Forest damage assessment specifics

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Abstract. The article deals with the issue of forming a suitable approach for assessing the damage caused by a forest fire in accordance with the Russian Federation Forest Code regulations. The subject of the research is the damage that can be caused by a forest fire. The existing methods of calculating the damage caused by forest fires have been analyzed and so has been the regulatory legal framework in the field of assessing the damage caused to forests by forest fires. None of the existing methodologies fully meets the provisions of the Russian Federation Forest Code Articles 100 and 95. The necessity of a conceptual approach to create a methodology for assessing the potential damage by a forest fire justifies the research rationale. The result of the study is the basis for the formation of a scientifically-based methodology for calculating the damage caused to forests, which is the monetary terms of damage.

1. Introduction

Compensation of damage to forests is one of the most important economic mechanisms which ensures environmental safety and guarantees the forest resources conservation. It must be well-founded from an economic point of view.

Forest fires are a key factor that greatly changes the state of forests, their ecological, social and economic capability. Forest fires are often a national disaster in many largely-forested countries. Besides the direct forest damage, forest fires pose a tremendous risk to manufacturing enterprises that are in the vicinity of forest areas. They pose a great risk to settlements as a forest fire can cause the death of people.

Large and extremely large-scale forest fires are especially dangerous as the fire overhaul involves enormous costs. Thus, in the USA 30 percent or more of the US Federal Forest Service annual expenditures is spent on 1-2 percent of fires. Last year the 10 largest fires cost the United States Forest Service more than $ 320 million. It is predicted that by 2025 the increase in the cost of fire extinguishing alone will almost total $ 2 billion.

Large-scale forest fires are the cause of emergencies similar to cases that arise as a result of natural or man-made disasters. Therefore, considering the method of calculating the damage caused to forests by forest fires, first of all it is advisable to take into account the accumulated experience in assessing the damage caused by the various negative factors of emergency as well as the specific features of forests and a negative impact of forest fires.

2. Experimental Part

There exist various forests and their natural sites damage caused by forest fires assessing methods. According to one of them, when calculating the damage caused by forest fires only direct damage caused by the death or damage of forest stands and other forest cover types is estimated. According to
others, the damage caused by forest fires is a broader concept compared to the concept of damage, including in addition to damage a loss of profit. The concepts of harm and damage can be interpreted in various ways.

The most complete analysis of determining the damage from negative factors is made by V N Baranin [1], Yu V Podrezov [2, 3], A S Tulupov [4, 5].

Most of the techniques are distinguished between:

1. Harm and damage loses. Harm is understood as a negative impact on the evaluated object, expressed in physical terms (in absolute or relative terms). Damage loss is understood as the monetary expression of harm also in absolute or relative terms. As a rule the amount of damage losses include the costs of reducing the negative impact of harmful factors on the protected objects.

2. Direct and indirect harm and damage. Direct harm and damage are understood as the harm or damage caused to economic entity, population and ecology. Indirect harm and damage are defined as some long-term effects of the direct harm and damage impact on other objects and systems.

3. Harm (damage) is complete or partial in those cases when certain protected object properties are affected by harmful factors. In fact, it is assumed that the protected object is a system consisting of interrelated elements and the damage is taken into account only for some of the most valuable or most damaged elements, as well as considering the real possibility and cost of negative impact assessment.

There are no universal working methods suitable for assessing harm and damage in all cases of life. Most likely, there is no need in it. A universal technique would be excessively complicated. It is desirable only that certain general principles be followed, which would allow comparing the scale of various phenomena in a single dimension.

The completeness degree of accounting for all negative phenomena is determined by the availability of information and resources including the time needed to obtain this information, as well as the beneficial effect of obtaining this information.

Most methods do not imply calculations accuracy determination.

The absolute majority of methods imply an assessment of the consequences of a negative phenomenon that already happened.

None of the existing methods fully meets the main goal of this study to obtain tools suitable for assessing damage caused by a forest fire in compliance with the provisions of Articles 100 and 95 of the Russian Federation Forest Code (hereinafter referred to as the Forest Code).

It should be mentioned that ambiguity in determining the extent of damage from forest fires arises in case of natural factors (lightning strikes due to thunderstorms) or for unknown reasons when the issue of compensation for forest damage is not raised [6].

Under tightened sanctions for violating the forestry legislation an understanding of the damage was developed as a form of punishment for a forest poacher. In this case, a damage calculation is made by means of multiplying the established rates for wood harvesting by increasing coefficients (simplified) and the multiplicity of wood cost without taking into account the real economic situation and the actual damage to forests as an object of the state federal property.

