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V. V. Balashenko [a)], **M. N. Ignatyeva** [a,b)], **V. G. Loginov** [a)]
[a)] Institute of Economics of the Ural Branch of RAS (Ekaterinburg, Russian Federation)
[b)] Ural State Mining University (Ekaterinburg, Russian Federation)

NATURAL RESOURCE POTENTIAL OF NORTHERN REGIONS: METHODOLOGICAL CHARACTERISTICS OF COMPREHENSIVE ASSESSMENT[1]

The economic assessment of renewable natural resources remains a relevant and as yet unresolved problem. Today, the economic assessment of natural resources is viewed as one of the priority tasks in the state strategy for environmental management. To a large extent, such economic assessment has become relevant following the development of market relations in Russia that require the valuation of natural resource potential. In Russia, the state cadastral appraisal of natural resources, which is already continuing for a second decade, serves as the basis to calculate the land tax for individual categories of land and does not allow making a comprehensive assessment of natural resource potential. This article expands the concept of economic assessment, describes the practice of its implementation in northern regions. It examines the traditional methodological approaches to economic assessment that are used today, such as the cost approach and its modifications, rental income approach, market approach, alternative approach, as well as the methodological approaches based on the results of sociological studies, which have become more widespread recently. The recommendations put forward by the authors with regard to the economic assessment provide for consistency in its implementation based on a results-driven approach that ensures the comparability of calculations and improves the reliability of obtained results. The methodological approaches proposed for assessing the land, forest, hunting, fishery and biological resources of wild plants allow considering the specific characteristics of northern territories and implementing a comprehensive economic assessment of the region's natural resource potential. The authors consider the expediency of calculating the unit value index of natural resource potential in order to rank the areas within the subject of the Russian Federation in proportion to the investment in the projects aimed at developing the natural resources. The methodological recommendations have been tested in the context of Berezovsky municipal district of Khanty-Mansi Autonomous Area — Yugra.

Keywords: natural resource potential, economic assessment of northern territories, methodological approaches, specific character

Introduction

The problem of the economic assessment of natural resources is one of the most complex and debatable. For many years, in the Soviet planned economy with its public ownership of all natural resources and their non-inclusion in the system of commodity-money relations, the issue of monetary assessment of such resources was not even raised. The seemingly limitless amount of natural resources served to justify their free-of-charge use. This free-of-charge use of natural resources and absence of appropriate accounting for natural factors led to the formation of the nature-intensive economy with its irrational environmental management, rise of unreasonable losses of natural resources in their production, processing and transportation, deterioration of environmental quality. Underestimating the nature will lead to irreparable consequences, degradation of natural potential and disruption of environmental balance.

Today, the economic assessment of natural resources is viewed as one of the priority tasks in the state strategy for environmental management. The development of market relations in Russia, which require the valuation of natural resource potential, largely contributed to increased relevance of economic assessment. In its essence, "the assessment of natural resources is aimed to establish a more clear link between the vital activities of people and resources of the natural environment in which they live, work and on which they make their impact" [1, p. 109]. It is necessary in order to "realize the potential of territory, determine the amount of benefits and the untapped reserves of national wealth"

[1] Original Russian Text © V. V. Balashenko, M. N. Ignatyeva, V. G. Loginov, 2015, published in Ekonomika regiona [Economy of Region]. — 2015. — No 4. — pp. 84–94.

[2, p. 323], to promote the rational use of natural resources, develop the mechanism of paid-usage basis for environmental management, ensure the reliable results of feasibility studies on development of natural resources, etc.

The importance of establishing the economic value of natural resource potential is especially great in the northern territories, where the natural capital is a key element of national wealth, and its relative share substantially exceeds its average share in the total national wealth[2]. An adequate economic assessment often changes the direction of exploration works and priorities in the comprehensive development of natural potential, it serves as the basis for economic agreements between the indigenous people and subsoil users and the mechanism of payment for subsoil use aimed at establishing the economic interest of enterprises in the rational use of natural resources and improving the technological processes to save resources and reduce emissions to the environment.

Specific Character of Factors Affecting the Economic Assessment of Natural Resources

Most studies interpret the economic assessment of natural resources as a monetary expression of their value determined by priority characteristics [3, p. 158; 4, p. 106; 6, p. 70; 6, p. 399–400, etc.]. Some papers [7, p. 51; 9, p. 239] recognize that the economic assessment of natural resources can be assessed not only in terms of their value but also in other terms (such as scores, natural indicators). However, we consider these recommendations as unacceptable. The economic assessment implies only a monetary valuation, which allows comparing the value of different natural resources and ranking them according to the sequence of their involvement in the operation, estimate the resource availability in individual regions (areas) in order to forecast their socio-economic development, etc.

