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IMPACT OF ROAD TRANSPORT ON THE ENVIRONMENTAL SITUATION IN THE URBAN ENVIRONMENT

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Abstract

A brief analysis of the latest literature sources was carried out, which showed that in Moscow, despite the increase in the fleet vehicles, emissions of harmful substances into the atmospheric air decreased from 1 million tons to 0.86 million tons in the period from 2010 to 2018, respectively. This improvement in environmental index was due to the implementation of the metropolitan comprehensive program, including the optimization of the route and road network, the use of modern environmentally friendly transport, the use of high-quality fuel, etc. Based on the analysis of pollution of districts, Rostov-on-Don (regional center) has the highest level of pollution with impurities: benzo(a)pyrene, formaldehyde, nitrogen oxides and dust, observed in the central part of the city near motorways. It is assumed that the same level of pollution may occur in similar urban areas, where road transport is one of the main sources of emissions. It is noted that reducing air pollution and noise exposure in urban environments can also be achieved through electric vehicles. In a lot of countries, the development of electric transport is considered as a way to solve existing environmental problems, the possibility of creating new markets for innovative products, and therefore is actively supported by the state by various methods. The main barriers to the development of 'green' transport are cost (high price for electric vehicles) and infrastructure (lack of a structure for charging, replacement and disposal of batteries).

Keywords: Road transport, ecological safety, environment

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1. Introduction

According to Solodkiy et al. (2016), the main pollutant (up to 80% in total emissions) of atmospheric air in large cities is automobile transport, and in Russia its contribution to total emissions reaches 40%.

According to Chomaeva (2020), the problems of ensuring the environmental safety of vehicles are an integral part of the environmental safety of the entire country

Gatiyatullin and Khabibullina 2(020) believe that to improve the environmental safety of road transport it is necessary:

- to reduce emissions of toxic substances into the atmosphere by improving carburetors, cleaning fuels and lubricants, etc.;
- to apply modern systems for neutralizing exhaust gases;
- to use natural gas as fuel;
- to use electric vehicles;
- to realize complete combustion of fuel using modern ignition systems;
- to take parking lots, gas stations outside the boundaries of residential areas.

2. Problem Statement

Improving the environmental safety of cities in the Russian Federation is an important national economic problem, which is inextricably linked with the environmental safety of road transport (Dmitrieva et al., 2020a).

3. Research Questions

Realizing the scope of the topic raised, the following issues will be considered:

1. analysis of literature sources on the impact of road transport on the environment;
2. the ways to reduce the negative impact of vehicles.

4. Purpose of the Study

In this regard, the purpose of this work is to analyze the impact of road transport on the environmental situation in Russian cities.

5. Research Methods

Like all types of human activity exclusively, the car operation must obey the first rule of the general theory of environmental safety (Dmitrieva et al., 2020b), it means to exclude harmful effects on the environment.

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One of the methods to reduce the level of emissions may be to reduce the number of cars on the roads of Moscow (Artamonov et al., 2015)

I.S. Polyakova (Polyakova, 2019) noted that in Moscow, despite the increase in the vehicle fleet, emissions of harmful substances into the atmospheric air decreased from 1 million tons to 0.86 million tons in the period from 2010 to 2018, respectively. This improvement in environmental index was due to the implementation of the metropolitan comprehensive program, including the optimization of the route and road network, the use of modern environmentally friendly transport, the use of high-quality fuel, etc.

Some authors (Novozhilov & Ivanova, 2020) believe that successful modernization of the transport system of St. Petersburg requires renewal of the motor vehicle fleet, making it environmentally friendly, economical and comfortable, rather than trying to install new equipment on existing public transport.

In 2019 in Rostov region (12 urban districts, 43 municipal districts, 17 urban settlements, 391 rural settlements) (Bodryakov et al., 2020) emissions from road transport amounted to 133.61 thousand tons, which is 3.5 and 3.6 times less than in 2017 and 2018, respectively. It takes 46.3% of the total emissions into the air (Bodryakov et al., 2020).

Based on the analysis of the pollution of the districts of Rostov-on-Don (regional center), it is noted that the highest level of pollution with impurities: benzo(a)pyrene, formaldehyde, nitrogen oxides and dust, is observed in the central part of the city near motorways (Bodryakov et al., 2020).

