**СОСТОЯНИЕ АТМОСФЕРного воздуха БЕЛГОРОДСКОЙ ОБЛАСТИ**

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**STATE OF THE ATMOSPHERIC AIR IN THE BELGOROD REGION**

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**АННОТАЦИЯ**

В статье рассматриваются основные проблемы загрязнения Белгородской области, такие как воздействие хозяйственной деятельности, проблема утилизации и хранения отходов производства и потребления, влияние природных факторов (пыльные бури, лесные пожары, процессы гниения, трансграничные переносы), но в большей степени — техногенные. Решение задач охраны и улучшения состояния окружающей среды, обеспечение экологической безопасности является одним из приоритетных направлений деятельности Правительства Белгородской области, так как экологическая обстановка важнейший фактор, оказывающий влияние на социальную и демографическую обстановку в регионе. Согласно экологическим контрольным лабораторным анализам, в Белгородской области не наблюдается превышения предельно допустимых концентраций загрязняющих веществ в атмосфере, воде или почве ни по каким параметрам.

**ABSTRACT**

The article discusses the main problems of pollution in the Belgorod region, such as the impact of economic activities, the issue of utilization and storage of production and consumption waste, the influence of natural factors (dust storms, forest fires, decay processes, transboundary transfers), but mostly anthropogenic. Solving the tasks of environmental protection and improvement, ensuring environmental safety is one of the priority areas of the Government of the Belgorod region, as the environmental situation is a key factor influencing the social and demographic situation in the region. According to environmental control laboratory analyzes, there are no exceedances of the maximum permissible concentrations of pollutants in the atmosphere, water, or soil in the Belgorod region by any parameters.

**Ключевые слова:** **Белгородская область, загрязнение атмосферы, вредные выбросы, деятельность человека.**

**Keywords:** Belgorod region, atmospheric pollution, harmful emissions, human activity.

The relevance of the topic of this work lies in the fact that today, along with the rapid growth of the number of vehicles, exhaust gases pose a serious threat to the ecology of the Belgorod region.

In total, in the Belgorod region in 2021, 156,317 thousand tons of pollutants were released into the atmosphere by stationary sources. The most common pollutants found in the atmosphere of every settlement are particulate matter (dust, soot, ash, etc.), nitrogen oxides, carbon, sulfur oxides, and hydrocarbons.

The main sources of air pollution in the Belgorod region are enterprises of the iron ore and metallurgical industries, the construction materials industry, including:

* Lebedinsky Mining and Processing Plant JSC (45 - 38 thousand tons/year);
* Oskol Electrometallurgical Plant JSC (23 - 25 thousand tons/year);
* Stoilensky Mining and Processing Plant JSC (14 - 16 thousand tons/year) [1, p. 473].

Furthermore, in recent years, the role of motor transport in shaping the quality of the air environment has been increasing, as well as unorganized sources and processes emitting foul-smelling substances (landfills, organic fertilizer application based on manure and droppings in soil as fertilizers). Currently, vehicle emissions are a priority source of atmospheric pollution.

One of the reasons for the negative impact on the health of the population is the quality of the atmospheric air in populated areas. The Belgorod Hydrometeorology and Environmental Monitoring Center, a branch of the Central Chernozem Hydrometeorology and Environmental Monitoring Department, regularly monitors the state of the atmospheric air in the Belgorod region at 8 stationary posts in the cities of Belgorod, Stary Oskol, and Gubkin. In addition, route and point sampling studies of the atmospheric air in populated areas are carried out to ensure supervisory measures by the Rospotrebnadzor Department in the Belgorod region, as well as for conducting socio-hygienic monitoring by the Federal State Budgetary Institution «Center of Hygiene and Epidemiology in the Belgorod region» [2, p. 56].

An analysis of the research results by the «Center of Hygiene and Epidemiology in the Belgorod Region» indicates a decrease in 2021 compared to 2020 in the overall number of samples exceeding the maximum permissible concentrations (MPC) of pollutants in the air of urban settlements from 0.37% to 0.29% overall.

