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## ANALYSIS OF VEHICLE EMISSIONS AS A HARMFUL ENVIRONMENTAL FACTOR FOR HUMAN HEALTH AND THE ENVIRONMENT

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**Annotation:** An analysis of data on emissions from mobile sources as a harmful environmental factor was carried out. Effective ways to reduce the negative impact of this factor on the environment and human health are analyzed. As a result of the research, it was found that in the structure of emissions there are oxides of nitrogen and carbon, and every year their number is growing. Motor transport accounts for at least 55 % of the total mass of gaseous air pollutants. As a result of the study, ways to improve the environment and prevent a large emission of exhaust gases from vehicles have been identified.

**Keywords:** public health, environment, mobile sources, vehicle emissions

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**Relevance.** Among the many types of human activities, a powerful source of environmental pollution is the operation of motor transport. It accounts for at least 55 % of the total mass of air pollutants in a modern city. The exhaust gases of carburetor and diesel engines include about 200 chemical compounds, the most toxic are carbon oxides, nitrogen, sulfur, hydrocarbons, including polycyclic aromatic hydrocarbons. The intake of these toxicants during the operation of the car is associated with the wear of

brake linings and tires, destruction of the roadway, emissions from the combustion of gasoline and diesel.

Grodno is the No. 1 city for motorization in Belarus. The Grodno region is considered the most motorized region of the country in terms of the number of cars per population. As of January 1, 2018, 370.7 thousand cars were registered in the region. Compared to the same period last year, their number has increased by 2 thousand cars. The provision of the population with passenger cars in the Grodno region amounted to 385 units per one thousand people. This is the highest indicator among the regions and Minsk. Provision of the population with passenger cars (per 1 thousand people) in the context of the Republic are as follows: Grodno region – 385; Minsk region – 346; Brest region – 357; Minsk region – 326; Vitebsk region – 334; Mogilev region – 315; Gomel region – 295.

The total length of public roads as of the beginning of 2020 was 102.8 thousand km, of which 86.7 % were paved roads. The length of the Grodno region's highway network at the beginning of the year was 14.9 thousand kilometers, of which 13.6 thousand kilometers were paved. A large fleet of cars and a significant amount of emissions makes it relevant and significant to analyze this factor and find effective ways to reduce its negative impact on the environment and the population [1, 2].

**The purpose of the study.** Analysis of data on emissions from mobile sources as a harmful environmental factor, search for effective ways to reduce the negative impact of this factor on the environment and human health.

**Materials and methods of research.** The materials for the study were the data of the state statistical reporting [1, 2, 3].

**The results of the study and their discussion.** It was found that on average per year a car emits 200 kilograms of carbon dioxide, 60 – nitrogen oxide, 40 – hydrocarbons, 3 – metal and rubber dust, 2 – sulfur dioxide and half a kilogram of lead into the atmosphere. Pollution is one of the main causes of global warming. Cars and trucks emit carbon dioxide and other greenhouse gases into the atmosphere, which account for a fifth of the total pollution as a result of global warming. The effects of automobile pollution are widespread, affecting the quality of air, soil and water.

Nitrogen and carbon oxides mix with rainwater, creating acid rain that damages crops, forests and other vegetation, and buildings. They are harmful to the health of humans, animals and plants even at low dosages [3, 4]. Hydrocarbons react with nitrogen dioxide and sunlight and form ozone, which has a beneficial effect on the upper atmosphere, but is harmful at ground level, participating in the formation of summer (Los Angeles) smog [5, 6]. Ozone and photo-oxidants formed under the influence of solar radiation and vehicle exhaust can have a strong irritating effect on the mucous membranes of the upper respiratory tract, bronchi and lungs, cause chest pain, cough and difficulty breathing, lacrimation and suffocation, and also causes a person a feeling of fear and strong emotional excitement.

Carbon monoxide, another exhaust gas, is especially dangerous for infants and people suffering from heart diseases, since it prevents the blood from carrying oxygen [7, 8]. Constant exposure to even small concentrations of CO causes cardiovascular diseases, angina pectoris and affects the nervous system. Other automotive pollutants that are harmful to human health include sulfur dioxide, benzene and formaldehyde. Noise from cars is also harmful, damaging hearing and causing psychological disorders.

The most unfavorable modes of operation are low speeds and «idling» of the engine, when pollutants are released into the atmosphere in quantities significantly exceeding the emission under load conditions. On a sunny summer day, when solar radiation converts nitrogen oxides and other exhaust components into extremely dangerous ozone and photochemical smog. The dilution of exhaust gases is facilitated by the wind, therefore, traffic jams in calm and on narrow streets, which are available in Grodno, are most harmful. Kirov Street and Karl Marx Street are roads with two lanes of traffic in one direction, with small sections of sidewalk on both sides. Due to the location of these streets near the city center, there is an active flow of traffic on them, resulting in a large concentration of exhaust gases in the air. Zamkovaya Street, Bolshaya Troitskaya, Ozheshko, Karbysheva, Budennogo are also located in the immediate vicinity of the center and have an active flow of vehicles at different times of the day.

The more exhaust gases a car emits, the greater its speed or acceleration. But exhaust gases mainly consist of water vapor, carbon

dioxide, nitrogen. But if we talk about dangerous components, their emissions are greater the slower the flow moves. The organization of car traffic in the city plays a huge influence on the amount of emissions (not counting fuel burning and time), a significant part of emissions occurs in «traffic jams» and in front of traffic lights. With a successful organization, it is possible to use less powerful engines at low (economical) intermediate speeds.

We get a lot of exhaust gas damage when we are in traffic jams, where there is simply nowhere to run from car emissions. With constant exposure to exhaust, it is worth diversifying your menu with antioxidants, which are found in berries, fruits, green vegetables and green tea, as well as in seeds, and drinking more water, as it promotes detoxification. Such “doping” helps the body cope with the consequences of inhaling a chemical cocktail and maintains health.

The most dangerous exhaust cars spew in the first 5-10 minutes after parking, and this applies to both old copies and modern ones with neutralizers. The latter work only at a certain temperature, so they let all the «dirt» through when cold. For environmental reasons, it is recommended to warm up the car at idle.

To reduce the negative impact of road transport emissions on human health and the environment, it is advisable and necessary to switch to other modes of transport, the organization of bypass roads around settlements, the construction of protective screens, the construction of forest plantations, the organization of tunnels for animals and mesh barriers. In the city center, the organization of transport-free pedestrian zones. Switching to other types of fuel. In Grodno, the reconstruction of the former railway bridge for a four-lane automobile with access to the M-6 motorway took place. It became part of the bypass road around Grodno. The bridge is four-lane (two lanes in both directions, each 4.5 meters), on both sides of the bridge there are sidewalks of 1.5 meters, and on the lower side there is also a bike path 3 meters wide. The length of the new bridge is 240 meters. Its height above the water level is 32.5 meters. The Old and Rumlevsky bridges were also repaired. The bridge on Popovich is being repaired. The Minsk–Grodno highway has been completely reconstructed and the speed has been increased up to 120 km/h in some sections. All this

helps to reduce traffic jams, unload individual sections of roads and bridges.

**Conclusions.** Thus, as a result of the conducted studies, it was found that there are nitrogen and carbon oxides in the structure of emissions and their number is growing every year. Motor transport accounts for at least 55 % of the total mass of gaseous air pollutants, which leads to environmental pollution, and it can also cause the death of a large number of people. As a result of the study, ways to improve the environment and prevent large emissions of exhaust gases from vehicles have been identified.

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