The natural and scoring indicators usually serve as the basic foundation for economic assessment of natural resources. A more expanded definition of economic assessment of natural resources provides for complementing it with a list of conditions and constraints within which is established their value. For example, in the paper [2, p. 324], the economic assessment of natural resources is viewed as "the definition of their value in monetary terms within specific socio-economic conditions of production under the given regimes of environmental management and environmental constraints on economic or other activities."

The need to reflect the variant (plan) selected for the use of natural resources and environmental constraints in the definition of economic assessment of such natural resources is also noted by the author of the paper [9, p. 572–573].

Therefore, the economic assessment of a natural resource is the monetary expression of its utility, the measurement of economic effect that can be obtained in its most appropriate use both in terms of economic and environmental aspects. All natural resources can and must have an economic assessment. Moreover, its basic principles imply the complete uniformity (comparability).

The economic assessment of natural resources requires a fairly large amount of initial information. To systematize the information on natural resource potential, the cadastral works are carried out in the Russian Federation since the early 2000s. These works continue to face a challenge in preparing the information base for determining the reliable economic assessment of natural resources. Preparing a cadaster requires the availability of information on the inventory of natural resources that reflects the quantity, dynamics of such inventory and changes in the use of various types of natural resources. The vast territory of the Russian North leads to significant problems in collecting such information, as a result of which the cadastral system has a number of shortcomings:

— The cadasters do not include information on all natural resources;
— Departmental character of information on natural resources;
— No defined procedure for using the departmental information;
— Difficulty to compare the contents of indicators between individual cadasters;
— Insufficient consideration of environmental factor in the assessment of natural resources;
— Most industry-specific cadasters have no indicators that allow measuring the effect from the use of natural resources.

When assessing the renewable natural resources, the initial natural information is collected during the interpretation of aerial and space photographs, used to obtain the data on the organization and management of forestry (taxation descriptions and maps of forest quarters), results of surveys of wild

[2] Natsionalnyye scheta Rossii v 2005–2012 gody: stat. sb. [Rosstat National accounts of Russia in 2005–2012: Collection of Articles]. (2013). Rosstat. Moscow, 363.

plant stocks, accounting of game animals, information on fishery stocks and scoring assessment of land resources. This information is very heterogeneous in terms of its sources and requires considerable labor costs. Moreover, it is often incomplete. The second factor is related to substantial differences in natural and geographic conditions that have an impact on economic development and intensity of environmental management. In particular, moving from the south to the north allows establishing natural and economic boundaries (northern or southern borders) for commercial agriculture, commercial forest management (forest harvesting), commercial Northern reindeer herding. Another specific factor in using and assessing the natural resources is their spatial limitation, which implies that, to ensure the reproduction of natural resources, only an economic part of their stock can be withdrawn.

Assessment Object

The economic assessment of natural resources is usually implemented in a natural object that represents a territorially limited set of natural resources with established boundary, surface area, location, legal status and other characteristics.

As the assessment object, we consider the natural complex of a northern region (the territory of Berezovsky Municipal District, a Ural part of Khanty-Mansi Autonomous Area—Yugra), including land, forests, wild plant, hunting and fishery resources located on lands used or usable for specific economic purposes. According to Article 7 of the Land Code of the Russian Federation[3], these lands vary by categories (intended purpose) and are divided into agricultural and non-agricultural lands (in line with their actual condition and usage) (Table 1).

Table 1

Land Structure of Berezovsky Municipal District of Khanty-Mansi Autonomous Area—Yugra by Categories and Lands, hectares

Type of Land	Total Surface Area	Agricultural Lands	Forest Lands	Tree and Shrubbery Vegetation*	Under Water	Lands under Buildings	Under Roads	Swamps	Other
Agricultural Lands	58,829	10,023	1,918	6,678	4,587	33	83	32,771	2,736
Settlement Lands	24,575	6,831	2,249	2,361	3,560	2,339	-	6,303	932
Lands of industrial sector, power industry, transport, communication, radio, television, computer science, lands for supporting space-related activities, defense, security and other special-purpose activities	437	—	275	—	—	142	—	17	3
Lands of specially protected natural territories	59,382	—	46,212	—	1,161	21	15	11,973	—
Lands of Forest Resources	8,075,698	8,277	5,877,396	—	86,098	—	4,329	1,960,345	139,253
Lands of Water Resources	220,000	—	—	—	220,000	—	—	—	—
Reserve Lands	371,132	12,836	80,560	500	2,767	—	55	270,724	3,690
Total lands within the boundaries of administrative district, hectares/%	8,810,053 /100	3,7967 /0.43	6,008,610 /68.2	9,539 /0.11	318,173 /3.61	2,535 /0.03	4,482 /0.05	2,282,133 /25.9	146,614 /1.67

Prepared based on the data from the Office of Russian Federal Registration Service for Khanty-Mansi Autonomous Area.