It is assumed (Bodryakov et al., 2020) that the same level of pollution may be in similar urban areas, where road transport is one of the main sources of emissions.

The level of air pollution by emissions from vehicles in the city of Komsomolsk-on-Amur was estimated (Krasnokutskaya, 2020). The toxicity coefficients of vehicles are given and the emissions of pollutants are calculated based on the concentration of carbon monoxide.

Emissions of pollutants from road transport at various sections of the city's highways have been compared.

It was found that in all observation sites there is an increased level of air pollution with carbon monoxide. An emphasis is made on the fact that road transport, unlike stationary pollutants, is dispersed throughout the city and located in close proximity to residential areas.

A significant reduction in emissions from vehicles is mainly determined by technical measures (Krasnokutskaya, 2020).

In addition to toxic emissions from road transport, there is a problem of dust and mud that is carried by cars on the roads. It has been established that roadside dust, smog, rising from cars, contains more than 200 types of chemical substances, many of which can be radioactive. Such dust settles in the lungs and dissolves in the human blood, accumulating in the body, causing various organ diseases, cancer, and allergies (Dmitrieva et al., 2020a).

Noise pollution of the atmosphere is currently considered as one of the main factors of harmful effects on the environment and human health (Tolstova & Drozdov, 2020). Residents of megalopolises are constantly in a situation of noise discomfort. The main source of noise exposure is motor vehicles, which contribute up to 80% of the total amount of noise (Tolstova & Drozdov, 2020). As cities grow, the negative impact of noise on human health is increasing. In this regard, the problem of noise pollution is an urgent environmental and social problem.

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Noise from road transport is a dangerous parametric environmental pollutant and an adverse type of negative impact on the human body. Road transport is the cause of noise pollution in 80% of urban areas. Since many highways are located near residential houses, the noise level in residential construction is 5-30 dB higher than the permissible standards. At the same time, it is advisable to compare the indicators of noise emission near residential buildings, depending on the type of construction: in Kirovsky district of St. Petersburg residential construction is quite dense traditional, and in the area of new buildings on the territory of the municipal formation South-West of Krasnoselsky district (Tolstova & Drozdov, 2020).

The total amount of noise impact on the territory of our country is much higher than this indicator in Western countries. The reasons for this are the following: lack of control over the noise level on highways; a large number of trucks moving in the general traffic flow; low regulatory requirements for manufactured vehicles. The level of noise generated is influenced by the technical condition and quality of vehicles and roads.

The architectural features of the sections and the general layout of the location of highways have been established and the levels of noise emission in the vicinity of residential buildings in public places largely depend on them.

Reducing air pollution and noise in urban environments can also be achieved through the use of electric vehicles, including full battery electric vehicles and plug-in hybrid electric vehicles (Mileshko, et al., 2020; Ragimov, 2020).

Further prospects for the development of electric vehicles in the Russian Federation were formulated (Dontsov, 2020).

- limited possibility of using as a public transport for the largest agglomerations of Russia, which have a high standard of living, “compatible” climate and the required infrastructure, in cities such as Moscow, St. Petersburg, Krasnodar, Nizhny Novgorod, Rostov-on-Don, etc.;
- popularization of the use of electric vehicles as personal transport, including “electric car sharing” in federal cities, resorts and recreational areas, that is, where it is first of all necessary to ensure higher requirements for the quality of atmospheric air;
- building the required infrastructure, taking into account regional and climatic specifics;
- carrying out scientific research and development projects to create domestic electric vehicles, lowering their cost, increasing the capacity and “survivability” of batteries with a simultaneous decrease in their weight, new technical solutions that make it possible to use this technology in the northern regions of the country;
- active educational work on the importance of replacing traditional cars with internal combustion engines with electric vehicles;
- application of world experience in providing preferential terms for the purchase, operation, maintenance and repair of electric vehicles.

In a lot of countries, the development of electric transport is considered as a way to solve existing environmental problems, the possibility of creating new markets for innovative products, and therefore is actively supported by the state by various methods. The main barriers to the development of ‘green’

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transport are cost (high price for electric vehicles) and infrastructure (lack of a structure for charging, replacement and disposal of batteries). The experts believe that the main growth drivers of the global electric vehicle market are measures of state support for the demand for environmentally friendly modes of transport, which are adopted in many European countries, in the USA and China, as well as advances in technology in the manufacture of batteries, allowing to reduce the cost of a battery, the most expensive element of an electric vehicle (Khitrykh, 2021).

