

THE PROBLEMS OF AZERBAIJAN'S TRANSPORT NETWORK AND ITS ROLE IN THE POLLUTION OF ATMOSPHERIC AIR

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Abstract

The study is devoted to the development of transport network and pollution of atmospheric air by the vehicles with particular emphasis on impact of motor transport in the territory of the Republic of Azerbaijan. The change of amounts of wastes discharged to the atmospheric air due to the operation of vehicles in the cities of the country as well as problems, created as a result of this pollution, are analyzed for the recent years, including on the example of Baku, Sumgait, Ganja and Nakhchivan cities. Origins and reasons of air contamination are shown, and the corresponding recommendations on prevention of contamination are given at the conclusion of paper.

Key Words: transport, ingredient, vehicle, harmful substances, monitoring, vehicle, favorable, concentration

Transport types are playing influential role in the contamination of components of the nature, damaging the air, water basins, soils and biological resources. In particular, influence on the atmospheric air is notable. This influence takes place more because of vehicles rather than stationary facilities. With growth of cities, transport problems are increasing, and the vehicles are negatively impacting on the environment and human health more. Gaseous substances make up 60-80% of all harmful substances, emitted by vehicles in cities of Azerbaijan. The recent growth by the number of motor vehicles urges to regard the problem of air pollution as serious issue. From this view, the study of pollution of the atmospheric air by vehicles in the industrial cities of Azerbaijan seems to be the one of topical problems.

Presently, there are over 860 thousand motor vehicles in the country. The increase of motor vehicles year by year leads to rise of non-combustible carbohydrogenic compounds, including lead, mercury compounds, sulfur, nitrogen, carbon oxides, carcinogenic compounds, benzopyrene, and other harmful substances. Wastes of transport are very toxic: entering into active zone of biosphere, they impacts on it dangerously. Lead within gaseous wastes has highly toxic property, and adversely influences on human health. In non-windy weather, as usual, wastes are dispersed out slowly in lower layers of the atmosphere, and harmful wastes are not spread at larger scale as usual. Accumulating of wastes takes place more between high buildings as well as in areas with low relief. Pollution of the atmospheric air with wastes of motor transport finds its reflection on health of urban population.

At the present, transport is an important integral part of economic infrastructure in Azerbaijan. Its effective functioning is considered to be a key issue in organization of economy and social works. On the other side, economy and society are sources of meeting requirement of this sector. In this regard, transport sector must function in accordance with demand and supply.

Transport is connected with a number of areas of economy. It is considered to be an important factor, affecting the development of economy because it allows increase labor efficiency, and reduce time of delivery of goods. Transport plays an important role in effective use of natural reserves of a country and integration into world economic system.

Transport historically has been playing an important role in social and economic life of Azerbaijan. Development of market mechanisms in economy increases possibilities of using of transport services by individuals and legal entities as clients. Transport is universal connector among various areas of economy.

Responsibility of improvement of social and environmental condition in the future necessitates managing of transport system in accordance with principles of sustainable economic development. Concerning sea transport, it is necessary enlarge the seaport network of Azerbaijan in accordance with perspective scenarios of development of international trade as well as increase of transportation capacity in this area to effectively export liquids, and also goods, transported in containers. As for air transport, the needed works of modernization include optimization of the number of airports of international importance; transition to unified system of airports; technical improvement of system of management of motion in the air to meet modern and international standards.

In this study, main emphasis is laid upon the problems of development of motor transport as the key source of air pollution in large cities of Azerbaijan.

In the country, the total length of operating roads of transport of common purposes is 22056 km, out of which 6935 km fall to the share of highways of state importance. Enlargement and improvement of roads is regarded as important factor in social and economic development of rural settlements. It creates favorable condition for transportation of grain, vegetable and other agricultural crops without loss. Low quality of roads creates serious problems for the population, especially dwellers of mountainous villages in terms of keeping of relations with centers of administrative regions. Because of bad condition of roads, connections between villages and regional cities may even be disrupted for weeks in winter season. Quality of roads of local and regional importance must serve as means of meeting social demands of villages. Taking this into consideration, and in order to provide economic advancement in the regions, improvement of technical condition of roads of local and regional importance is needed as well.

One of main problems is determination of sources of financing. From this view, the creation of more effective and globally practiced mechanisms of using private capital is needed for the development of transport sector of Azerbaijan.

