to wood or other forest produce. Hence, operating Forest Code allows to improve the infrastructure of forest lands, but this requires financial resources.

Let us consider the approaches used in reports on state cadastral valuation of forest lands in Kaliningrad, Rostov Oblasts and Karachay-Cherkessk Republic. Having studied these reports, one may come to the conclusion that linear objects of the forest infrastructure have been appraised basing on specific index of cadastral value (SICV) for the lands of industrial and special designation. In Irkutsk, Nizhny Novgorod, Omsk, Astrakhan Oblasts, Yamal-Nenetsk and Chukotka Autonomous Okrugs and Perm Krai the valuation was performed regardless of the infrastructure. In Ryazan Oblast the valuation of forest territories under infrastructure objects was carried out by method of capitalized income – the income from these lands was divided by capitalization rate. Appraisers obtained the income figures from the data on rental rates for the use of forest resources. In Tver Oblast the value of such rates was decreased by an average cost of forest-related arrangements, and the remainder, divided by the land area, was equated to SICV.

In Sakhalin Oblast [16] appraisers separated forest lands with and without infrastructure and carried out cadastral valuations of such areas basing on entirely different methods. To calculate profitability of 1 ha of forest lands with the infrastructure in place, a cost analysis has been performed for the construction of a 5 m-wide logging road (including its protection zone), with regard to the felling volumes. According to the relevant economic data, each km of the constructed road allows to utilize 1,000 ha of the forest area and to assure timber production of up to 2,000 m² [16].

Rental income from forest facilities is defined basing on the marginal productivity gained due to their construction [8]. To calculate profitability of 1 ha of the forest lands with a logging road in place, appraisers carried out a cost analysis of facility construction and estimated the income from felling after its completion. According to the Decree of Russian Government from 22.05.2007 N 310 «Concerning the rental payments per unit of forest produce and payments for the land in federal property per unit of the land area» [15], appraisers calculated: a) average rental rate per unit of main type of wood logged in Sakhalin Oblast; b) averaged rates classified according to wood species (conifers, hardwood, parvifoliates) and distance of wood transportation. Estimations demonstrate that the yield of industrial wood is 80 %, whereas the share of firewood is 20 % from the total volume of the commercial produce [10]. The payment rates per unit of wood logged in the lands belonging to the federal state, set forth in 2007 and used in 2012 (year of the appraisal) were multiplied by 1.30.

According to the standards of forest road engineering, the average width of the logging road should be 5 m including the protection zone [8]. Estimations show that the costs of constructing 1 m of an all-weather logging road amount to 30 USD (by 01.01.2013 the exchange rate USD/RUB has been 30.37). Analysis of the auctions for the purpose of selling the right to conclude contracts of lease in respect of the plots of forest land, performed in 2011 in Sakhalin Oblast, demonstrates that the average rental period is 14.2 years. Thus, construction of 1 km of the forest road will permit to utilize up to 2,000 m³ of additional wood resources with an average profitability of 15.74 rub/m² per year. Construction costs amount to 12.83 rub/m² per year. Net profit therefore equals 2.91 rub/m².



It can be seen from the methods described above that most of them evaluate forest lands regardless of their infrastructure or substitute its SICV with other objects' data. The application of standard capitalization method also makes little sense, because the major share of economic data in these estimations has no direct relation to the forest infrastructure, but is a mere average value for all the lands of the entire forestry fund.

On the one hand, transport facilities of the forest territories are a part of the integral transport infrastructure of the region, on the other – it has a number of critical distinctions and should be characterized using different technical and economic indicators [3]:

1. Single-purpose roads (e.g., logging roads) are different from the network of multiple-purpose roads constructed in big urban centers as a part of the interstate transport infrastructure. As a rule, the costs of logging road construction are borne by logging companies, they often have no hard surface, but they play an important role in social and economic development of the forest region.

2. Construction and maintenance of public access forest roads fall within the responsibility of regional and local budgets, which often lack financial resources for these purposes. With this in mind, there is a need for additional extra-budgetary sources to finance construction and modernization of transport facilities in the forest regions, primarily in the form of public-private partnership.

