Fuel and energy complex and methods for assessing the harm from air pollution

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Abstract. A significant impact of the fuel and energy complex of Russia on the components of the environment is shown; in particular, the air pollution. The necessity of adopting the methodology for calculating the amount of harm from air pollution is substantiated. The analysis of the draft of Methodology for the Estimation of the Amount of Environmental Damage Caused by Air Pollution developed by the Ministry of Natural Resources and Environment of the Russian Federation is performed. The estimations of the amount of damage caused to the environment by excess emissions from stationary air pollution sources, as well as from agricultural burning and from combustion at waste disposal sites, including landfills, sites of temporary waste accumulation and unauthorized landfills. The directions of improvement have been developed both in terms of structure and content, theoretical and calculated part of the Methodology proposed by the Ministry of Natural Resources and Environment of the Russian Federation.

1. Introduction

The fuel and energy complex has a significant impact on the components of the environment. In figure 1, according to the Federal State Statistics Service, the dynamics of air emissions of pollutants from stationary sources by types of economic activity is provided.

The environmental footprint caused by the economic activity “mining” is clearly seen in the figure. At the same time, more than 90% of pollutants are emitted due to the extraction of fuel and energy minerals.

Any kind of negative impact on the components of the environment requires an appropriate economic estimation. We have collected and analyzed more than 200 methods of assessing damage from environmental pollution or, in modern terms, harm from violation of environmental legislation for the last fifty-year period 1967-2018 [1-5]. It should be noted that most of the methods are not approved at the federal level, they have the status of unofficial scientific and research developments. During the past decade, the Ministry of Natural Resources and Environment of the Russian Federation set the goal to close up a gap. So, in 2007 two Methodologies were approved – calculation of the amount of damage caused by water pollution [6], and violations of the forest legislation [7].
Figure 1. Emissions of pollutants into the atmosphere from stationary sources by types of economic activity, thousand tonnes.

In 2008, the methodology was approved [8] that allows damage caused to fauna objects listed in the Red Book of the Russian Federation to be estimated, as well as to other objects of the animal world that do not belong to hunting and fishing objects and their habitat. In 2009, the methodology [6] was adjusted taking into account the experience of its two-year application in practice, the complaints of business entities; and it was reapproved [9]. In 2010, a methodology for soils was adopted [10], and in 2011 for aquatic biological [11] and hunting resources [12]. Since 2012 there have been no changes.

Everyone was waiting for the adoption of the necessary methodology for assessing the amount of damage caused by air pollution. This methodology was needed not only to assess damage and resolve litigation caused by incidents and accidents related to air pollution, but also to develop project documentation taking into account the environmental factor, as well as in the areas of environmental auditing and insurance.

The opponents of the adoption of this necessary document represented by business and large industrial enterprises that have significant environmental impacts justified their position by the fact that harmful substances emitted into the atmosphere are dissipated and damaged forests, soils, water, wildlife and other components of the environment, the methods for that have already been developed and are working. At the same time, in our opinion, even information about air pollution, for example, in large cities, was ignored. And before the harmful substances get dissipated, a great number of people would be exposed to harmful substances that are hazardous to health.

Until now, the damage from air pollution, unlike a number of other environmental components, had to be calculated at the rates of pollution charges, which even with a multiple increase did not show the real extent of the harm done. The methodological approach, in contrast to the calculation of the necessary costs for the restoration of the violated right, takes into account broader aspects of the harm caused, including long-term consequences.

In 2018, the Ministry of Natural Resources and Environment of Russia announced the Methodology for the Estimation of the Amount of Environmental Damage Caused by Air Pollution
This methodology is still at the final stage, in the so-called draft state. Acquaintance with this methodology, including the performance of calculations, made it possible to form an opinion about the document proposed by the Ministry of Natural Resources and Environment of Russia, as well as to formulate recommendations for the completion and improvement of this methodology.

2. Methods of research

The system analysis of the Methodology for the Estimation of the Amount of Environmental Damage Caused by Air Pollution proposed by the Ministry of Natural Resources and Environment of Russia, taking into account the existing methodological support for assessing harm and damage from both air pollution (see, for example, [14-17]) and other components of the environment, as well as approved and unofficial documents was performed.

The necessity to take into account the features of specific developing territories of the fuel and energy complex, the Arctic Region in particular, was identified [18]. It is also necessary to take into account the approaches applied in the countries of the Eurasian Economic Union [19].

The environment and economic analysis of theoretical provisions, the estimation and methodological tools of the Methodology proposed by the Ministry of Natural Resources and Environment of Russia was carried out. In particular, the estimation of the amount of environmental damage caused by air pollutants (Section 3 of the Methodology) of 1, 2, 3, 4 classes of hazard, NOx, CO, benz (a) pyrene, as well as hydrocarbons and other substances with the determined reference impact safe level (RSIL) in the air of populated areas was performed.

