

Sustainable Urban Transport In the City of Yerevan

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1.Objective

The objective of this study is to determine the problems of sustainable urban transport in the city of Yerevan and to draw the attention of competent authorities to the need of solution of these problems. The results of the study will be presented during the seminar on “Sustainable Urban Transport and Land Use Planning” which will be held from October 18-20, in Tbilisi. The problems determined in the process of the study can be taken into account during development of strategies and action plans.

2. Introduction

The problem of sustainable urban transport is one of the most complex environmental, health and transport issues in the world and it is relevant for all the big cities. Yerevan is not an exception. On the one hand the importance of the problem is due to the over norm air pollution and on the other hand it is conditioned by the great share of the motor vehicles in that pollution.

The complexity of the problem particularly depends on the fact that it derives from different fields of economic activities, such as urban construction, road construction, transport, traffic organization, etc. Any policy and strategy developed and implemented in these fields must be in compliance with environmental and human health protection issues.

The policy of air protection is closely related to the transport policy. Urban air pollution from transport is the contiguous result of transport running. The transport has a significant role for the urban economy and prosperity of its population. Environmental problems are important, but they are only one of the policy aspects of urban transport, among economic, financial, social and other aspects. These different sides of the issue must be balanced during development of local or national policy.

2.1 Brief description of the city

In 2005¹, the population of the city of Yerevan was 1.1 million people, the territory was 227 km² and the population density was 4859 people per km². Yerevan occupies 0.76% of the territory of the Republic, but 34% of the population. In 2004, the net migration was away from Yerevan, as 2,100 people left the city, compared to 7,700 who left the country, as a whole – a decrease of 25% compared to 2000. The average income of the population in 2004 was 417,978 AMD (Armenian drams), which is approximately double that of 2000.

Yerevan is one of the most ancient cities in the Region. This year 2,788th anniversary of its foundation was celebrated. Yerevan had steep upsurge in the 20th century becoming from a provincial town a big cultural and industrial center. Yerevan is a compact city. It was founded in Ararat Valley, afterwards it expanded and included Kotayk and Eghvard foothill uplands. The absolute grades of the height above sea level oscillate between 850-1420m. The average height of the city above the sea level is 1,110m. On the whole the territory of the city has complex cut relief. Plane surfaces occupy 40% of the territory, sloped planes occupy 30% of the territory, the 20% of the territory has slightly sloped relief and 10% of the territory consists of inclined slopes. Yerevan is surrounded by mountains from 3 sides, which makes difficult natural ventilation, in this way becoming the reason of frequently observed surface temperature inversion during winter months, which in its turn leads to the accumulation of hazardous substances in the urban air. The rivers Hrazdan, Getar and Jrvedz cross the territory of the city of Yerevan. Besides the rivers, there are artificial reservoirs in the territory of the city, such as Yerevanyan Lich, Vardavari Lich and a number of small reservoirs. The general surface of the water territory of the city consists 141.9 hectares.

3. Analysis of the current situation

3.1. Vehicle use

- **Passenger by mode, including occupancy rates**

Passenger transport in the Republic has, between 2000 and 2004, increased from 137.2 million to 185.6 million passengers per year. The share of passenger transport by different transport means for 2004 was:

- Railroad - 0.4%;
- Motor vehicles – 87% (of which about 90% was by minibuses, 8.5% by buses and 1.5% by taxi);
- Air - 0.6%; and
- Electric transport – 12% (of which 75% by underground lines, 23% by trolleybuses and 2% by rope-ways).

Moreover, the use of railroad, in comparison with 2000, halved, whereas the use of motor vehicles increased by 15%, the use of air increased by 20% and the use of electric transport decreased by 45%. Passenger transport by taxis has increased during the given period approximately 10 times, increasing from 0.3 million per year to 2.8 million passengers.

¹ According to the statistical yearbook

Approximately 70% of passenger transport use occurs in the city of Yerevan. Detailed information on passenger transport use is given in the Annex. Studies on occupancy rates of public transport and cars have not been carried out, but by the experts assessment we can say that in rush-hours minibuses are overloaded, and that other times they run with 70-80% loading, buses accordingly with 100% and 30-40%, and underground lines 100% and 50-40%, trolleybuses with 40% and 10-20%.

The care occupancy rate is approximately 1.5 passengers per car.

- **Energy consumption in transport**

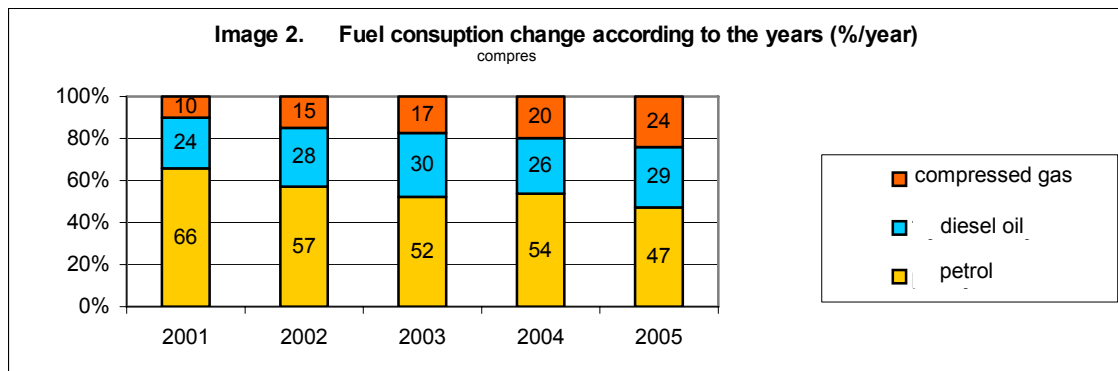
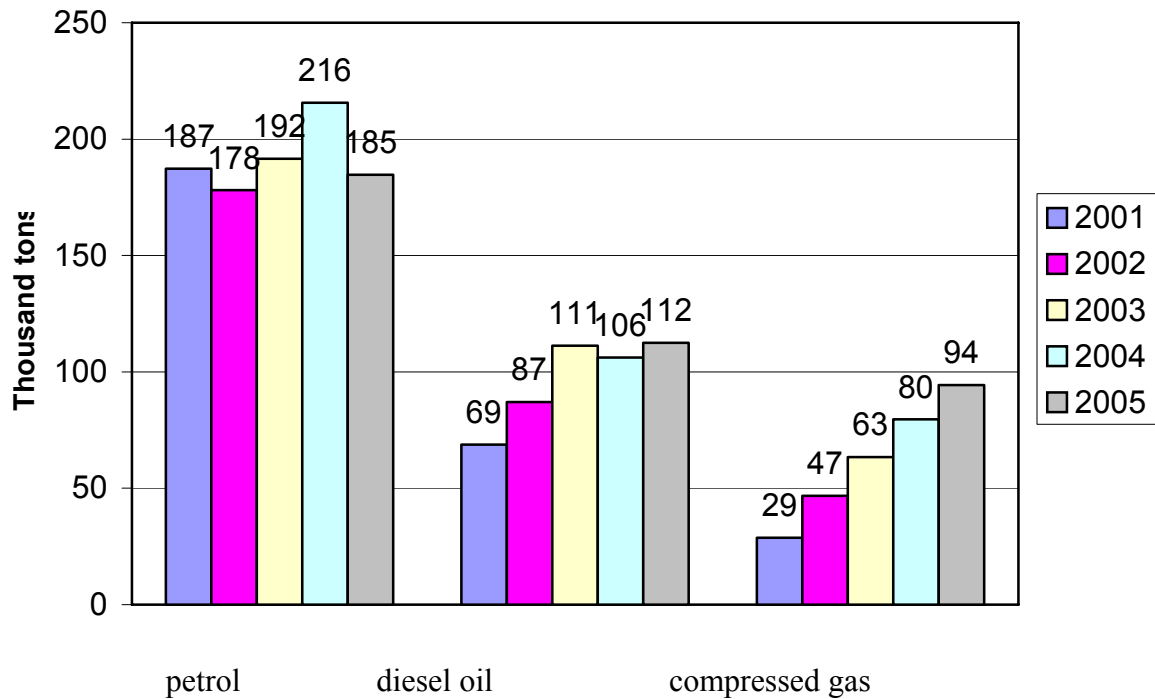
Armenia has no fuel production and all the fuel used in Armenia is imported. The change of fuel consumption in the Republic according to the years is given below:

Table1. The change of fuel consumption in the Republic according to the years, by %

Years	2001	2002	2003	2004	2005
Petrol	66	57	52	54	47
Diesel oil	24	28	30	26	29
Compressed gas	10	15	17	20	24
Total consumption -thousand. ton	285	312	366	401	391

According to the data given in the Table 1, total fuel consumption from 2001 to 2004 increased, although in 2005 it decreased a little in comparison with 2004 (See image 1). In general fuel consumption during this period has increased by 40%, although petrol consumption has remained more or less stable, the use of diesel has increased by 60% and the consumption of compressed natural gas has increased by 230%, because the natural gas is about 3 times cheaper than petrol. The share of petrol during observed years has decreased from 66% to 47% and that of gas has increased from 10% to 24% (see image 2).

Image 1. The change of fuel consumption by years



3.2. Vehicle technologies

- **Fuel quality. Share of unleaded, low/zero sulfur fuels, biofuels**

The carried out studies have demonstrated, that the quality of the fuel imported into the Republic during recent years corresponds to the existing standards, moreover, petrol does not contain lead. The production, import and sale of petrol, which contains lead, are prohibited².

² By decision N 799 of the Government of RA on "Regulating Lead Containing Petrol Use", 31, December 1999, and by the decision N 902 of the Government of RA on "Prohibiting the Transportation of Particular Goods through the Custom of RA According to the Custom Regime"

During 2001-2005 the content of lead in the imported petrol fluctuated from 0.006 to 0.0085g/liter, while the content of sulphur fluctuated from 0.000025 to 0.00018kg/kg in petrol and from 0.00087 to 0.0017 kg/kg in diesel.

The current fuel quality standards in Armenia by some parameters are not as strict as EU standards. For example, according to the standards of the Republic of Armenia (RA) the permissible quantity of polyphenols, aromatics and sulfur is higher. There is no biofuel use in Armenia yet, but taking into account the importance of the issue the Government of RA has foreseen the study of the possibilities of biofuel production and use in RA.

- **Use of emissions standards, catalytic converters**

The emissions standards³ are in compliance with UNECE regulations N 49-02, N 49-03, N 49-04, N 96-01, N24-03, N 83-04 and N83-05. Gradual concentration of these standards is foreseen with the aim of harmonizing them with the newer UNECE standards. The share of vehicles with hazardous emission neutralizers is very small, so in general we can say that in Armenia cars do not have catalytic converters. But taking into account the importance of the issue the Government of RA has foreseen implementation of activities aimed at introduction of neutralizers. We can mention as one of the first steps prohibition of import of cars without hazardous emission neutralizers to the Republic starting from 1st January 2007.

3.3 Vehicle numbers

- **New vehicles versus imports of second-hand vehicles, age of vehicles**

Approximately 50% of transport means registered in the Republic are in the city of Yerevan. According to the studies carried out by the Policy of the Republic of Armenia and the Ministry of Nature Protection in the second half of 90's drastic decrease by 50% of the quantity of the registered motor vehicles took place. It is conditioned by the fact that in Soviet era many cars which actually were out of order, plundered and were not subject to exploitation were registered according to the documents in different companies. After independence, when the national system of registration has been introduced, such cars were not submitted to registration.

The majority of the cars which are currently exploited were produced during 1980-1990 in the Former Soviet Union or Russian Federation and they do not have emission neutralizers. The cars produced in other countries consist of 5% of the vehicle fleet. In general the vehicle fleet is old. According to the data of the annual technical examination of the motor vehicles, 30% of cars are more than 20 years old, 60% are between 10 and 20 years old, while only 10% are less than 10 years old and only 3% are less than 1 year old. Only 27% of cars imported in 2005 were new. Age restrictions for the use of motor vehicles are applied only for the minibuses exploited in public transport. Their maximum age must not exceed 15 years. According to the data of the custom service during 2004 approximately 15,000 cars have been imported to the Republic - 50% of which were produced in Russia.

So we can say that the vehicle fleet of the Republic is out of date, as a result it has negative environmental consequences.

³ As determined by "Technical Regulations on Environmental Safety of Transport Means Exploited in the Territory of RA"

There is not modern and effective system for motor vehicles technical service. All vehicles are subject to technical examination once a year and the vehicles exploited in public transport are subject to technical examination twice a year; moreover one of the conditions of technical examination passing is the verifying of the compliance of the emissions to the standards. Though the formal part of these examinations is provided, but its efficiency is very low.

3.4 Vehicle impacts

- **Air quality**

According to the data of Armecomonitoring, 10 pollutants have been studied in 2005 in Yerevan, 4 of which: dust, nitrogen dioxide, benzene and sulphur dioxide are important from the transport emissions point of view.