Provision of system of monitoring road equipment at all automobile roads, including use of radio-receiving settings for revealing break of rules, and other special equipment at highways, is one of main terms for successfully and effectively functioning in transport sector. Conformability of technical parameters of vehicles with international standards, the raise of qualitative indicators in services as well as improvement of condition of traffic infrastructure will play considerable role in ensuring security in transport sector.

As for environmental aspects of the development of transport types, it is notable that the use of only new vehicles is advisable to escape larger amounts of wastes. In order to prevent air pollution, it is necessary to improve technical condition of automobiles, prevent the use of obsolete cars, and also enlarge greening areas within cities.

Air pollution is directly connected to growth of vehicles of motor transport. There are over 86000 thousand vehicles of motor transport in Azerbaijan, including over 20 thousand buses and about 70 thousand lorries. Functioning of obsolete parking areas is damaging the environment. 90% of vehicles is being used more than 5 years, as well as 40% of them more than 10 years.

The amount of harmful substances emitted to the air makes up 875,1 thousand ton, of which 344,2 thousand tons fall to the share of industry, and 530,9 thousand ton to motor transport. This area is responsible for

271,9 thousand ton of wastes (out of 373,3 thousand, fixed by the all sources), emitted to the air in Baku city.

According to the recently conducted technical survey, only 39,2% of automobiles and 25,4% of lorries has technical eligibility in the country. Most of cars do not meet ecological standards. Still significant part of cars is made in CIS countries. Models of these cars are lagging automobiles, made in the developed countries by 8-10 years in terms of thriftiness, reliability, security and ecological suitability. Operation of such vehicles leads to overuse of fuel as well as growth of harmful substances, emitted to the air. From view of environmental impact, ineffective privatization of fleet of motor vehicles with poor technical base also is responsible.

Automobiles, operating with internal combustion engine remain as key source of atmospheric air. Cars operating with such engine are responsible for arising of used gases which consist of up to 280 compounds, of which 160 are harmful ones. Combustion of benzine causes emergence of 20 kg of carbon oxides per 100 liter of fuels. The figure is several times higher if combustion engine is unhealthy. The other reason of high air pollution is incomplete combustion of fuel in burning camera. Approximately about 15% of fuel is spent for reaching process of motion, and 85% of fuel is emitted to the air as material of burning.

The major part of wastes of motor industry consists of harmful gases, including sulfuric compounds, nitrogen oxides, carbon oxides as well soot, dust, slag, chlorine, fluor, mercury, lead, etc. The number and intensity of movement of cars have grown in Baku-Sumgait agglomeration in recent years, and this is responsible for arising of higher amount of wastes in the capital as well as Sumgait city. More than half of all wastes, emitted into the air by vehicles is contributed by cars, buses and lorries, operating in Baku city. The increase of concentration of harmful substances in the air may lead to growth of deceases among the population. As is reflected on the figures 1,2 and 3, the average concentration of pollutants in the air of Baku and Sumgait cities was different by years. The available data on the concentration of dust in the air have not been changed by the cities in recent years with the exception of Ganja city (figures 2, 3; tables 1,2).

