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CONFERENCE ON IMPLEMENTING SUSTAINABLE URBAN TRAVEL POLICIES IN RUSSIA AND OTHER CIS COUNTRIES

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POLICIES ENSURING THE SUSTAINABLE DEVELOPMENT OF URBAN TRANSPORT SYSTEMS IN RUSSIA

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I. MAIN TRENDS AND FORECASTS IN URBAN TRANSPORT DEVELOPMENT IN THE RUSSIAN FEDERATION

1.1. The urbanization process in the Russian Federation

At present 73.3% of the Russian population (more than 106 mln. people) lives in cities and towns. Trends in the size of urban population for the period 1897-2003 are shown in Fig. 1. Table 1 shows the distribution of Russian cities and towns by size of population in accordance with data from the All-Russia General Census of the population (2002). Thirteen Russian cities have a population of over 1 mln. The majority of them (9) are in the European region of the country (Table 2).

Fig.1. Trends in urban population in Russia 1897 - 2003

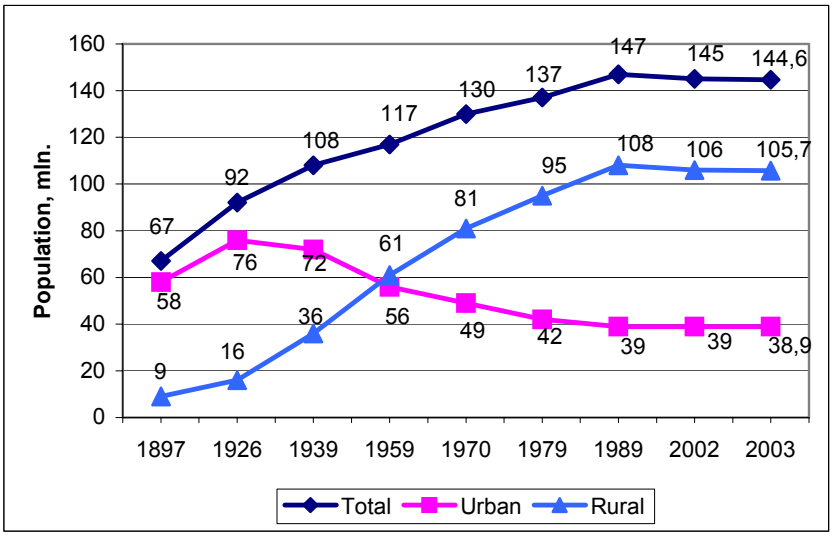


Table 1
Distribution of cities and towns by population size

Population in cities and towns, in thousands	Number of cities and towns with this size of population	Total population in this category of cities and towns, in thousands (% from total Russian population)
Cities		
more than 1 mln.	13	27416 (18,9)
500,0-999,9	20	12404 (8,6)
250-499,9	42	14574 (10,1)
100-249,9	92	13817 (9,5)
50-99,9	163	11083 (7,7)
less than 50	768	16622 (11,5)
In all:	1098	95916 (66,3)
Towns		
more than 20	25	631 (0,4)
10-19,9	247	3231 (2,2)
5-9,9	582	4108 (2,8)
less than 5	988	2543 (1,7)
Bcero:	1842	10513 (7,1)

Table 2

Population of the biggest Russian cities (2003)

Name of city	Population, mln. people,	Location in the Russian territory
- Moscow	10,101	European
(Moscow+Moscow Region)	17,002	-"-
- Saint Petersburg	4,669	European
(Saint Petersburg +Leningrad Region)	6,265	-"-
- Novosibirsk	1,425	Asian
- Nizhny Novgorod	1,311	European
- Ekaterinburg	1,293	Asian
- Samara	1,158	European
- Omsk	1,134	Asian
- Kazan	1,105	European
- Chelyabinsk	1,078	Asian
- Rostov-on-Don	1,070	European
- Ufa	1,042	European
- Volgograd	1,013	European
- Perm	1,000	European

Only 10% of the urban population lives in towns, the remaining 90% - in cities. Over the period 1989 to 2002 the total number of cities has increased by 61 and size of the urban population has increased by 1 466 thousand.

Growth in a number of cities and in population size took place in small cities (population of up to 50 000), large cities (100 to 250 000) and the largest cities – over a million. Population growth in the biggest cities was related to an increase in population only in five (Moscow, Kazan, Rostov-on-Don, Novosibirsk and Volgograd). The capital of the Russian Federation – Moscow – is reckoned to be one of the 12 biggest cities in the world.

The results of the All-Russia General Census of the population in 2002 confirmed that the urbanization process which had proceeded rapidly from the end of the eighties had practically stopped (1989 – 73.5%, 2002 – 73.3% of urban population in the country). Table 3 compares urbanization in Russia and in some other countries.

Table 3

Motorization level in Russia and some other countries

Country	Population, mln.	% of urban population			Area, '000 km^2	Density of population, '000 people per '000 km^2
		1990	1999	2000		
1	2	3	4	5	6	7
Australia	19	85	85	85	7741	2,45
Austria	8	65	65	65	84	95,23
Byelorussia	10	67	70	70	208	48,08
Belgium	10	97	97	97	30,5	327
Great Britain	60	89	89	90	243	246,91

Country	Population, mln.	% of urban population			Area, '000 km^2	Density of population, '000 people per '000 km^2
		1990	1999	2000		
Germany	82	85	87	88	357	229,69
Spain	39	75	77	78	506	77,07
Italy	58	67	67	67	301	192,69
Canada	31	77	77	77	9971	3,11
Mexico	98	73	74	74	1958	50,05
Netherlands	16	89	89	89	42	380,95
Poland	39	62	65	66	323	120,74
Russia	**145**	**74**	**73**	**73**	**17075**	**8,49**
USA	282	75	77	77	9629	29,29
Ukraine	50	67	68	68	604	82,78
Finland	5	61	67	67	338	14,79
France	59	74	75	76	552	106,88
Czech. Rep.	10	75	75	75	79	126,58
Sweden	9	83	83	83	450	20,00
Japan	127	77	79	79	378	335,99

In comparing the trends in urban population in Russia and other countries with a developed economy it is important to note that the criteria for defining a city are rather different in different countries. Thus, in the USA cities are defined as settlements with a population of more than 2.5 thousand, in the Netherlands – 20 thousand, in Spain – 200. In some countries cities are defined as any administrative centre irrespective of population size.

In Russia all settlements with a population of no less than 12 thousand people are considered cities.

In accordance with the Town-planning Code of the Russian Federation which was approved in 1998 (Article 5, point 3) urban and rural settlements are subdivided into the following groups:

Groups of settlements	Population, thousand people.	
	Cities	Rural settlements
Super-large	more than 3000	-
The largest	from 1000 to 3000	-
Very large	from 250 to 1000	more than 5
Large	from 100 to 250	from 1 to 5
Middle	from 50 to 100	From 0,2 to 1
Small*	up to 50	Up to 0,2

*including towns.

The sheer size of the Russian Federation (17 075 km^2), the unevenness of its economic development and, accordingly, the unevenness of population density (Fig.2) make for considerable variations in the urbanization level in the Russian regions (Table 4). Agricultural regions, regions with low population density and with inclement climate conditions are the least urbanized.

Latterly, trends in the urbanization process in the Russian Federation have been shaped jointly by a number of social and economic processes:

- As a result of migration processes and the cancellation of the registration order which was in force in the time of the Soviet Union there has been considerable growth in the number of Russian citizens and citizens from other countries coming to Russian cities in search of permanent or temporary employment. Some of them are not registered officially and so are not included in official reports of the State Statistic Committee which reflect urban population size. Every day, a considerable number of people come to work in the large and largest cities from neighbouring towns and rural settlements, amounting to what is known as the "day population" of these cities. The bigger the city, the bigger its "day population". For example, in Moscow according to some estimates, it totals 13 mln. people (i.e. the population increases during the day time by more than 2 mln.). The increase in urban population attributable to these categories of citizens leads to an additional load on the transport infrastructure of Russia's large and largest cities.

