

Expert Forensic Environmental and Soil Investigation in the Administration of Justice

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Received December 16, 2022; revised February 21, 2023; accepted March 1, 2023

Abstract—This paper analyses the problems of identifying the factual circumstances of environmental disruptions of soils, presents examples from judicial practice, and shows the possibilities of using special knowledge when considering the cases related to the negative anthropological impact on soil objects. Observation, analysis, synthesis, description, and comparison are used in the research. The need for wider application of forensic examination of geological evidence in the administration of justice is substantiated. The most effective and science-based form of using the special knowledge is forensic environmental examination and, in particular, geological evidence examination or forensic ecological soil examination. Expert examinations of this sort are actively carried out in the Russian Federal Center of Forensic Science of the Ministry of Justice of the Russian Federation and in the Forensic Expert Center of the Investigation Committee of the Russian Federation. An example of the comprehensive forensic environmental examination is given. Proposals are made to expand the range of persons involved in the forensic ecological soil examinations.

Keywords: soil objects, forensic ecological soil examination, law-enforcement practice, and negative impact on soil objects

DOI: 10.3103/S0147687423020084

INTRODUCTION

A trend toward land and soil deterioration is consistently observed in almost all regions of Russia. Increasing land and soil degradation is one of the internal challenges to the Russia's environmental security, and the prevention of this degradation process is one of the major objectives outlined in the Ecological Safety Strategy of the Russian Federation for the period of up to 2025 that was approved by the Decree of the President of the Russian Federation no. 176 dated April 19, 2017.

The legal views of the Supreme Court of the Russian Federation, subject to consideration by the courts under criminal, civil, arbitration, and administrative proceedings related to violation of environmental-protection legislation, are defined in

(1) Decree of the Plenum of the Supreme Court of the Russian Federation no. 21 dated October 18, 2012, "On Applying by the Courts the Legislation on Liability for Violations in the Field of Environmental Protection and Nature Management" (as amended on December 15, 2022);

(2) Decree of the Plenum of the Supreme Court of the Russian Federation no. 49 dated November 30, 2017, "On Certain Issues of the Application of Legis-

lation on Compensation for Damage Caused to the Environment"; and

(3) Review of the Practical Application of the Environmental Protection Legislation approved by the Presidium of the Supreme Court of the Russian Federation on June 24, 2022.

Paragraph 11 of the Review dated June 24, 2022, of the Supreme Court of the Russian Federation formalized an important legal opinion: the excessive concentration of a substance not included in the List of Polluting Substances in the soil compared with the concentration of this substance in the adjacent area with a similar purpose and type of use can be indicative of the damage done to the environment.

In illustrating this provision, the court indicated that the plaintiff (Department of the Federal Service for Supervision of Natural Resources) proved the fact of soil pollution as a result of the defendant's (pipeline owner) production activities, because the analysis of soil samples made it possible to reveal the excess of oil products over the background samples by 32 times and that of chloride ions by 175 times; in other words, a negative impact was found on lands and soils. To calculate the damage, we used the Procedure for Estimating the Damage Caused to Soils As an Environmental

Protection Object approved by order of the Ministry of Natural Resources of Russia no. 238 dated July 8, 2010, "On Approval of the Procedure for Estimating the Damage Caused to Soils as an Environmental Protection Object" (as amended on November 18, 2021) (hereinafter, "Procedure no. 238").

The absence of chloride ions in the List of Pollutants Subject to State Regulation Measures in the Field of Environmental Protection approved by the Decree of the Government of the Russian Federation no. 1316-r dated July 8, 2015, does not exclude the negative impact of the specified chemical element on the environment status. Adverse environmental consequences can occur after a long time, while being complex in nature, having a negative impact on several components of the natural environment simultaneously. Meanwhile, the person responsible for damage is not deprived of the right to provide evidence that the entry of such substance into the soil does not lead to changes in the soil's physical and chemical composition and does not cause the general ecosystem imbalance and losses.