[3] The Land Code of the Russian Federation No. 135-FZ of October 25, 2001, Chapter 2. The Land Code of the Russian Federation No. 136-FZ of October 25, 2001, Article 7. Ekaterinburg, 2008, 80 p. (in Russian).

In addition to a traditional accounting of lands by categories and specific lands, today, when the land can be held in various forms of ownership, the accounting is also provided by the forms of ownership.

Methodological Approaches to Economic Assessment

Currently, the most elaborated and used approaches are as follows:
— Cost approach and its modifications;
— Result-driven approach;
— Rental income-based approach;
— Market (comparative) approach;
— Approach based on alternative value [2, 11–13].

With the cost approach , the value of natural resources is determined by summing the costs of their development, production or use. This approach is widely used in assessing the costs of restoration (recreation) of a natural resource in its former quantity and quality. Such modification of cost approach is called the "reproduction approach." When the assessment is made with regard to the replacement cost in case of possible loss or degradation of assessed natural resource, a modified version of the cost approach is called the "replacement method." Despite all the simplicity of its use, the cost approach carries a certain contradiction—a mismatch between the assessment of quality and location of the resource in terms of their reflection in the cost and economic assessment of these resources, which substantially limits its use.

Compared to the cost method, the rental income-based approach has a number of advantages in assessing the natural resources. The economic meaning of the term "Rent" is reflected in the theories of D. Ricardo and K. Marx. D. Ricardo considered the rent not only as the payment for using a land plot for specific needs, but also as a payment for the land as such [14, P. 333]. In economic theory, the land as a gift of nature should not be subject to economic assessment, but in practice, it has a market price. This was explained by K. Marx, who based on his labor theory of value, studied the land rent, the capitalized form of which makes the purchase price of the land [15, p. 172]. Such rent is based on identifying the effect (differential rent) arising from the use of a resource with better natural characteristics compared to the use of a resource with lower natural characteristics. In an integral assessment, this approach allows a better consideration of the higher value of various natural resources, such as specific land plots, forests, etc.; and to estimate the increase of productivity as a result of additional costs incurred during the use of a resource. At the same time, despite the widespread use of rental income-based approach, a number of its shortcomings limit the possibilities of its practical application:

— The real system of prices for natural resources is not oriented on the marginal costs of their use. The costs tend to increase following — the introduction into the economic turnover of natural resources with increasingly lower quality or resources in undeveloped areas, which results in conventional character of definition of the net income from the use of specific natural resources, particularly such as the forest resources (with multi-purpose use);

— To correctly calculate the amount of capitalized rent, it is necessary to accurately determine the period of use for various types of natural resources, which is not always feasible in practice;

— It is impossible to establish common standards for the effectiveness of capital investments in various types of natural resources, especially those located at different areas with various natural and geographic conditions. The methods of determining the rent income-based assessment have not yet been definitely developed;

— There are no available rent income-based assessments and payment for resources that includes the rent, and the issue of whether it is possible to make an economic assessment of intangible natural goods remains unresolved.

The result-driven approach is used with regard to the natural resources that generate revenue. In this case, the economic assessment is determined by the difference between the value of primary products, derived from the use of assessed resources, and the costs to obtain it or a monetary expression of primary products. However, it is believed that this approach has a number of shortcomings in terms of rational environmental management, in particular, it "does not include the potential results" [6, s. 401].

The undoubted advantages are associated with the market approach, which allows making the economic assessment based on the prices prevailing on "natural" markets. This approach is based on

comparing an object with similar objects, for which there is available information on their value, that is, it reflects the actual practice of buying and selling. The difficulties are caused, first, by the absence of markets for some natural resources, secondly, by the complexity of searching for comparable analogs in undeveloped areas where such analogs may even not exist, and, thirdly, by the subjectivity in accounting for various adjustments.

It is also necessary to use the alternative value (opportunity cost) approach. With this approach, the economic assessment is determined through the lost revenue and benefits that could have been obtained by using the assessed natural resource for other purposes.

In recent years, the simplified economic assessment approaches, methods of subjective assessment based on imaginary (surrogate) markets and the use of sociological studies have become more widespread. The methods that imply such studies include the following:

— Willingness-to-pay method;
— Willingness-to-accept method;
— Travel cost method;
— Method for identifying the loss of profit by consumers, and other.