The average annual recorded level of some of these substances in the atmosphere exceeded permissible norms: the average levels of dust were double the permissible levels, while levels of sulphur dioxide were 140% higher, those of nitrogen dioxide were 180% higher, those of benzene were 40% higher and these of tropospheric ozone were 120% higher. The maximum average daily norms for nitrogen dioxide were exceeded in 62% of samples and levels were nearly 5 times permissible levels in some cases. Similarly, the concentration of tropospheric ozone exceeded daily norms in 6% of samples and benzene exceeded these norms in 1% of samples, with maximum levels of up to 120% and 130% higher than the permissible standards.

In comparison with the data of previous year the annual average concentration of nitrogen dioxide has decreased by 17%, whereas the equivalent figures for benzene and tropospheric ozone are 37% and 23% lower, respectively.

Since the second half of 1997 measuring of carbon oxide (CO) (which is the indicator of air pollution from motor vehicles) in Yerevan by Armecomoinitoring has been stopped as the equipment is out of order and a new one has not been bought. Measuring carried out before it demonstrated that the annual average concentration of CO exceeded the determined norm by between 30% and 100%. So it should be expected that carbon monoxide is still a problem.

At the same time we must mention that the system of Armecomonitoring requires fundamental improving as:

- a) Today only 5 air pollution observation posts function in Yerevan and naturally it is not possible to give the full image of the pollution in the city based only on the data of 5 posts. According to the calculations it is required to have at least 10 stationary and one mobile observation stations.
- b) Such important substances as carbon monoxide and lead are not considered.
- c) The quantity of sample and analysis taking and technical saturation of equipment for their realization is small.

- **Emissions from transport, including greenhouse gases (i.e. CO₂)**

The Share of the Different Sources in the Air Pollution

Detailed information on hazardous emissions is given in the Table 2.

Table 2. Total of hazardous substances emitted into the atmosphere (thousand ton/year)

	Year	Industry	Energy	Transport	Total
Republic	1987	149.5	92.5	498.2 (68%)	731.2
	1998	12.6	3.8	140.7 (90%)	157.1
	2000	15.2	3.5	124.3 (87%)	143.0
	2001	13.3	3.8	134.8 (88%)	152.4
	2002	19.4	2.0	133.7 (90%)	147.0
	2003	25.9	2.2	147.9 (84%)	174.5
	2004	39.0	1.9	164.4 (80%)	205.2
	2005	49.9	1.1	146.9 (74%)	197.9
Yerevan	1987	46.7	26.1	175.2 (71%)	248.0
	1998	0.7	1.0	74.8 (98%)	76.5
	2000	0.8	1.8	67.3 (96%)	69.9
	2001	1.5	0.5	67.4 (97%)	69.4
	2002	1.2	0.35	66.8 (98%)	68.35
	2003	1.4	0.4	73.9 (98%)	75.7
	2004	1.8	0.4	82.2 (97%)	84.4
	2005	2.1	0.7	73.4 (96%)	76.2

As the Table 2 shows the main reasons of air pollution are emissions from transport. According to the data of 2005 the emissions from transport in the Republic consisted 74% of the total emissions, and in Yerevan they consisted 96%. The share of transport in air pollution is incomparably great because of the fact that in comparison with the organized, high-level sources of pollution (pipes) emissions from motor vehicles are made at the level of human breathing and are accumulated in the surface air in the whole territory of the city.

Hazardous emissions from vehicles in the Republic during 2001-2004 demonstrated a tendency of increase. In 2005 it decreased by 7%, reaching lower level than in 2003. This is due to increase of share of compressed natural gas consumption as a motor fuel in transport, as well a little decrease of total imported fuel.

According to the fuel type the shares of hazardous emissions since 2001-2005 are given in the Table 3:

Table 3. Emissions from motor vehicles and their share according to the fuel type

Years	Total hazardous emissions/ CO ₂ (thousand. ton)	Shares of hazardous emissions according to the fuel type(%)		
		Petrol	Diesel oil	Compressed natural gas
2001	135 / 891	90	8	2
2002	134 / 968	86	10	4
2003	148 / 1134	83	12	5
2004	164 / 1238	85	10	5
2005	146 / 1170	81	12	7

Moreover it can be stated with high precision that passenger cars consume petrol, heavy-duty trucks consume diesel oil and minibuses, buses and light-duty trucks consume natural gas.

As it is shown in the Table 2 the great share of hazardous emissions fall to petrol. Moreover, the share of emissions from petrol among total hazardous emissions demonstrated decreasing tendency during 2001-2005, from diesel oil – increasing tendency, from compressed natural gas-increasing tendency, which are in compliance with the consumed quantity of fuel.

The emissions are calculated at the level of the Republic, as according to the current Initial data it is impossible to carry out precise calculation of emissions from motor vehicles and to divide them according to the regions and big cities.

Main pollutants and their sources

Nitrogen dioxide- petrol and diesel transport

Carbon oxide-petrol transport

Sulphur dioxide-diesel transport

Suspended elements- both motor vehicles operating on diesel oil (direct emissions) and all transport means (indirect emissions)

Benzene and aromatic hydrocarbon- petrol transport

Ozone- arising from combination of nitrogen oxides and evaporable organic units that in general are emitted from petrol motors.

Lead- petrol transport

- **Noise**

It is known that the noise is one of the main negative impacts of the transport, but nowadays studies on this issue are not being realized in Armenia and any information regarding this problem does not exist.

- **Accidents**

The number of traffic accidents in Yerevan during 2000-2005 has increased from 414 up to 569, as a result of which the number of victims increased from 56 to 81, and the number of wounded from 529 became 685. More detailed information on traffic accidents is presented in the Table 4. below

Table 4. Traffic accidents in Yerevan

Year	Accidents	Victims	Wounded
2000	414	56	529
2001	493	82	540
2002	456	64	499
2003	483	84	569
2004	512	71	589
2005	569	81	685

- **Congestion**

Traffic congestion has become a very frequently observed phenomenon in Yerevan. Its frequency is especially great in the center of the city, in the crossings of the main streets and streets adjacent to markets and trading centers. Only during last 6 years the number of cars which are registered and used in Yerevan increased approximately by 40%, moreover the number of minibuses and taxis which are used permanently during the day has increased in several times. The first Main Plan of the city of Yerevan was developed in 1930's and it was foreseen by it that the population of the city would not exceed 250,000 (less than a quarter of its current population). The city constructed by this Main Plan currently is the center of the city and naturally it cannot secure the available level of urban transport flow. The situation is even becoming worse because of large scale construction activities in the center of the city as from the one hand due to formation of building sites the traffic zones of several streets became narrower, from the other hand the traffic of vehicles that serve this construction has increased. The situation will become more complicated after the construction activities in the center are over and when the density of the population in the center of the city increases accompanied with emerging transport problems.

