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AIR POLLUTION: CAUSES, CONSEQUENCES AND SOLUTIONS

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Abstract. Air pollution is one of the most serious environmental problems of our time. It affects human health, the state of ecosystems, and even the planet's climate. According to the World Health Organization, millions of people die prematurely every year due to diseases related to poor air quality. The task of forming and developing demographic potential as the basis for implementing policies for structural modernization of the economy and the socioeconomic development of the country and its regions is a priority in the context of the Concept of Demographic Policy, the Decree of the President of the Russian Federation "On National Goals and Strategic Objectives for the Development of the Russian Federation through 2024," and the Decree of the President of the Russian Federation "On National Development Goals of the Russian Federation through 2030." A special role is given to maintaining children's health, as emphasized in a special decree of the President of the Russian Federation, according to which 2018-2027 have been declared the Decade of Childhood.

Key words: Air pollution, greenhouse gases, carbon dioxide, methane, nitrogen oxides, sulfur dioxide, particulate matter, smog, fossil fuels, industrial emissions, vehicle exhaust, deforestation, climate change.

The aim of the study is a hygienic assessment of the impact of chemical components of alumina production on the respiratory system in children in order to improve the system of social and hygienic monitoring.

In accordance with the stated goal, the research objectives included:

1. Conduct a hygienic assessment of the impact of economic activity of large-scale alumina production on the state of living environments.
2. Conduct an assessment of the risk of developing respiratory diseases in children in the area of exposure to chemical factors associated with the economic activities of an alumina production entity in violation of the mandatory requirements of sanitary legislation.
3. Conduct an in-depth assessment of the risks of developing respiratory diseases in the form of harm to health in the exposed child population.

Research results. Key mechanisms for implementing national development priorities in the area of protecting children's health and improving their quality of life include the work of Rospotrebnadzor's territorial bodies and organizations to define a system of targeted measures and benchmarks aimed at ensuring the sanitary and epidemiological well-being of the population, including those related to poor air quality. Optimization of the state social and hygienic monitoring system is the starting point for ensuring effective causation for the implementation of adequate regulatory measures within the framework of Rospotrebnadzor's functions and powers . This will improve the objectivity of the analysis and assessment of the results of dynamic monitoring of the current situation.

Main sources of pollution . Air pollution results from both natural and anthropogenic factors. However, human activity plays the primary role today.

Industry . Factories and power plants emit sulfur dioxide, nitrogen oxides, carbon dioxide, and fine particulate matter into the atmosphere. Heavy industry and coal-fired power plants make particularly significant contributions.

Transportation . Cars, airplanes, and ships emit exhaust gases containing carbon monoxide and other harmful substances. In large cities, transportation is the main source of smog.

Agriculture . The use of fertilizers and the raising of cattle lead to ammonia and methane emissions.

Household sources. Waste burning, the use of solid fuels for heating, and smoking also degrade air quality.

Effects of air pollution. Impact on human health. Polluted air causes respiratory diseases (asthma, bronchitis), cardiovascular diseases, and cancer. Children and the elderly are particularly vulnerable.

Environmental impacts. Acid rain destroys forests and soils. Atmospheric pollution increases the greenhouse effect, leading to global climate change. International agreements such as the Paris Agreement aim to reduce greenhouse gas emissions.

Economic damage. Countries incur enormous costs to treat diseases, restore ecosystems, and implement environmentally friendly technologies.

Solutions. Transition to renewable energy sources —solar, wind, and hydropower. Develop public transportation and electric vehicles . Tighten environmental standards for businesses . Green cities and preserve forests. Raise environmental awareness among the population .

Conclusions. Air pollution is a global problem that requires the combined efforts of governments, businesses, and every individual. Only a responsible approach to environmental stewardship and the adoption of modern technologies will help preserve clean air for future generations. A ranked list of chemical factors posing an unacceptable non-carcinogenic health risk, primarily due to respiratory diseases in children exposed to airborne pollutants, is substantiated. A predictive assessment of the evolutionary increase in the additional risk of developing respiratory diseases in children over the coming years is provided.

Mathematical models were constructed and parameterized, based on which the risks of harm to the health of the exposed child population were quantitatively assessed based on the criteria of additional cases of respiratory diseases.

A system of cause-and-effect relationships (population and group level) and coefficients describing the relationships “exposure to airborne chemical factors - exposure biomarkers - biomarkers of negative effects - negative response (disease)” was obtained to establish the fact of harm to health (individual level).

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