DOI: https://doi.org/10.36719/2663-4619/102/20-26

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# TRANSPORT AND ENVIRONMENTAL PROBLEMS

**Abstract**

The article pays special attention to environmental protection and notes that in the modern world, issues of ecology and energy saving are finding new solutions, this is facilitated by large corporations and their financing of projects. Technological modernization of old systems takes transport enterprises to another level and allows them to be competitive in the international market. The transport and road complex is a powerful source of environmental pollution. Transport is one of the main sources of noise in the city, the traffic intensity of which is constantly growing. The article also notes that transport has caused many other negative phenomena: every year hundreds of millions of tons of harmful substances enter the atmosphere with exhaust gases; The road network, especially near urban agglomerations, “eats up” valuable agricultural land. Under the influence of the harmful effects of transport, people's health deteriorates, soils and water bodies are poisoned, and flora and fauna suffer.

***Keywords:*** *ecological problems, road transport, energy efficiency, environment, environmental and economic problems, toxic substances, dangerous goods*

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# Nəqliyyat və ekoloji problemlər

**Xülasə**

Məqalədə ətraf mühitin mühafizəsinə xüsusi diqqət yetirilir və qeyd olunur ki, müasir dünyada ekologiya və enerjiyə qənaət məsələləri yeni həll yolları tapır, buna iri korporasiyalar və onların

layihələri maliyyələşdirməsi kömək edir. Köhnə sistemlərin texnoloji modernləşdirilməsi nəqliyyat müəssisələrini daha yüksək səviyyəyə qaldırır və beynəlxalq bazarda rəqabətə davamlı olmağa imkan verir. Nəqliyyat-yol kompleksi ətraf mühitin güclü çirklənməsi mənbəyidir. Hərəkət intensivliyi daim artan nəqliyyat şəhərin əsas səs-küy mənbələrindən biridir. Məqalədə həmçinin qeyd olunur ki, nəqliyyat bir çox başqa neqativ hallara da səbəb olur. Belə ki, hər il yüz milyonlarla ton zərərli maddələr işlənmiş qazlarla atmosferə daxil olur. Yol şəbəkəsi, xüsusən də şəhər aqlomerasiyalarının yaxınlığında qiymətli kənd təsərrüfatı torpaqlarını "yeyir". Nəqliyyatın zərərli təsirlərinin təsiri altında insanların sağlamlığı pisləşir, torpaq və su hövzələri zəhərlənir, flora və faunaya güclü ziyan dəyir.

***Açar sözlər:*** *ekoloji problemlər, yol nəqliyyatı, enerji səmərəliliyi, ətraf mühit, ekoloji və iqtisadi problemlər, zəhərli maddələr*

## Introduction

Transport powered by fossil fuels causes enormous harm to both the environment and human health. Harmful emissions produced by transport aggravate the problem of global warming, and lead to various diseases in people, including the respiratory system and nervous system. The impact of transport on the environment is significant. It leads to an increase in the greenhouse effect, air and water pollution, noise pollution, soil erosion, etc.

Transport is one of the largest sources of greenhouse gas emissions on the planet - about 16%. Most of them come from cars (11.9%), planes and ships generate 1,9% and 1,7% respectively, trains – 0,4%. Reducing transport emissions is critical to combating climate change (1).

**Research methods.**

A large share of air pollution comes from emissions of harmful substances from cars. There are currently about 1 billion cars in use on Earth. Currently, road transport accounts for more than half of all harmful emissions into the environment, which are the main source of air pollution, especially in large cities. On average, with a mileage of 15 thousand km per year, each car burns 2 tons of fuel and about 26 - 30 tons of air, including 4,5 tons of oxygen, which is 50 times more than human needs. At the same time, the car emits into the atmosphere (kg/year): carbon monoxide - 700, nitrogen dioxide - 40, unburned hydrocarbons - 230 and solids - 2-5. In addition, many lead compounds are emitted due to the use of mostly leaded gasoline .

Observations have shown that in houses located next to a major road (up to 10 m), residents suffer from cancer 3-4 times more often than in houses located 50 m away from the road. Transport also poisons water bodies, soil and plants (2).

Toxic emissions from internal combustion engines are exhaust and crankcase gases, fuel vapors from the carburetor and fuel tank. The main share of toxic impurities enters the atmosphere with exhaust gases from internal combustion engines. Approximately 45% of the total hydrocarbon emissions enter the atmosphere with crankcase gases and fuel vapors.