The number of transit cars in the capital is great too, as it is situated in the central part of the Republic and the great number of cars going from the South-Western regions to North-Eastern regions pass through Yerevan. If we consider the allocation of the cars inside the city, then we are to say that the density of the cars in the center of the city is higher because the density of the population is higher as well as administrative buildings, cultural and trading centers are centralized here.

Stopping and parking in the traffic zone significantly impede the normal traffic. The cars often are being parked at angle near the pavement in this way closing the first zone of the traffic. Afterwards in order to go in the traffic again these cars enter the second zone of the traffic with backward movement so making this part of the traffic not exploitable for the main flow of the cars. As in such places the cars making backward movement follow each other, it is obvious that only one zone of the road having 3 traffic zones remains free in this way reducing the passability of the road.

Under the current situation the only perspective solution of the problem will probably be creation of dens underground net and reviewing of the traffic organization.

3.5 Vehicle costs

- **External cost estimates**

There is no study or estimation of external cost in Armenia yet.

- **Costs of fuel and public transport fares**

Nowadays the fuel costs are the following: petrol-approximately 1 USD/liter, diesel oil-0.8 USD/liter and compressed natural gas-0.35 USD/liter. The public transport fares are the following: minibuses-0.26 USD, electric transport-0.13 USD, buses 0.13-0.26 USD for one trip and taxi-0.26 USD/km. During last 5 years the price of the petrol has increased by approximately 40%, that of diesel oil has doubled, while the price of natural gas has increased by 70%. Notable changes in the prices of the public transport have not taken place.

3.6 Vehicle disposal

At present there are no special places for allocation of out of order cars. The parts which are subject to future exploitation of the out of order cars are being taken away and reserved or sold as spare parts and the remaining metals are being handed over to metal receiving points which in their turn export or alloy them in future.

3.7 Infrastructure

- **Length by mode**

The exploited length of the communication roads in RA is presented in the Annex in the form of a table. As the table demonstrates the length of railways remained the same during 2000-2004 forming 731.9km, roads during the same period increased from 7527km to 7629km, the length of tramways decreased from 43.1km to 0km, those of trolleybuses from 174.3km decreased to 92.6km, those of underground and ropeway (which are only located in Yerevan) remained the same forming correspondingly 12.1km and 5.7km. It is worth mentioning that after an accident, which took place in autumn of 2004, the ropeway of Yerevan does not function. The total road area in Yerevan forms 15.9 million m² occupying 7% of the total area of the city. There are 144 roads of urban importance in Yerevan with total length of 266km. The rest of the roads of Yerevan are of community importance.

- **Impact, e.g. land take, proximity to protected areas**

Due to increase of quantity of cars and traffic density the asphalted areas in the city increased. The enlargement of the roads and building of new parking are in general realized at the cost of roadside grass-plots and green zones.

- **Investment/expenditure**

Information on benefit and expenses of different types of public transport is given below in the section “Public Transport” and in the Annex in the form of a table.

Investments on road repairs in Yerevan during last 3 years increased by 3.4 times forming 2930 million AMD in the year 2005 and the repairs area increased by 3 times forming 0,75mln m² in the year 2005, which is approximately 5% of total area of roads in Yerevan.

- **State of infrastructure**

We cannot evaluate the general condition of the roads in RA as satisfactory. The roads of interstate importance in general are in good condition. Part of roads of republican and regional significance is also in good condition, and the other part and the roads of community importance are in insupportable condition. The railway and its infrastructures are also in insupportable condition.

In general the roads are classified into 4 groups: roads of interstate importance, of republican importance, of regional importance and of community importance. The responsible body for the first two groups is the Ministry of Transport and Communication, the responsible bodies for the third group are the Municipalities and the responsible organs for the roads of community importance are community administrations.

3.8 Public transport

The current situation in this field can be described as not having a strategic perspective and requiring strategic solutions. A semi-chaotic situation has been created, where the big and medium size buses almost have been pushed out from the urban passenger transport and minibuses have taken their place. The use of electric transport is declining. Passenger transport electric transport approximately halved. Exploitation of trams has been stopped. The reason of reduction of electric transport exploitation is probably that it runs at a loss, and provided financing is not enough. In the Annex the revenues and expenditures according to the transport mode are given.

So during 2000-2003 the income of trams decreased from 173.3 million AMD to 57.7 million AMD (in 3 times) and the expenses decreased from 359.3 million AMD to 204.6 million AMD (1.8 times). During the same period the income of trolleybuses decreased from 321.9 million AMD to 89.7 million AMD (in 3.6 times), increasing in 2004 up to 154.1 million AMD and the expenses decreased from 608.7 million AMD up to 241.4 million AMD (2.5 times), increasing in 2004 up to 405.6 million AMD. The income of the underground during 2000-2002 decreased from 476.3 million AMD to 383.2 million AMD, afterwards it decreased becoming in 2004 579.6 million AMD and the expenses in 2000 consisted 1546.0 million AMD, in 2001 they decreased up to 1324.7 million AMD, afterwards gradually increased and in 2004 consisted 1383.5 million AMD. At present 125 microbus routes with 1916km length and approximately with 3000 minibuses, 18 bus routes with 270km length and 120 buses and 7 trolleybus routes with 96.2 km length and 50 trolleybuses function in the public transport of Yerevan. The underground of the city of Yerevan has 1 line with 10 stations. The length of the underground consists 12.1km and it has 70 carriages. During last 6 years the number of taxis has increased approximately 10 times, in 2005 consisting 1784 cars, which is 77% of the taxis operating in the territory of the Republic.

A great number of minibuses impede normal traffic, often leading to traffic congestions, which in its turn leads to increase of emissions from motor vehicles and noise. In general we can say that the public transport and corresponding sub-structures are not attractive for passengers.

The infrastructures of the public transport are in insupportable condition too. There are no equipped stops, information on itinerary is not provided, and the ticket system is not developed. The responsible body for the condition of the public transport is the Yerevan Municipality. The responsible bodies for the microbus exploitation are different private organizations, which are licensed by the Yerevan Municipality. The companies which exploit the buses, underground and trolleybuses operate under the Yerevan Municipality.

3.9 Legal framework

In Armenia currently National Program or Strategy on Transport has been developed. There is no general transport plan or strategy for Yerevan either, but a number of activities are implemented in order to reduce negative environmental impact of transport.

