Economic estimation of forest recreation

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Abstract. The population's demand for recreational services tends growing steadily, the amount of growth varies depending on objective and subjective factors. The problem of economic assessment of forest recreation can be solved only after the recognition of recreational services and their inclusion in the economic relations between the state, the population and private business. Economic estimation of the recreational function of forests will help to scientifically justify the amount of damage to be compensated for damage caused to forests by industry, institutions, organizations and citizens. Recreational function can be attributed to natural resources, since it has a potential value. In market conditions, it is the final consumer of recreation-the population-that should evaluate the recreational function. The size of this theoretical payment revealed in the course of the study allows us to judge the value that the recreational function of forests represents for the state and the population. The inclusion of recreational services in economic relationships will allow to get an independent and objective estimation of the recreational function of forests.

1. Introduction

The problem of evaluating any useful, human-consumed services delivered by an unknown performer of these services is individually irrational. This applies to the recreational services of forests.

Despite the generally recognized benefits of forest recreation, attempts by economists to integrate forest recreation services into economic relations have not yet been successful. The main reason is the difficulty of measuring the service itself and the degree of its usefulness to a person, and what is not measurable cannot be reasonably expressed in cost form.

Interest in the valuation of the recreational component of forests was inspired due to an increase in the population, recreational load and the absence of prohibitions on visiting forests, including private ones. The increase in the number of tourists increases the risk of forest fires, the load on forest ecosystems, the cost of upgrading forest areas, and so on.

For these reasons, the solution to the General problem of forest recreation originally came from forestry workers in our country or private forest owners in foreign countries, but not from economists.

The first step to solving this problem was to scientifically prove the permissible recreational load on urban forests and forests that have the status of green zones of neighborhoods.

The next step was to try to develop special forest management regimes for forest Park farms in suburban areas of large cities, proposed recreational zoning, measures to improve the viability of forest stands, improve their aesthetic properties, etc.
One of the scientific centers that dealt with this problem was the Leningrad forestry Academy. In the early 80-ies of the last century, under the leadership of prof. A G Moshkalev, L N Yanovsky conducted extensive research on the example of urban forests and forest-park zones of cities [1, 2]. As a result of the research, theoretical prerequisites were established and practical recommendations were given for the allocation of green zones and forest-Park belt in cities and suburban areas according to science-based standards. The organization of forestry operations according to such standards required an increase in the number of employees and the amount of funding. Thus, there were prerequisites for the involvement of forest recreation in economic relations. Again, there was a problem: no tangible result or tangible service was opposed to increasing costs. In this regard, scientific research has begun to substantiate the economic assessment of recreational functions of forests [3].

Today the economic evaluation of the recreational function of the forest is primarily necessary to determine the contribution of recreation to the total national product, determine the reasonableness of the existing amount of state funding, and contribute to "the theory of economic evaluation of natural resources in common, especially in the analysis of difficult-to-measure useful functions with hidden results of manifestation".

Economic assessment of the recreational function of forests will help to scientifically justify the amount of damage to be compensated for damage caused to forests by enterprises, institutions, organizations and citizens.

The practical side of estimating the recreational function of a forest is the crowning achievement of any practical solution to forestry in recreational forests.

Currently, there is no single approach to the valuation of forest recreation, this problem remains unsolved. Moreover, a conflict of interests is slowly brewing between consumers of forest recreation-the population and forest management authorities [4]. Proponents of free consumption of such services adhere to the so-called impossibility of justifying the cost of recreational services in monetary units, forestry practices advocate monetary evaluation of recreation in order to compensate for increased costs [5].

The authors, who aim to assess the recreational function of the forest economically, face a number of difficulties, primarily of a methodological nature. This is due to the fact that the recreational function of forests has a broad interpretation, it is useful not as a thing, but as a result of the favorable impact of the forest environment on human well-being.

In economic theory, the economic value of a product or service is primarily a comparison of costs and results. But this approach is not applicable to forest resources. The main productive factor in the production of recreational services is nature. Human actions make some improvements in the forest for more comfortable access to recreational services for vacationers.

A recreational function can be attributed to natural resources, since it has a potential value.

The recreational function of the forest, being an element of the economic sphere, can be represented in physical and monetary terms using absolute and relative indicators, while the recreational function can be considered both as a product of labor and as an object of labor. We understand economic valuation as a procedure for determining the price, which is aimed at obtaining an objective cost characteristics of the phenomena occurring in the sphere of financial relations.