The use of these approaches is directly related to the concept of total economic value [1, 16–18], which is beyond the scope of this article.

In the economic assessment of natural resource potential, the quantitative estimates of natural resources, included in such potential, are based on a variety of approaches to the assessment, which reduces its reliability. The only way out of this situation is to achieve the uniformity in the implementation of assessment procedures.

The authors attempted to use the result-driven approach for all natural resources that form the natural resource potential of northern territories, such as land resources (A_l), hunting resources (A_h) and biological renewable resources (wild plants) (A_w).

The economic assessment of the natural resource potential of a territory is made in accordance with the following formula:

$$P_{rj} = \sum_{i=1}^{n} (P_{loc})_i F_{yi}, \tag{1}$$

where P_{rj} is the economic assessment of natural resource potential of j-th district; P_{loc} are the economic assessments of the local potential of i-th resource; i—is the natural resource (i = 1, ..., n); F_{yi} is the landscape stability factor of j-th district to anthropogenic impact, within which is assessed the natural resource potential.

Each of the local potentials is assessed by using special calculation formulas that reflect the specific character of forming and using such potential in underdeveloped northern territories. The stability factor is determined in the process of pre-project geo-ecologic research studies of the territory. If necessary, the proposed formula (1) can include correction factors for regional conditions, socio-ecologic importance of resources, etc.

The main purpose of proposed comprehensive assessment is to compare the natural resource potentials of municipal districts within a subject of the Russian Federation (in order to substantiate the priority investment projects).

For such comparison, we calculate the unit value index of the natural resource potential of each district:

$$I = \frac{UP_{rj}}{UP_{reg}}, \tag{2}$$

where I is the unit value index of the natural resource potential of the j-th district; UP_{rj} is the unit value of the natural resource potential of the j-th district defined as

$$UP_{rj} = \frac{P_{rj}}{S_{rj}}, \tag{3}$$

where S_{rj} is the surface area of the j-th district, in hectares; UP_{reg} is the unit value of the natural resource potential of the region defined as

$$UP_{reg} = \frac{\sum_{j=1}^{m} UP_{rj}}{S_{reg}}, \quad (4)$$

where j is the district (j = 1, ..., m); S_{reg} is the surface area of the region, in hectares The increase of index J value leads to the increase in the priority order of the district in terms of developing its natural resource potential.

The use of a single methodological approach to the economic assessment of natural resources provides ensures the comparability of calculations and improves the reliability of obtained results.

Economic Assessment of Renewable Natural Resources in Northern Districts

Land Resources. In the early 1990s, the land resources were assessed by soil productivity and actual use of lands for the studied territory. This practice turned out to be not entirely acceptable, since some highly productive lands were included in the forest resources or industrial and transportation sectors. According to the explanatory notes of land reserves, in Khanty-Mansi Autonomous Area—Yugra, the lands suitable for tillage occupy only a small surface area, and in the northern districts of the Area, such as Berezovsky District, they virtually do not exist (Table 1). Therefore, the value of products in these lands may be actually determined in accordance with the value of products obtained from reindeer pastures, which account here for a considerable share and are located on the lands of forest resources (Table 2).

Table 2

The Share of Reindeer Pastures and Reindeer Livestock in the Main Areas of Public Reindeer Husbandry of Khanty-Mansi Autonomous Area — Yugra

Territory	Total Surface Area, hectares	Reindeer Pastures, hectares	Share, %	Reindeer Livestock, as of 1/1/2014
Beloyarsky District	4,164,599	1,867,665	44.8	10,670
Berezovsky District	8,810,053	3,578,905	40.6	7,381

[*] Public Sector (Informatsionnyy byulleten o rabote agropromyshlennogo kompleksa za 2013 god [Information bulletin on the work of agro-industrial complex for 2013]. (2013). Khanty-Mansiysk. Departament prirodnykh resursov i nesyryevogo sektora ekonomiki KhMAO-Yugry [Department of Natural Resources and Non-Commodity Sectors of the Economy, Khanty-Mansi Autonomous Area—Yugra], 52).

The natural basis for estimating the actual livestock or estimated reindeer capacity of pastures[4], the annual revenue is determined on the basis of economic withdrawal of animals (about 20 % of the total livestock), which is compensated by the animal yield of the current year. The economic assessment is made for conditions existing on 1 hectare of reindeer pastures.