3. In the context of transport facilities of the forest lands it is customary to create specialized transport and logistics centers, used by the widest possible range of companies located in the forest region. The systematic principle of this infrastructure has to be reflected in the position of these centers, which must take into account transportation intensity of round timber and other wood-cutting produce and proximity to regional logging enterprises. When choosing a location for such centers, it is also important to keep in mind the trends and prospects of the population distribution in the area.

Forest roads are located in the lands of the forestry fund, provide the needs of the forest industry and ensure timely access to specific forest areas. Depending on their primary function, they can be subdivided into the following classes:

- logging roads that mostly serve for wood transportation;
- silvicultural roads, supporting various silvicultural measures in the forest lands;
- fire-protection roads, needed to reach fire-hazardous areas;
- touristic roads, allowing to access certain regions of the forestry fund, touristic camps, recreation areas, hunting farms etc. [2].

Countries with a developed hunting sector (Sweden, Finland) are usually characterized by greater density and better quality of forest roads. High level of forest accessibility makes it possible and economically feasible to organize regular improvement cuttings to care for the wood stand that greatly enhance the productivity of the forest. In Central Europe and USA legislation introduces limits on the maximal density of forest roads in order to preserve local ecosystems, whereas in the developing countries (South Korea, China, Thailand) one can witness active construction of forest roads and rising amounts of wood logging that often lack a sound environmental and economic justification [1].

Creating an infrastructure is only possible by means of objective cadastral appraisal of the forest lands in order to calculate the rental payments for forest resources. To ensure rational forestry management it is necessary to obtain reliable data on land capacity and productivity, taxation indices and age composition of the wood stand. These parameters combined with the yield of non-timber forest produce have to be used for cadastral appraisal [4].

The authors propose to calculate infrastructure contribution to cadastral value of forest lands through the logging costs [11]. Calculated operational costs (in money terms) are based on physical values of labour, material and other resources per unit of standing wood:

$$C = (tP_t + vP_e + K \frac{a}{100})(l + \frac{b}{100}),$$

where C – operational costs per 1 m³ of logged wood, rub; t – labour intensity of the logging process, man-days/m³; P_t – regional wage standard per time unit, rub/man-day; v – energy consumption (fuel, lubricants and electricity per 1 m³ of logged wood), kg/m³ (l/m³, kW/m³); P_e – market price of fuel and electricity, rub/kg (rub/l, rub/kW); K – capital investment (specific capital costs), rub/m³; a – asset depreciation rate, %; b – percentage of overhead costs, %.

According to the formula above, the structure and level of operational expenditures have to be determined basing on the variable costs of the logging process, as suggested by the Federal Land Inventory Service of Russia. The costs of wood transportation from the cutting site to the processing point must rely on actual freight rates by various means of transport.

As seen from the formula, this method offers a relatively detailed accounting of the logging costs (depending on the complexity) and wood transportation. However, the information necessary for these calculations is very generalized and there is no real access to it, as the statistical data is highly specific and demands additional market research. Thus, theoretical soundness of this formula does not make it practically applicable.

There are other suggestions on how to adjust logging expenses to the distance of wood transportation (see Table) [7]. From the Table it is evident that division by the relative coefficient provides the fluctuation of timber price and, consequently, cadastral value of the forest land depending on the distance from the main transportation routes.

Coefficients of timber price adjustment for areas with different distance from the log depot for taxation category 8

Stand normality	Distance from the log depot, km						
	< 10	10-25	25-40	40-60	60-80	80-100	100 <
0.6	3.6744	3.3375	2.8379	2.1798	1.6673	1.3383	1.000
0.8	3.6650	3.3341	2.8287	2.1709	1.1622	1.3332	1.000
1.0	3.6672	3.3352	2.8319	2.1700	1.6653	1.3344	1.000

O.A.Antsukevich in 1991 performed a research on calculating differential income from recreational use of the forestry fund in rubles per 1 person, visiting the forest area of 1 ha [1]. It is difficult to assess the absolute value of the figures, but one can notice how the figures change depending on the proximity to transportation routes:

Distance, km	< 10	11-30	31-70	71-120	> 120
Differentiated income, rub/man·ha	4.5	4.1	3.5	2.3	0.8

These coefficients can be used in any method of forest land cadastral appraisal, including the ones that take into account forest infrastructure. However, the authors could not find the details of their calculation in the reference source [1], so it is hard to judge how accurately they reflect the real dependence between these parameters.