During last 3 years a lot of activities aimed at improving of legal framework have been implemented. So, taking into account that the problem of air pollution from motor vehicle emissions is complex and diverse the Ministry of Nature Protection first developed the “Concept on Reduction of Hazardous Emissions from Motor Vehicles” which was approved by the Government of RA by the Decision N40, on the 14th of October 2004.

Afterwards, based on the main problems determined in the Concept, the “Action plan Aimed at Reduction of Emissions from Motor Vehicles” was developed. The Government of RA by the Decision N1033 on the 14th of July 2005 approved this Action plan. Simultaneous with the development of the above mentioned Action plan a number of urgent steps have been taken, particularly;

The Government of the RA by its Decision N220-N (March 3, 2005) on “Amendment of the Decision N902” (December 31, 2000) prohibited the import of the cars without hazardous emissions neutralizers into Armenia starting from the 1st of January 2007.

In order to improve fuel quality of internal-combustion engines exploited in the Republic the Government of RA adopted a decision (N522) on “Approving Technical Regulation on the Internal-Combustion Engines Fuel and Recognizing the Decision N799 (December 31, 1999) of the Government of RA Invalid”, according to which quite strict environmental norms were determined.

In order to prohibit exploitation of the cars with over-standard emissions, to establish emissions measuring points and to regulate their activities the Laws of RA on amending and complementing the Laws on “Air Protection”, “Licensing” and “State Taxes” were developed and adopted in May 2005.

Currently following steps are being implemented with the aim of ensuring application of the above-mentioned laws:

- The decision N1600 on “Approving Licensing Procedure for vehicle Hazardous Emissions Measuring activity and Approving the Form of License” was developed and adopted by the Government of RA on the 15th of September 2005 - to establish the network of measuring points and to regulate their activities.
- The decision N1750 on “Approving the List and Measuring Procedure for Pollutants Emitted from Motor Vehicles and Subject to Measuring in the Measuring Points Operating in RA” was developed and adopted by the Government of RA on the 20th of October 2005 – to regulate activities of measuring points.
- The decision N965 on “Approving the Technical Procedure for Environmental Safety of Transport Means Exploited in the Territory of RA” was developed and adopted by the Government of RA on the 22^d of June 2006.-This decision determines the emissions standards for vehicles.

From the activities that have already been implemented it is worthy of mentioning that the Government of RA has prohibited by its decision N913, (29.09.2001) production, use and import of leaded petrol starting from Year 2001.

In order to improve the Inspection System the National Assembly of RA adopted Law on “Environmental Inspection” on the 10th of May 2005. In order to ensure application of the Law:

- The decision N2410-N on “Approving the Procedure of Measuring Hazardous Emissions from Motor Vehicles Exploited in RA” was developed and adopted by the Government of RA on the 29th of December 2005 – to regulate measuring activities to be done by inspection.
- The decision N160-N on “Approving the Norms of Permissible Concentrations of Air Pollutants in Settlements and those of Hazardous Substances Contained in emissions of the Motor Vehicles in RA” was developed and adopted by the Government of RA on the 2^d of February 2006 – to determine the norms of air pollutants in settlement and in motor vehicle emissions.

Besides the above mentioned the Decision NK-70-A of the President of RA on “Approving the time-table of implementation of activities aimed at solution of RA traffic” was adopted on the 4th of April 2006. In accordance with that Decision the corresponding ministries were charged with development of a number of legal documents aimed at regulating of several provisions of the road traffic. These provisions particularly refer to periodical technical examination of cars, their registrations, traffic safety, increasing of the road pass abilities, regulation of public transport stops, etc.

The Government of RA approved the Action Plan arising from the Main Plan of the city of Yerevan in September 2006. Several provisions of the Action Plan refer to improving of transport and its structures, to appropriate environmental problems, to zoning of different areas of the city, etc.

In spite of the enormous work done, there are some omissions in this field yet:

- The technical service of the cars is done spontaneously and is not systematic.
- The restrictions of old cars import are not determined.
- The existing tax administration does not encourage the use of “cleaner” motor vehicles, etc.

According to the law of RA on “Rates of Environmental Pays” the rates of environmental pays are determined taking into account the power of engines. In this case it is not paid attention to its exploitation rate. So the payments levy system does not contribute to the emissions reduction at all and has become one more type of tax. From fiscal point of view such approach is very effective, but from environmental point of view it is unacceptable. Collected environmental payments are not used for providing financial support to the environmental projects aimed at reduction of hazardous emissions or mitigation of their results. A part of those resources is used in the framework of general expenses foreseen by the state budget, and the other part is used for financing of environmental activities foreseen by the action plan of the Government.

In order to correct these defects a number of activities, which are included in the Action Plan 2006 of the Government of RA, are also being implemented. Particularly it is foreseen to include in the formula of environmental payments costs calculation factors of vehicle weight and neutralizer existence. It is also foreseen to direct environmental payments to special environmental funds. These payments will be used in future for financing of environmental activities.

4. Main problems

In conclusion we can say that the following problems exist:

1. It is not assessed how substantial is negative impact of noise and air pollution on human health and environment.
2. It is not assessed which pollutants are more problematic.
3. Air pollution proper monitoring is not carried out.
4. Legislation requires improving.
5. Collected environmental payments are not used for providing financial support to the environmental projects aimed at reduction of hazardous emissions or mitigation of their results.
6. Strategy or Action Plan on Transport Development, in which environmental and health requirements will be taken into account, are not elaborated.
7. The awareness level in the field of sustainable transport is low.
8. The necessary steps towards reduction of transportation general demand are not implemented (such urban construction solutions, which will minimize the necessary movements of the resident).
9. Accepted strategy or perspective plan on public transport development do not exist.
10. Low fuel efficiency of motor vehicles.
11. Small share of electric transport in passenger conveyance.
12. Low level of pedestrian and cycle traffic.
13. Not optimal transport flow (traffic congestion, often stops on crossings, stops in traffic zone, etc.).
14. Bad management of traffic.
15. Bad roads and insufficient road networks.
16. Insufficient use of incentive financing.
17. Lack of conducting culture and knowledge from environmental point of view among the drivers (unnecessary sharp braking and acceleration, etc.)
18. Cars do not have catalytic converters (absence of fiscal incentives).
19. A great number of out-of-order cars.
20. Insufficient control.
21. Low quality of fuel.
22. Low quality of car maintenance.
23. Absence of effective system of technical service.

5. Overview of policies to address the city's transport problem

5.1 National transport plans

Detailed information on concepts, projects and other legal acts connected with this field is given in the section "Legal Field".