Berezovsky Municipal District is a key area for the development of reindeer husbandry in Khanty-Mansi Autonomous Area—Yugra. The territory has a great potential and capability for reindeer husbandry, including feeding resources, history of traditional activity and availability of experienced workforce. The reindeer pastures are located on the lands of forest resources, and the specific character of their economic use implies some particular aspects in assessing their value, which are accounted for by adjustment factors:

$$A_l = (V_r - C_r) \times P_r \times F_{de} \times F_q, \quad (5)$$

where V_r is the value of products (meat and side products (by-products, skin, blood, antlers, etc.) from 1 hectare of pastures, in rubles; P_r is the annual output of reindeer products from 1 hectare of pastures (headcount, including the withdrawal of animals), units; C_r is the costs of reindeer husbandry products F_{de} is the factor that reflects the decrease of efficiency in the use of pastures, it is determined following the overgrazing of pastures as the ratio of an average annual animal livestock to reindeer the capacity of pastures, in decimal fraction; F_q is the factor of pasture quality (availability of feed stuff, its structure, such as the share of lichen, grass, shrub feed stuff), in a decimal fraction. It is determined on the basis of statistical data and field studies.

[4] The reindeer capacity of pastures is the capability of the natural complex of pastures to ensure the annual (or seasonal) keeping of a particular reindeer livestock without violating the regional standards of animal feeding.

Forest Resources. The economic assessment of forest resources has some differences resulting from their specific character, the most important of which is their reproduction capacity. In the case of compliance with the conditions necessary for reproduction (rated cutting area), they have an unlimited period of use. As an economic complex, the forest is represented by several types of natural resources: timber, non-timber (wild plants) and hunting resources. The cadastral method of forest resource assessment has been practically canceled (a rent or fee under a contract for purchase and sale of forest plantations is paid for the use of forests). The amount of rent and the amount of fee under a contract for purchase and sale of forest plantations are determined in accordance with the Articles 73 and 76 of the Forest Code of the Russian Federation[5] (the fee rates for the volume unit of wood harvested on lands that are the federal property, property of subjects of the Russian Federation and municipal property). The fee rates are set, respectively, by the Government of the Russian Federation, authorities of the subjects of the Russian Federation, local self-government authorities.

For economic assessment of timber stand, we propose to use the taxes for timber sold on the stump by taking into account the scale of rent charges[6]. The economic assessment of timber resources (A_f) must consider the actual stock of timber at the time of withdrawal (L_f), potential increase of timber (P_f) over the entire period of the withdrawal of the land plot from economic turnover and restoration of the timber stock, taxes or prices for timber (T) sold on the stump, by taking into account the scale of rent charges for commercial timber. In general, we determine the economic assessment of timber resources by using the following formula:

$$A_f = (L_f + P_f) \times (T - H_l), \tag{6}$$

where H_l are the costs of timber harvesting.

The increase of timber is assessed by using the following formula:

$$A_{fit} = [I_l \times T_l) + (I_m \times T_m) + (I_s \times T_s) + (I_t \times T_t)], \tag{7}$$

where I_l, I_m, I_s are, respectively, the increase of large, medium, and small timber over the entire period of withdrawal of the land plot, m^3/hectare; T_l, T_m, T_s are, respectively, the taxes on large, medium and small timber, rubles/m^3.

The assessment is based on the indicator of rated cutting area for withdrawal of the timber, which allows maintaining annually the existing potential based on the principle of sustainable forest management.

Non-Timber Resources. To assess the biological resources of wild plants, we propose the following formula:

$$A_W = \sum_{i=1}^{n} \left(P_{Wi} - C_{Wi}\right) \times Pt_{Wij} \times Q_W, \tag{8}$$

where A_{Wi} is the economic assessment of wild plants, rubles/hectare; P_{Wi} is the market price of i-th species of wild plants, rubles/kg; C_{Wi} are the costs of harvesting the i-th species of wild plants, rubles/kg; Pt_{Wi} is the potential productivity of the i-th species of wild plants, kg/hectare; Q_W is rate of allowable withdrawal of wild plants; i are the species of wild plants ($i = 1, \ldots, n$).

The resource of raw berry plants are assessed by each type species for their projected coverage[7], nut-bearing trees (cedar—Siberian pine) are assessed by their share in the plantations. In the previous economic assessment of wild plants, based on the data provided by forestries, the projected coverage of berries was accepted to be at the level of 25 % of the total surface area[8]. The comparison of the use of forest resources with the use of wild plants showed that the latter have an advantage over the timber by producing a greater long-term effect because, unlike the timber resources, they reproduce annually, and their processing creates products with higher added value that are demanded in the markets of the region, as well as within and outside Russia. The rational use of the wild plant potential

[5] The Forest Code of the Russian Federation No. 200-FZ of December 4, 2006 (as revised on July 21, 2014).