Fig.2. Distribution of Russian regions by population density

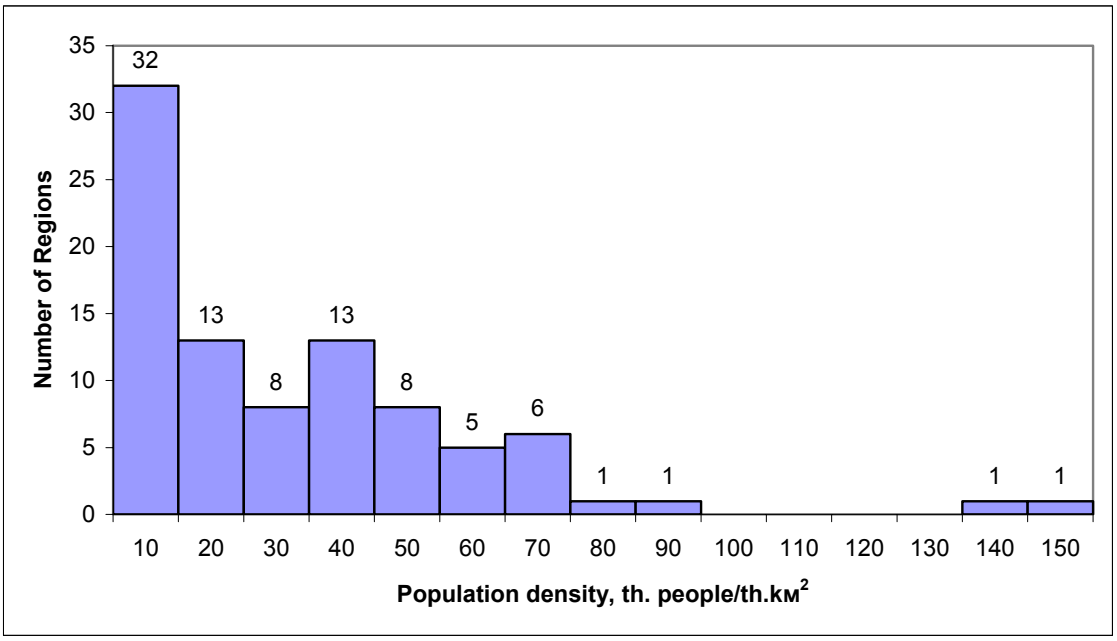


Table 4

Urbanization level in Federal Okrugs of the Russian Federation

Name of Federal Okrug	Area, km^2 (% of the total territory of Russia)	Population, thousand people (2001)	Population density (people per km^2)	Urbanization level
North-Western	1677,9 (9,8)	14259	8,5	81,9
Central	650,7 (3,8)	36482	56,1	79,1
Southern	589,2 (3,4)	21471	36,4	57,3
Privolzhsky	1038,0 (6,1)	31642	30,5	70,8

Uralsky	1788,9 (10,5)	12520	7,0	80,2
Siberian	5114,8 (30)	20542	4,0	70,5
Far Eastern	6215,9 (36,4)	7038	1,1	76,0

- The concentration of economic and financial activity in the biggest cities leads to the formation of a stratum of people whose income is considerably higher than in the country on average. This category of population in recent years prefers to settle in environmentally clean rural areas or in new elite accommodations which are erected in "environmentally clean" urban areas. Often such buildings are constructed without taking into account city transport planning, which results in an additional burden on the existing road network.
- In many cases Russian cities sprang up around big industrial works or near extractive industries (so called "new-town" undertakings). In the course of economic reform many of these industries considerably reduced production, were reoriented to the production of other types of outputs or closed. This partially stimulated the outflow of the urban population from these cities (mainly small and medium-sized). Conversely, it has been observed that the process of creating major new modern works, the development of extractive and processing industries (oil-extracting and oil-processing, gas-extracting, processing of agricultural production, food production, timber processing and so on) results in the creation of new workplaces in cities and, hence, in urban population growth.
- For the large and largest Russian cities urban sprawl continues to be a current problem. First, there is the fact that a considerable number of citizens need improved housing conditions. New mass house-building projects in many cases are located in the urban periphery or in bordering rural areas. Urban sprawl is also stimulated by the growth in the number of private cars which considerably increases urban population mobility and the accessibility of remote urban areas. As a result, the length of urban travel links and transport costs increase.

Systematic development of cities raises not only architectural and planning issues and problems of urban engineering equipment but also the issue of improving urban transport systems. In Russia, the redevelopment of existing cities and the construction of new cities is conducted in accordance with General City Development Plans. One of the most important sections of these Plans is the section devoted to transport planning in cities, which includes a package of transport, building, planning and environmental measures. The goal of this section is the rational structuring of a city's transport network so that it best serves the transport needs of the city's economy and population. The normative base for this section of General Plans is the document Building Norms and Regulations (SNiP) 2.07.01-89* "Town-planning. Planning and building of cities and rural settlements".

1.2. Motorization and economic development

World experience shows that the social and economic development of states, and increased population welfare are always accompanied by growing transport needs.

Russia's transport network, which is intended to satisfy these needs, is composed of various transport modes – railway, motor, sea, internal waterway, air and pipeline transport. The main performance indicators for these modes of transport in 2002-2003 are presented in Figs.3-6.

These diagrams show that road transport holds the lead position in Russia's transport structure by volume and passenger throughput.

Because of its specific features – reasonable price, considerable autonomy, possibility of delivering goods and passengers "from door to door" – road transport in the last 20 years of the last century held the lead in the structure of the transport sector in all developed countries. At the same time, as practice has shown, the development of road transport can itself act as a catalyst for the development of a number of state economy sectors (motor-car industry, oil-refining, electronic and chemical industries, road-building industry and so on). Besides this, road transport also promotes the development of domestic and foreign trade and presents a stimulus for further growth in population transport mobility, which is an important factor influencing the level of economic activity.

