

Impact of Waste on Pollution of Agricultural Areas

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Abstract—Land plays an important role as the main means of production. Soil as an element of the human environment is of great importance, since soil quality affects human health and living conditions. In the Russian Federation, much attention is paid to improving the efficiency of agricultural land use. This category of land is important for the country's food security, protection of vital interests and rights to a safe natural environment for present and future generations. Currently, there is a reduction in the area of agricultural land. This is due to the alienation of agricultural land for non-agricultural needs, as well as a number of negative factors affecting the state of agricultural land. The growing trend towards a reduction in agricultural land and pastures due to waste pollution, erosional land degradation processes, a decrease in the content of humus in soils, an increase in pollution of surface and groundwater negatively affects the quality and productivity of agricultural crops. The article analyzes the level of waste generation and their impact on agricultural land. The authors studied land legislation, in particular, in relation to agricultural land, which have a special legal regime as subject to special protection to preserve not only their territories, but also to prevent the development of environmentally unfavorable processes caused by technogenic impact and irrational actions of environmental management. Properly organized monitoring of the dynamics of changes in the area of land plots, including irrigation, is important.

Keywords—*agricultural land, production and consumption waste, pollution, environment*

I. INTRODUCTION

It is known that 15% of the territory of Russia, where most of the population, production and the most productive agricultural land are concentrated, is unfavorable in terms of environmental parameters. The total area of contaminated land in circulation is about 75 million hectares. The area of disturbed

land that has lost its economic value or has a negative impact on the environment is more than 1 million hectares. In most regions of the Russian Federation, the land and soil degradation is recorded, and half of the total area of farmland is subject to negative impacts that lead to degradation. These include not only natural phenomena (water and wind erosion, waterlogging, salinization, etc.), but also not meeting the deadlines for land reclamation, development of mineral deposits on the territory of against the background of cluttering territories with waste.

Russia is one of the countries that generate a large amount of waste. Despite a significant decline in production over the past decade, volume growth continues to grow. The reason is the outdated technology used in the enterprise. It is known that the amount of waste is an indicator of the perfection or imperfection of technologies in which waste is accumulated and not reused. A significant amount of land is alienated for waste disposal. About 15 thousand authorized waste disposal facilities cover an area of approximately 4 million square meters. This territory is growing by 300-400 thousand hectares annually. Such landfills do not have any serious sorting system on waste separation by composition and hazard class. Moving garbage from one landfill to another not only solves environmental problems, but also contributes to their scaling within the country, which in turn will force arable land and other agricultural land to “shrink”, use sown fields annually, leading them to the same desertification. In addition, the problem is also worsened by the fact that the middle zone of our country is, in General, a risky region for agriculture, and one of the ways to ensure risks is to expand the area of arable land and agricultural land, which may not be possible in the above case.

The problem of the technogenic impact of waste is urgent because as a result of the industrial development of territories, large areas of land were formed that are not suitable for further use. A large amount of production and consumption waste is

generated in the Russian Federation annually and their growth continues (Table I).

About 93%, or 5786.2 million tons, of all generated waste falls on the extraction of minerals. Manufacturing industries account for 4.4% of the total waste. The agriculture, forestry, hunting, fishing and fish farming is about one percent. During the study period, the ratio of production and consumption waste generation for various types of economic activity did not change [1].

TABLE I. DYNAMICS OF WASTE GENERATION IN THE RUSSIAN FEDERATION (2010-2018)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
Mln tons	3735	4303	5008	5153	5268	5060	5441	6221	7266

In addition, the problem is represented by the accumulated waste from past economic activities, according to various estimates, the total amount of such waste is from 38.1 billion tons to 90 billion tons. Part of the waste is neutralized and placed at enterprises, and part was disposal (Table II).

TABLE II. WASTE DISPOSAL DYNAMICS, 2010-2018 (ACCORDING TO ROSPRIRODNADZOR DATA)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
Mln tons	593	665	773	814	524	355	504	826	1029

Municipal Solid waste (MSW) is an additional environmental problem. In the country as a whole, the volume of MSW removed from the territory of urban settlements in 2018 amounted to 275.4 million m³, or 0.89% of the total amount of waste generated (according to Rosstat), it should be noted that for the period 2010-2018 the volume of MSW removed increased by 40 million m³ (16.9%).

II. PURPOSE OF THE STUDY

The main goal of the article is to study the peculiarities of the implementation of environmental legislation in matters of industrial waste disposal in certain rural areas of Russia in the conditions of modern overproduction and environmental pollution. With regard to the identified environmental problems of rural areas, this article formulates and consistently presents the processes of accumulation of production and consumption waste in various territories.