5.2 Spatial planning policies

- **Objectives of these, re urban sprawl, locating developments, zoning etc**

The main document connected with these issues is the recently adopted new Main Plan of Yerevan, which is at present secret and the information included in it is inaccessible.

- **Approach to traffic generation**

With the aim of improving of traffic the Yerevan Municipality by the Decision N1033 dated 14.07.2005 of the Government of RA is charged with the following:

To introduce during 2007 automatic systems of traffic management.

To develop and to submit to the Government for consideration the scheme of traffic organization of the city of Yerevan and a perspective program on development of road network of the city of Yerevan during 2007.

To realize study, marking out and current situation assessment of parking places of the city of Yerevan during 2005-2006.

By the same decision the Ministry of Nature Protection has been charged with development of the procedure on notifying of unfavorable meteorological conditions of atmosphere pollution and restriction of car exploitation under such conditions.

By the Decree NK-70-A of the President of RA dated 4.04.2006 was give a commission to develop a number of normative documents, which will contribute to traffic improvement.

5.3 Regulation

- **Emission standards in place, e.g. Euro emission standards**

The general policy in this field is aimed at gradual introduction of European standards. Detailed information on available standards is given in the section “Vehicle Technologies”

- **Restrictions on movement of goods vehicles**

It is necessary to review the restriction of truck traffic in Yerevan and it is foreseen that it will be done in the framework of the scheme of traffic organization of the city of Yerevan and the perspective project on development of the road network of the city of Yerevan.

- **Restrictions on import/use of old cars**

We can mention from the activities realized in this direction the prohibition of import of vehicles without neutralizers starting from 1st January, 2007, as well the prohibition of exploitation of vehicles in public transport which are more than 15 years old.

RA at present has not car production consequently the cars which are being sold are imported. The custom clearance cost constitutes the great part of the market price of cars. It constitutes 32% of the custom cost of cars. So through custom clearance cost differentiation it is possible to impede or prevent the import of this or that type of cars.

5.4 Taxation

- **Taxes to encourage use of cleaner fuels, biofuels, taxes to encourage purchase of cleaner vehicles**

To encourage use of cleaner fuels, biofuels, to encourage purchase of cleaner vehicles using the taxation instrument by the decision of the Government of RA N 1033 dated 14.07.2005 the Ministry of Nature Protection has been charged with realization of the following activities during 2006:

To develop and submit to the Government of RA Draft Law on “Amending the Law on the Rates of Environmental Payments ”, reviewing the rates of environmental payments of cars imported into RA and exploited in the territory of the Republic, according to the type of consumed fuel, specific weight and availability of hazardous emission neutralizers giving preference to the more favorable from environmental point of view ones.

- **Subsidies for public transport**

It is not developed a perspective project on public transport subsidizing. The subsidies of each year are being determined according to the budget of that year. At present the project on ground electric transport development of the city of Yerevan is being elaborated in which the quantity of necessary subsidies will be mentioned.

5.5 Encouraging public transport

- **Policies in cities to encourage public transport use**

By the Decision N1033 dated 14.07.2005 of the Government of RA the Municipality of Yerevan was charged with the following:

1. During 2007 elaborate and to submit to the Government of RA for discussion a project on development of the system of internal public transport of the city of Yerevan, including in it particularly the acquiring of big and medium size buses and development of electric transport (particularly including the possibilities of closing several routs which are extended parallelly with the underground and organizing of routs which will complement and unite underground and electric transport) with the aim of reducing the number of minibuses regularly realizing passenger conveyance, as well realizing integrated activities aimed at improving of the service of the passengers who use the internal public transport of the city of Yerevan.

2. To elaborate and to submit to the Government of RA for discussion mid-term project on development of ground electric transport of the city of Yerevan.

3. To form effective financial mechanism of metro (underground) development during 2007-2008.

By the Decree NK-70-A dated 04.04.2006 of the President of RA it is foreseen developing of Draft of the Decision of the Government of RA on Regulating and Equipping the Stops of Public Transport.

Currently the Municipality of the city of Yerevan carries out activities aimed at increasing the number of medium-size and big buses, and trolleybuses in public transport.

So it is foreseen acquiring of 70 new buses and 20 trolleybuses during 2006. During future 3 years it is foreseen import of 60 new trolleybuses, and increasing of the number of buses up to 400. It is also foreseen putting into operation a new underground station till 2011 and other 3 stations till 2020.

It must be stressed that Development of electric transport is especially important for Yerevan. Air pollution level of Yerevan and the analysis of their reasons show the following: bad geographic location and specific climate conditions of Yerevan besides of high pollution have led to frequent formation of photochemical smog. Studies and calculations confirm that if all the technical means aimed at pollution reduction and developed by now are applied, for example: installation of neutralizers on all the cars, full gasification of the auto park, even in this case taking into account the increase tendency of motor vehicles, it will not be possible to ensure air clearness in the permissible hygienic norms and prevent formation of mentioned photochemical smog.

So we can say that development of electric transport is a priority for Yerevan and in this case it has not an alternative.

As the experience of other countries shows financial assistance for electric transport development and normal exploitation is needed. So necessary steps in this direction must be taken and for realization of that objective financial assistance must be provided. For example: from environmental payments collected for hazardous emissions.

- **Campaigns to encourage public transport use**

By the above mentioned decision of the Government of RA the corresponding ministries are charged with implementation of certain activities in this field aimed at awareness raising, particularly trough including appropriate corrections in the educational programs.

- **Policies to promote cycling and walking**

By the Decision of Government of RA N1033 dated 14.07.2005 the Municipality of the city of Yerevan is charged with elaborating of activities contributing to the development and safety of pedestrian and cycle traffic during 2007. Particularly develop and implement activities aimed at determining partial restrictions of transport traffic in the streets adjacent to crowded parks and recreational zones.

5.6 Other innovative approaches

By the Decision of Government of RA N1033 dated 14.07.2005:

- During 2006 the Ministry of Nature Protection is charged with developing and submitting to the Government of RA for discussion the Draft Law on “Purposeful Use of Environmental Payments Raised for Exploitation of Vehicles”, particularly with the aim of taking apportion for financing of environmental projects on reduction of hazardous emissions from vehicles and mitigation of their consequences, especially attaching much importance to the development of electric transport in the capital.
- The Ministry of Transport and Communication is charged with studying and submitting to the Government of RA for approval the corresponding draft decision on Putting Neutralizers on Passenger Microbuses, Passenger Taxis and light duty vehicles in Yerevan.
- The Ministry of Trade and Economic Development is charged with organizing of repairing, regeneration and service of emissions neutralizers during 2007-2008 in the framework of development and transfer of technologies foreseen by the Climate Change Framework Convention and Convention on Long-Range Transboundary Air Pollution
- During 2007-2008 the Ministry of Health is charged with determining and classifying according to its importance the pollutants in the over norm polluted cities of RA based on surveys and studies on air pollution impact on human health.
- The Ministry of Nature Protection is charged with realizing during 2007-2008 a number of activities aimed at improving of the environmental monitoring state.