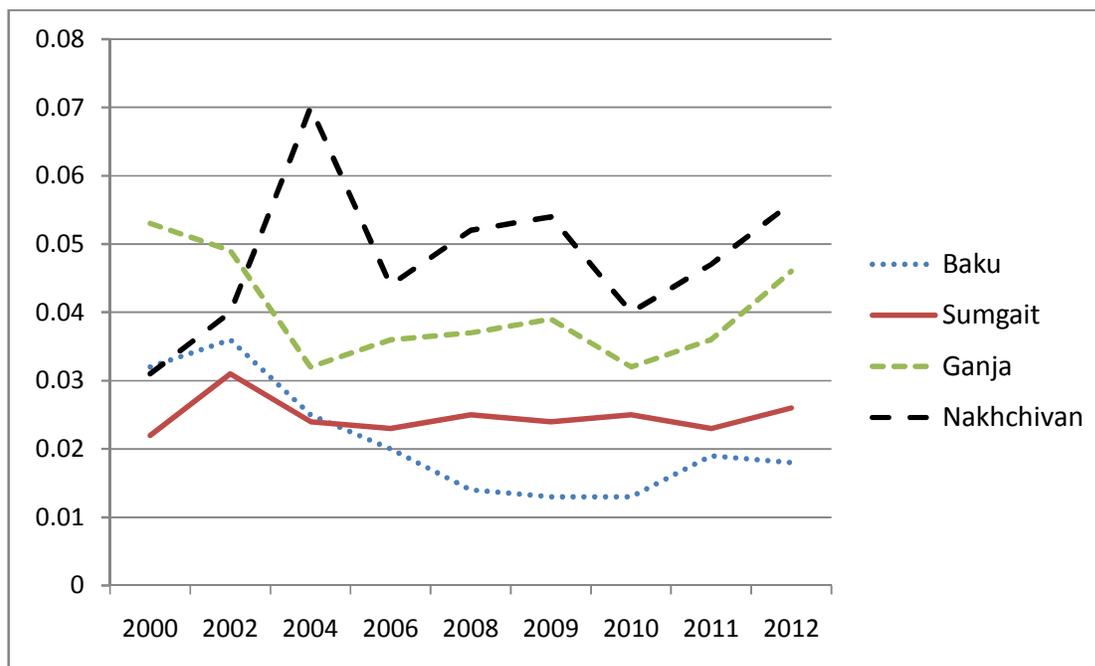


Figure 1.The average daily concentration of the sulfide anhydride in the atmospheric air by the cities of Azerbaijan (mg/m^3)

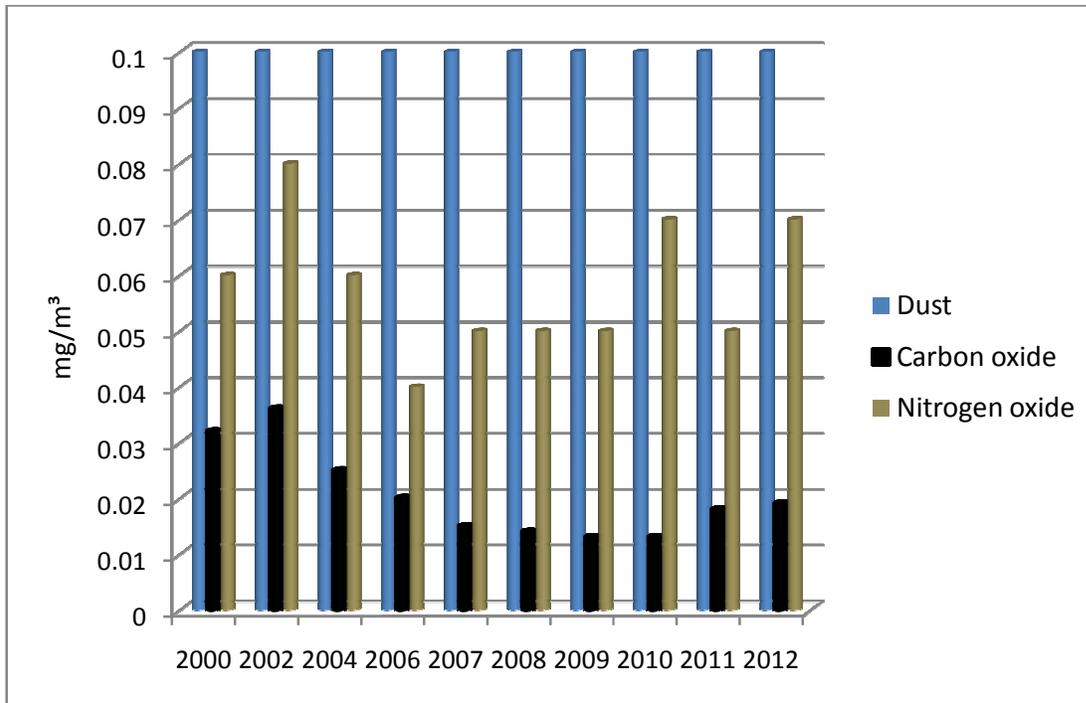


Figure 2. The average daily concentration of the harmful substances in the air of Baku city (mg/m³)