Subsequently, when considering another case on the recovery of damage caused to soil, the Judicial Collegium for Economic Disputes of the Supreme Court of the Russian Federation, (Decision of the Judicial Collegium for Economic Disputes of the Supreme Court of the Russian Federation no. 309-ES22-3206 dated September 29, 2022, on case no. A50-23706/2020) granted the claim of the plaintiff (the Department of the Federal Service for Supervision of Natural Resources), because it proved that the chemical company caused damage to the soil as a result of sewage leakage and exceeding the maximum permissible concentrations: the potassium background was less than 39 mg/kg, and the excess was 16.6 times; the sodium background was less than 23 mg/kg, and the excess was 1725 times; the calcium background was 150 mg/kg, and the excess was more than 13.3 times; and the chloride-ion background was 408 mg/kg, and the excess was 57.8 times.

In both cases, the court independently declared that the enterprises that exerted an anthropogenic impact on soils had the right to provide evidence in support of their objections, which would make it possible to substantiate the conclusion that the entry of controversial substances into the soil, taking into account their content and concentration, did not lead to negative changes in the soil's physicochemical composition, as well as evidence that the soil pollution was allowed by other persons and did not result from their economic activity. Obviously, under such circumstances, the forensic expert solution of such problems as the characterization (determination of properties) of anthropogenic impact on soils in time and space and finding out of such impact process can be of decisive importance in the court decision. When a petition for an expert examination is filed by an interested per-

son (the courts are limited in their right to call for an expert examination on their own initiative), it is necessary to take into account the procedure for scheduling the expert examination in the course of legal proceedings.

In accordance with *GOST* (State Standard) R 58081-2018, environmental damage is a negative change in an environmental object caused by anthropogenic impact on it as a result of economic and other activities.

The need to improve the procedure for revealing and assessing the harm caused by violations of environmental requirements has long been on the agenda of the law enforcement practice. According to paragraph 3 of Article 77 of the Federal Law "On Environmental Protection" no. 7-FZ dated January 10, 2002 (hereinafter, "Law no. 7-FZ"), damage to the environment caused by a legal entity or an individual entrepreneur should be compensated in accordance with the duly approved rates and methods for assessing the damage to the environment, or, if such are absent, should be based on the actual costs for restoring the damaged environment taking into account the losses incurred, including lost profits.

Analysis of court decisions in the cases related to assessing the harm caused to the environment in terms of cost is indicative of the fact that the calculation of harm by an interested party in monetary terms is often based on environmental regulatory authorities, in support of claims when applying to the court, presenting final calculations based precisely on the approved methods. In addition, nonstate experts involved in the corresponding calculations during the forensic environmental examination are also guided by these methods. For example, when making one of its decisions, the Supreme Court of the Russian Federation, assessing the arguments of the cassation appeal applicant, checked the calculated damage resulting from the storage of fourth- and fifth-hazard-class waste (respectively, "fresh cattle manure" and "rotted cattle manure") on an open soil surface. This calculation was made by the plaintiff (Territorial Department of the Federal Service for Supervision of Natural Resources) on the basis of Procedure no. 238 and was recognized by the court as correct (Decision of the Supreme Court of the Russian Federation no. 308-ES22-8330 dated June 6, 2022, on case no. A32-7792/2021). In another case related to excessive concentrations of pollutants (petroleum products, Ni, Pb, and Fe) due to the placement of snow, waste from cleaning streets and roads, the court also verified the soil pollution damage calculated by the Territorial Department of the Federal Service for Supervision of Natural Resources in accordance with the specified Procedure no. 238 (Decision of the Supreme Court of the Russian Federation no. 301-ES21-11007 dated July 19, 2021, on case no. A79-401/2020). In the decisions on forensic environmental examination, the

courts can also raise the issue of assessing the damage caused to soils in monetary terms to the expert, precisely in accordance with the Procedure no. 238 (for example, Decision of the Moscow Arbitration Court dated September 16, 2022 on case no. A40-232064/21).