Fig. 3. Freight transport volumes by mode of transport in 2002 and 2003

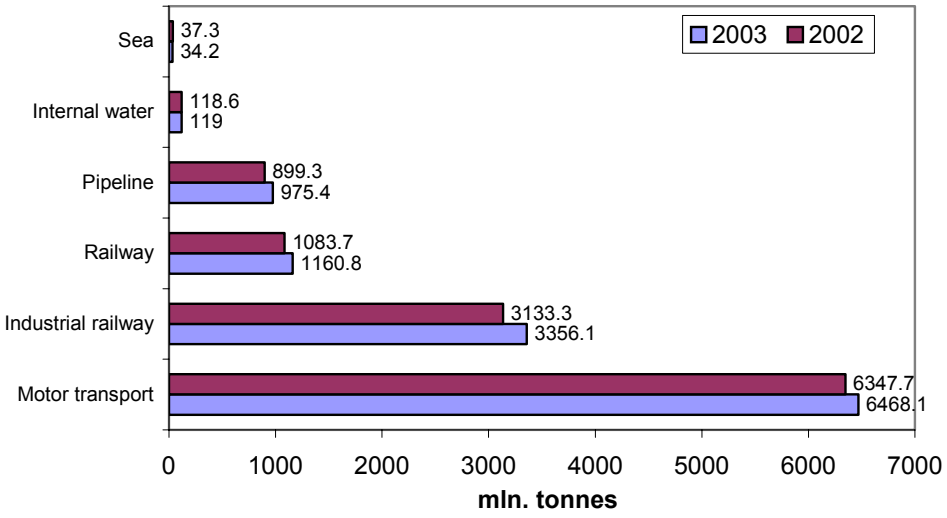


Fig.4. Freight turnover by mode of transport in 2002 and 2003

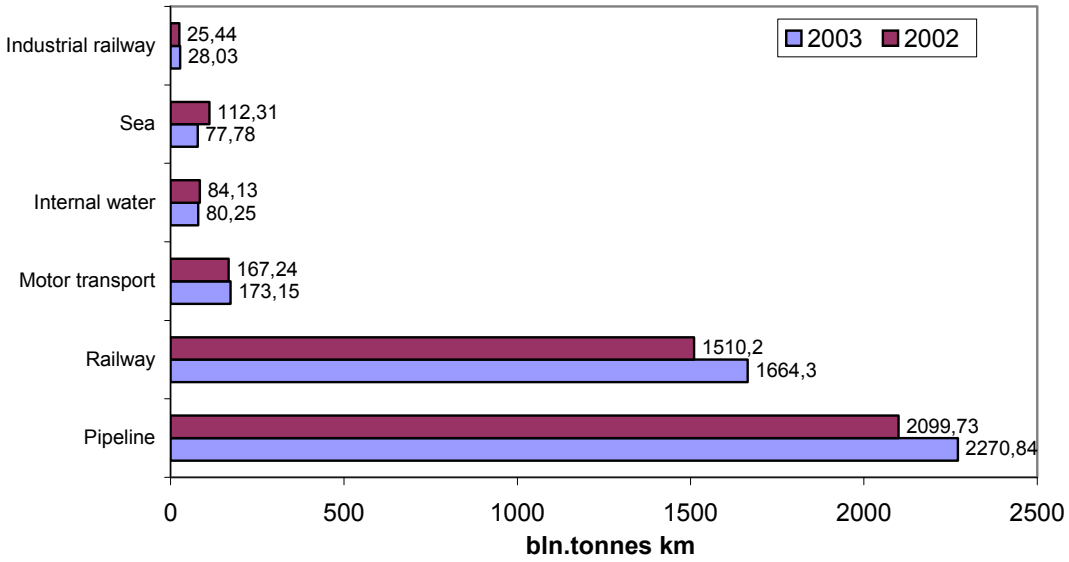


Fig. 5. Volume of passenger transport by mode of transport in 2002-2003

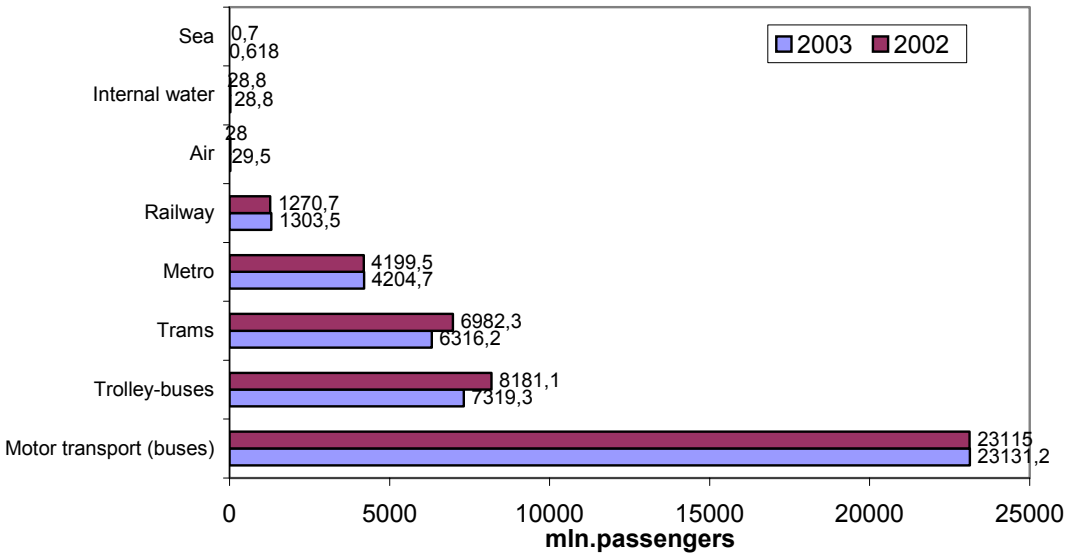
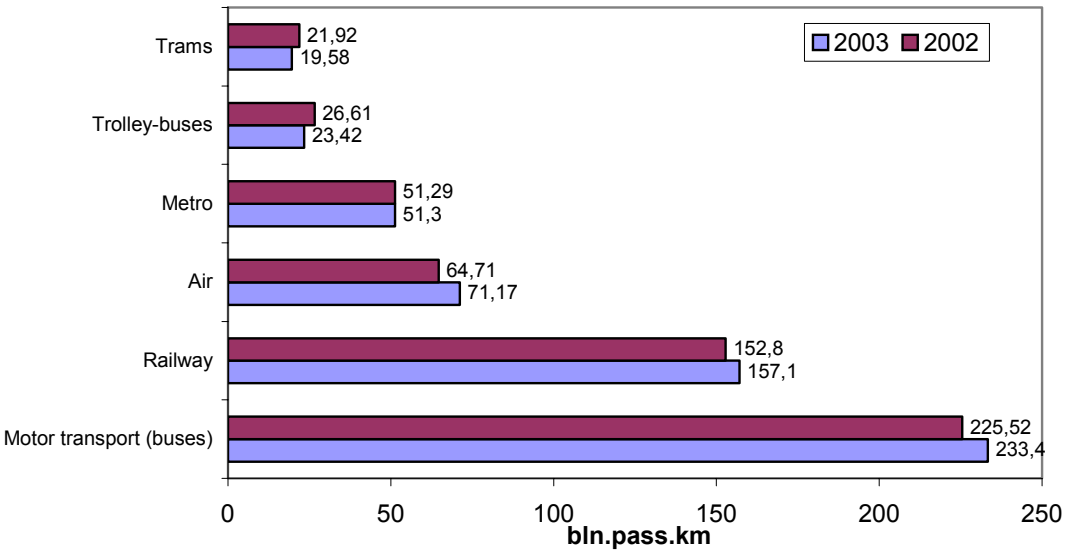


Fig.6. Passenger throughput by modes of transport (2002-2003)



Growth of the motor fleet is independent of state investment activity and is mainly the result of people's private savings and private investments. In Russia, the volume of these investments (about USD 4 bln. annually) is defined by the objective increase in demand for motor transport and at present is only minimally dependent on the state's control actions.

The specific features of motor transport development, its role and place in the development of society may be defined by the term "motorization". Motorization may be considered in two ways:

- as a social phenomenon defined by constantly increasing motor vehicle use in all spheres of human activity;
- as the totality of the processes of development of motor transport activity.

First of all, motorization represents a truly multi-factoral social phenomenon which is shaped by a number of social, economic and psychological factors and has both positive and negative consequences (overloaded road network, road accidents, air pollution and so on) (Fig.7).

In the early stages of motorization mainly the positive sides were apparent – reduction in travel time ensuring speed and accuracy of goods and passenger delivery and trip comfort. However, with the growth of motorization the negative consequences became increasingly apparent:

- use of non-renewable natural resources (energy, material, land);
- death and injury of people in road accidents;
- environmental pollution (ingrediental and parameterical);
- growth of congestion and proportionate reduction in efficiency of transport use;
- growth in expenses connected with development and maintanance of transport infrastructure.

In estimating motorization level different indicators may be used among which the most widespread are:

- number of cars per 1 000 population (per household, per person);
- number of buses per 1 000 population;
- annual rate of motor fleet growth;
- share of motor transport in the total volume of goods and passenger transport.

The motorization level in Russia is now more than 160 cars per 1 000 population. This is 2-3 times less than in European countries (Table 5).

The structure of the Russian motor fleet and its changing dynamics over recent years are presented in Table 6.

This is quite clearly illustrated by Fig.8 and Table 7 which shows the relationship of motorization level in a number of countries to an integral index such as GNR* per capita. Fig.9 gives similar data for Russian regions and also shows the same relationship (although less marked).

* Gross National Revenue

In accordance with a Russian Government decision, GNR in the country is to double by 2012. Growth of the country's economic potential and improved social welfare may lead to a further increase in the stock of private cars and a motorization level of 210-230 cars per 1 000 people by the end of 2010.