In practice, damage is calculated without considering economic basis. Such an approach to calculate forest damage is irregular.

Having violated the forestry legislation the offender bears administrative or criminal liability. The criterion for assigning to a particular type of liability is the calculated amount of damage caused to forests. Penalty upgrading of the offender by increasing the estimated amount of damage due to the multiplicity of wood cost and as a result bringing the perpetrators to criminal liability is contrary to the basic principles of the Russian Federation legislation.

3. Methods and Materials
To achieve this goal, tested and applied in forest science analytical methods of research have been used in the development and improvement of the regulatory legal and methodological framework.
4. Results and Discussion

According to article 3 of the Forest Code, legal provisions regulate forestry affairs. However, the turnover management of forest areas, forest plantations, wood and other extracted forest resources is carried out on the basis of the Russian Federation Civil and Land Codes provisions. The legal regulation of forest affairs and relations connected with the turnover of forest areas and forest plantations has a different legal nature.

Forest affairs are understood as the realization of delegated powers by state regional executive bodies. Turnover of forest areas and forest plantations is controlled by civil and land laws [7].

Forest in the forest legislation is considered as a set of soil, forest plants, wild animals and other nature elements. In this regard, the legislator in Article 5 of the Forest Code specifically stipulates that the use, protection and reforestation should be based on the concept of a forest as an ecological system or as a natural resource.

Science completely rejects the concept of a forest only as trees and shrubs and characterizes it as an ecological system, a part of the earth surface, occupied by virtue of certain biological properties by the corresponding woodlands.

The Forest Code advises to use the concept “Forest” in relation to forest affairs namely the use, conservation, protection and reforestation.

When implementing civil law relations the concept of “Forest” was excluded by Federal Law No. 201-FL of December 4, 2006 “On the enactment of the Russian Federation Forest Code (hereinafter Law No. 201-FL). The forest concept is excluded from the immovable property list and in other legislative acts does not designate tree-shrub vegetation or wood. An incorrect interpretation of this exception was noted as the transition of forests to the category of movable property. With regard to issues of civil circulation, the forest cannot be its object because it is not a property (thing). In forest affairs only the forest area is used as an object, which is at the same time the land area according to the Forest Code and the same relates to forest plantations. According to the state land and forest measurement forests are located on lands of all categories (article 7 of the Russian Federation Land Code). Thus, the Forest Code applies to any forests.

The principal difference between a forest area (not included in the forest fund) and a forest fund site is that it is univocally attributed to such type of immovable property as a land plot and is recognized as an object of property relations connected with civil circulation (civil law relations).

The Forest Code clearly defines the list of property and mandatory rights to forest areas, i.e. property (land owners), permanent (perpetual) use and limited use of other forest areas (servitude).

A special feature of the rights emergence to forest areas is their correlation with use types.

The provision defined by the Forest Code says that the ownership of forest and land plots becomes the federal property which excludes their privatization or transfer to municipal property and property of constituent entities of the Russian Federation.

To determine the compensation amount for property damage caused to forest areas and property rights arising while using forests, Article 100 of the Forest Code contains a reference to Article 95 of the legal act. The basis provides the assessment of forests, which is carried out when determining the initial price of a tender for the right to conclude a lease agreement of a forest area in state or municipal ownership.

The damage caused to the forest as an ecological system will be determined by the law to compensate, taking into account its beneficial properties in accordance with the provisions of Federal Law No. 7-FL of January 10, 2002 “Environmental Protection”. Thus, the Code provides for the separation of damage types, i.e. forest areas and property rights arising from the use of forests, ecological system.

Currently, the forest industry lacks a justified monetary value for indicators such as uniqueness, renewability, location and other properties. Thus, the federal state executive bodies that have the appropriate competence are to assess forests being an ecological system.
Within the framework of the forest affairs defined by the Forest Code, one should carry out an assessment of forest areas and property rights arising from the use of forests, while separating the concepts “assessment of forest areas” and “assessment of property rights arising from forest use”.

Considering the fact that the evaluation objects are determined by Article 5 of the Valuation Act, in compliance with the law and the Forest Code, the following objects can be evaluated:

- forest plot as a land plot;
- intangible assets giving the right to use forest land.

The evaluation objects are:

- forest plantations (trees, shrubs and vines in the forests);
- available supplies of other resources (secondary, minor etc.);
- land as a source of timber or other forest resources;
- environment protection forest functions.

The Forest Code stipulates not the turnover of forests but of forest areas and forest plantations. Therefore, the forest cannot be the object of evaluation under Article 5 of the Valuation Act since it is not a property (thing) and is not involved in civil circulation

The value of the forest for a specific user can be expressed in terms of individual indicators of the market (market value of the forest area, full and partial rights of use, the right of the lessor and the lessee, the right of limited use, the investment value) and non-market value (the right of permanent perpetual use and the right of fixed-term use without consideration).