[6] On Cadastral Comprehensive Economic Assessment of Natural Resources in the Khanty-Mansi Autonomous Area, Annex to the Decree of the Head of Administration of Khanty-Mansi Autonomous Area No. 4 of November 11, 1996.

[7] The projected coverage is the surface area occupied by projections of above-ground parts of the plants, expressed as a percentage of the total accounted surface area.

[8] On Cadastral Comprehensive Economic Assessment of Natural Resources in the Khanty-Mansi Autonomous Area, Annex to the Decree of the Head of Administration of Khanty-Mansi Autonomous Area No. 4 of November 11, 1996.

within a territory (by withdrawing only its economic stockpile), while ensuring the conditions for its reproduction, preserves the safety of biocoenosis. In the case of their processing with the use of innovative technology at the harvesting locations, the value of non-timber resources can exceed the value of timber resources.

Hunting resources. The economic assessment of hunting resources (A_h) is determined as the difference between the market price and hunting resources development costs multiplied by the factor of withdrawal of hunting resources (Q_h):

$$A_h = \sum_{i=1}^{n} \left(P_{hi} - C_{hi} \right) \times Pt_{hij} \times Q_h, \tag{9}$$

where A_h is the economic assessment of hunting resources, rubles/hectare; P_{hi} is the market price of the i-th species of hunting resources, rubles/unit; C_{hi} are the costs of procurement of i-th species of hunting resources, rubles/unit; Pt_{hi} is the potential productivity of i-th species of hunting resources, units/hectare; Q_h is the quota of withdrawal of hunting resources; i are the species of hunting resources; n is the number of accounted species of hunting resources.

The information on the potential productivity of hunting resources and various species of vegetation provided by All-Russian Research Institute for Hunting Husbandry and Livestock Breeding (VNIIOZ, city of Kirov) served as the basis for calculating the economic assessment. The data were averaged in the context of agro-environmental groups of lands in the Khanty-Mansi Autonomous Area. In addition, the raw materials with medicinal or technical value can be regarded as the non-game animal resources. These include horns and hoofs, fat and bile of brown bear, etc.

Fishery resources. The economic assessment of fishery resources is determined as the difference between the market price and fishery resources development costs multiplied by the factor that reflects the quota for catching the fishery resources:

$$A_f = \sum_{i=1}^{n} \left(P_{Fi} - C_{Fi} \right) \times (S_l \times S_r + Pr_{ifl} \times Pr_{ifr}) \times Q_F, \tag{10}$$

where A_f is the economic assessment of fishery resources, rubles/hectare; P_{Fi} is the price of i-th species of fishery resources, rubles/kg; C_{Fi} are the costs of harvesting the i-th species of fishery resources, rubles/kg; S_l is the surface area of enclosed bodies of water (lakes), hectares; S_r is the surface area of river system, hectares; Pr_{ifl} is the productivity of i-th species of fishery resources in the lakes, kg/hectare; Pr_{ifr} — productivity of i-th species of fishery resources in the rivers, kg/hectare; Q_F are the quotas for catching the fishery resources; i are the species of fishery resources; n is the quantity of recorded species of fishery resources.

The fishery is a traditional occupation of the local population and, for many people, it is the main source of income and jobs. The indicators of productivity of fishing areas, including their potential stock, serve as the basis for economic assessment of fishery resources.

Table 3

Assessment of Natural Resources of Berezovsky District with the Discounted Cash Flow Method

Type of Natural Resource	Economic Assessment	
	thousand rubles	rubles/km²
Land (reindeer pastures)	95,667	1,085.9
Forest	5,234,797	59,418.8
Biological (wild plants)	805,750	9,145.8
Hunting	115,000	1,305.3
Fishery	160,733	1,824.4
TOTAL	6,412,947	72,791.7

Note: The calculation is based on data from [19] and municipal statistics (see: Analiz ispolzovaniya rybnykh i okhotnichikh resursov Khanty-Mansiyskogo avtonomnogo okruga — Yugry [The analysis of the use of fishery and hunting resources of Khanty-Mansi Autonomous Area—Yugra]. (2006). Pravitelstvo Khanty-Mansiyskogo avtonomnogo okruga — Yugry; Upravlenie po ispolzovaniyu rybnykh i okhotnichikh resursov [The government of the Khanty-Mansi Autonomous Area—Yugra; Department for the Use of Fishery and Hunting Resources]. Khanty-Mansiysk, 90; The State Program of Khanty-Mansi Autonomous Area — Yugra Developing the Agro-Industrial Complex and Markets for Agricultural Products, Raw Materials and Foodstuffs in Khanty-Mansi Autonomous Area — Yugra in 2014–2020, The Procedure of Calculating and Granting Subsidies for the Development of Procurement and Processing System, Khanty-Mansiysk, 2013; The Analysis of the Use of Fishery and Hunting Resources of Khanty-Mansi Autonomous Area — Yugra/the Government of the Khanty-Mansi Autonomous Area — Yugra; Department for the Use of Fishery and Hunting Resources, Khanty-Mansiysk, 2006, 90 p. (in Russian)).