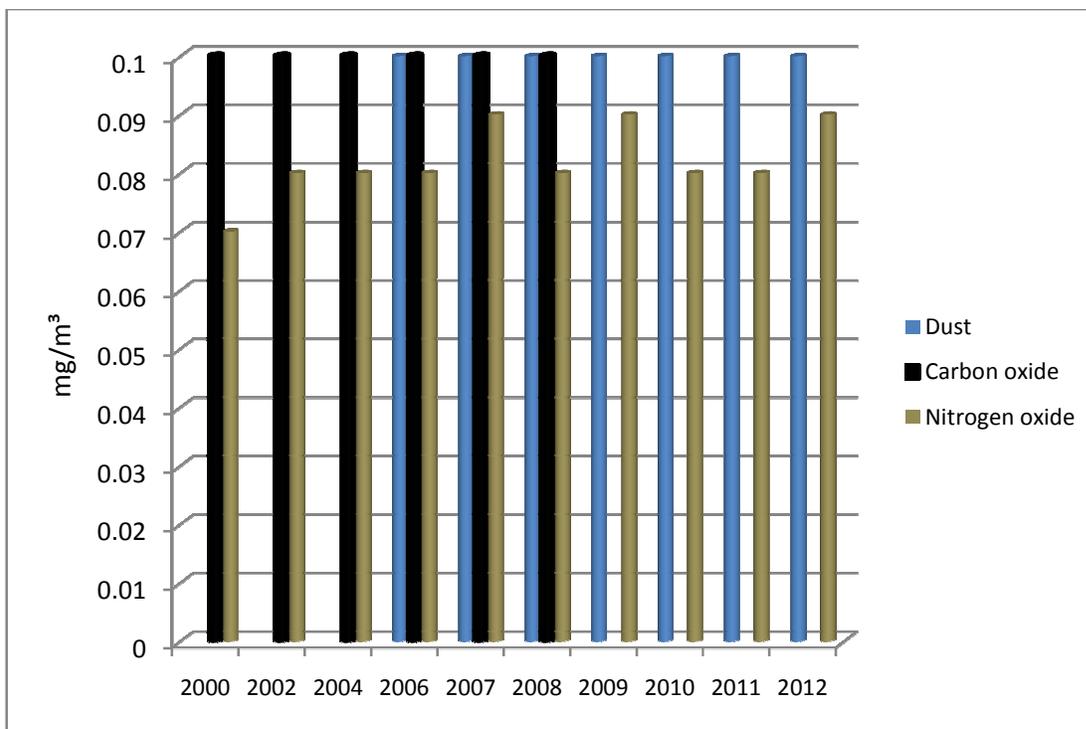


Figure 3. The average daily concentration of the harmful substances in the air of Sumgait city (mg/m³)

Highly-developed transport network is one of important terms for creation of favorable condition and rapid socioeconomic development of Ganja city, which is the second largest city in Azerbaijan. The

developed transport network allows involve the existing natural and human resources more efficiently. Obviously, creation of transport network as a necessary process is followed by process of air pollution because of numerous automobiles. The feature, characteristic for large cities of Azerbaijan relates to Ganja as well: the air is being polluted mostly due to vehicles. Situated in favorable territory in terms of economic activity, Ganja is one of the largest transport networks of the country, where functioning of railway and motor transports play significant economic role for both the city and neighboring regions. The city has also its airport of regional importance. In addition, the Baku-Tbilisi-Jeyhan pipeline and the Europe-Caucasus-Asia transport corridor, including Baku-Gazakh highway cross the territory of Ganja. Motor transport and railway remain as main and significant transport areas.

The condition of transport facilities is not satisfactory in Ganja as well as in the economic region of Ganja-Gazakh. There is a big need for reconstruction of the highways of local and interregional importance, and transport infrastructure in general.

Quality of highways impacts on speed of vehicles on roads in terms of efficiency as well as elongates the duration of use of automobiles, and allows reduce additional costs. Comfort of automobile roads has an impact on social efficiency. In Ganja city, improvement of technical equipment of road infrastructure may positively affect intensity of movement of automobiles as well as transportation of goods, and also allow use fuel in lesser amount. In 2008, the number of automobiles was over 32800, or 12,5% of all automobiles in the country. Ganja city has transport relations with the neighboring countries (Georgia, Turkey and the Russian Federation). The increase of vehicles of motor transport in recent years have resulted in rise of traffic intensity, reduction of medium technical speed of vehicles, and rise of amount of harmful substances in the air of Ganja. In this regard, improvement of technical service in motor transport is directly connected to ecological problems of Ganja.