The damage caused by an environmental offense is assessed by plaintiffs based on various estimations of the damage caused to various environmental objects. Along with dangerous hydrometeorological and geological phenomena, soil and land quality can decrease due to the anthropogenic impact. The correlation of a number of classifying signs of such anthropogenic impact with the existing economic activity consequences makes it possible to assess this impact as negative or positive. For example, an increase in soil-cover degradation and soil-cover pollution by heavy metals, oil products, and other harmful substances, as well as a decrease in the soil (ground) fertility level compared with corresponding characteristics of the soil cover on land plots adjacent to the area in question, are indicative of environmental damage. Specifying the negative impact of human economic activity on the soil cover; its characteristics, sources, processes, and scale; and measures to restore the damaged environment, as well as assessing the damage caused, are the main tasks that experts have to face when performing the soil environmental research during legal proceedings.

The impact of economic activity on soil objects is studied in the course of a soil–ecological land survey, which, in turn, consists of soil–environmental assessment procedures. The term “soil–environmental assessment,” for the purposes of regulating the property and other economic relations and disputes, including those resolved in the court, is defined as a range of special field and laboratory studies conducted by soil scientists to determine the soil status on a particular land plot, its resource characteristics, and risk posed to human health, as well as risks that reduce the quality of related environmental components (water, air, and biota) (*GOST* (State Standard) R 58081-2018).

Ten years ago, a forensic environmental expert examination has rarely been carried out to resolve the issue of presence or absence of environmental damage (Omel'yanyuk, Mikhaleva, 2012). However, already 8 years later, we could observe an increase in the number of forensic environmental expert examinations called for by the arbitration courts in various Russian regions in the cases of compensation for harm (damage) caused to environmental objects as a result of environmental offenses; in addition, special environmental knowledge was more often used in the legal proceedings (Mikhaleva, 2020).

The main legislative act that defines the legal framework, principles of organization and main directions of state forensic activities in the Russian Federa-

tion in civil, arbitration, administrative, and criminal proceedings is the Federal Law “On State Forensic Activities in the Russian Federation” no. 73-FZ dated May 31, 2001 (hereinafter, “Law no. 73-FZ”).

The forensic ecological examination does not apply to the types of forensic expert examinations carried out exclusively by state forensic organizations (Decree of the Government of the Russian Federation no. 3214-r dated November 16, 2021). Therefore, the forensic soil–environmental research in the course of legal proceedings can be carried out by both state forensic experts and outsourced experts with the special knowledge in the relevant fields of science (Article 41 of Law no. 73-FZ). This paper is devoted to the potential for using expert forensic ecological investigation of soil objects in the legal proceedings.

MATERIALS AND METHODS

The study was carried out using examples from judicial and expert practice related to expert soil and environmental research, as well as methods such as observation, analysis, synthesis, description, and comparison.

RESULTS

Compensation for damage caused to soils is often carried out on the basis of court decisions. Law-enforcement practice has an experience of claim dismissals in cases in which violations were made during the inspection and registration of its results, as well as when not all instances of environmental violation have been proven. For example, the Arbitration Court has refused to satisfy claims that had been laid out, taking it into account that the defendant did not violate the legislation in the field of environmental protection by his actions and did not cause harm to the environment, while the plaintiff did not prove that there were grounds for recovering damages from the defendant (Omel'yanyuk, 2012).

This paper is focused on typical situations from judicial practice on cases related to the negative impact on soil objects, as well as on the possibility of using expert examination results obtained for the above-mentioned objects in the administration of justice.

Mechanical disturbance of the soil cover is a negative change in the initial soil structure as a result of anthropogenic impact, which can include removal and/or mixing of soil horizons and their parts, as well as soil deformation, redeposition, and movement (*GOST* (State Standard) R 58081-2018).

An example is given below concerning the Arbitration Court's decision on a case related to mechanical disturbance of the soil cover and a decrease in soil fertility as a result of removal and mixing of a fertile soil layer with underlying horizons.

The Department of the Federal Service for Veterinary and Phytosanitary Surveillance applied to the Arbitration Court with a statement of claim against a closed joint-stock company for the recovery of 1450000 rubles as compensation for damage caused to agricultural land. The claim was satisfied by the court's decision. This decision was left unchanged by the Court of Appeal. The Court of Cassation left the adopted judicial acts unchanged for the following reasons.