Moreover it is necessary to take into account that a real increase in the stock of cars is defined not only by common economic growth in the country but also by real growth in social welfare (which is not always is the same!), and also by a number of other important factors, namely:

- the dynamics of change in modern motor vehicle production volumes by the Russian motor-car industry and the import of new and second-hand foreign motor vehicles;
- the level of road network development;
- the development of public transport services market;
- the implementation of different instruments of state transport policy at federal, regional and local level (in particular, different instruments for restricting the number of private cars and their use in cities).

Fig. 10 presents a forecast of the number and structure of the Russian motor fleet to 2010.

It is necessary to note that the motorization process in Russia has, in fact been uncontrolled in nature (i.e. it is not regulated by the State) and already has been accompanied by noticeably higher losses and costs than in European countries. Under these circumstances, the maintenance of the existing trends in motor fleet growth may result in a considerable adverse effects especially in the social sphere, in the future.

Fig.7. Social and economic consequences of motorization

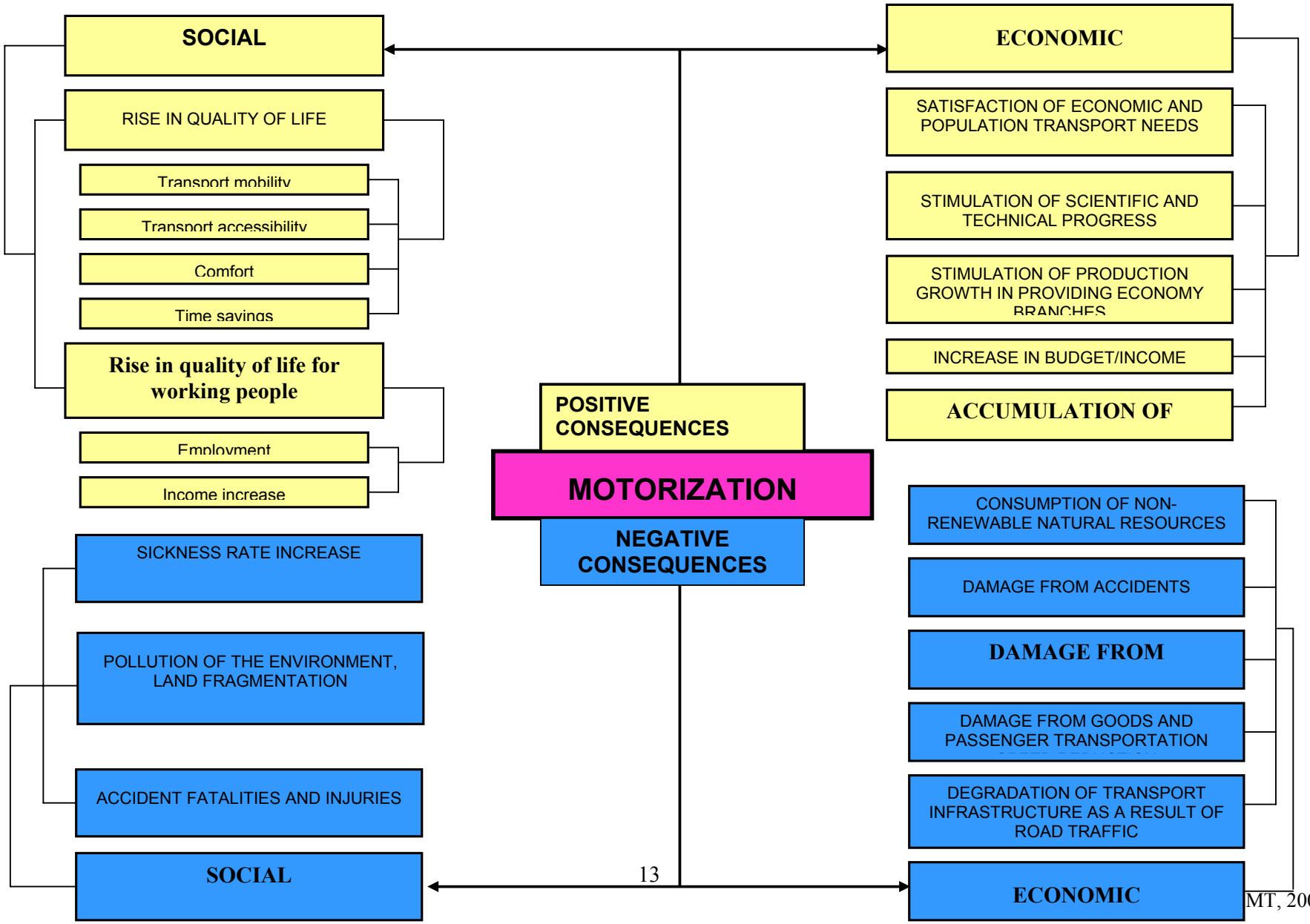


Table 5

Motorization level in different countries

Country	Number of motor vehicles per 1000 people.			Road network density (paved roads only), km/1000 km^2	Number of cars per 100 families
	Cars	Trucks and lorries	Buses		
Russia (2003)	161	32	5,0	31,2	30
Belgium	470	51	1,0	n/d	n/d
Great Britain	430	49	4,0	1510	n/d
Hungary	223	29	2,0	325	37
Germany	524	31	1,0	1820	n/d
Italy	567	53	1,6	3	n/d
Canada	482	131	2,1	n/d	n/d
Netherlands	382	39	1,0	n/d	n/d
Poland	242	42	2,1	771	33
USA	812	31	3,0	n/d	n/d
France	477	88	1,6	1618	108
Sweden	448	35	1,0	361,6	94
Japan	412	175	1,0	2285,7	130

Sources: Transport and Communication in Russia
n/d - no data

Table 6

Rusian motor fleet structure

Motor vehicle type	Number of motor vehicles, thousand								Average growth rate, % (1998/2003)
	1991	**1995**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	
Cars	8964	14195	18820	19624	20247	21232	22468	23383	4,8
including:									
private cars	8677	13688	17761	18543	19097	19984	21135	22082	4,8
Trucks and lorries	2744	3860	4277	4387	4401	4482	4625	4668	1,8
including:									
private trucks and lorries	4	798	1249	1440	1568	1698	1920	1996	11,9
Buses	449	631	627	633	640	663	703	729	3,2
including:									
private buses	0,1	н/д	н/д	170	186	211	250	270	
TOTAL	**12157**	**18686**	**23724**	**24644**	**25315**	**26377**	**27796**	**28780**	**4,3**