The next most significant, but difficult to calculate economic result at the macroeconomic level is stable income to the consolidated budget from improving the performance of recreational workers, reducing the level of disease in the population and reducing the duration of illness.

The economic significance of expanded reproduction of human forces (physical, intellectual and emotional) for the state is also hidden and difficult to calculate.

Solving the issue of economic estimation of the recreational function of the forest will make the main object of economic activity - multi-purpose forest use-economically protected from irrational use. It should be noted that protective forests that perform primarily recreational, environmental, sanitary and health functions, as well as specially protected natural territories, in our opinion, should be recognized as forests of direct social (socio-cultural) significance. Solving the issue of economic
assessment of the recreational function of the forest will make the main object of economic activity-multipurpose forest management-economically protected from irrational use. It should be noted that protective forests that perform primarily recreational, environmental protection, sanitary-hygienic and health-improving functions, as well as specially protected natural territories, in our opinion, should be recognized as forests of direct social (socio-cultural) significance. But we should not forget that operational and reserve forests also have a recreational value, although they meet the needs of society with other utilities.

Previously, when trying to estimate the economic recreational function of the forest, researchers did not even include the possibility of paying for recreational services consumed by the population in the range of research questions, using various indirect methods of estimation. At the moment, the population is aware of the need for forest recreation and understands the economic assessment given to it.

The data obtained from the population survey indicate the willingness of the population to pay for the service consumed, i.e. the increasing recreational role of forests, and at the same time the economic significance of urban forests. We can assume that this trend will continue in the future.

2. Methods and materials
The economic assessment of the recreational function of a forest depends on interrelated factors such as socio-economic conditions, assessment methods, assessment goals, and assessment subjects - figure 1.

Figure 1. Relationship of the main components in assessing the recreational function of forests [6, 7].

From the components of the forest recreational function assessment presented in figure 1, legal and socio-economic conditions play a determining role. These include legal norms, economic, social, and historical conditions. Based on the general economic theory, there are two subjects of forest relations: demand reflects the consumer (population), supply - the producer of recreational services (the owner of the resource - the State).

A recreational function can get its own economic assessment if it is in demand by society. In market conditions, it is the final consumer of recreation-the population-who must evaluate the recreational function. Therefore, out of all the variety of methods, we have chosen the market method of "willingness to pay", which is aimed at identifying and determining the value (monetary) value of consumer demand for recreational services received directly from the consumer.

To solve this problem, we shift from such a category as the recreational function of the forest to a more specific object of economic assessment - recreational services, considering it against the background of economic relations between the state and the population. The recreational function of a forest is mainly an ecological category, since it is derived from the natural and biological
population that the forest represents. It seems to us that the recreational function is mainly subject to qualitative assessment, since it is at the level of human sensations and perceptions.

Recreational services are subject to quantitative, qualitative and cost measurement, are comparable with other types of services and are in the sphere of civil law relations. The quality of recreational services is indirectly expressed by such objective quantitative indicators as attendance (number) and, indirectly, the volume of recreation (hours of forest recreation).

Since recreational services are non-productive, they can be compared with other types of services (communications, healthcare, tourism, etc.). The distinctive features of recreational services will be their national significance and public character as a good. Recreation represents a certain value for the recreant, i.e. this phenomenon has characteristics in which the recreant is interested in one way or another and which he evaluates either positively or negatively. Recreational services are an economic good, which is why it gives them a quality and cost assessment. The consumption of a recreational service by one person does not affect the actual amount of it, and the marginal cost of each additional recreant is zero. The only, though significant, limitation to this provision is that if there is a number of recreants in one territory that is more psychologically comfortable or acceptable, the quality of this service decreases.

A characteristic feature of recreation is that it is the consumer who goes for this service (in contrast to the commodity market and the financial market), since it cannot be moved to it without losing its properties. Recreational services are linked to the object of their production - urban forests, and are intended for immediate consumption, in other words, acts on the "retail market".

The uniqueness of forest recreation lies in the fact that depending on the season of the year recreants actively form a recreational service, amongst the forest territory of the place of rest, when defining the types of activities and duration of recreational services.

The size of the theoretical payment revealed in the course of the study allows us to judge the value that the recreational function of forests represents for the state and the population.

In our opinion, the best way to determine the value of recreational services for the population is not to use indirect methods (the price of free time, transport costs, etc.), but using an economic and sociological survey of consumers directly to identify the value of recreational services consumed by them. At the same time, we will evaluate the recreational service, not the function, not the forest stands or the land under them.