Conclusions

1. In Russia there is no universal method of state cadastral appraisal of the forest lands, and the authority to develop approaches to such valuation is delegated to private appraisers.

2. Private appraising organizations develop valuation methods separately from one another and lack coordination. Many organizations carry out cadastral valuations regardless of the forest infrastructure. Other appraisers use averaged statistical data on the forestry fund that is inapplicable to specific facilities.

3. The method of state cadastral appraisal of forest lands that existed before 2010 did take into account forest infrastructure. However, in order to be implemented one had to know a lot of parameters that characterized the market of logging produce and economic activity of the landholders. Often this information was protected and therefore inaccessible. Using the limited available data from certain enterprises distorted the overall picture due to various business approaches of different logging companies.

4. The impact that the distance of wood transportation has on the cadastral value of the forest land greatly depends on its area. When evaluating local forest districts, it is sufficient just to define certain price coefficients that would adjust SIC values depending on their distance from the main economic centers. In case the appraisal deals with forest compartments or sub-compartments, as suggested in previous publications of the authors [18, 19, 21], the transportation distance will not affect adjacent territories as they are located too close to each other and belong in the same range of proximity to wood processing centers. Hence, empirical data and dependencies described above demonstrate that for each regional forest district it is feasible to introduce specific coefficients of infrastructure development and to perform cadastral valuation for compartments or sub-compartments of the forest region.

REFERENCES

1. Antsukevich O.N. Economic Assessment of Forests for Recreational Purposes. *Lesnoe khozyaistvo*. 1991. N 2, p. 19-23 (in Russian).
2. Bogomolova E.Yu., Vasil'eva G.V. The Impact of Forest Road Density on the Amounts and Quality of Logging and Silvicultural Operations. *Izvestiya Baikalskogo gosudarstvennogo universiteta*. 2016. Vol. 26. N 2, p. 284-290 (in Russian).
3. Bulatova N.N. Complex Approach to the Development of Transport Infrastructure in the Forest Regions. *Baikal'skie ekonomicheskie chteniya. Sotsial'no-ekonomicheskoe razvitie regionov: problemy, perspektivy: Mat. mezhdunarodnoi nauchno-prakticheskoi konferentsii*. Ulan-Ude: Vostochno-Sibirskii gosudarstvennyi universitet tekhnologii i upravleniya, 2015. Vol. 1, p. 29-33 (in Russian).
4. Kovyazin V.F., Romanchikov A.Yu. Current State of Cadastral Appraisal of Forest Lands in Russia. *Nauki o Zemle*. 2015. N 4, p. 26-30 (in Russian).
5. The Forest Code of Russian Federation: Federal'nyi zakon ot 29.01.1997 g. N 22-FZ (red. 24.07.2007 g.). URL://<http://legalacts.ru/kodeks/LK-RF/glava-5/statja> (date of access 18.03.2017) (in Russian).
6. The Forest Code of Russian Federation: Federal'nyi zakon ot 04.12.2006 g. N 200-FZ (red. 03.07.2016 g.). URL://http://www.rosleshoz.gov.ru/activity/forestConserv/docs/21/II-1_Lesnoj_kodeks_Rossijskoj_Federacii (date of access 18.03.2017) (in Russian).
7. Lopatkina L.F. Economic Assessment of Multi-Purpose Forest Use in the Agro-Industrial Sector on the Example of Novgorod Oblast. The autor ... Candidate of Economics: 08.00.05. Velikii Novgorod: Novgorodskii universitet imeni Yaroslava Mudrogo. 2000, p. 21 (in Russian).
8. Technological Design Standards of Forest Traffic Routes: Proekt / TsNIIME. Khimki, 2010. URL: http://www.tsniime.ru/03_paz.htm (date of access 29.12.2017) (in Russian).
9. Concerning Valuation Activities in the Russian Federation: Federal'nyi zakon ot 29.07.1998 g. N 135-FZ (red. 05.07.2016 g.). *Sobranie zakonodatel'stva Rossiiskoi Federatsii*. 1998. N 31. St. 3813 (in Russian).
10. Discussion: Timber. Internet-forumy lesnoi otrasli. URL:www.forums.wood.ru/showthread.php?threadid=58771 (date of access 29.12.2016) (in Russian).
11. Introduction of the Method of State Cadastral Appraisal for the Lands of the Russian Forestry Fund: Prikaz Roszemkadastra ot 17.10.2002 g. N P/336// URL:<http://legalacts.ru/doc/prikaz-roszemkadastra-ot-17102002-n-p336-ob/> (date of access 18.03.2017) (in Russian).
12. Introduction of the Federal Valuation Standard «Basic Principles of Appraisal, Valuation Approaches and Requirements to the Valuation Procedure (FSO No. 1)»: Prikaz Minekonomrazvitiya ot 20.05.2015 g. N 297// URL:<http://legalacts.ru/doc/prikaz-minekonomrazvitiya-rossii-ot-20052015-n-297/> (date of access 18.03.2017) (in Russian).