The amount of harmful substances entering the atmosphere as part of exhaust gases depends on the general technical condition of the vehicles and, especially, on the engine- the source of the greatest pollution. Thus, if the carburetor adjustment is violated, carbon monoxide emissions increase 4...5 times. The use of leaded gasoline, which contains lead compounds, causes atmospheric air pollution with highly toxic lead compounds. About 70% of lead added to gasoline with ethyl liquid enters the atmosphere in the form of compounds with exhaust gases, of which 30% settles on the ground immediately after the cut of the vehicle's exhaust pipe, 40% remains in the atmosphere. One medium-duty truck emits 2,5...3 kg of lead per year. The concentration of lead in the air depends on the lead content in gasoline (Aziyev, Mamedova, 2023: 390).

Railroad trains, due to the combustion of coal or fuel oil, are also sources of greenhouse gas emissions and toxic substances: carbon dioxide, methane, carbon monoxide, nitrous oxide and oxide, sulfur dioxide and particulate matter. Freight and high-speed trains, city electric trains are the main sources of noise and vibration that negatively affect human health - they increase anxiety and

stress levels, and reduce the number of insects and birds living near railways. For many years, railroads used wooden ties soaked in toxic creosote oil.

About 90% of all goods traded in the world are transported by water. Ships pollute the world's oceans - in the event of oil and chemical spills, waste during cargo transshipment or ship dismantling also ends up in the water. Accidents on a ship carrying hazardous substances or crude oil can result in emissions of carbon dioxide, nitrogen oxide, and sulfur dioxide. The latter easily dissolves in water, causing ocean acidification, which kills coral reefs. Ships transport non-native species of flora and fauna around the world, threatening local biodiversity (Aziyev, Nadzhafov, Veliyev, 2024: 400).

Sea transport plays a significant role in modern logistics, but the environment still remains a problem for this form of transportation. Container ships or passenger ferries can still have a negative impact on the underwater and surface environments and on the quality of life of people living near ports. Waterborne vehicles can disrupt ecosystem functioning in the following ways:

increased noise level (underwater and above water);

oil and wastewater spills;

exhaust emissions ($CO_2$, carbon monoxide, sulfur oxides, nitrogen oxides, particulate matter).

The issue of the impact of marine vehicles on the environment or threats associated with increased water traffic remains relevant.

Half of the world's aviation carbon emissions come from just 1% of passengers. Americans have the largest carbon footprint-more than the UK, Japan, Germany, and Australia combined. One of the negative impacts of airplanes is noise. It affects not only passengers but also people living near airports. The hum of aircraft engines impairs hearing, and concentration, and increases stress. In addition, aviation fuel and de-icing agents often end up in streams, which carry the chemicals into water bodies, polluting them (Vəliyev, Əliyev, 2011: 93).

The consequences of air pollution are:

- melting glaciers and a rapid rise in water levels in the seas and oceans (which is the direct cause of floods, inundations, and even the disappearance of entire cities or ocean islands!);
- climate change and frequent weather anomalies: fires, avalanches, hail;
- reduction of fresh water reservoirs (which is associated with the melting of glaciers, a natural reservoir of drinking water).

Expanding road infrastructure also negatively impacts animals and plants. The natural habitats of various species of mammals, birds, amphibians, etc. are shrinking. Animals die under the wheels or migrate to other places where the chances of survival are usually low. Due to various road works, trees and bushes are constantly being cut down. These plants produce oxygen and provide shelter for birds, insects, etc. The more we destroy roadside greenery through cutting down and salinization, the higher the risk of extinction of subsequent species of fauna and flora. Excessive deforestation and chemicals contribute to soil erosion and groundwater contamination (Əliyev, 2017: 63).

Logisticians and scientists around the world are joining forces to make transport less invasive and protect the planet from the effects of the greenhouse effect. One of the most promising areas in the logistics industry is the ecology of transport. What is its essence? This is a continuous search for an answer to the question: what can be done to reduce the amount of pollution and other negative consequences of transport? Key issues for transport ecology are issues related to:

- energy saving solutions;
- the possibility of using alternative fuels;
- reducing the noise level generated by vehicles, ships, railways, etc.;
- methods of processing waste generated during transportation.