Nowadays, Russian market for electric vehicles is practically not supported by any measures of state regulation and is developing spontaneously. However, interest in the electrification of vehicles in the Russian Federation is beginning to grow gradually in line with global trends (Khitrykh, 2021).

Despite the perceived environmental friendliness, the use of electric transport does not eliminate the known problems associated with electricity generation. For example, about 38% of the world's electricity (Presnyakova, 2021) comes from coal-fired power plants, which are considered one of the dirtiest industries. Even if we do not take into account the method of generating electricity, an important and still unresolved problem is the disposal of storage batteries (Presnyakova, 2021).

6. Findings

A brief analysis of the latest literature sources was carried out, which showed that in Moscow, despite the increase in the fleet vehicles, emissions of harmful substances into the atmospheric air decreased from 1 million tons to 0.86 million tons in the period from 2010 to 2018, respectively. This improvement in environmental index was due to the implementation of the metropolitan comprehensive program, including the optimization of the route and road network, the use of modern environmentally friendly transport, the use of high-quality fuel, etc.

In Rostov region in 2019, emissions from road transport amounted to 133.61 thousand tons, which is 3.5 and 3.6 times less than in 2017 and 2018, respectively. It takes 46.3% of the total volume into the atmospheric air.

Based on the analysis of pollution of districts, Rostov-on-Don (regional center) has the highest level of pollution with impurities: benzo(a)pyrene, formaldehyde, nitrogen oxides and dust, observed in the central part of the city near motorways.

It is assumed that the same level of pollution may occur in similar urban areas, where road transport is one of the main sources of emissions. It is noted that reducing air pollution and noise exposure in urban environments can also be achieved through electric vehicles, including full battery electric vehicles and plug-in hybrid electric vehicles.

7. Conclusion

In a lot of countries, the development of electric transport is considered as a way to solve existing environmental problems (Khitrykh, 2021).

At the present stage of development of advanced energy-saving technologies in the automotive industry, the use of electric vehicles is becoming more relevant. More than a dozen Western firms are actively working in this direction and have already achieved significant results in the development and

production of electric vehicles. This has been possible due to the development of fast-charging lithium-ion batteries and fast charging stations for electric vehicles in recent years. A comparative analysis of the use of electric vehicles and traditional cars in urban operating conditions has shown a higher efficiency of using electric vehicles when operating them in urban conditions. An electric car is five times more energy efficient than a traditional car, but its efficiency is significantly lower in winter conditions. Developers of storage batteries and electric vehicles continue to improve power plants in the direction of increasing their energy intensity and, accordingly, the electric vehicle's range, planning to get indicators that are not inferior to traditional cars.

The possibility of creating new markets for innovative products, and therefore is actively supported by the state by various methods. The main barriers to the development of 'green' transport are cost (high price for electric vehicles) and infrastructure (lack of a structure for charging, replacement and disposal of batteries). The experts believe that the main growth drivers of the global electric vehicle market are measures of state support for the demand for environmentally friendly modes of transport, which are adopted in many European countries, in the USA and China, as well as advances in technology in the manufacture of batteries, allowing to reduce the cost of a battery, the most expensive element of an electric vehicle (Khitrykh, 2021). Nowadays, Russian market for electric vehicles is practically not supported by any measures of state regulation and is developing spontaneously. However, interest in the electrification of vehicles in the Russian Federation is beginning to grow gradually in line with global trends (Khitrykh, 2021).

Our country has the necessary energy potential and deferred demand, and for large cities there is also the need to switch to environmentally friendly transport, which together creates a favorable environment for the development of this area. A tangible push should be expected after the release of the next generation of electric vehicles, which will have improved performance indicators, that is quite feasible in the next few years.

Despite the perceived environmental friendliness, the use of electric transport does not eliminate the known problems associated with electricity generation. For example, about 38% of the world's electricity (Presnyakova, 2021) comes from coal-fired power plants, which are considered one of the dirtiest industries. Even if we do not take into account the method of generating electricity, an important and still unresolved problem is the disposal of storage batteries (Presnyakova, 2021).

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