ECOLOGICAL SAFETY OF THE MOTOR TRANSPORT COMPLEX

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Abstract: *One of the urgent issues today is the improvement of the ecological safety of motor transport. This article addresses the issues of environmental safety in the automotive transport sector. Ecological safety is understood as such an impact of the motor transport complex and its subsystems on the environment, population, and personnel that remains within officially established permissible norms.*

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The growing number of vehicles increasingly affects environmental pollution. Worldwide, vehicles consume 2.1 billion tons of fuel annually and emit about 700 million tons of harmful substances into the atmosphere, including 420 million tons of CO, 170 million tons of hydrocarbons (CH), 60 million tons of nitrogen oxides (NOx), 17 million tons of soot, and 0.6 million tons of lead (on average, 1.3 tons of emissions per one average car per year). As a result, the share of motor transport in total atmospheric pollution in developed countries has reached 45–50%.

In Uzbekistan, the share of motor transport in environmental pollution has reached 40%, including 50–60% in cities and 85–90% in metropolitan areas. The harmful impact of the motor transport complex on the environment refers to its negative changes caused by the release of toxic components from exhaust gases into the atmospheric air, water, and soil, as well as by products of wear and tear of vehicle parts, road surfaces, and waste from production and operational activities. These pollutants are generated during vehicle movement, loading and unloading operations, fueling, washing, storage, maintenance, and repair of vehicles.

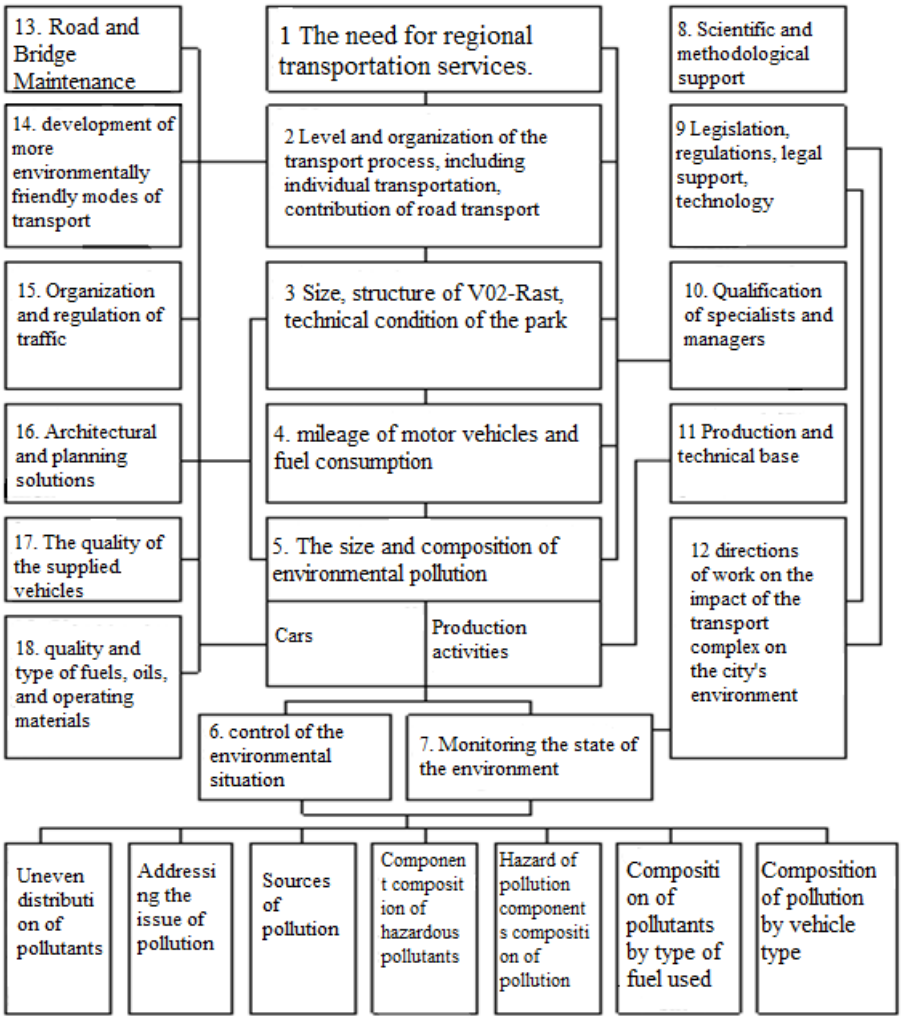

Fig. 1. Factors Influencing Environmental Pollution by the Motor Transport Complex of a Region (City)