A good example is, in which goods are transported in the same container at all stages. This reduces the need for additional transportation of goods, which increases $CO_2$ emissions (Vəliyev, Axundov, 2020: 52).

Noise above 80 dBA is harmful to the human body, and at levels above 90 dBA, partial hearing loss is possible. The pain threshold lies in the range of 120-130 dBA. The noise impact on the acoustic environment in cities is almost always local in nature and is predominantly caused by vehicles (up to 80% of noise), with road transport having the most adverse impact, since cars are the predominant sources of intense and long-lasting noise and, moreover, are common throughout the city. Transport noise has the greatest negative consequences for the population than industrial or household noise, since its scope is much wider, and the physical parameters characterizing the impact of noise on the human body are incomparably higher.

One of the main sources of noise in the city is road transport, the traffic intensity of which is constantly growing. The highest noise levels of 90...95 dB are observed on the main streets of cities with an average traffic intensity of 2-3 thousand or more transport units per hour. The level of street noise is determined by the intensity, speed and nature of the traffic flow. In addition, it depends on planning decisions (longitudinal and transverse profile of streets, height, and density of buildings) and such landscaping elements as roadway coverage and the presence of green spaces. Each of these factors can change the level of transport noise by up to 10 dB (Jacyna, 2017: 5639).

In an industrial city there is usually a high percentage of freight transport on highways. An increase in the overall traffic flow of trucks, especially heavy-duty ones with diesel engines, leads to an increase in noise levels. In general, trucks and cars create a heavy noise environment in cities.

The noise generated on the roadway of the highway extends not only to the area adjacent to the highway, but also deep into residential areas. Thus, in the zone of greatest noise impact there are parts of blocks and microdistricts located along city-wide highways (equivalent noise levels from 67,4 to 76,8 dB). Noise levels measured in living rooms with open windows facing the indicated highways are only 10…15 dB lower.

The acoustic characteristics of traffic flow are determined by vehicle noise indicators. The noise produced by individual transport crews depends on many factors: engine power and operating mode, technical condition of the crew, quality of the road surface, and speed. In addition, the noise level, as well as the efficiency of vehicle operation, depends on the driver's qualifications. The noise from the engine increases sharply when it starts and warms up (up to 10 dB). Moving a car at first speed (up to 40 km/h) causes excessive fuel consumption, while the engine noise is 2 times higher than the noise it creates at second speed. Significant noise is caused by sudden braking of the car when driving at high speed. The noise is noticeably reduced if the driving speed is reduced by engine braking until the foot brake is applied. For the last (Sladkowski, 2020).

## Conclusion

The main measures to combat vehicle emissions include the following:

- assessment of cars based on exhaust toxicity. Day-to-day control of vehicles is of great importance. All vehicle fleets are required to monitor the serviceability of the vehicles produced on the line. When the engine is running well, the exhaust gases of carbon monoxide should contain no more than the permissible limit;
- According to the Regulations on the State Automobile Inspectorate, it is entrusted with control over the implementation of measures to protect the environment from the harmful effects of motor vehicles;
- the adopted toxicity standard provides for further tightening of the norm: for carbon monoxide – by 35%, for hydrocarbons-by 12%, for nitrogen oxides-by 21%;
- factories have introduced control and regulation of vehicles for toxicity and smokiness of exhaust gases;
- urban transport management systems. New traffic control systems have been developed that minimize the possibility of traffic jams because when stopping and then picking up speed, the car emits several times more harmful substances than when moving uniformly;

- highways were built to bypass cities, which absorbed the entire flow of transit transport, which previously stretched like an endless ribbon along city streets. The intensity of traffic has sharply decreased, the noise has decreased, the air has become cleaner;

- an automated traffic control system has been created. Thanks to advanced technical means, mathematical methods, and computer technology, it allows optimal control of traffic throughout the city and completely frees people from the responsibilities of directly regulating traffic flows. This system will reduce transport delays at intersections by 20-25%, reduce the number of road accidents by 8-10%, improve the sanitary condition of urban air, increase the speed of public transport, and reduce noise levels;

- conversion of vehicles to diesel engines. According to experts, switching vehicles to diesel engines will reduce the emission of harmful substances into the atmosphere. Diesel exhaust contains almost no toxic carbon monoxide since diesel fuel is burned almost completely. In addition, diesel fuel is free of lead tetraethyl, an additive used to increase the octane number of gasoline burned in modern high-burning carbureted engines;