The inspection made it possible to reveal destruction of the fertile-soil layer on the land plots as a result of removal and mixing of a fertile-soil layer with underlying horizons during installation of a gas pipeline on the agricultural land plots by the closed joint-stock company. The closed joint-stock company did not have a permit for removal and relocation of the fertile soil layer, as well as a land-plot reclamation plan.

The closed joint-stock company was held liable under Part 2 of Article 8.6 of the Code of Administrative Offenses of the Russian Federation for the destruction of the fertile soil layer, and the director was held liable under Part 1 of Article 8.7 of the Code of Administrative Offenses of the Russian Federation for failure to fulfill the obligation to reclaim the land in the course of construction and other work.

The subordinate organization of the Federal Service for Veterinary and Phytosanitary Surveillance carried out an expert study of soil samples at the site under consideration. The expert examination results are indicative of a significant decrease in soil fertility on the land plots where the gas pipeline was installed.

The courts found out that the violation by the closed joint-stock company was confirmed by the case files.

The courts verified and recognized as lawful the damage calculation carried out using the Procedure no. 238.

The closed joint-stock company's argument about imposing on it the obligation to compensate for harm in both kind and cash was rejected by the courts on the basis of the following. The norms of paragraph 1 of Article 77 of the Federal Law "On Environmental Protection," paragraph 1 of Article 1064 of the Civil Code of the Russian Federation (hereinafter, "Civil Code of the Russian Federation"), and paragraph 1 of Article 76 of the Land Code of the Russian Federation provide for the legal entity's obligation to fully compensate for the damage caused as a result of offenses it committed. According to Article 15 of the Civil Code of the Russian Federation, full compensation for harm is understood as a compensation for losses as both real damage and lost profits.

There is no evidence that the closed joint-stock company took measures to reclaim the disputed land plots.

According to Decree of the Government of the Russian Federation no. 800 dated July 10, 2018, "On

Land Reclamation and Conservation," land reclamation is carried out at the expense of a legal entity in the case of law violation. This reclamation can be recognized as completed only if approved land-reclamation projects are in place. Land reclamation is carried out by legal entities at their expense on the basis of reclamation projects subject to development and approval even before the fertile-soil removal.

Hence, disturbed-land restoration, elimination of the consequences of environmental legislation violations, and compensation for harm caused by this violation are independent actions directly provided for by the law.

An example is given below concerning the Arbitration Court's decision on a case related to mechanical disturbance of the soil cover and a decrease in soil fertility as a result of soil littering.

The Department of the Federal Service for Supervision of Natural Resources applied to the Arbitration Court with a claim against a limited liability company for the recovery of 36 123 000 rubles for damage caused to soils. The court recovered the damage in full from the limited liability company. The Court of Appeal upheld the decision in connection with the following.

It was found in the course of inspection of the underwater lines constructed by the limited liability company for the oil company that the oil-producing company and the limited liability company entered into a work contract under which the limited liability company constructed the underwater gas pipelines by directional drilling across the rivers. The Department conducted a full-scale inspection of the underwater gas pipeline across the river. According to the inspection results, drill cuttings were placed near the river and along the forest.

The specialist of the Center for Laboratory Analysis and Technical Measurements in the Federal District (CLATM) carried out sampling directly on the terrain in the water-protection zone of the river. Then, the taken samples were studied in the same CLATM. According to the study results, these samples were drill cuttings and could be classified as fifth-hazard-class waste. In addition, sampling was carried out in the water protection zone of the river. Based on the study in the above-mentioned CLATM, they were also drill cuttings and could be classified as the fifth-hazard-class waste.

In accordance with paragraph 1 of Article 1064 of the Civil Code of the Russian Federation, the damage caused to the legal entity's property should be subject to compensation in full by the entity who caused this damage.

Due to the fact that compensation for damages is a measure of civil liability, it can be applied only if the law provides for the liability terms.

According to the approved rates and methods, the compensation for damage caused to the environment is an increased property liability provided for by the

civil law, which is specified taking into account not only material, but also environmental damage caused to the natural environment.