III. PROBLEM STATEMENT

The composition of the total land fund of Russia has been studied and the implementation of land legislation has been analyzed, its shortcomings have been identified and recommendations have been developed for the effective use of agricultural land in case of technogenic impacts on the environment.

According to the data of the Public Chamber of the Russian Federation, today in Russia, on average, from 4 to 7% of solid municipal waste from the total volume of generated MSW is processed (sorted and disposed of) [2]. Disposal of waste in illegal landfills is not only an environmental problem, but also makes it difficult to understand its scale due to the emerging gaps in the calculation of their annual volumes. So, according

to the same data of the Public Chamber of the Russian Federation, at the end of 2018, out of 30 garbage containers equipped with the ERA GLONASS system as part of the experiment, only 6 delivered garbage from Moscow to certified landfills.

According to the current legislation, waste is allowed to be disposed in which are included in the state register of waste disposal facilities, disposal of waste at facilities not included in this list is strictly prohibited. The State Register of Waste

Management Facilities includes about 3700 facilities. Of these, 1155 are MSW landfills [3]. As of June 1, 2019, about half of the landfills did not meet legal requirements and operated with violations (Fig. 1).

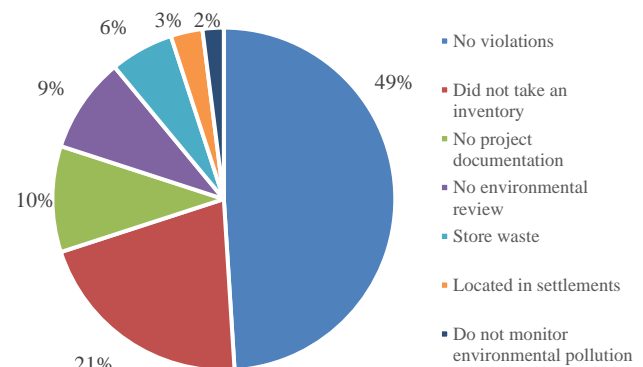


Fig. 1. Violations of MSW landfills, % (according to [2])

The most common violations include work without project documentation and without an environmental impact assessment. Most waste disposal sites lack any serious sorting system for separating waste by composition and hazard class, which suggests that garbage transported from one landfill to another not only does not solve environmental problems, but also contributes to their scaling up within countries. This, in turn, in the near future, will force arable land and other agricultural land to “shrink”, as well as use the sown fields annually, thereby leading to desertification.

IV. METHODS AND MATERIALS

The authors used the methods traditionally used to conduct research, jointed by a systematic approach. The study was carried out using the methods of graphical presentation of information, statistical data analysis, methods of classification, grouping and analysis of the dynamics of the studied processes were used.

V. RESULTS AND DISCUSSION

Urbanization has affected the environment and climate around the world. Currently, many research works are devoted to the influence of megacities on the chemical composition of the atmosphere and climate change. The Panel on Climate Change suggests that the mining, agriculture, deforestation and others are not the main sources of emissions, but not cities. Other sources claim that cities are responsible for 78-80% of global greenhouse gas emissions. Collectively, cities generate a higher percentage of emissions and contribute to global warming, as cities are concentrated in industries, power plants, transportation and landfills.

The global problems associated with environmental degradation and imbalance between nature and humans are reflected in the general epidemiological situation in the world. Over the past 100 years, humanity has been under constant attack by a number of infectious diseases inherent in the wild animal world. Diseases such as AIDS, EBOLA, SARS, bird flu and swine flu – are human infections that are caused by intervention in the life of wildlife. Today, a new COVID-2019 pandemic is raging in the world, which is unprecedented in its scale. The explosive growth in the incidence of coronavirus infection in the Wuhan province of the PRC in December 2019 – January 2020 forced states to reconsider their domestic policies and introduce paternalistic measures to protect their own epidemiological, economic and food security.

Initially, the restrictive quarantine measures introduced by many countries concerned the movement of tourists and foreign citizens across state borders. Gradually, as the threat of a pandemic rise, quarantine measures were tightened and turned into economic bans on the export of food raw materials. To support national economies, the leaderships of the countries introduced additional economic support measures for citizens and businesses.