Fig.8. Motorization relative to per capita GDP in different countries

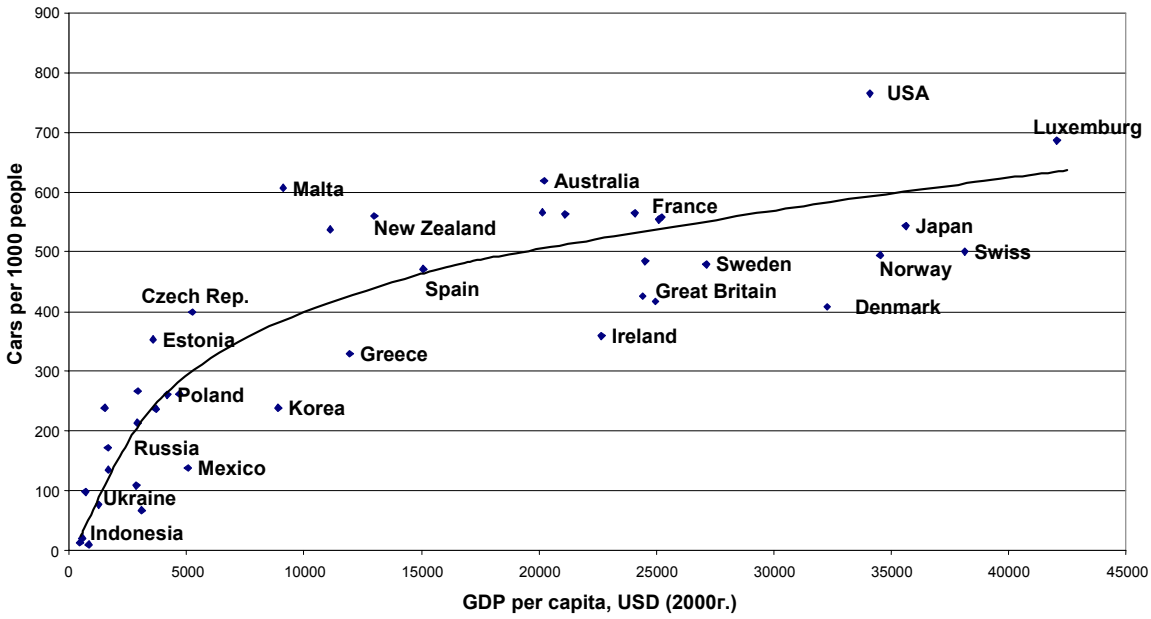


Table 7

Level of motorization and Gross National Revenue in different countries

Country	GNR per capita (USD per year, 2000)	Motorization level (number of cars per 1000 people) (year)
1	2	3
Australia	20240	619 (1997)
Austria	25220	558 (1997)
Byelorussia	2870	109
Belgium	24540	484 (1997)
Bulgaria	1520	239 (1997)
Great Britain	24430	426 (1995)
Hungary	4710	262 (1997)
Germany	25120	554
Greece	11960	329 (1997)
Denmark	32280	408 (1998)
India	450	13
Indonesia	570	21 (1995)
Ireland	22660	359 (1997)
Spain	15080	471 (1997)
Italy	20160	566 (1994)

Country	GNR per capita (USD per year, 2000)	Motorization level (number of cars per 1000 people) (year)
1	2	3
Kazakhstan	1260	77
Canada	21130	563 (1997)
China	840	10
Republic of Korea	8910	239
Latvia	2920	214 (1997)
Lithuania	2930	267 (1997)
Luxemburg	42060	686 (1997)
Malta	9120	607 (1997)
Mexico	5070	138 (1997)
Netherlands	24970	417 (1997)
New Zealand	12990	560 (1997)
Norway	34530	494 (1997)
Poland	4190	261 (1997)
Portugal	11120	537 (1996)
Russia	1660	160 (2003)
Romania	1670	135 (1997)
Slovak Rep.	3700	237 (1997)
USA	34100	765 (1996)
Turkey	3100	67 (1997)
Ukraine	700	98
France	24090	566
Czech Republic	5250	399 (1998)
Switzerland	38140	500
Sweden	27140	479
Estonia	3580	353 (1997)
Japan	35620	543 (1997)

Sources: Unated Nations World Statistic Pocketbook and Statistical Yearbook.

Fig.9. Motorization relative to average income per head in Russian regions (by Administrative okrug)

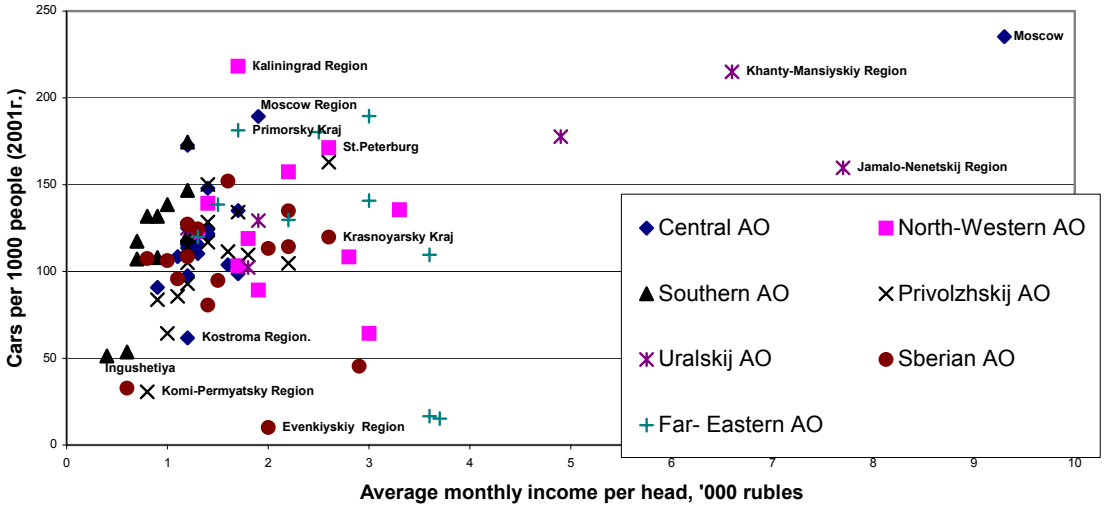
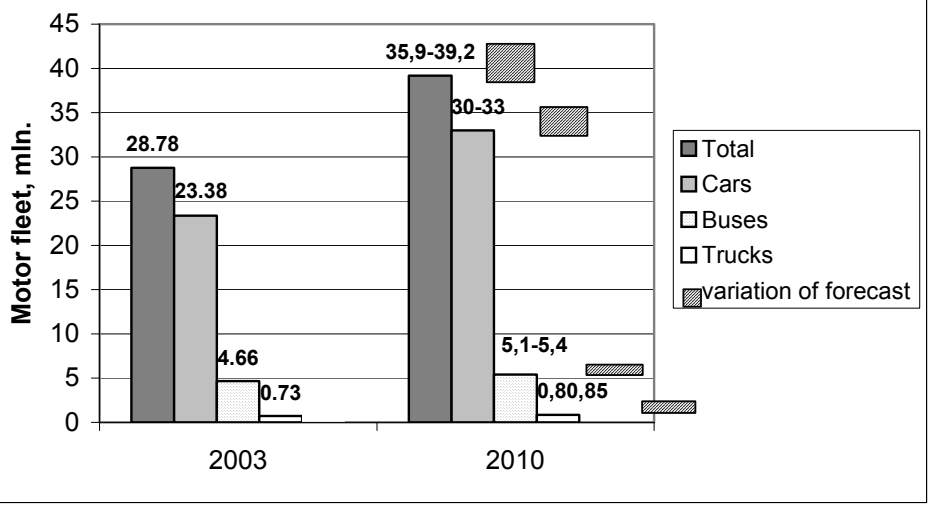


Fig.10. Forecast trends in Russian motor fleet to 2010



Thus, annual economic damage related to road accidents is an estimated 4-5% GDP; environmental effects accounting for 1.5-2% GDP and overload of the road network, -2-3% GDP. These figures argue that social losses connected with motor transport operation are already very high.

The level of motorization differs from region to region in Russia. The greatest number of cars – about 2.5 million or almost 11% of the Russian car fleet – is registered in Moscow. Then (although some way behind) follow the Moscow Region, Krasnodar Kraj, Saint-Petersburg, Samara and Rostov Regions. The structure of the car fleet in the different regions is not identical.

The highest share of foreign manufactured cars (imported or assembled in Russia) is in Primorskij Kraj (more than 70%), followed by Moscow and near-border regions. There is a constant process of car redistribution: new cars are sold mainly in regions with a relatively high per capita income and used (second-hand) cars find their new owners in regions with lower per capita income, i.e. car fleet growth takes place against a background of slow removal of old motor vehicles from operation. According to GIBDD (the State Traffic Safety Inspectorate) data, in 1999 about 142 000 cars (0.7% of the car fleet) were removed from operation and in 2000 – about 162 000 cars (0.8% of the car fleet). Unfortunately, GIBDD statistics do not give the full picture of the actual number of cars removed annually from operation. In accordance with expert estimates the number is several times higher than official statistics (3-5% of the car fleet).