6. Required steps

In conclusion we can say that for development of sustainable transport it is necessary to implement the following steps:

1. Developing of Strategy or Action Plan on transport development in compliance with environmental and health requirements.
2. Carry out studies for determination of negative impact of noise on health and environment in Yerevan

3. Developing of technical mechanisms aimed at reduction of import of old vehicles. Particularly reviewing of rates of pay levied during car import depending on year of production.
4. Awareness raising in the field of sustainable transport.
5. Developing of activities aimed at reduction of general transport demand (such urban construction solutions which will contribute to minimizing the necessary movements for vital needs).
6. Development of activities contributing to restriction of passenger cars use and their intensity.
7. Development of activities aimed at fuel efficiency increasing, particularly encouraging the use of cars with injector motors.
8. Developing of activities aimed at increasing of share of electric transport in passenger conveyance
9. Developing of activities aimed at traffic management improving, including one-sided traffic systems, timing of road signals in crossings, precise tracing of traffic zones, bus zones creation, etc,
10. Elaborating of measures aimed at improving of road quality and road network development. Including circular roads, nonintersecting crossings, etc.
11. Using of financial incentives for supporting development of preferable means of transport.
12. Improving of driver's behavior with integration of "Environmentally Reasonable Driving" project and trainings.
13. Developing activities for encouraging the use of cars with emissions neutralizers.
14. Development of measures aimed at reduction of out-of-order cars
15. Encouraging of use of environmentally cleaner fuel
16. Periodical improving of fuel and lubricating oil standards and strengthening of control.
17. Creation of effective technical service system

Annex

255. ՈՒՂԵՎՈՐՆԵՐԻ ՓՈՆԱԳՐՈՒՄՆ ԸՆԴՀԱՆՈՒՐ ՕԳՏԱԳՈՐԾՄԱՆ ՏՐԱՆՍՊՈՐՏԻ ՏԵՍԱԿՆԵՐՈՎ
PASSENGERS TRANSPORTATION BY TYPES OF GENERAL PURPOSE TRANSPORT
ПЕРЕВОЗКИ ПАССАЖИРОВ ПО ВИДАМ ТРАНСПОРТА ОБЩЕГО ПОЛЬЗОВАНИЯ

(մլն. ուղևոր)
 (mln. passengers)

(млн. пассажиров)

	2000	2001	2002	2003	2004	
Տրանսպորտ, ընդամենը <i>Transport - total</i>	132.7	151.9	156.8	174.0	185.6	Транспорт - всего
այդ թվում՝ <i>of which:</i>						в том числе:
երկաթուղային <i>railroad</i>	1.1	1.2	1.3	1.1	0.8	железнодорожным
ավտոմոբիլային <i>motor vehicles</i>	100.1	121.6	128.9	147.5	158.6	автомобильным
քեփև մայրաքաղաքի տարսիներով <i>by passenger taxi</i>	0.3	0.3	0.7	1.2	2.8	таксомоторным
օդային <i>air</i>	0.6	0.8	0.9	0.9	1.1	воздушным
տրամվայով <i>tram</i>	5.2	4.9	3.6	2.4	0.1	трамвайным
տրոլեյբուսով <i>trolley-bus</i>	9.5	7.4	5.7	4.1	5.1	троллейбусным
մետրոպոլիտենով <i>underground</i>	15.5	15.3	15.1	16.2	16.6	метрополитеном
ճապանակով <i>rope-ways</i>	0.4	0.4	0.6	0.6	0.5	канатной дорогой

259. ՈՒՂԵՎՈՐԱՓՈՆԱԳՐՈՒՄՆԵՐԻ ԸՆԴՀԱՆՈՒՐ ԾԱՎԱԼՈՒՄ ՏՐԱՆՍՊՈՐՏԻ ԱՌԱՅԻՆ ՏԵՍԱԿՆԵՐԻ ՈՒՂԵՎՈՐԱՓՈՆԱԳՐՈՒՄՆԵՐԻ ՏԵՍԱԿԱՐԱՐ ԿԵՆՈՋ
SHARE OF PASSENGER TRANSPORTATION BY SEPARATE TYPES OF TRANSPORT IN TOTAL VOLUME OF PASSENGER TRANSPORTATION
УДЕЛЬНЫЙ ВЕС ПАССАЖИРОПЕРЕВОЗОК ПО ВИДАМ ТРАНСПОРТА В ОБЩЕМ ОБЪЕМЕ ПАССАЖИРОПЕРЕВОЗОК

	2000	2001	2002	2003	2004	(%)
Տրանսպորտ, ընդամենը <i>Transport - total</i>	100	100	100	100	100	Транспорт - всего
այդ թվում՝ <i>of which:</i>						в том числе:
երկաթուղային <i>railroad</i>	0.8	0.8	0.8	0.6	0.4	железнодорожный
ավտոմոբիլային <i>motor vehicles</i>	75.7	80.3	82.7	85.5	87.0	автомобильный
օդային <i>air</i>	0.5	0.5	0.5	0.5	0.6	воздушный
էլեկտրատրանսպորտ <i>electric transport</i>	23.0	18.4	16.0	13.4	12.0	электротранспорт

265. ՈՒՂԵՎՈՐՆԵՐԻ ՓՈՆԱԳՐՈՒՄՆԵՐԻՑ ՀԱՍՈՒՅԹԸ* ԵՎ ԾԱՌՍԵՐԸ
REVENUES* AND EXPENDITURES FROM PASSENGER TRANSPORTATION
ВЫРУЧКА* И РАСХОДЫ ОТ ПЕРЕВОЗОК ПАССАЖИРОВ

(մլն. դրամ)
 (mln. drams)

(млн. драмов)

