

## Ecological Problems of Motor Transport of Azerbaijan

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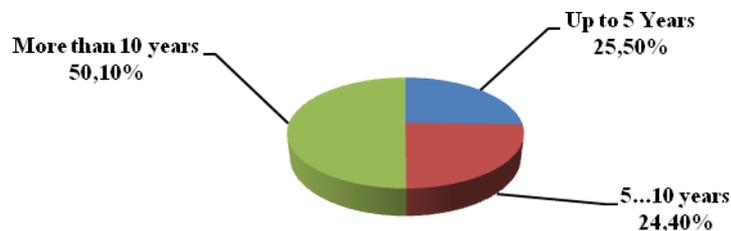
Automobile transport is one of the leading and the most complex means in the transport system of Azerbaijan.

Over the past decade the motor transport has been developing at faster pace relative to other transport modes and sectors of economy (Table 1). This has been provided by its objective advantages supplemented by significant progress in the field of road construction and construction of motor vehicles. It should be noted that the number of cars per 1000 people was 55 in 2000 while in 2011 it was about 115. Currently, the number of car park of the Azerbaijan Republic is more than one million units.

Years	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of automobiles, unit.									
Azerbaijan	511 460	554 031	612 069	690 012	773318	860 047	925 866	982 553	1030079

Table 1

Car park of the country is relatively old (as shown in the following diagram) and the average age is about 10 years, where about 20% of the car park is being exploited for more than 15 years, and part of that car park has been completely worn out and should be disposed off.



Age structure of the car park of the Azerbaijan

The process of motorization had a significant influence on the rapid development of the economy and social sphere. However, one of the main problems in the motorization of the country are the environmental problems, similar to all developed countries. Motorization in the Republic leads to intense pollution of the environment.

The actual total mass of emissions can be determined by the expression:

$$M = \sum_{i=1}^n m_{i,n} \cdot K_{i,m,c} \cdot A_i \cdot L_{i,q};$$

where:

$m_{i,n}$ -the regulatory allowable weight of  $i$  harmful emissions:

$K_{i,m,c}$ -Coefficient taking into account the influence of technical conditions of the vehicle for the weight of  $i$  harmful emissions:

$A_i$ -The number of the vehicles of type  $i$ :

$L_{i,q}$ -The average annual mileage of the vehicles of type  $i$

According to the calculations the total annual amount of emissions of the car park of Azerbaijan Republic (with good technical condition of vehicles) is about one million tons. Of these, about 600 tons of carbon monoxide (CO), 240 tons of hydrocarbon (CH), 85 tons of nitrogen oxides (NOx), 25 tons of soot and 0.05 tons of lead.

In conditions of rapid growth of the car park other problems rise related to the complexity of the situation in organisation of transportation safety in the field of road safety. As a result, road accident rate also increases.

Analysis of accident statistics (Fig. 1) shows that the majority of them are directly or indirectly related to the intensity or tightness of transport movement.

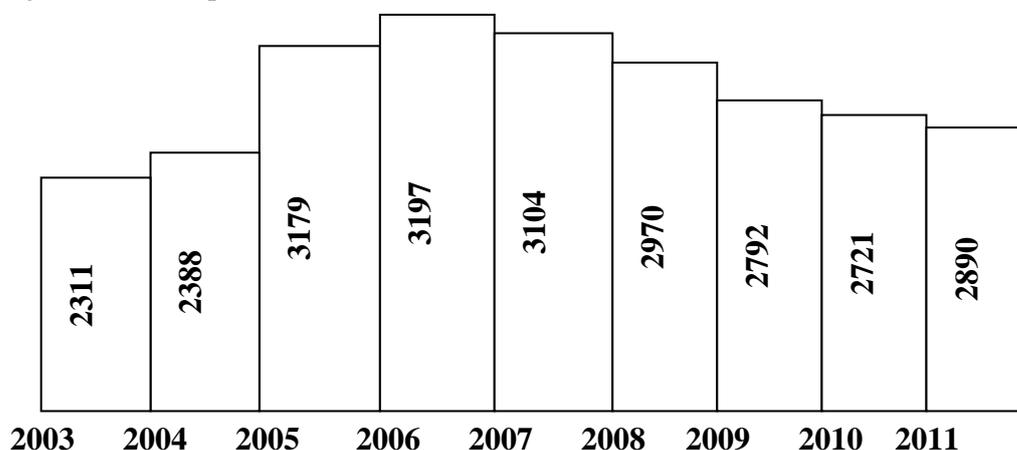


Fig.1. Dynamics of road traffic accident change in Azerbaijan

In addition, one of the main negative aspects is the uneven distribution of the car park around the regions of the country, which is typical for most of CIS countries. That is why, a complex situation regarding the environmental safety and organization of road safety has particularly emerged in Baku. Rapid growth of private car park should also be considered as one of the main reasons for this situation along with unsatisfactory road conditions. Currently, about 60% of the vehicles are located in Baku. It should be noted that the statistics do not consider the number of cars whose drivers are temporarily working and living in Baku without official registration. The accumulation of the main part of the car park in Baku creates huge problems, both in terms of traffic safety (occurrence of traffic jams), and urban air pollution. Proportion of the road transport vehicles in the total amount of pollutants' emissions into the atmosphere by all man-made sources is up to 75%, and the noise impact on the city's population is 85-90%. The greatest harm from air pollution is effecting people. International experience suggests that the biggest concern in this context usually causes such pollutants of the urban environment as lead and fine aerosols. These pollutants result from the use of leaded gasoline.