The proposed approach based on result-driven method was validated in Berezovsky District of Khanty-Mansi Autonomous Area—Yugra. The results of calculations are provided in Table 3.

Therefore, the annual income from the use of renewable natural resources in Berezovsky District can be more than 6.4 billion rubles, or 256,517 rubles per capita. The figures of average revenue per 1 sq.m. are required for comparison with other municipal districts of Khanty-Mansi Autonomous Area—Yugra in order to determine the investment attractiveness of the territory. Further calculations are based on landscape areas[9].

Conclusion

In recent years, at the level of economic theory, there is an ongoing discussion on the possibility of integrating the ecosystem services, as part of the natural capital, into the evolving system of assessments with regard to the economic value of natural potential [20–24]. At the same time, there is an emerging issue of legal regulation for relations arising in connection with the economic assessment of specific natural component. Thus, the Forest Code of the Russian Federation refers the preservation of habitat-forming, water-protecting, safeguarding, sanitary and hygienic, health-promoting and other functions of the forest to the principles of the forestry legislation. It is emphasized that the prospects for resolving the problem depend not only on creating the necessary formal conditions but to a larger extent, on the ideological readiness to recognize the full-fledged importance of an intangible component in the value of natural resources that is not involved in the economic use. The method-based approach proposed above reflects the assessment of resource functions, and the additional consideration of ecosystem services can have a significant impact on assessing the investment attractiveness of the territory when comparing the alternative options for the development of natural resources.

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References

1. Protasova, V. F. (Ed.). (2013). *Ekonomika prirodopolzovaniya [Economics of environmental management].* Moscow: KURS Publ., Infra-M Publ., 304.

2. Lukyanchikov, N. N. & Potravnyy I. M. (2007). *Ekonomika i organizatsiya prirodopolzovaniya [Economics and organization of environmental management].* Moscow: Yuniti-Dana Publ., 591.

3. Shimova, O .S. & Sokolovskiy, N. K. (2009). *Ekonomika prirodopolzovaniya [Economics of environmental management].* Moscow: INFRA-M Publ., 377.

4. Anisimov, A. V. (2007). *Prikladnaya ekologiya i ekonomika prirodopolzovaniya [Applied ecology and economics of environmental management].* Rostov on Don: Feniks Publ., 317.

5. Moskalenko, A. P. (2014). *Ekonomika prirodopolzovaniya i resursosberezheniya [Economics of environmental management and resource-savings].* Rostov on Don: Feniks Publ., 478.

6. Vorobyov, A. E. et al. (2006). *Osnovy prirodopolzovaniya: ekologicheskie, ekonomicheskie i pravovyye aspekty [Foundations of environmental management: environmental, economic and legal aspects].* Rostov on Don: Feniks Publ., 544.

7. Ryabchikov, A. K. (2002). *Ekonomika prirodopolzovaniya [Environmental economics].* Moscow: Elit Publ., 192.

8. Drogomiretskiy, I. I., Kantor, E. L. & Chikatueva, L. A. (2011). *Ekonomika i upravlenie v ispolzovanii i okhrane prirodnykh resursov [Fundamentals of environmental management: environmental, economic and legal aspects].* Rostov on Don: Feniks Publ., 536.

9. Chirusov, Ye. V. (Ed.). (2007). *Ekologiya i ekonomika prirodopolzovaniya [Ecology and economics of environmental management].* Moscow: Yuniti-Dana Publ., 591.

10. Mkrtchyan, G. M. (1982). Kompleksnaya otsenka territorialnykh sochetaniy prirodnykh resursov [The comprehensive assessment of territorial combinations of natural resources]. *Prirodnyye resursy v modelyakh territorialno-proizvodstvennykh sistem [Natural resources in the models of territorial and production systems].* Novosibirsk: Nauka Publ., 22–45.