The fact of causing harm to soils by unlawful actions of the defendant in the amount claimed by the plaintiff was proved.

The limited liability company disputed the issue of waste disposal on the disputed land plot: it insisted that the drilling-waste location directly under the "open sky" was provided for by the project documentation. Due to the fact that this waste was placed on the land plot in accordance with the project, the defendant assumed that there were no violations that could have given rise to damage-compensation liability.

However, the project documentation does not provide for the possibility of free disposal of waste under the open sky. On the contrary, the design documentation directly provides for drilled-soil redirection into waste pits. The case files do not contain the information that the indicated requirement of the limited liability company's project was complied with.

That drilling waste was placed directly on the terrain in the water-protection zones of rivers was confirmed by the field-inspection report, expert-sampling protocols, and study results obtained by the CLATM.

It also follows from the Court of Appeal's decision on another case that the limited liability company allowed the open storage of production waste on the terrain in the water protection zone of the rivers; this production waste was formed in the process of directional drilling for the construction of underwater lines. These circumstances are indicative that the applicant failed to show due care and diligence in the performance of works. Alongside with that, no evidence indicating that the limited liability company took comprehensive measures to comply with the environmental legislation requirements in the manner prescribed by the law was presented in the case files. The amount of waste placed was calculated according to Procedure no. 238.

According to the design documentation for directional drilling across the rivers, the total generated waste is 3040 m³, which is 5016 t at the waste density of 1.65 t/m³ specified by the working documentation. Taking into account these parameters, the damage comes to 36 123 000 rubles.

According to the limited liability company, the damage was unlawfully calculated by the plaintiff based on the waste weights specified in accordance with the working documentation for capital construction projects, whereas the actual weight of the disposed waste should have been taken as a basis. Instrumental measurements of the actual weight were not carried out. However, insisting on the need to measure the actual waste weight, the limited liability company did not take measures to carry out such measurements. It did not report the volume of drilled soil placed on the construction site in the inspection period.

The limited liability company's reference to the absence of harm to the environment as degradation of natural ecological systems and depletion of natural resources and, thus, to the absence of grounds for the recovery of damage from it, was rejected. In this case, the basis of compensation for environmental damage is the very fact of violation of requirements for handling hazardous waste. This violation entails the depletion of natural resources due to specific features of the object of civil rights such as natural resources.

An example is given below concerning the Arbitration Court's decision on a case related to soil pollution as a result of an oil spill.

The Department of the Federal Service for Supervision of Natural Resources filed a lawsuit against an open joint-stock company for the recovery of damage caused by soil pollution by oil products as a result of a crude-oil spill. The recovery amounted to 23961600 rubles. The claim was dismissed by the Arbitration Court's decision. The Court of Appeal upheld the decision on the following grounds.

The Department received the information about the crude-oil spill from the oil pipeline. The open joint-stock company was the oil-pipeline owner. It was found during the inspection of the accident site that the crude-oil volume released to the soil surface was 9.8 m³ and the area of pasture-land pollution was 0.3 ha. The CLATM specialists took samples at the accident site. Soil-assay protocols were drawn up based on the laboratory study results.

The damage was estimated at 23961 600 rubles by a soil-assay analysis based on Procedure no. 238.

The Court of the First Instance found that the defendant did not dispute the fact of causing degradation and damage to the soil on the land plot.

Article 1082 of the Civil Code of the Russian Federation and Article 78 of Law no. 7-FZ provides for two ways to compensate for the environmental damage: recovery of losses in cash and compensation for damage in kind by taking measures to restore the disturbed state. Environmental-damage compensation should be based on the principle of equivalence taking into account the type and volume of negative impact on the environment.

According to the law, each of these methods is sufficient to compensate for harm. Therefore, the damage caused to the natural environment is compensated in kind by restoring its disturbed state and there are no grounds for additional collection of monetary amounts to compensate for damage.