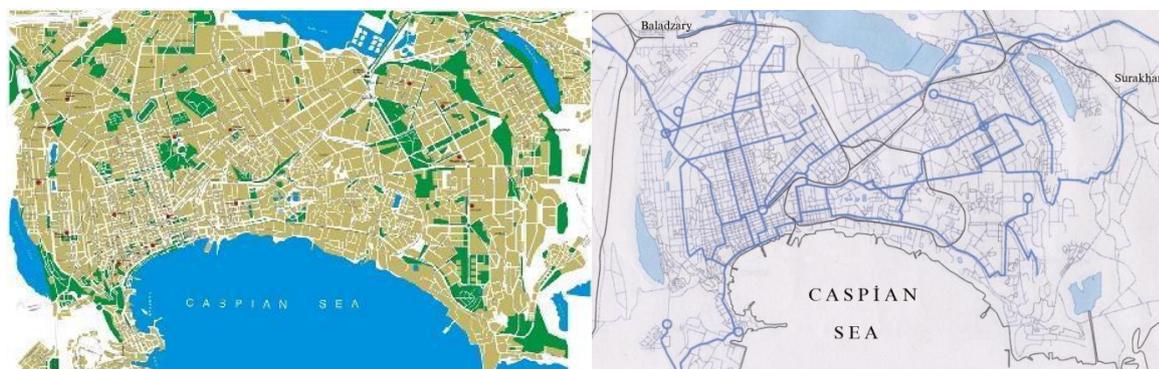


Fig. 2. Scheme of street road network of Baku

One of the main problems of the process of motorization in the Republic is a growing discrepancy between the rate of growth of motorization and the demand for transportation to the rate of development of roads. It would be enough to compare the growth dynamics of cars and roads in the city of Baku for the last 9 years (Table). As can be seen from the table (data from the State Committee on Statistics of Azerbaijan Republic),

the total number of vehicles for the period rose by more than 3.0 times, whereas the total length of the roads increased only by about 16.0%.

Years	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Automobiles, units.									
City Baku	205 072	249 857	295 862	363 918	427 083	502 369	549 511	598 132	638 649
Roads, km									
City Baku	1923	1963	2018	2087	2113	2138	2173	2198	2223

Table 2

Baku is an ancient city with its formed architecture layout and a complex scheme of the road network (Fig. 2). A part of the city (the old part of town and "Icheri Sheher") was built on a rectangular pattern layout of the road network, another part of the microregions on a neighborhood scheme, and some parts are based on a free style. So this in its turn makes the optimal functioning of the traffic flow and operation of the services and facilities that are responsible for the organization and regulation of traffic even more complicated. The total length of road network suitable for car traffic in Baku city is about 2173 km. Given the above data the most simple and approximate calculations show that for normal traffic conditions (at the level of street and road load of  $Z = 0.4 \dots 0.6$ ) that there is a need for 3550 km of single-lane streets more (which is 1775 km of two-lane or 888 km of four-lane streets).

For constrained motion, these values would be about 1056 km of single-lane or 528 km of two-lane, or 264 km of four-lane streets respectively. Whereas the number of visitors, parked cars and the coefficient of getting to the line which was equal to 0.7 were also taken into account. According to the calculations it is clearly seen that the traffic is particularly busy on the main highways of Baku, especially around the central parts, additionally almost blocked or completely blocked during the "peak" hours. It is impossible to improve the movement on the roads by usual organizational and management methods, which contributes to traffic accidents, increase of emissions and noise pollution, increase in the delay of passengers and cargo transfer.

Different methods are being used in order to change the traffic situation and thus improve the ecological situation in Baku. The most typical of which are the following:

- parking management system (paid parking, parking restrictions);
- development of the public transport network (construction of new subway stations, increasing the length of public transport routes);
- construction of new multi-storey interchanges, tunnels, express highways, construction of new highways;
- restricted access of vehicles to certain areas of the city (the introduction of residential and pedestrian areas, prohibition or restriction of movement of freight transport).



Fig. 3. Transport infrastructure of Baku city

All these methods and tools used in practice do not respond flexibly enough to the traffic conditions and do not provide radical solutions to environmental problems of road transport.

In order to improve traffic management and to provide significant changes in the environmental impact of road transport in Baku the center of intellectual control of transport processes (cictp) has been introduced for exploitation in December 2011. This is a comprehensive system of information support and management on land road transport based on the use of modern information and telecommunication technologies and management practices.



Fig. 4. Centre for Intellectual Control of Transportation Process in Baku

The introduction of the center of intelligent management of traffic processes allows to reduce delays in traffic, travel time and decrease the volume of harmful emissions.

In general, in order to reduce the harmful effects of road transport on the environment of Azerbaijan and to provide the rational management of environmental activities the following must be done:

- The organization of effective management of environmental activities through targeted program planning;
- A gradual upgrade of the age and structure of the car park of the republic:

- Improvement of existing industrial and technological base for the control of technical condition and maintenance of vehicles:
- Creating an effective system of environmental control and monitoring using a network of stationary and mobile monitoring stations, as well as points of control of environmental parameters of vehicles;
- A combination of legal and economic methods of environmental management in transportation;
- The use of mandatory certification on environmental standards for vehicles, fuel, equipment, technology, etc:
- Development of a system of environmental training and retraining of transport specialists.

In order to implement these areas enormous work is being done to improve and technically upgrade the entire transport system of Azerbaijan in recent years.

### References

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