	2000	2001	2002	2003	2004	
Ընդամենը						Всего
Total						
Խառույթ	28004.9	34391.7	33008.2	34343.6*	46710.9	выручка
revenues						
Ծախսեր	33736.3	35633.8	34316.0	30328.6	41426.8	расходы
expenditures						
այդ թվում՝						в том числе:
of which:						
Երկաթուղային						железнодорожный
railroad						
Խառույթ	159.0	213.9	246.3	177.6*	143.7	выручка
revenues						
Ծախսեր	437.0	484.8	448.3	563.0	755.2	расходы
expenditures						
ավտոմոբիլային**						автомобильный**
motor vehicles**						
Խառույթ	3686.8	4490.5	4160.0	4260.6	4943.2	выручка
revenues						
Ծախսեր	3492.7	4277.4	3936.0	3834.5	4570.8	расходы
expenditures						
տաքսի						такси
taxi						
Խառույթ	57.8	106.7	177.0	386.8	940.0	выручка
revenues						
Ծախսեր	124.5	108.4	165.6	326.5	715.6	расходы
expenditures						
օդային						воздушный
air						
Խառույթ	23109.6	28814.5	27795.4	28874.3	39920.2	выручка
revenues						
Ծախսեր	27149.7	28555.2	27789.8	23780.8	33558.6	расходы
expenditures						
տրամվայ						трамвай
tram						
Խառույթ	173.3	134.9	86.6	57.7	2.5	выручка
revenues						
Ծախսեր	359.3	227.6	246.8	204.6	13.7	расходы
expenditures						
տրոլեյբուս						троллейбус
trolley-bus						
Խառույթ	321.9	209.2	126.3	89.7	154.1	выручка
revenues						
Ծախսեր	608.7	633.0	362.0	241.4	405.6	расходы
expenditures						
մետրոպոլիտեն						метрополитен
underground						
Խառույթ	476.3	390.6	383.2	464.4	579.6	выручка
revenues						
Ծախսեր	1546.0	1324.7	1347.5	1357.9	1383.5	расходы
expenditures						
ճաղանաղի						канатная дорога
gore-ways						
Խառույթ	20.2	31.4	33.4	32.5	27.6	выручка
revenues						
Ծախսեր	18.4	22.7	20.0	19.9	23.8	расходы
expenditures						

* Մտանց դրուացիայի:
 Without subsidies.
 Без дотаций.

** Ըստ վիճակագրական հաշվետվությունների տվյալների:
 According to the data of the statistical reporting data.
 По данным статистических отчетностей

269. ՀԱՂՈՐԳԱԿՑՈՒԹՅԱՆ ՈՒՂԻՆԵՐԻ ԸՆԿՎՈՐԾՎՈՂ ԵՐԿԱՐՈՒԹՅՈՒՆԸ, տարվա վերջին
OPERATIONAL LENGTH OF COMMUNICATION WAYS, end of year
ЭКСПЛУАТАЦИОННАЯ ПРОТЯЖЕННОСТЬ ПУТЕЙ СООБЩЕНИЯ, на конец года

(կմ)
(km)

	2000	2001	2002	2003	2004	
Երկաթուղային գծեր, ընդամենը <i>Railway tracks, total</i>	1006.5 ^o	993.2 ^o	976.4 ^o	930.8 ^o	930.8	Железнодорожные пути - всего
այդ թվում՝ <i>of which:</i>						в том числе:
ընդհանուր օգտագործման <i>general purpose</i>	731.9 ^o	731.9 ^o	731.9 ^o	731.9 ^o	731.9	общего пользования
և՛ ընդհանուր օգտագործման <i>non-general purpose</i>	274.6	261.3	244.5	198.9 ^o	198.9	необщего пользования
Ավտոմոբիլային ճանապարհներ, ընդամենը <i>Total motor roads</i>	12071.5	11619.3	11577.9	11637.9	10313.3	Автомобильные дороги - всего
այդ թվում՝ <i>of which:</i>						в том числе:
ընդհանուր օգտագործման <i>general purpose</i>	7527.0	7527.0	7527.0	7633	7629	общего пользования
և՛ ընդհանուր օգտագործման <i>non-general purpose</i>	4544.5	4092.3	4050.9	4004.9	2684.3	необщего пользования
Ավտոմոբիլային ճանապարհների ընդհանուր երկարությունից անուր ծածկույթով ճանապարհներ, ընդամենը <i>Roads covered with hard surface from total length of motor roads</i>	7773.5	7462.2	7462.2	7174.9	7110.8	Из общей протяженности автомобильных дорог - дороги с твердым покрытием, всего
ըսանցից՝ ընդհանուր օգտագործման <i>of which general purpose</i>	7245.0	7245.0	7245.0	6967.0	6875.0	из них: общего пользования

271. ԸՆԴՀԱՆՈՒՐ ՕԳՏԱԳՈՐԾՄԱՆ ՄԻՋՊԵՏԱԿԱՆ, ՀԱՆՐԱՊԵՏԱԿԱՆ ԵՎ ՏԵՂԱԿԱՆ ՆՇԱՆԱԿՈՒԹՅԱՆ ԱՎՏՈՄՈՆԱՊԱՐՀՆԵՐԻ ԵՐԿԱՐՈՒԹՅՈՒՆԸ
LENGTH OF GENERAL PURPOSE PUBLIC ROADS OF INTERGOVERNMENTAL, REPUBLICAN AND LOCAL IMPORTANCE
ПРОТЯЖЕННОСТЬ АВТОМОБИЛЬНЫХ ДОРОГ МЕЖГОСУДАРСТВЕННОГО, РЕСПУБЛИКАНСКОГО И МЕСТНОГО ЗНАЧЕНИЯ

(կմ)
(km)

(km)

	2000	2001	2002	2003	2004	
Ընդհանուր օգտագործման ավտոմոբիլային ճանապարհներ <i>General purpose motor roads</i>	7527	7527	7527	7633	7629	Автомобильные дороги общего пользования
ըսանցից՝ անուր ծածկույթով <i>of which hard surface roads</i>	7245	7245	7245	6967	6875	из них: с твердым покрытием
այդ թվում՝ <i>of which:</i>						в том числе:
միջպետական նշանակության ճանապարհներ <i>roads of intergovernmental importance</i>	1560	1560	1560	1561	1561	дороги межгосударственного значения
ըսանցից՝ անուր ծածկույթով <i>of which hard surface roads</i>	1560	1560	1560	1561	1561	из них: с твердым покрытием
հանրապետական նշանակության ճանապարհներ <i>roads of republican importance</i>	1800	1800	1800	1826	1826	дороги республиканского значения
ըսանցից՝ անուր ծածկույթով <i>of which hard surface roads</i>	1744	1744	1744	1770	1776	из них: с твердым покрытием
տեղական նշանակության ճանապարհներ <i>roads of local importance</i>	4167	4167	4167	4246	4236	дороги местного значения
ըսանցից՝ անուր ծածկույթով <i>of which hard surface roads</i>	3941	3941	3941	3636	3538	из них: с твердым покрытием