The regulatory acts provide for special methods of environmental-damage compensation in kind. In particular, for restoration purposes, disturbed lands are reclaimed. The land reclamation is carried out at the expense of legal entities' own funds in the case of violation of the law (Decree of the Government of the Russian Federation "On the Land Reclamation and

Conservation” (as amended on March 7, 2019) no. 800 dated July 10, 2018). In this case, the reclamation can be recognized as completed only if the approved land-reclamation projects are in place. Lands disturbed during the liquidation of the land-pollution consequences are subject to reclamation.

As can be seen from the case file, the defendant presented the evidence of a number of measures to eliminate the accident consequences.

The following materials were submitted as evidencing that the defendant fulfilled the corresponding measures to localize the accident consequences: contracts, local budget calculation for biological land reclamation, soil utilization completion certificates, an agreement on the transfer of a land plot for temporary use to eliminate the accident consequences with compensation for agricultural production losses, a letter of work plan coordination with the land plot owner, a letter of approval for soil removal, a letter of hummus supply coordination with the land plot owner, a reclaimed land acceptance-and-delivery certificate, and project documentation.

Under such circumstances, the court came to the correct conclusion that the damage caused to the soil by the oily liquid spill was compensated by the open joint-stock company on a voluntary basis by restoring the disturbed environment at its own expense confirmed by the case files.

In addition, the Court of Appeal took into account the fact that the open joint-stock company submitted the land plot survey report drawn up with the participation of the head of the Department of Agriculture, Environmental Protection, and Nature Management of the District Administration, the land plot owner, and OJSC representatives. According to this report, engineering and biological reclamation works were completed. Oil-contaminated soil was removed and carried away, bulky manure was brought in and arranged, and alfalfa was sown, there were uniform seedlings in the reclaimed area, no oil films were found in the puddles, and no plant inhibition was detected. The commission came to the conclusion that the work quality was satisfactory, and it was possible to use the land for its intended purpose. In this case, based on the soil-study results, the court recognized the environmental-damage compensation in kind as sufficient.

DISCUSSION

Analysis of judicial acts and expert practice made it possible to reveal that the forensic ecological examination aimed at resolving the issue of presence or absence of environmental damage is not carried out in most cases. Another problem is that subordinate institutions of the Federal Service for Supervision of Natural Resources (primarily the CLATM in different federal districts) are often involved in the sampling of

soil objects and in the expert examination. In this case, the defendant can question the lack of interest of forensic experts and the reliability of their research results, because departments of the Federal Service for Supervision of Natural Resources apply to the courts with claims for environmental-damage compensation.

For the purpose of assessing damage caused to the environment, first of all, it is necessary to find out the fact of damage infliction, as well as a number of factual circumstances, including a causal relationship between the economic entity’s activities and the damage caused to environmental objects.

When applying the above-mentioned rates and methods for assessing the damage, it is not possible to determine such circumstances. It is one of the negative aspects of using damage-calculation rates and methods. The second negative point is that the damage calculated using such methods often does not correspond to the scale and nature of the actual environmental damage (Omel’yanyuk and Mikhaleva, 2012).

It should be noted that, in an increasing number of countries, the actual environment-recovery costs are becoming at present the basis for assessing the damage caused to the environment (Yazhlev, 2006).

In this connection, it is expedient to use special knowledge, first of all, to commission a forensic examination to assess the damage caused to the environment by an environmental offense and to specify the recommendations for the elimination of identified violations (Omel’yanyuk and Mikhaleva, 2012).

As mentioned above, the anthropogenic impact on soil objects is studied, among other things, under legal proceedings in the process of forensic ecological examinations commissioned by the courts, which are entrusted to state forensic experts and other experts from among persons with the special knowledge.

The most actively developing forensic environmental examinations performed in the forensic institutions of the Ministry of Justice of Russia include the “Study of the Ecological Status of Soil Objects” and “Study of the Ecological Status of Environmental Objects in Order to Determine the Restoration Cost” (Order of the Ministry of Justice of Russia no. 237 dated December 27, 2012).