The decrease in the total number of samples with exceeding the maximum allowable concentrations (MAC) of pollutants in the air of urban settlements is associated with a decrease in positive samples of: carbon oxide from 1.8% in 2020 to 0% in 2021, hydroxybenzene from 1.6% in 2020 to 0% in 2021, formaldehyde from 0.4% in 2020 to 0% in 2021. It should be noted that in 2021, there was an increase in samples exceeding the MAC in 2021: sulfur dioxide from 0% in 2020 to 2.02% in 2021, dihydrosulfide from 0% in 2020 to 3.8% in 2021 " [3, p. 88].

Analysis of air pollution research results in rural settlements by the Center data shows a decrease in 2021 compared to 2020 in the total number of samples exceeding the maximum allowable concentrations (MAC) of pollutants in the air from 1.2% to 0.04%. It is noted a decrease in the share of samples exceeding the MAC – for suspended substances from 5.1% to 1.67%, dihydrosulfide from 0.2% to 0%, carbon oxide from 3.9% to 0%, ammonia from 0.6% to 0.5%, hydrocarbons from 1.9% to 0%, other substances from 0.3% to 0%. The sources of atmospheric air pollution were agricultural enterprises, industrial poultry farming, and livestock farming.

Exceedances of MAC pollutants by more than 5 times during the analyzed period from 2019 to 2021 according to the Center's data were not registered.

Exceedances of the maximum allowable daily concentrations (MACss) of priority substances were not recorded at Roshydromet stationary posts for the period analyzed from 2019 to 2021, being more than 5.1 times and from 1.1 to 2 times. Exceedances from 1.1 to 2 times in 2019, 2020, and 2021 were not identified.

In the city of Belgorod, a partial program was implemented for the collection and analysis of atmospheric air samples: 3528 samples were taken and analyzed for the content of particulate matter, carbon oxide, nitrogen dioxide, 2646 samples for sulfur dioxide and phenol, and 882 samples for nitrogen oxide content [4, p. 103].

Sulfur dioxide concentrations: the average annual concentration and the maximum single concentration are below the MAC.

Nitrogen dioxide-nitrogen oxide concentrations: the average annual concentration of nitrogen dioxide is 0.95 times the MAC, nitrogen oxide is 0.3 times the MAC, and the maximum single concentrations of nitrogen dioxide and nitrogen oxide did not exceed the MAC.

Particulate matter concentrations: the average annual concentration in the city is 0.157 mg/m3, which is 2.09 times the MAC. The maximum of the single concentrations is 0.8 times the MAC.

Carbon oxide concentrations: the average annual concentration was 0.8 times the MAC (2.3 mg/m3). The maximum single concentration reached 1.6 times the MAC near industrial zone №6.

Benzo(a)pyrene concentrations: the average annual concentration was 0.6 times the MAC, and the maximum of the average monthly concentrations was 0.9 times the MAC.

Specific impurities concentrations: the average annual and maximum single concentrations of phenol did not exceed the MAC. Measurements of ammonia and formaldehyde concentrations were not conducted due to a lack of specialists.

Trend for the period of 2017-2021. Pollution levels decreased for nitrogen oxide, phenol, and benzo(a)pyrene; increased for particulate matter, carbon oxide, and nitrogen dioxide.

With the introduction of SanPiN 1.2.3685-21, the annual average maximum permissible concentrations (MPC) for dust decreased by 2 times, phenol by 2 times, formaldehyde by 3.3 times. Accordingly, the Integrated Pollution Index (IPI) increased from 2.86 to 4.38.

Monthly reports on the state of atmospheric pollution are submitted to Rospotrebnadzor, Rosprirodnadzor, Rosstat, and the administration of the city of Belgorod.

Operational information on atmospheric air pollution is daily posted on the public website www.cgms.ru. Simultaneously, information on conditions that promote or hinder the accumulation of impurities in the atmosphere (NMU) is posted as they occur.

The atmospheric air in the major cities of the Belgorod region fully meets the environmental standards and requirements for the level of harmful substances. However, the constant expansion of industrial activities in the regions, the increase in the number of vehicles and other motor transport contribute to a trend of worsening air quality.

Thanks to the air purification system, stationary sources of atmospheric pollution do not pose a serious threat to the ecology of the Belgorod region today. This cannot be said about cars.