Only in nine Russian regions are there more than 10 buses in general use per 1 000 population (Nizhny Novgorod Region, Novgorod Region, Orenburg Region, Samara Region, Tumen Region, Tatarstan Republic, Khanty-Mansy Autonomous Okrug and Yamalo-Nenetsky Autonomous Okrug). Only three of these regions registered absolute growth in the number of buses.

In most regions there are 5-7 buses per 1 000 people and the number is reduced every year. This is evidence that provision of bus transport is approaching the critical level. One of the consequences of this situation is an increase in the intensity of car use.

Considering the motorization process in Russia it is important to note that 70% of the car fleet is concentrated in cities and towns.

At first, it was just cities that felt the impact of the whole complex of motorization problems. As was shown by studies conducted in the middle of the 1980s, in cities with traditional Russian town-planning solutions (radial – circular) a motorization level of 170-180 cars per 1 000 population is critical from the point of view of car use in terms of the existing capacity of the city.

Exceeding this level results in considerable oversaturation of the road network, increased traffic congestion and difficulties in car parking, reduction of traffic speed, growth in the number of road accidents and negative environmental and health effects.

One of the main problems of Russian cities by now is the gap between the existing road (street) network capacity and the sharply increased motorization level. The town-planning structure of Russia's large and largest cities was mostly set up in the days of the planned economy, when a motorization level of 180 motor vehicles per 1 000 population was accepted as the norm for town-planning projects for the long-range outlook (to 20 years). The revision of this

norm in 1994 when it was replaced by "200-250 cars per 1 000 people" made virtually no difference, because of a lack of resources for the reconstruction and development of urban road networks. At present, the level of motorization of 180 cars per 1 000 population has been reached and exceeded in a number of Russia's large and largest cities (Table 8). In accordance with available estimates more than 20% of total passenger transport volumes in urban areas is by private car instead of a forecast 10-15%.

This results in the substantial overload of the road (street) network in Russia's large and largest cities. The increased incidence of congestion results in considerable economic and social losses and greatly reduces the efficient functioning of both the urban and national economy.

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Table 8
Level of motorization in some of Russia's largest cities (2003)

City	Population, mln.	Number of cars per 1 000 people
Moscow	10,10	235
Saint Petersburg	4,54	216
Novosibirsk	1,42	150
Nizhny Novgorod	1,31	164
Ekaterinburg	1,29	193
Samara	1,16	200
Omsk	1,13	165
Kazan	1,10	101
Chelyabinsk	1,08	165
Rostov-on-Don	1,07	178
Volgograd	1,01	123
Perm	1,00	172
Ufa	1,04	193
Voronezh	0,98	186
Krasnoyarsk	0,88	183
Saratov	0,86	186
Vladivostok	0,63	222
Khabarovsk	0,60	185

1.3. Transport mobility of population and demand for urban public transport services

Demand for transport in cities is shaped by the needs of the municipal economy (goods transport, transport to work) and the transport mobility of the population, which is estimated from the specific number of trips (per inhabitant per day or per year), their distances and purpose.

The general mobility of the population includes transport mobility and mobility without the use of transport vehicles (pedestrian, use of non-motorized means of transport) and is determined by a combination of factors chief among which are (Fig. 11):

- city size and presence of industrial, cultural, commercial and leisure mobility;
- town-planning policies;
- development of labour and real estate markets;
- level of population welfare and quality of life;
- price accessibility of transport.

Quantitative estimation of the transport mobility of the population provides a basis for the calculation of the capacity of the urban passenger transport system and for forecasting road (street) network traffic capacity. The ability to influence transport mobility of the population or, in other words, demand for passenger transport, is the key prerequisite for improved transport efficiency where transport capacity is limited.

Estimates of urban population mobility are obtained by specially conducted studies or (where there are none) – are based on average statistical data. The latter give rather approximate estimates of mobility. Studies on population mobility require substantial financial resources and work input and are therefore organized seldom enough. In other countries such investigations are carried out every 10-12 years. In the Soviet Union in the 1970s the All-Union General Census of the population, for the first time analysed the settlement of gainfully employed population groups in more than 90 cities and obtained quantitative characteristics of labour intensity, cultural and commercial travel and so on. During the following censuses of the population such analyses were not conducted. In the 1980s-1990s only separate studies (i.e. separate cities) relating, as a rule, to estimation of public transport commuter and passenger traffic flows were carried out. Estimates of population mobility in Russian cities for the last two decades are fragmentary and their results are insufficiently reliable.

As any increase in population mobility gives rise to additional demand for transport services and accordingly leads to an increase in transport activity, which is accompanied by a range of adverse effects (traffic accidents, air pollution, traffic congestion and so on), one of the most pressing tasks for contemporary town-planning and transport policies is to develop instruments for population mobility and transport demand management. This may be accomplished e.g. by means of: improved town-planning; fare and pricing policy in the transport sector; improved conditions for "non-motorized" modes of travel and so on. The basic principles of an appropriate – "sustainable mobility" concept – were first formulated as far back as in the EU White Paper of 1993.

When data from special-purpose studies are absent, in Russian town-planning practice the recommendation is to use the next reference values for general mobility for the size of the city's population (Table 9).

Table 9
Mobility index and city's population

City's population, in '000s	50	100	250	500	750	1000	2500	5000 and more
General number of trips per inhabitant per year	950	1030	1080	1100	1130	1150	1200	1300-1400