When studying the ecological status of soil objects, the experts of forensic institutions (FIs) of the Ministry of Justice of Russia apply the relevant methodological recommendations for the forensic ecological investigation of these objects (Omel’yanyuk et al., 2009). This method is intended for the forensic-ecological expert examination of soil objects in order to find out the source, process, characteristics, scale, and actual circumstances of anthropogenic impact on them. The study of the ecological status of soil objects is understood as a range of actions carried out in the form prescribed by the law by persons with special knowledge in the field of ecology, soil science, and related natural sciences, who give an opinion on the

issues related to the study of anthropogenic impact on soil objects.

On the basis of the conducted studies, after solving certain diagnostic and identification tasks, an expert on his own behalf or an expert commission gives a written opinion and signs it. Requirements for the content of the expert or expert commission opinion are contained in Article 25 of Law no. 73-FZ, as well as in the relevant articles of procedural laws.

The expert-opinion content is presented in Article 25 of Law no. 73-FZ. If the expert opinion does not contain at least one of the provisions indicated in the above-mentioned article, it can be recognized as inadmissible evidence. For example, in one case, the expert opinion that the judicial act was based on was recognized as inadmissible evidence, because it was not signed by the expert. In addition, it did not indicate the expert examination time and place and did not record study objects and case files submitted to the expert (Decree of the Arbitration Court of the Volga-Vyatka District no. F01-1688/2016 dated May 31, 2016, on case no. A43-20857/2014). Therefore, when preparing the expert opinions on the cases involving damage to environmental components, it is recommended that special attention be paid to the procedural aspects of processing such documents.

An example is considered below concerning the expert opinion on the criminal case initiated on the grounds of a crime under Article 246 of the Criminal Code of the Russian Federation "Violation of the Environmental Protection Rules in the Course of Work" (Vlasova et al., 2017).

The following questions were posed to the experts.

(1) Was the soil cover of the land plot located at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir, subjected to negative anthropogenic impact as a result of land works? If yes, what was it expressed in?

(2) Was the biocenosis of the land plot located at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir, subjected to negative anthropogenic impact as a result of land works? If yes, what was it expressed in?

(3) Were M. water reservoir and water bioresources on the land plot located at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir, subjected to negative anthropogenic impact as a result of land works? If yes, what was it expressed in?

(4) Were the environmental components of the land plot located at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir, subjected to negative anthropogenic impact as a result of land works? If yes, what was it expressed in, and was this harm significant from an environmental point of view?

(5) Was there a causal relationship between land works carried out at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir, and deterioration of the ecological state of M. water reservoir and the adjacent area?

(6) Is it possible to restore the original state of natural environment objects disturbed as a result of land works at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir? If yes, what recultivation measures need to be carried out for this purpose?

The comprehensive expert examination provides for the participation of experts who have the right to independently conduct a forensic examination in three expert specialties: 24.1 "Study of the Ecological Status of Soil Objects," 24.2 "Study of the Ecological Status of Natural and Artificial Biocenoses," and 24.5 "Study of the Ecological Status of Water Bodies." The expert examination was carried out by both standardized methods (*GOST* (State Standard) 26423-85, 26213-91, and 26207-91) and methodological recommendations for forensic environmental investigation of soil objects (Omel'yanyuk et al., 2009). In addition, the forensic examination involved literature sources and legal acts.

Initially, the expert commission certified in three expert specialties studied the criminal case files submitted for examination; then, an expert examination of the accident scene was carried out with sampling of environmental objects; and, then, laboratory studies of the selected samples were carried out.

The next stage was discussion of the results obtained during the expert examination and statement of the following conclusions.

(1) As a result of land works, the land plot located at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir, was subjected to negative anthropogenic impact on the soil cover. It was expressed in mechanical damage to the soil cover in the area of at least 7350 m², blocking by a piled-up soil brought out from pits and brought-in ground in the area of at least 3350 m², and flooding of the area of at least 4000 m², which contributed to swamping of the adjacent area and a significant drop in the soil fertility.

(2) On the land plot located at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir, as a result of land works, the biocenosis was subjected to a negative anthropogenic impact as destruction of the original vegetation cover in an area of at least 7350 m², partial destruction of the population of rare (and Red Book) plant species, and dramatic deterioration in the growing conditions of the remaining population.