The pandemic affects the environment in two ways. On the one hand, the shutdown of many factories, plants, mines and other polluting industries has a positive effect on the state of the environment. The air near industrial facilities becomes cleaner, water and surrounding areas are purified. On the other hand, the pandemic forces us to predatorily take away biological resources. Thus, there is a depletion of natural resources, the balance in nature is upset and the biosphere itself changes. These changes are delayed, they will be really noticeable after a certain period of time, so in present this problem is not posed acutely.

Accepting modern challenges, it is necessary to build new relationships between people and nature, as climate change and loss of biodiversity, declining soil fertility and shrinking soil areas threaten progress.

The existing problem of the effective use of agricultural land is most relevant in the context of the introduction of restrictive economics action sand a reduction in food supplies from foreign countries. The food security doctrine outlined the priority indicators of ensuring the state's food independence, which must be observed in light of the growing global threats. In this case, we should talk about the protection of human health and working capacity, about the realization of the human right to life and protection of vital interests and the right to a safe natural environment. In this situation, the land plays a key role, acting as the main means of production [4, 5]. The Earth's surface experiences the most significant anthropogenic load in terms of mass. According to T.A. Akimova and V.V. Haskin 1 billion tons of harmful substances (excluding CO₂) are emitted into the atmosphere, about 15 billion tons of pollutants are emitted into the hydrosphere, 85-90 billion tons of anthropogenic waste falls on the Earth's surface annually.

The legal system of land relations in the RF is based in accordance with the Constitution and the Land Code, federal laws, decrees of the Government of the Russian Federation, departmental normative legal acts and other acts of the subjects of the RF. Land legislation regulates the attitude to the use and protection of land in the Russian Federation. According to the current legislation, seven categories of land are distinguished in

the Russian Federation (Fig. 2).

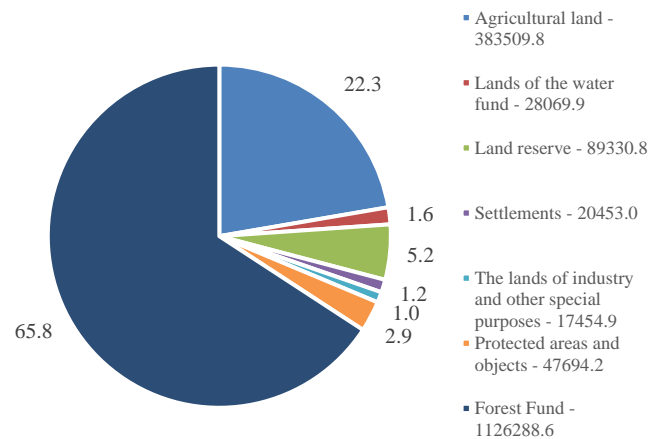


Fig. 2. The structure of the land fund of the Russian Federation by land categories, thousand hectares (based on the materials of the National report on the state and use of land in the Russian Federation in 2018)

According to Russian register of land funds as of January 1, 2019, the land fund within the administrative borders of the Russian Federation amounted to 1712.52 million hectares. Of the total area of the land fund, less than a quarter of the land is suitable for agricultural use (23.8%, or 407.5 million hectares of land, of which 383.2 million hectares are agricultural land and 24.2 million hectares are agricultural land from other categories of land) [6]. Dynamics of change in the area of agricultural land in 2010-2018 displayed in Table III.

TABLE III. DYNAMICS OF WASTE GENERATION IN THE RUSSIAN FEDERATION (2010-2018)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
Min hectares	393.4	386.1	386.5	386.5	385.5	383.7	383.6	383.2	383.5

During the study period, since 2010, the area of agricultural land has decreased by 2.6%. In 2017, compared to 2016, the area of this category of land decreased by 0.4 million hectares and amounted to 383.2 million hectares. The largest reduction in the area of agricultural land was noted in the Nenets Autonomous Okrug, Omsk Oblast, Kirov Oblast, the Republic of Bashkortostan, Ryazan Oblast, Yaroslavl Oblast and Amur Oblast.

Agricultural lands have a special legal regime and are subject to special protection in order to preserve their area, prevent degradation processes and increase soil fertility. Soil is the main means of agricultural production and belongs to non-renewable natural resources. At present, in the Russian Federation, much attention is paid to the issues of increasing the efficiency of the use of agricultural lands, since the lands of this category are of the highest importance in the context of their preservation [7]. This approach is based on ensuring the food security of the country's inhabitants. The problem of efficient use of agricultural land is very urgent. It is about the realization of the human right to life and the protection of vital interests and the right to a safe natural environment. The land plays a key role as the main means of production [8, 9]. Based on the analysis of the data from reports of the constituent entities of

the Russian Federation on the state and use of land in terms of their quality and ecological state for 2017, Rosreestr shows that land degradation and loss of soil fertility are everywhere recorded in the country. As a result of improper use of agricultural land, soil bio productivity decreases. Losses of fertile soils are increasing every year and, according to various estimates, amount to about 15 million hectares per year. In general, in the Russian Federation in 2017, the area of disturbed lands amounted to 1062.5 thousand hectares, which is 3.9 thousand hectares more than in 2016 [10].