The size and composition of environmental pollution depend on a number of interrelated factors, which vary over time and space and have different levels of manageability (see Fig. 1). These factors can be divided into two groups:

1. Factors primarily managed at higher system levels (state, region, city);

2. Factors managed at the level of motor transport enterprises and vehicle owners.

The first group of factors includes:

the size and structure of the vehicle fleet; conditions and organization of the transportation process;

the technical level and quality of the rolling stock used, the quality of fuels, oils, and operating materials applied;

the length and condition of the street and road network and the organization of traffic;

the level of development of automobile transport infrastructure and the production-technical base of motor transport enterprises;

regulatory and resource support, regulation of the ecological safety of the motor transport complex;

federal and regional systems for monitoring the technical condition of the fleet, and the level of environmental safety of vehicles and motor transport enterprises;

qualifications and level of environmental education of specialists and managers in the motor transport sector.

The second group of factors includes:

equipping motor transport enterprises (MTE) with vehicles that have improved environmental performance;

equipping fleet vehicles with technical devices that reduce the toxicity of exhaust gases;

managing the age structure of the vehicle fleet;

high-quality and timely execution of vehicle maintenance and repair (M&R) recommendations;

use of fuels, oils, and other materials with improved environmental characteristics;

rational organization of M&R processes using modern technological equipment;

increasing the efficiency of rolling stock use on the road;

improving standards and control over the consumption of fuel, oils, and other materials;

implementation of progressive methods of garage-free vehicle storage and starting;

improvement of processes for fueling, storing, and transporting fuels and oils;

wastewater treatment, collection, and disposal of industrial waste;

improving staff qualifications.

Similar data have been obtained in other countries.

For example, in Finland, passenger cars account for 77% of total emissions; in the USA – 67%, while trucks and buses account for 33%, including 22% from gasoline-powered light-duty vehicles, 4% from medium and heavy gasoline vehicles, and 7% from diesel trucks and buses.

Improving the technical operation of vehicles is one of the key areas to reduce harmful emissions and enhance the environmental safety of the motor transport complex.

The contribution of technical vehicle operation to solving this issue is estimated at 20–25%, which consists of:

first, ensuring and maintaining the technical condition of vehicles and their components, which largely determines the volume of harmful emissions;

second, reducing environmental pollution during storage, fueling, maintenance, and repair of vehicles;

third, economical use of resources (fuel, oil, electricity, water, spare parts, tires, batteries, technical fluids, etc.);

fourth, reducing, collecting, and disposing of industrial waste and reusing it where possible.

According to the degree of impact on the human body, toxic substances are classified into four hazard classes:

Class 1 – extremely hazardous;

Class 2 – highly hazardous;

Class 3 – moderately hazardous;

Class 4 – low hazard.

Toxic emissions from automobiles include:

Sulfur dioxide and lead compounds – Class 1 hazard;

Nitrogen dioxide and aldehydes – Class 2 hazard;

Soot – Class 3 hazard;

Carbon monoxide and hydrocarbons – Class 4 hazard.

For toxic substances, maximum permissible concentrations (MPC) have been established (see Table 3):

MPC in the working zone (MPC_wz);

Average daily MPC in residential area atmospheres (MPC_ad);

Maximum one-time MPC in the air of populated areas (MPC_mt).

The mass of toxic substances emitted with exhaust gases into the atmosphere (kg per ton of fuel) and their maximum permissible concentrations (mg/m^3)

Substance	Gasoline	Diesel	MPCrz	MPC	PDKir
Carbon monoxide CO	200,0	45,0	20,0	3,0	5,0
Hydrocarbons CH	80,0	55,0	100,0	1,5	5,0
Nitrogen oxides NO	25,0	35,0	2,0	0,04	0,085
Sulfur dioxide SO2	2,0	4,0	10,0	0,05	0,5
Lead compounds	25,0-10,0	-	0,0003	0,0003	0,01
Soot with	-	8,0	4,0	0,005	0,15

Thus, motor transport is a major source of environmental pollution, and the amount of harmful substances emitted into the atmosphere depends on the number of vehicles, their technical condition, and the type of fuel used.

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