- diesel is 20-30% more economical than a carburetor engine. Moreover, producing 1 liter of diesel fuel requires 2,5 times less energy than producing the same amount of gasoline. Thus, it turns out to be a double saving of energy resources. This explains the rapid growth in the number of diesel vehicles;

- improvement of internal combustion engines. Creating cars taking into account environmental requirements is one of the serious challenges that designers face today;

- the entry of highly toxic lead compounds into the atmosphere can be eliminated by replacing leaded gasoline with unleaded gasoline;

- improvement of the fuel combustion process in an internal combustion engine, the use of an electronic ignition system leads to a reduction in harmful substances in the exhaust;

- neutralizers. Much attention is paid to the development of toxicity reduction devices - neutralizers, which can be equipped with modern cars;

- the method of catalytic transformation of combustion products is that the exhaust gases are purified by coming into contact with the catalyst. At the same time, afterburning of incomplete combustion products contained in vehicle exhaust occurs;

- the neutralizer is attached to the exhaust pipe, and the gases passing through it are released into the atmosphere purified. At the same time, the device can serve as a noise suppressor. The effect of using neutralizers is impressive: under optimal conditions, the emission of carbon monoxide into the atmosphere is reduced by 70-80%, and hydrocarbons by 50-70%;

- the composition of exhaust gases can be significantly improved using various fuel additives. Scientists have developed an additive that reduces the soot content in exhaust gases by 60-90% and carcinogenic substances by 40%;

- Recently, the process of catalytic reforming of low-octane gasoline has been widely introduced at oil refineries. As a result, it is possible to produce unleaded, low-toxic gasoline. Their use reduces air pollution, increases the service life of automobile engines, and reduces fuel consumption;

- gas instead of gasoline. High-octane, composition-stable gas fuel mixes well with air and is evenly distributed throughout the engine cylinders, promoting more complete combustion of the working mixture. The total emission of toxic substances from cars running on liquefied gas is significantly less than from cars with gasoline engines. Thus, the ZIL-130 truck, converted to gas, has a toxicity indicator almost 4 times less than its gasoline counterpart. When the engine runs on gas, the mixture is burned more completely. This leads to a decrease in the toxicity of exhaust gases, a reduction in carbon formation and oil consumption, and an increase in engine life. In addition, liquefied gas is cheaper than gasoline;

- electric car. Nowadays, when a gasoline-powered car has become one of the significant factors leading to environmental pollution, experts are increasingly turning to the idea of creating a “clean” car. As a rule, we are talking about an electric car (Sladkovskiy, 2020).

The fight against traffic noise, aimed at creating a normal environmental situation and comfortable conditions for people's lives and recreation in populated areas, provides for:

- zoning of territories and targeted routing of street and road networks;
- creation of more advanced vehicles and engines;
- improvement of traffic organization and separation of freight traffic;
- use of more advanced road pavement designs;
- use of special noise protection measures.

The most drastic measure to combat traffic noise and create a normal environmental situation in cities (at least the largest ones) is considered to be the construction of underground, well-ventilated transport routes, which require large investments (Fridrikh, 2001).

Urban planning measures to protect the population from noise include: increasing the distance between the noise source and the protected object; the use of acoustically opaque screens (slopes, walls and screen buildings), special noise protection strips for landscaping; the use of various planning techniques, rational placement of microdistricts. In addition, urban planning measures include rational development of main streets, maximum landscaping of microdistricts and dividing strips, use of terrain, etc.

A significant protective effect is achieved if residential buildings are located at a distance of at least 25...30 m from highways and the rupture zones are landscaped. With a closed type of development, only the spaces within the block are protected, and the external facades of houses are subject to unfavorable conditions, therefore such development of highways is undesirable. The most appropriate is free development, protected from the street side by green spaces and screening buildings for temporary residence of people (shops, canteens, restaurants, studios, etc.). The location of the main in the excavation also reduces noise in the surrounding area.

To reduce vehicle noise, first of all, they strive to design less noisy mechanical components; reduce the number of processes accompanied by shocks; reduce the magnitude of unbalanced forces, the speed of gas jets flowing around parts, and the tolerances of mating parts; improve lubrication; use plain bearings and silent materials. In addition, reducing vehicle noise is achieved by using noise-absorbing and sound-insulating devices (Banister, 2015: 1).

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Received: 08.04.2024 Accepted: 03.05.2024