Fig.11. Forming of demand for transport services and factors affecting mobility

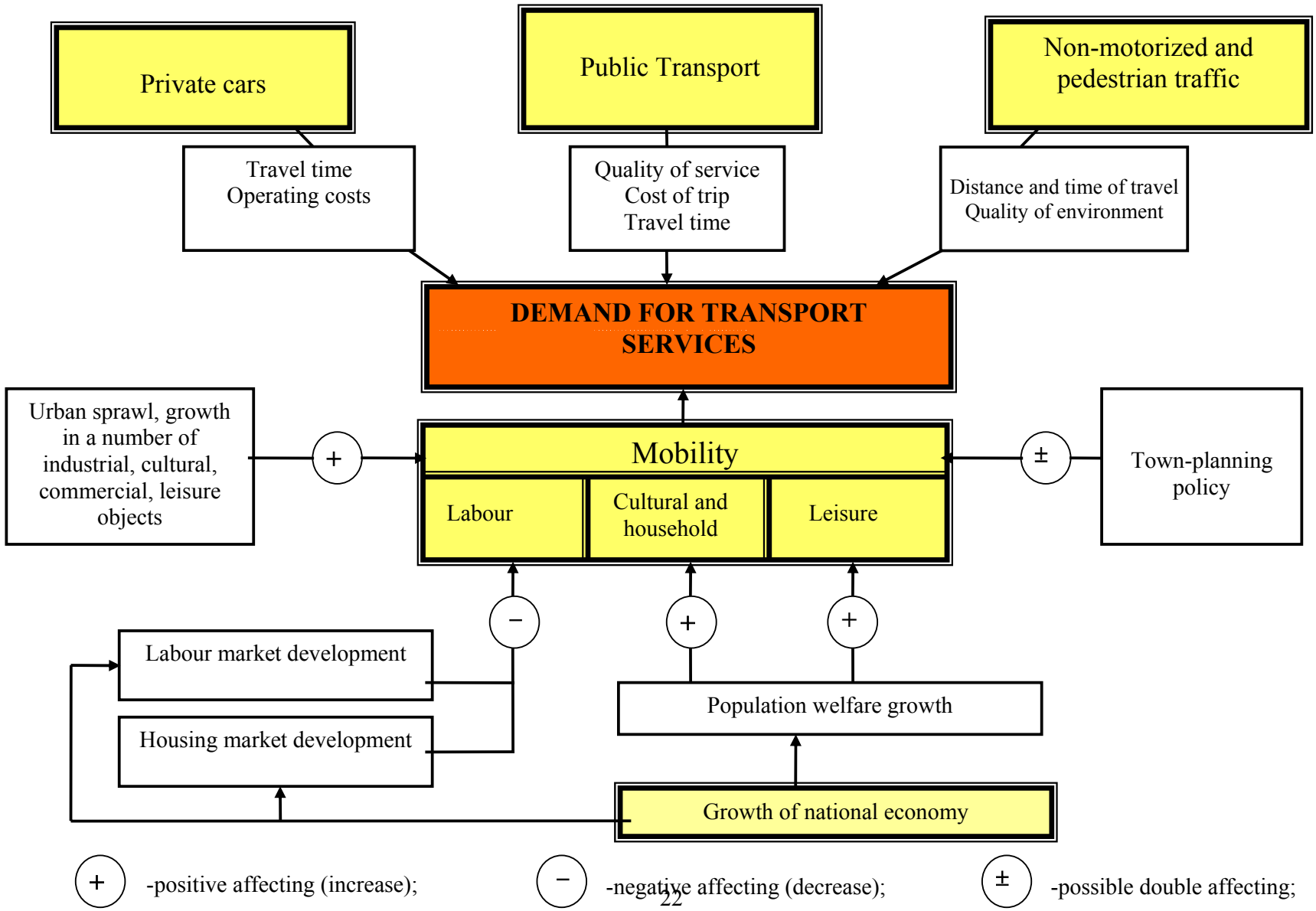


Table 10 presents average statistical coefficients of transport use (ratio of transport mobility to general mobility of the population) as a function of distance and trip purpose.

Table 10
Coefficients of transport use

Travel distance, km	To 1	1,5	2	2,5	3	More than 3
Commuter trips	0.3	0.65	0.9	1	1	1
Leisure, shopping and other trips	0.15	0.4	0.65	0.8	0.9	1

The distribution of trips by purpose depends on the social and age structure of the city's population, the income rates of different groups of population, and the development of commercial, cultural, and leisure infrastructure. Data for the 1980s gives the following snapshot of trip distribution by purpose for Moscow:

- commuter trips - 43-45%
- cultural, shopping and so on - 45%
- leisure - 9-11%
- to airports, railway stations - 1%.

Table 11 summarizes the results of different studies on population mobility which were conducted in the 1970s and 1980s in different cities of the former USSR.

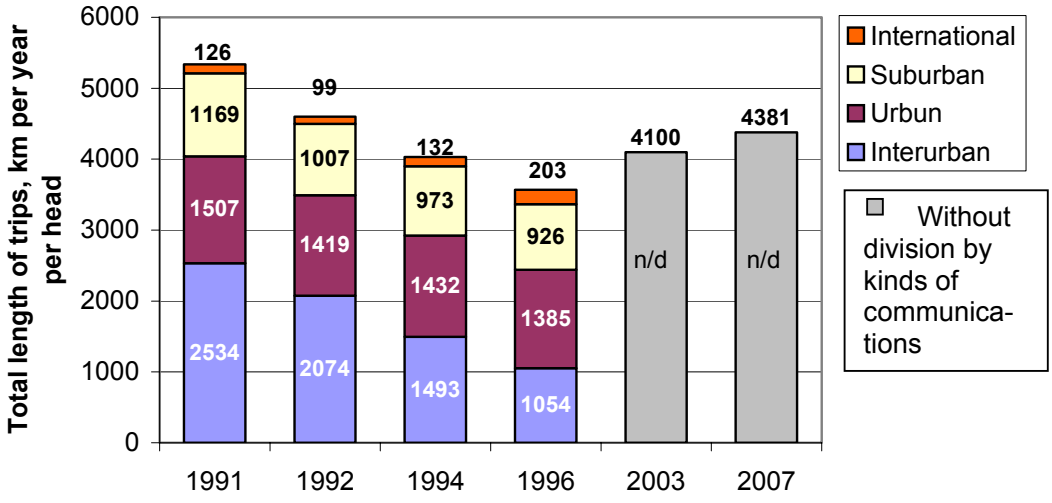
Table 11

City	**City's population mobility by trip purpose (number of trips per inhabitant per year)**		
	General	**Commuter**	**Cultural, shopping and other**
Moscow	800	350	450 (-)
Leningrad (now Saint Petersburg)	945	400 (0,73)*	545 (0,51)
Kiev (Ukraine)	1120	268 (0,79)	852 (0,43)
Kharkov (Ukraine)	963	396 (0,58)	567 (0,47)

*** in brackets – coefficients of transport use**

Fig.12 presents data on the dynamics of population mobility change in Russia, expressed as total annual length of trips per capita by type of transport. These data show that at the first stage of the economic reforms in Russia (1991-1996) as a result of the worsening social and economic situation in the country, the general transport mobility of the population declined by almost 33% while for urban trips the reduction was only about 8%.

Fig.12. Specific average annual length of trip in Russia by type, km per capita per year



n/d – no data

Table 12 presents the results of a comparative analysis of population transport mobility in some of the largest cities of developing countries conducted by World Bank experts.

The project, conducted by the French research Centre CERTU in 1999 at the request of the ECMT obtained the following average estimates of population mobility in 167 cities of OECD and ECMT member countries (Table 13).

Table 12

City	Previous years				Recent years			
	Year	Popula-tion, mln..	Average number of trips with the use of public transport per capita per day	% of total number of trips	Year	Popula-tion, mln..	Average number of trips with the use of public transport per capita per day	% of total number of trips
Hong Kong	1973	4,2	1,1	85	1992	5,6	1,7	89
Manila	1984	6,6	1,5	75	1996	9,6	1,5	78
Mexico City	1984	17,0	0,9	80	1994	220	1,2	72
Moscow	1990	8,6	2,8	87	1997	8,6	2,8	83
Santiago	1977	4,1	1,0	70	1991	5,5	0,9	56
Sao Paulo	1977	10,3	1,0	46	1997	16,8	0,6	33
Seoul	1970	5,5	н/д	67	1997	11,0	1,5	61
Shanghai	1986	13,0	0,4	24	1995	15,6	0,3	15
Warsaw	1987	1,6	1,3	80	1998	1,6	1,2	53

Table 13

Average population mobility by kind of urban travel in cities of OECD and ECMT member countries

Kind of urban travel	Average mobility by kind of urban travel, number of trips per capita per year	
	Beginning of 1990s	End of 1990s
Developed countries – OECD members		
Cars and motorcycles	515	573 (+11,2%)
Public transport	321	299 (-6,7%)
Bicycle	157	157(-)
Pedestrian traffic	299	281 (-6%)
In all	1292	1310
Eastern European Countries and NIS		
Public transport	657	606 (-7,8%)
Cars and motor cycles	241	412 (+70%)
Bicycle**	36	36
Pedestrian traffic*	n/d	161
In all	934	1215

*) Only countries entered EU in 2004
**) Only Polish cities

Given the lack of comprehensive studies on population mobility in Russia during the last few years it is quite difficult to estimate and compare the data on transport mobility in cities, first of all, because of the lack of accurate information on passenger transport volumes by private car (see also Section 1.5), on trips with or without the use of non-motorized transport and also because of errors in statistical records of the public transport work. Nevertheless, Table 14 presents some data on population transport mobility in a number of Russia's large and largest cities which are available in the literature or have been based on statistical indices.

Table 14
Population transport mobility in some Russian cities

City	Number of population, thousand	Number of trips per capita per year	
		In all	Including public transport
Krasnoyarsk (2001)	875	n/d	585
Novosibirsk (2002)	1388	n/d	540
Voronezh (2002)	981	n/d	930
Moscow (2002)	10380	1002	843
St. Petersburg (2002)	4540	819	737
Ufa	1086	n/d	547
Toliatti (1999)	726	n/d	803

n/d – no data

It should be pointed out that up-to-date methods of urban transport system management have to be based on objective information about population mobility. In this connection, the task of creating a proper system for periodic population mobility analyses should be considered as an important element of urban transport policy.

