

THE IMPACT OF ATMOSPHERIC POLLUTION ON THE HEALTH OF CITIZENS AND THEIR QUALITY OF LIFE

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Relevance of the study. With the national industry reviving and the rapid growth of motorization, the problem of air pollution has become increasingly acute. More than 30 million tons of various pollutants enter the atmosphere annually, including more than four million tons of sulfur dioxide, more than three million tons of nitrogen oxides, more than 15 million tons of carbon oxides, and almost three million tons of volatile organic compounds. Currently, approximately 70% of cities have poor air quality, with concentrations of key pollutants 3-5 times higher than regulatory limits. The most significant sources of air pollution are industrial enterprises, power plants, and transport, which release more than 60,000 toxic substances into the atmosphere, the most significant of which are sulfur and nitrogen dioxides, carbon monoxide, lead, benzopyrene, formaldehyde, and suspended solids. At the same time, air pollution remains one of the main risk factors for public health. Analysis of numerous epidemiological data from domestic and international authors highlights the significant impact of air pollutants on the health of the urban population, especially children. Exposure to air pollution leads to poor physical development in children and an increased prevalence of chronic diseases, particularly allergies, respiratory, urinary, and cardiovascular diseases, diseases of the blood and blood-forming organs, and diseases of the skin and subcutaneous tissue.

For adults, air pollution is a significant risk factor for sudden and premature death, circulatory and respiratory diseases, and lung cancer. Residents of large cities and industrial centers are at risk, representing an estimated 53% of the population.

The rapid increase in the number of cars, coupled with the underdevelopment of the road network, is contributing to a significant increase in transport-related air pollution. Over the past 40 years, the contribution of motor vehicles to air pollution has increased from 10-13% to 70-80% and continues to increase.

The objective of the study was to develop a set of scientifically based recommendations for reducing the intensity of air pollution by components of vehicle exhaust gases in residential areas of the regional center with historically established buildings and transport infrastructure in modern conditions.

Research objectives:

1. To study the transport conditions and the emission levels of the main pollutants entering the atmosphere with the exhaust gases of motor vehicles on the elements of the transport and road network and to determine their contribution to the gross emission of pollutants.

2. To study the dispersion patterns of key pollutants from stationary sources and motor vehicles in the atmospheric air of residential areas using modeling results. To determine the role of motor vehicles and individual factors influencing the formation of maximum one-time concentrations of pollutants.

3. Provide a hygienic characterization of the quality of atmospheric air in individual areas of the city's residential zone based on analytical monitoring data.

Study Results. A multi-stage, comprehensive hygienic study was conducted to examine traffic patterns and volumes, vehicle and stationary emissions, and atmospheric air levels of priority pollutants based on analytical monitoring data and dispersion modeling results. These studies also examined their impact on overall and primary morbidity rates based on pediatric hospital visits in residential areas of the city center. Statistically significant differences were identified in traffic volumes between residential areas and on inter-district roads, indicating significant transit traffic through the historic city center, which accounts for the highest traffic loads and the worst traffic conditions on its streets.

A new, original system for comparative assessment of vehicle emissions in residential areas of the city and on inter-district roads has been developed and tested. This system takes into account the nature of the pollutants' impact. This system has made it possible to identify the "City Center" as the area with the greatest anthropogenic load caused by vehicle emissions.

Patterns in vehicle emissions in a city with a compact historic center and isolated residential areas were identified. These patterns include a nearly equal contribution of inter-district roads and residential road network elements to the total pollutant emissions, a significant contribution of additional emissions, and a seasonal increase in pollutant emissions during the warm season and on weekdays. New data were obtained on the priority stationary sources of air pollution, represented by oil refining and fuel and energy industries, and the priority pollutants. Among these, nitrogen and sulfur dioxides are the most significant in terms of reflective and resorptive effects, and benzene and chromium (VI) are the most significant in terms of carcinogenic potential.

The primary role of motor vehicles in the formation of ground-level concentrations of nitrogen dioxide, carbon monoxide, hydrocarbons, and benzopyrene in the atmospheric air has been demonstrated. Scientific understanding of the adverse impact of atmospheric air pollution with nitrogen oxides, carbon monoxide, and hydrocarbons on the overall and primary morbidity of children seeking medical attention has been expanded. The influence of the main components of motor vehicle exhaust gases on the incidence of overall and primary morbidity in children, including neoplasms, diseases of the endocrine, nervous, and musculoskeletal systems, chronic pharyngitis, and congenital anomalies, has been demonstrated. Specific features of residents' subjective assessments of the impact of motor vehicles on the quality of the urban environment and their living conditions have been identified, including chemical and noise pollution of the atmospheric air, anxiety, and adverse effects on sleep. The main risk factors were clear and windless weather, the beginning and end of the work week, the time interval from 4 p.m. to 8 p.m., living near streets with heavy traffic, and the orientation of window openings toward the roadway.

Conclusions. The implementation of preventative measures to reorganize traffic flows (reconstruction of the Northern Ring Road) has resulted in the diversion of significant transit traffic from the city center to the suburbs and a reduction in the impact of its emissions on the air quality in residential areas.

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