Standard cost indicators specified by the state or local governments:

- cadastral value of a forest area;
- payment for the use of forest plantations;
- payment for the right to conclude a lease agreement of forest plots;
- rates of payment per unit of wood volume harvested on lands under federal ownership in compliance with the Forest Code;
- rates of payment per unit of forest resources and rates of payment per unit of forest area lease.

Assessment of the value of a forest (assessment of the forest area and assessment of property rights arising from the use of forests) is carried out to determine the damage caused to forests by fires, industrial emissions and other natural and anthropogenic factors.

Assessment of the value of forest areas means the money equivalent of the effect (rent) received by the owner of these forest areas in case of integrated and rational exploitation.

The criterion for assessing the value of a forest area is the rate of the economic effect obtained as a result of its rational use.

From an economic point of view, the concept of "forest area" corresponds to the concept of a single property object consisting of land and improvements. The role of improvements in the forest area is performed by forest plantations or a growing forest. The forest area has fixed boundaries and is characterized by a certain location, natural conditions, physical parameters, legal and economic management [8, 9].

Various production factors (labor, capital, natural resources) are engaged in income generation from the forest exploitation and receive the newly created value [8-10]:

- wage;
- rate of return on capital (entrepreneurial income);
- natural resources (rent or residual income).
- In assessing the forest area two concepts of rent are distinguished:
- net return from forest land (relative to 1 m3 of wood);
- land rent (relative to 1 ha of forest area).

Thus, the amount of land rent arising from the use of the forest area is determined by the timber stock and income per each cubic meter of this stock [8-10].

Net return from forest land in the sale at the stump and auction prices of forests are usually the same.
A characteristic feature of the net return from forest land is a long period of time required for growing a stand that has commercial wood.

5. Conclusion

Considering the provision of the Forest Code which stipulates that the forest area is at the same time a land plot, its assessment including forest resources should be carried out using the general principles of land assessment [7-9]:

- duration of the production cycle of growing mature wood;
- cyclic fluctuations in the value of forest areas;
- dependence of a wood stand cost on the quality characteristics of forest plantations;
- decrease in the value of money over time (the value of the forest which will grow in 100 years);
- economic accessibility of forest resources;
- multipurpose use of forests;
- lack of turnover of forest land plots.

In order to develop a unified approach to calculating the amount of damage, based on the provisions of Articles 100 and 95 of the Russian Federation Forest Code, the damage should be determined considering the assessment of forests.

For this purpose it is necessary to approve a periodic reporting form of damaged or destroyed forest areas (forest plantations) having data of forest areas:

- unforested areas (in hectares);
- immature stands (in hectares and m$^3$);
- maturity stands (in hectares and m$^3$);
- if there are no expenditures for artificial reforestation or tending of plantations;
- forest fire extinguishing costs (thousand rubles);
- with due regard to the cost of creating forest plantations, as well as the annual costs of carding of plantations, forests protection and preservation and other forestry activities (in hectares and m$^3$).

Damage assessment caused to forest areas should be carried out on the basis of forests assessment considering data from periodic reporting and the following indicators [8, 9]:

- cost of forest land, rub.;
- value of the forest yield every T years, rub.;
- cutting cycle or time interval (T) through which it is possible to receive income from timber, years;
- age of accepted stand maturity, years;
- after regeneration period in felled areas, years;
- discount rate, %;
- the cost of the forest plot with a maturity stand, rub.;
- net return from forest land resulting from clear-cutting in a stand of age (as a loss of profit, as an income shortfall) rub. / m$^3$;
- available inventory of standing timber at the age of clear cutting, m$^3$ / ha;
- reforestation costs, rubles / ha;
- annual expenditures for the exercise of separate powers by the state government body of the constituent unit of the Russian Federation in the field of forestry affairs (except for fire safety measures and extinguishing forest fires expenditures, as well as the costs of maintaining and supporting the given state government body of the constituent unit of the Russian Federation) on 1 hectare of commercial and protection forests taking into account the intensity of their exploitation (in rubles) and determined by the Federal Agency for forestry affairs as prescribed by the Ministry of Natural Resources and Ecology of the Russian Federation rubles / ha;
- land capitalization ratio.

The proposed approach will make it possible to formulate a methodology for calculating damage, which is a monetary terms of the harm caused to forest plantations, based on the assessment of forests,
which meets the requirements of forest legislation. This will allow eliminating the contradictions to the basic principles of the Russian Federation legislation.

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