In Ganja-Gazakh region, the second important area of transport after motor transport is the railway network. 12,6% (272 km) of all railway lines falls to the share of Ganja-Gazakh region. The Baku-Ganja-Agstafa railway line is electrified. The railway station of Ganja is a significant point in terms of transportation of goods and passengers. It plays a role of center in conducting of centralized operations by transportation of goods between administrative regions.

Favorable geographical position of the economic region serves as a positive background for the operation of pipeline as well. The transport sector of Ganja-Gazakh includes also the Baku-Batumi oil pipeline and the Garadag-Agstafa gas pipeline, which play considerable role in the economic development. Transportation of liquid gas is being conducted since 60s.

The airport of Ganja city has air relations with cities of Azerbaijan and the CIS countries. The airport has been reconstructed in 2004-2008.

As it is mentioned above, environmental effect of motor transport is much higher in Ganja. The average concentration of main pollutants by Ganja city is shown on the table 1.

Table 1

The average daily concentration of the harmful substances in the atmospheric air by Ganja city (mg/m³)

Table	Concentration (mg/m ³)			
	Dust	Sulfur oxide	Carbon oxide	Nitrogen oxide
Allowable concentration	0,15	0,05	3	0,04
Years				
2000	0,3	0,053	-	0,04
2002	0,4	0,049	-	0,04
2003	0,3	0,032	-	0,03

2004	-	0,032	-	0,04
2005	-	0,033	-	0,03
2006	-	0,036	-	0,03
2007	0,2	0,034	-	0,03
2008	0,2	0,037	-	0,03
2009	-	0,039	-	0,05
2010	0,1	0,032	-	0,02
2011	-	0,036	-	0,03
2012	0,2	0,046	-	0,03

Development of transport sector is considered as one of significant problems for Nakhchivan city, another large city of Azerbaijan. The number of motor vehicles is about 23000 in this city. Automobile transport is the main type for transportation of passengers and goods. Most of the villages are accessible via bus service. The role of bus services in transportation of passengers and goods is significant in the Nakhchivan region. According to agreement gained with Turkish companies 'Igdirlı tourism' and "Jan Igdır", transportation of passengers and goods is being conducted to the direction of Istanbul, Ankara, Izmir, Antalia and other large cities of Turkey. In the meantime, contracts are concluded with Iranian companies 'DidariSeyriGiti' and 'Nil CheshmiGostar' on transportation of passengers between Nakhchivan and Islamic Republic of Iran by the routes of Nakhchivan-Tabriz-Tehran and Nakhchivan-Urmiya.

In order to facilitate movement of population from Nakhchivan to the main part of Azerbaijan, bus routes are regularly functioning since the end of 2007 in the direction of Nakhchivan-Baku-Nakhchivan via passing the territory of Iran. The development of motor transport considerably depends on the quality of the existing roads. State Company of Motor Highways of Nakhchivan Autonomous Republic is operating on roads of 1473 km long, out of which 274 km are of state importance, and 1199 km long roads are of local importance. The implementation of works on improvement of transport infrastructure in accordance with international standards is underway.

The development of transport relations between Nakhchivan and other countries with the exception of Iran and Turkey is possible via air transport due to its regime of blockade. The constructed high-level International Airport of Nakhchivan is functioning since 2004. Planes from this airport fly to Baku and Ganja cities. In the meantime, international passenger services are rendered by the lines of Nakhchivan-Moscow and Baku-Nakhchivan-Istanbul, and in opposite directions.

Railway transport plays important role in socioeconomic life of Autonomous Republic of Nakhchivan. From Julfa station, the existing railway line has access to Tabriz city of Iran. As a result of confrontation between Armenia and Azerbaijan, the connection with the mainland of Azerbaijan railway line is disrupted since the beginning of 1992. At the present, transportation of passengers via the Nakhchivan-Ordubad and Nakhchivan-Sharur lines, i.e. within the territory of Autonomous Republic lines is being conducted. Moreover, the agreement between AR of Nakhchivan and Islamic Republic of Iran allows conduct transporting of passengers- and goods between Nakhchivan and Tabriz cities by two directions. Compared to 1995, transportation of goods has been increased by 11,2 times in Nakhchivan. The corresponding growth by transportation of passengers was at 1,9 times as much.

Monitoring of pollution of the atmospheric air is being conducted at the station of observation, located in different regions of Azerbaijan as well as Nakhchivan city. Concentration of pollutants in the air is being determined on the basis of samples taken 3 times a day: at 07:00, 13:00 and 19:00. Chemical analyses are being conducted on specific pollutants appropriate to industrial profile of the city.