Also, calculations of the amount of damage caused to the environment by air pollution as a result of combustion at waste disposal sites, including landfills, temporary waste storage sites and unauthorized landfills (Section 4 of the Methodology), as well as as a result of agricultural burning (Section 5 of the Methodology) were performed.

The special attention is paid to the verification of examples of calculations on the amount of damage, given in Appendix 2 of the Methodology.

3. Results and discussion

The methodology harmoniously fits into the accepted and applied to date list of methodological support for assessing damage from pollution of water [9], soil [10], forests [7], aquatic biological resources [11], wildlife [8], hunting resources [12], etc. Paragraph 4 of the Methodology takes into account the biological cycle of substances (pollutants) in nature.

Section 1 states that the Methodology “is designed to estimate the damaged caused to the environment by air pollution in monetary terms ... including natural disasters, ..., accident and emergency situations of natural and industry-related nature ...”. In our opinion, for such cases a separate section with appropriate calculation support is needed.

Section 2 contains the provisions for calculating the weights of pollutant emissions that are taken into account when calculating the amount of damage caused to the environment by air pollution. The formulas given in this section, in our opinion, duplicate each other. If the subject of economic activity does not have a special permit and the established norms of MPE and/or TDP, the value indicator of the standard in formula (1) is not automatically taken into account and equated to zero. The distinction between formulas (1) and (2), in our opinion, is not necessary, because formula (1) and the indices written under the formulas are repeated.

At the same time, in this section the procedure for calculating the weight of pollutant emissions by their concentrations, which is often used for these purposes, is not described here. It is necessary to supplement this section of the Methodology with formulas, or to make exact references to regulatory sources.

The Methodologies also should take into account the need to stimulate the transition of enterprises of the fuel and energy complex to the best available technologies [20].
Figure 2 shows the results of calculations on the amount of specific damage caused to the environment by air pollution, performed in accordance with the formula from Section 3 of the Methodology.

Figure 2. The calculated amount of damage per 1 tonne of pollutants (for cases of serviceable operation, or for gas cleaning installations not included into the design documentation, or for failure or non-use (disconnection)) or for gas purification installations not included into the design documentation), rubles.

Section 4 contains the rules for calculating the amount of damage caused to the environment by air pollution from combustion at waste disposal sites, including landfills, temporary waste storage sites and unauthorized landfills.

As shows the calculation according to formula (4) of the Methodology, the specific damage for one tonne of burnt waste in prices of 2018 will be 81 000 rubles.

Section 5 regulates the calculation of the amount of damage caused to the environment by air pollution as a result of agricultural burning.

According to formula (6), in the prices of 2018, the damage from 1 square meter of agricultural burning will be 2 rubles. This value, in our opinion, even taking into account the real areas of agricultural burnings, is understated.

Appendix 1 of the Methodology, containing fees for calculating the amount of damage, in our opinion, generalizes the force of exposure to pollutants, that results in the average damage values.

Appendix 2 of the Methodology provides examples of calculating the amount of environmental damage caused by air pollution. At the same time, in the calculation examples for the faulty gas cleaning equipment a cleaning factor, which does not correspond to the coefficient from paragraph 14 of the Methodology, is applied. In addition, in this Appendix, in the calculation examples the fee for calculating the amount of damage caused by the excess emission for nitrogen dioxide NO₂ and sulfur dioxide SO₂ does not correspond to the values given in Appendix 1 of the Methodology.

4. Conclusions

The study of the theoretical part of the Methodology proposed by the Ministry of Natural Resources and Environment of Russia, as well as the implementation of calculation procedures according to the basic formulas from the Methodology, made it possible to conclude that the methodology is relevant and necessary. But, at the same time, it needs to be corrected and refined.
First, it is necessary to devote a separate section to the calculation of the amount of damage caused to the environment by air pollution due to incident and emergency situations.

Second, Section 2 of the Methodology should be corrected: to eliminate duplications in formulas (1) and (2), and also to supplement this section with the provisions for calculating the weight of pollutant emissions by their concentrations.

Third, in Section 5, it is necessary to increase the fee per square meter of agricultural burning.

Fourth, in Appendix 1 it is necessary to structure the fee rate in more detail depending on the harmful substances, which would allow for more differentiated calculations.

Fifth, in Appendix 2, it is necessary to adjust the applied coefficients for compliance with the main text of the Methodology.

In general, the adoption of the Methodology proposed by the Ministry of Natural Resources and Environment of the Russian Federation for calculating the amount of damage to the environment caused by air pollution will help to make significant progress towards the construction of an integral system of compensation for damage caused by violations of legislation in the field of environmental protection.

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