The exhaust gases from vehicles in the Belgorod region (as of 2019) account for 56% of the total harmful emissions into the atmosphere of the region. For comparison, the combined contribution of mining and metallurgical enterprises is only 24%; the share of the construction industry in air pollution in the Belgorod region does not exceed 5.5% and is currently unable to compete with road transport.

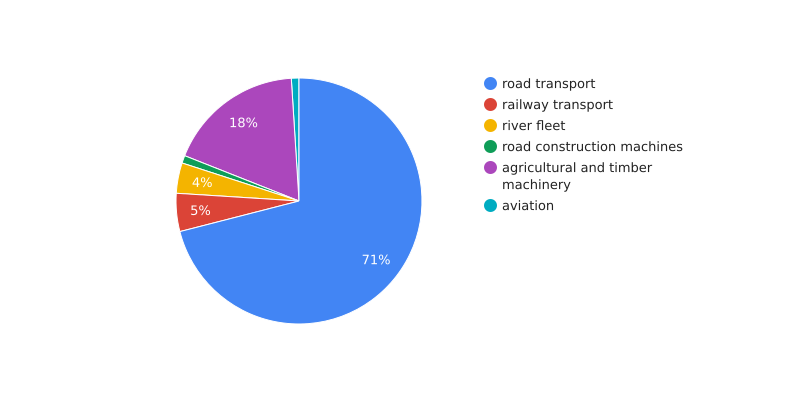
The quality of the atmospheric air in the studied region is determined by the intensity of pollution from stationary and mobile sources. One of the priority problems is environmental pollution by industrial enterprises, heat and power plants, non-ferrous and ferrous metallurgy, and road transport.

Continuous monitoring of the level of atmospheric pollution in the Belgorod region is carried out by the Federal State Budgetary Institution «Belgorod Regional Center for Hydrometeorology and Environmental Monitoring» (Belgorod Laboratory for Atmospheric Pollution Monitoring and the Stary Oskol Integrated Environmental Monitoring Laboratory) at 9 stationary posts in the cities of Belgorod, Stary Oskol, and Gubkin [5, p. 33].

High and extremely high levels of air pollution in the settlements of the Belgorod region during the period 2010-2013 were recorded in the cities of Belgorod and Stary Oskol. In 2020, there is a low level of pollution observed in Belgorod, Gubkin, and Stary Oskol.

Over the past five years, the level of atmospheric air pollution has increased in terms of dust and nitrogen dioxide, while it has decreased in terms of sulfur dioxide and carbon oxide. The main stationary sources of air pollution in the region are iron ore and metallurgical industry enterprises, as well as the construction materials industry. At the same time, in recent years, the role of automotive transport has been increasing in shaping the quality of the air environment. Currently, emissions from road transport are a priority source of atmospheric pollution.

Emissions from road transport are assessed in three groups: carbon oxides, nitrogen oxides, and a larger group - volatile organic compounds. Picture 1 shows the dynamics of emission volumes in the Belgorod region by these pollutants.



Pic. 1 Distribution of harmful emissions by types of transport.

In solving tasks to improve the environmental situation in the region in 2021, measures are successfully implemented to reduce the anthropogenic impact of industrial production on the environment through the implementation of environmental protection measures, modernization of production, and the introduction of best available technologies, which positively affects the preservation and restoration of existing natural systems [6, p. 77].

In 2021, environmental education and awareness-raising of the population about the state of the environment were largely developed, primarily due to the openness of authorities at all levels and environmental information using social networks and mass media.

Work is being carried out systematically and on an ongoing basis to improve the effectiveness of state supervision in the field of environmental protection. Despite the limitations associated with the epidemiological situation, the quality of the environment remained at its usual high level.

Thus, analyzing all of the above, it can be understood that the current state of atmospheric air in the Belgorod region does not cause critical concerns. The environmental problems of the Belgorod region are typical for many regions of Russia: unresolved issues of waste disposal of production and consumption, air pollution, especially in large settlements. High quality of life and health of the population, as well as sustainable economic development of the regions can be ensured only if natural systems are preserved and the appropriate environmental quality is maintained [7, p. 112].

Solving the problems of environmental protection and improvement, ensuring environmental safety is one of the priorities of the Government of the Belgorod region, since the environmental situation is the most important factor influencing the social and demographic situation in the region. All problems that arise are strictly controlled and resolved through additional measures.

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