Having defined recreational services as a market economic category, for further economic research it is necessary to identify and determine the amount of demand for it using the method of "willingness to pay", using a sociological survey.

The survey of direct consumers of the final result allows us to obtain from primary sources a quantitative value of the potential effective demand for this recreational service, to establish its dependence on various factors discussed below. The survey is an supplemental tool in this study, despite its independent value.

3. Results and discussion
Using the above theoretical provisions, an algorithm and a program of population survey were previously compiled [8], for the purposes of this article, a program was developed that allows extrapolating previously obtained data taking into account a number of changed conditions (increased mobility, increased density of the road network, changes in the priorities of the population, etc.). This economic and sociological study was conducted using a survey of citizens living in St. Petersburg, which was the necessary amount to achieve the goals (table 1).

Table 1. The correlation between the number of respondents and their "willingness to pay" by season.

| Prices intervals, rubles | 0-50 | 51-100 | 101-150 | 200 and more |
|-------------------------|------|--------|---------|-------------|
| Winter                  | 2625 | 984    | 150     | 269         |
If you have information about the respondents’ readiness to pay for a recreational service in rubles and the number of such responses, you can build a demand curve for this service of the respondents. This curve will be the sum of individual demand curves for a recreational service. The construction of an economic and mathematical model of demand for recreational services allows us to confirm the accuracy and correctness of the research. The resulting function equation for the average annual function has the form formula 1:

\[ Y = e^{0.036x} - 0.063x + 7.84 \]  

(1)

where, \( Y \) is the demand function for a recreational service; \( x \) - price of a recreational service unit; \( e \) is the base of the natural logarithm, equal to 2.72.

The graphical function of demand for recreational services is shown in figure 2

\[ \text{Figure 2. Demand for recreational services and willingness to pay for them by the population.} \]

As you can see from figure 2, the empirical function decreases exponentially between 0 and 150 rubles, then increases. It is on this segment that the standard deviation of the theoretical function is minimal. We can assume that the actual demand curve behaves this way under the influence of a group of respondents with high income (as follows from the survey data, the number of respondents who agree to pay more than 200 rubles per visit does not exceed 12%).

People with high incomes who are prepared to pay more than 200 rubles for a single visit will also consume this service at a price from zero to 200 rubles, while receiving additional benefits. Thus, it is correct to consider the demand function on the segment from zero to 200 rubles as the most typical for all residents of St. Petersburg and possible to describe as an exponential function.

As you know, the price elasticity of demand can be expressed by formula 2[9]:

\[ E_d = \frac{\% \Delta Q \cdot Q}{\% \Delta P \cdot P} \]  

(2)

where, \( E_d \) - the coefficient of elasticity of demand for the price, \( Q \) - volume of demand for the product; \( P \) - price of product, RUB.

The elasticity of demand for recreational services by price is shown in the table 2.
Table 2. Elasticity of demand for recreational services.

| Quantity, people | Price interval, rubles |
|------------------|------------------------|
| Winter           | 0-50                   | 51-100      | 101-150     | 200 and more |
|                  | 0.45                   | 0.74        | 0.84        | 0.91         |
| Spring           | 0.43                   | 0.73        | 0.82        | 0.87         |
| Summer           | 0.28                   | 0.64        | 0.82        | 0.90         |
| Autumn           | 0.42                   | 0.69        | 0.73        | 0.80         |

According to the data obtained, for all seasons of the year, the elasticity of the demand function changes as follows: at the interval 0-50 - demand is elastic; 51-100 - demand elasticity decreases; 101-150 - becomes little elastic; 200 or more - reflects the consumption of luxury goods. Starting from 200 rubles, the demand function radically changes its direction, which indicates an increase in demand for recreational services when its price increases. This behavior can be explained by the "demonstration effect", when for people with high incomes, the higher the price, the more attractive the service, thus they show their well-being.

4. Summary
The problem of economic estimation of forest recreation can be solved only after the recognition of recreational services and their inclusion in the economic relations between the state, the population and private business [10].

The population's demand for recreational services tends to grow steadily, the amount of which varies depending on objective and subjective factors.

In practice, there is no correlation between the increased costs of forest management in recreational forests and the distribution of budget funding [11].

The recreant, as an independent estimator and end user of a recreational service, can give it an individual cost estimate.

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