Table 2**The average daily concentration of the harmful substances in the air of Nakhchivan city (mg/m³)**

Table	Concentration (mg/m ³)		
	Dust	Carbon oxide	Nitrogen oxide
Allowable concentration	0,15	3	0,04
Years			
2000	0,1	-	0,03
2002
2003	0,1	-	0,03
2004	0,1	-	0,03
2005	0,1	-	0,03
2006	0,1	-	0,03
2007	0,1	-	0,03
2008	0,1	-	0,03
2009	0,1	-	0,03
2010	0,1	-	0,03
2011	0,1	-	0,03
2012	0,1	-	0,04

As is seen from Figure 1, the average concentration of sulfur anhydride exceeds the daily norm in the air of Nakhchivan city. Contamination of the atmospheric air by sulfuric gases takes place as a result of combustion of sulfuric oil and oil products. Intensification of the pollution process is responsible for growth of number of infantry deceases as well as emergence of hardly treated deceases among the population.

Wastes of motor transport become larger as usual than the number of vehicles. Maintaining of the lower limit of amount of wastes, previously provided by producer of car is possible only within 1-3 years of operation.

Vehicles pollute the atmospheric air not only with used toxic compounds but also with steam of fuel and dust of wheels. Each automobile is responsible for emergence of dust of resin at 10 kg in a year. Diesel fuel as well as benzene, produced in Azerbaijan is relatively qualitative with concentration of sulfur at 0,08-0,2 and 0,16-0,03. However, in many cases vehicles of motor transport are not provided with system of neutralization, whereas the number of stocks of vehicles steadily increases year by year.

Transition to using of qualitative automobiles, and also application of standards of Euro-4 and Euro-5 concerning use of benzene and diesel in Azerbaijan, is strongly recommended by European Union.

Main conclusions, key moments and appropriate recommendations, concerning the carried out research can be formulated as follows:

1. Prevention of the air will inefficient if the conducted works aiming to liquidation of sources of contamination are one-sided and incomplete. More effective results will be reached if impact of different origins of contamination as well as real potential of limitation of wastes is being determined in detail and thoroughly.

2. Analysis of air temperature, direction and speed of winds in Baku, and also monthly and yearly data of concentration of carbon oxide in the atmospheric air of this city in average was measured for 2011-2012 years. Depending on air temperature and speed of wind, medium monthly concentration of carbon oxide is changeable. Although the air temperature of August is usually higher, the concentration of carbon oxide has been fixed as higher by June and July (when speed of wind is relatively lower). Correlation coefficient between curves is higher (from 0,73 to 0,88).

3. As the studies show, change in amount of emitted wastes of motor transport has taken place in different years in the large industrial cities (with the exception of Sumgait). The amount of the pollutants has increased from 229,9 thousand ton to 410,7 thousand ton in the air of Baku as well as from 20,8 to 37,2 thousand tons in Ganja. By Sumgait city, the amount of pollutants has been reduced from 14,3 to 8,2 thousand tons.

4. Reconstruction of obsolete railway transport in order to increase volume of transportation capacity as well as modernization of existing infrastructure and rail vehicles is seen as significant problem.

5. Concerning motor transport it should be noted that highways, crossing the territory of Azerbaijan, should be reconstructed. Highways of interregional importance must be modernized as well. In the meantime, it is necessary to improve traffic management and the related control system, modernization of vehicles in term of international technical standards and ecological requirements. Creation and applying of systems of standardization and certification in motor transport is also required.

6. Modernization of transport infrastructures and facilities in Baku and other large cities of Azerbaijan, including reconstruction, elongation and enlargement of automobile roads of all importance must be conducted. Moreover, construction of new roads, bridges, road-conductors, underpasses, multi-storey and underground parking areas is needed. Buses with low capacity should be replaced by large ones.

7. It is advisable manage works on removal of harmful sulfur, lead and other compounds from composition of liquid fuel in order to reduce wastes of motor transport.

8. Enlargement of territory of greening areas in cities is needed.

9. Standards, rules of ecological certification and other juridical documents on regulation of ecological impact of motor transport, should be developed.

10. It is necessary develop standards of ecological security for determination of toxicity extents of wastes of motor transport.

11. Creation of system of environmental control by state agencies, and also regularly-functioning roadblocks at highways seem as needed work.

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