11. Lukin, Yu. N. (2007). Razvitie ekonomicheskikh metodov zemlepolzovaniya v Rossii [Development of economic methods of land use in Russia]. *Vestnik Chelyabinskogo gosudarstvennogo universiteta [Bulletin of the Chelyabinsk State University], 19(97),* 91–96. (Economics).

12. Gusev, A. A. (2005). Ob ekonomicheskoy otsenke prirodnykh resursov [On the economic evaluation of natural resources]. *Ekonomika prirodopolzovaniya [Economics of environmental management], 5,* 99–103.

13. Bobylev, S. N. & Khodzhayev, A. Sh. (2009). *Ekonomika prirodopolzovaniya [Economics of environmental management].* Moscow: Infra-M Publ., 377.

14. Kharvey, Dzh. (2003). *Sovremennaya ekonomicheskaya teoriya [Modern economic theory].* Moscow: Yuniti-Dana Publ., 703.

15. Marx, K. & Engels, F. (1962). *Sochineniya [Works],* Vol. 25, Pt. II. Moscow, 6th ed., Ch. 37, 163–189.

16. Magaril, E. R., Berezyuk, M. V. & Rukavishnikova, I. V. (2013). *Ekonomika prirodopolzovaniya: mezhdistsiplinarnyy podkhod [Economics of environmental management: a multidisciplinary approach].* Moscow: ID KDU Publ., 422.

[9] A landscape area is a local natural complex with genetically linked geomorphological, climatic, geo-botanical, soil, and other characteristics.

17. Makar, S. V. & Glushkova, V. G. (2010). *Ekonomika prirodopolzovaniya [Economics of environmental management].* Moscow: Yurayt Publ., 588.

18. Ignatyeva, M. N. (Ed.). (2009). *Ekonomika prirodopolzovaniya [Economics of environmental management].* Ekaterinburg: UGGU Publ., 706.

19. Malkin, E. M. (1997). *Reproduktivnaya i chislennaya izmenchivost promyslovykh populyatsiy ryb: avtoreferat diss. d-ra biol. Nauk [Reproductive and numerical variability of commercial fish populations: author's abstract of the dissertation of the doctor of biological sciences].* Moscow, 51.

20. Bobylev, S. N. & Zakharov, V. M. (2009). *Ekosistemnyye uslugi i ekonomika [Ecosystem services and economy].* Institut ustoychivogo razvitiya, Tsentr ekologicheskoy politiki Rossii [Institute of Sustainable Development, Center of Ecological Policy of Russia]. Moscow: LEVKO Publ., 72.

21. Ignatyeva, M. N. (2014). Formirovanie prirodnogo potentsiala territoriy [The formation of the natural potential of territories]. *Izvestiya UGGU [Bulletin of the Ural State Mining University], 4,* 51–56.

22. Glazyrina, I. P. (2001). *Prirodnyy kapital v ekonomike perekhodnogo perioda [Natural capital in the economy of transition period].* Moscow: NIA-Priroda Publ., REFIA Publ., 204.

23. Tishkov, A. A. (Ed.). (2002). *Ekonomika sokhraneniya bioraznoobraziya [Economics of biodiversity conservation].* Moscow: Proekt GEF «Sokhranenie bioraznoobraziya RF» [The GEF Project "Biodiversity Conservation in the Russian Federation"]. Institut ekonomiki prirodopolzovaniya Publ., 604.

24. Lebedev, Yu. V. (2011). *Otsenka lesnykh ekosistem v ekonomike prirodopolzovaniya [Assessing the forest ecosystems in the economics of environmental management].* Ekaterinburg: UrO RAN Publ., 575.

Authors

Balashenko Valery Vasilyevich — PhD in Economics, Research Associate at the Sector of Regional Environmental Management and Ecology, Institute of Economics of the Ural Branch of RAS (29, Moskovskaya St., Ekaterinburg, 620014, Russian Federation; e-mail: bala10@mail.ru).

Ignatyeva Margarita Nikolayevna — Doctor of Economics, Leading Research Associate at the Sector of Regional Environmental Management and Ecology, Institute of Economics of the Ural Branch of RAS; Professor at the Department of Economic Theory and Entrepreneurship, Ural State Mining University (29, Moskovskaya St., Ekaterinburg, 620014; 30, Kuybysheva St., Ekaterinburg, 620014, Russian Federation; e-mail: rinis@mail.ru).

Loginov Vladimir Grigoryevich — Doctor of Economics, Head of the Sector of Regional Environmental Management and Ecology, Institute of Economics of the Ural Branch of RAS (29, Moskovskaya St., Ekaterinburg, 620014, Russian Federation; e-mail: log-wg@rambler.ru).