13. Introduction of the Federal Valuation Standard «Cadastral Valuation (FSO No. 4)»: Prikaz Minekonomrazvitiya ot 22.10.2010 g. N 508 (red. 22.06.2015 g.). URL://<http://legalacts.ru/doc/prikaz-minekonomrazvitija-rf-ot-22102010-n-508/> (date of access 18.03.2017) (in Russian).

14. Introduction of the Federal Valuation Standard «The Purpose of Appraisal and Types of Values (FSO No. 2)»: Prikaz Minekonomrazvitiya ot 20.05.2015 g. N 298 URL://<http://legalacts.ru/doc/prikaz-minekonomrazvitija-rossii-ot-20052015-n-298/> (date of access 18.03.2017) (in Russian).

15. Concerning the Rental Payments per Unit of Forest Produce and Payments for the Land in Federal Property per Unit of the Land Area: Postanovlenie Pravitel'stva RF ot 22.05.2007 g. N 310 (red. 09.06.2014 g.) URL:<http://legalacts.ru/doc/postanovlenie-pravitelstva-rf-ot-22052007-n-310/> (date of access 18.03.2017) (in Russian).

16. Database of State Cadastral Appraisal. Rosreestr. URL:<https://rosreestr.ru/site/activity/fond-dannykh-gosudarstvennoy-kadastrovoyo-otsenki/> (date of access 29.12.2016) (in Russian).

17. Amacher G.S., Ollikainen M., Koskela E. Economics of Forest Resources. Massachusetts: The MIT Press, 2009, p. 424.

18. Kovyazin V., Romanchikov A., Pasko O. Comparative Analysis of Forest Lands Cadastre Appraisal Estimated with Regards to Wood and Food Resources. *IOP Conference Series: Earth and Environmental Science*. 2015. Vol. 27. 01203. doi:10.1088/1755-1315/27/1/012039

19. Kovyazin V., Romanchikov A., Belyaev V. Use of Forest Inventory Data as a New Method for Cadastral Valuation of Forestlands in North-West Russia. *Forestry Studies. Metsanduslikud Uurimused*. 2015. Vol. 61. Iss. 1, p. 69-78. doi: 10.2478/fsmu-2014-0011

20. Stenger A., Harou P., Navrud S. Valuing Environmental Goods and Services Derived from the Forests. *Journal of Forest Economics*. 2009. Vol. 15. 1-14. doi: 10.1016/j.jfe.2008.03.001

21. Kovyazin V., Belyaev V., Pasko O., Romanchikov A. Taxation Indices of Forest Stand as the Basis for Cadastral Valuation of Forestlands. *IOP Conference Series: Earth and Environmental Science*. 2014. Vol. 21. 012026. doi:10.1088/1755-1315/21/1/012026

Authors: **Vasilii F. Kovyazin**, Doctor of Biological Sciences, Professor, vfkedr@mail.ru (Saint-Petersburg Mining University, Saint-Petersburg, Russia), **Aleksei Yu. Romanchikov**, Assistant Lecturer, romanchicov@inbox.ru (Saint-Petersburg Mining University, Saint-Petersburg, Russia).

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