(3) On the land plot located at T. Region, N. District, and K. Settlement, near V. horticultural non-

profit partnership and M. water reservoir, as a result of land works, M. water reservoir and water bioresources were subjected to a negative anthropogenic impact as changes in the hydrological conditions due to moving of the original coastline by more than 100 m up the terrain, formation of stagnant areas near the coast, and development of stagnant phenomena in the areas adjacent to the changed coastline.

(4) On the land plot located at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir, as a result of land works, the damage was caused to natural environment components such as the Volga River, soil, vegetation, and aquatic biological resources. This damage led to changes in the hydrological conditions of the area under consideration and water area, soil degradation, and deterioration of vegetation conditions and aquatic biological resources. This damage was significant from an environmental point of view.

(5) There is a causal relationship between land works carried out at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir, and deterioration of the ecological status of M. water reservoir and the adjacent area.

(6) It will take a long time (more than 5 years) to restore the original state of natural environment objects disturbed as a result of land works at T. Region, N. District, and K. Settlement, near V. horticultural nonprofit partnership and M. water reservoir. For this purpose, it is necessary to carry out a range of reclamation activities listed in the expert's opinion.

Under the comprehensive examination, the conclusions on issues nos. 4–6 were stated by experts certified in three expert specialties.

The FI experts of the Ministry of Justice of Russia specializing in forensic ecological examination do not assess the harm (damage) according to available methods, but they determine the cost for restoring the specific disturbed environmental objects. In this case, it is important to carry out the expert inspection of disturbed environmental objects at their location in order to improve the calculation objectivity, accuracy, and reliability (Mikhaleva, 2020).

When calculating the costs for restoring the disturbed environment, the experts justify in each specific case the choice of one or another cost-calculation method or a range of methods. The cost-based approach is a basic method to determine the cost for optimum restoring of the environmental component harmed as a result of negative anthropogenic impact.

The importance and main directions for improving the methodological support of forensic ecological examination was already repeatedly indicated in the scientific literature. Due to the fact that the damage calculated according to rates and methods often does not correspond to the scale and nature of the actual damage to the environment, it is necessary to develop the methodological materials with regard to forensic

methods, rather than the methodological recommendations for all types of forensic environmental examinations (Mikhaleva, 2022).

CONCLUSIONS

Based on the generalization and analysis of judicial and expert practice, we substantiated the need for a wider application of the forensic examination of soil objects in the administration of justice. The most effective and evidence-based form of using the special knowledge is a forensic environmental expert examination, first of all, “study of the ecological status of soil objects” or forensic ecological soil examination. The state forensic examination institutions actively involved in these examinations include the Russian Federal Center of Forensic Science of the Ministry of Justice of the Russian Federation and the Forensic Expert Center of the Investigative Committee of the Russian Federation. To expand the circle of persons involved in the forensic environmental and soil-science expert examination, it is proposed to carry out the following activities.

(1) Voluntary certification of the competence of forensic experts in the field of forensic ecological soil examination in the voluntary certification system developed by the Russian Federal Center of Forensic Science of the Ministry of Justice of the Russian Federation.

(2) Creation of a register of certified forensic experts in the field of forensic ecological soil examination on the website of the Federal Chamber of Forensic Experts developed by subordinate institutions of the Ministry of Justice of Russia.

(3) Informing judges and other law enforcers on the possibilities of forensic ecological soil examination, in particular, on forensic experts in this field certified in the voluntary certification system developed by the Russian Federal Center of Forensic Science of the Ministry of Justice of the Russian Federation, including sending of information letters, giving of lectures for investigators and judges, and other joint events.

(4) Sending of petitions to the persons commissioned the forensic ecological soil examinations in the Russian Federal Center of Forensic Science of the Ministry of Justice of the Russian Federation on involvement of forensic experts certified as freelance forensic experts by the Federal Chamber of Forensic Experts in the field of forensic ecological soil examination.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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Translated by E. Maslennikova