The most typical are such negative impacts as pollution and littering of land with industrial and household waste, as well as radioactive waste disposal. Some mineral fertilizers and pesticides used in modern agricultural practices and vehicle emissions contribute to pollution. The Vladimir region is one of the constituent entities of the Russian Federation, which is part of the Central Federal District of the Russian Federation, one of the few with a relatively low anthropogenic load. At the same time, the Vladimir region is a place with a developed industry and transport network, located between the Moscow and Nizhny Novgorod regions, which are the zones of high environmental stress. According to the data of the state cadastral registration on the territory of the Vladimir region, the area of erosion-hazardous farmland, including eroded, is 104.7 thousand hectares, including 62.6 thousand hectares of arable land. The danger is represented by the processes of flooding and water logging, changes in soil quality, technogenic disturbance and littering of land.

Production and consumption wastes have the greatest impact on the change in soil quality (pollution) in the region. More than 4 million tons are produced annually in the Vladimir region (Fig. 3).

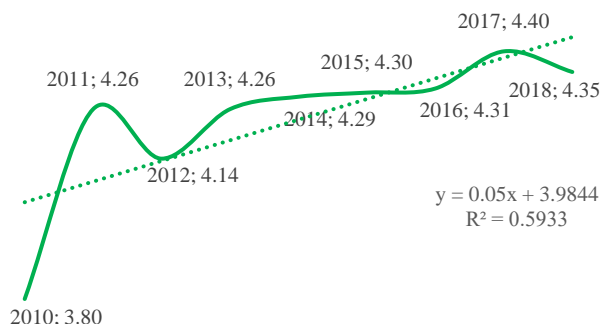


Fig 3. Generation of production and consumption waste on the territory of the Vladimir region in 2010-2018, million tons (based on Annual Report. Monitoring the state of the environment, 2019. (In Russ.). Retrieved <https://dpp.avо.ru/ezegodnyj-doklad.-monitoring-sostoania-okruzausj-sredy>)

Due to the lack of organized storage and disposal sites, as well as production facilities for the processing and disposal of industrial waste, their main share remains on the territory of the enterprises, and waste generated by the population is sent to MSW landfills. At present, 10 waste disposal sites are included in the State Register of Waste Management Facilities. Before the amendments were made to the relevant legislation, there were about 119 waste disposal facilities in the Vladimir region, currently they are not used. This situation complicates the waste management system in the region, since not all settlements are

equipped with container garbage disposal, as a result, land is littered. As a rule, these are lands that are adjacent to settlements and roads. The fields are used for other purposes and become unsuitable for further cultivation.

In the course of unscheduled and planned activities in the Vladimir region in 2018, Rospotrebnadzor specialists identified unauthorized waste disposal sites on the lands of municipalities. In the region, modern technologies for processing (sorting) waste are poorly introduced, which would reduce the volume of waste entering landfills and garbage dump, thereby extending their service life and reducing the adverse impact on human objects (air, surface waters and soil) [11, 12].

VI. FINDINGS

The analysis of the impact of industrial waste on agricultural areas showed that this problem is an environmental threat for many Russian regions. The assessment of the total land fund of Russia showed the unfavorable dynamics of reduction of the land suitable for farm production due to the littering and the soil pollution with industrial waste. This issue has recently been given close attention by the country's leadership through adjusting and improving the legal status of agricultural land.

VII. CONCLUSIONS

The land plays an important role as the main means of production. Soil as an element of the human environment is of great importance, the quality of the soil affects the health and living conditions of a person [13, 14]. The Russian Federation pays great attention to the issues of increasing the efficiency of agricultural land use. This category of land is of the highest importance for the country's food security, protection of vital interests and rights to a safe natural environment for the present and future generations [15].

To compensate various negative phenomena in the country, measures are being developed that provide for the interconnected use of organizational, economic and agrotechnical measures. They are applied for the protection and rational use of soils and lands within the framework of state and federal targeted programs. Work is underway to monitor the state of land to identify the current state and dynamics of changes in land are as exposed to negative processes.

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