1.4. Public transport development in Russia

Up until the mid-1990s in Russia, public transport was regarded as the basis for meeting the population's urban transport needs.

Under the planned economy, growth in the stock of private cars was artificially curbed by high prices for domestically produced motor vehicles and by an internal market closed to the production of Western automobile manufacturers. At the same time, the State provided a high level of funding for public transport enterprises which were then able to sustainably and systematically increase passenger transportation volumes, renovate the vehicle fleet and develop proper infrastructure.

It was expected that by 2005 public transport would account for as much as 85-90% of the total volume of passenger transport in cities.

However, the initial stages of economic reforms in Russia led to qualitative changes in the structure of demand and supply in the urban passenger transport market.

These changes related to:

- the dramatic and still continuing growth in the number of private cars (see also Section 1.2). Already, car ownership levels exceed 200 cars per 1 000 inhabitants in Moscow, St. Petersburg, Samara, Vladivostok, Kaliningrad and some other cities;
- considerable growth in expenditure for ensuring urban public transport system operation in combination with a lack of budget funding, which in recent years has led to the substantial ageing of the fleet and infrastructure of municipal transport providers and, as a result, to a reduction in the quality of services which are offered to the public by social sector carriers[*];
- the development from the middle of the 1990s of commercial transport services in the urban passenger transport sector. So, in 2003 in Russia more than 50 000 buses belonging to different commercial firms or individuals operated on urban routes. However, by now only 4-6% of the total volume of passenger transport in cities is effected by commercial carriers, since they use mainly minibuses working regular routes. Fig.13 shows the change in transport volumes in the social and commercial sectors from 1996 to 2002. The increase in commercial bus transport volumes is a result of the exodus of paying passengers from the social sector (Fig.14).

The main indicators for the urban public transport work in the Russian Federation from 1990 to 2000 are presented in Tables 15 and 16. At present 44% of Russian cities and towns have regular passenger transport services.

[*] Social sector: passenger transport to which all established privileges on fares apply.
Commercial sector: passenger transport for which established privileges on fare are restricted or cancelled.

Data presented in Table 14 show that bus continues to be the main type of urban public transport. Tramways are operated in 68 cities (6%) and trolley-bus services in 87 cities (8%). In the six largest Russian cities, underground services (metro systems) are in operation (Table 17).

From the data presented in Table 15 it is clear that during the period under consideration there was no substantial reduction in passenger transport volumes carried by municipal urban public transport mainly owing to the growth in transport volumes carried by urban surface electric transport and metro. At the same, time passenger turnover by municipal urban public transport within this period declined constantly (first of all – at the expense of a reduction of bus turnover). In 2001 this reduction was 14.6% compared with 1990 and is indirectly confirmed by the reduction in the average length of passenger transport (Table 18).

The total number of urban public transport (UPT) vehicles in the social (municipal) sector has decreased 11% over the last 10 years by (excluding metro wagons, by 13%).

During the period under review, there was significant change in such integral indicators of the quality of UPT services as "number of UPT vehicles per 100 000 inhabitants" and "number of UPT trips per 100 000 inhabitants (Table 19).

The preservation of total volumes of passenger transport and the shortage of resources for renewal of the UPT fleet has hastened aging and considerably increased rolling stock wear and tear (Table 20).

In accordance with data from the Ministry of Transport of Russia, the share of UPT vehicles in operation beyond their normal life span is: for buses – 55%, for trams – 47.8%, for trolley-buses – 49.1% and for metro wagons – 7%. Figs.15 and 16 present the changing age structure of the UPT fleet in the social sector and investments in renewal of rolling stock. Side by side with the intensive aging of rolling stock there is also considerable (more than 50%) wear and tear of UPT's industrial base as a whole (equipment, buildings and structures, tools and so on).

In most Russian cities, public transport is substantially overloaded. The average number of passengers carried in a UPT vehicle's saloon (5 people per 1 m^2) is in many cases considerably exceeded: if, in Europe, there are 1 to 3 passengers per 1 m^2 of standing room, in Russia the figure is 5 to 9. Table 21 presents a comparison of UPT vehicle use in Russia and some western countries.

Some indicators characterizing average passenger service quality in Moscow and in Russia are presented in Table 22. Changes in some of these indicators in Russia for the period 1996 to 2000 are presented in Figs.17 and 18.

The decline in UPT service quality has resulted in a reduction in demand for these services from people with relatively high income, with these transport consumers switching to private car use or commercial public transport. Where services are unprofitable, this has led to further deterioration in the financial state of municipal UPT enterprises and greater budget expenditure to support their operation (Fig.19).

Fig.13. Total volume of passenger transport

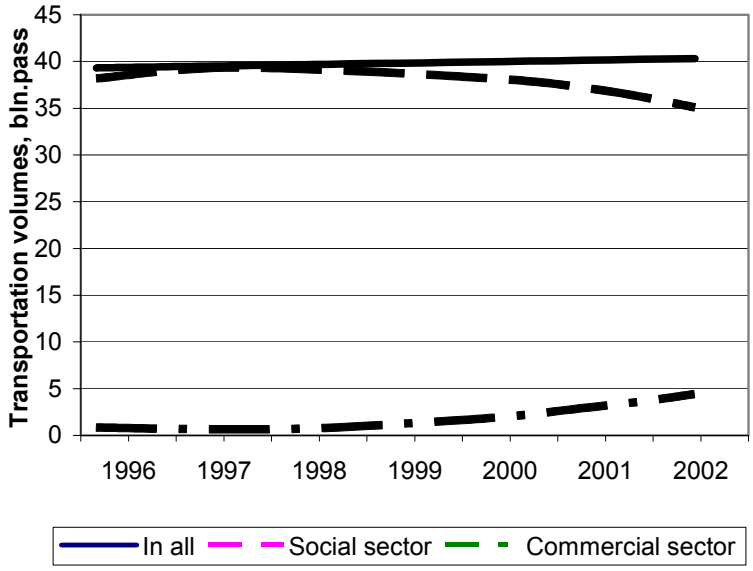


Fig.14. Volumes of transport of paying passengers

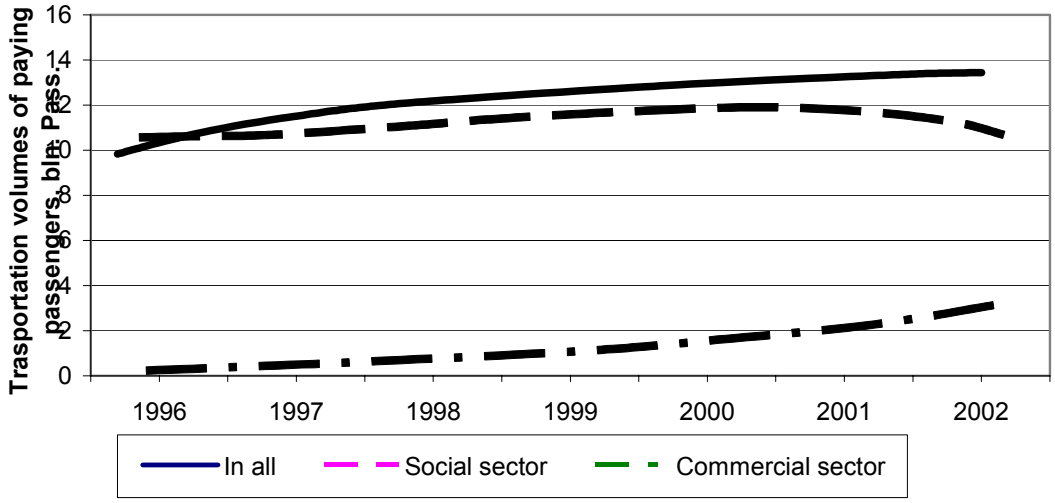


Table 15

Main indicators of urban public transport performance in the Russian Federation (UPT for general use only)

Index	1980	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	2	3	4	5	6	7	8	9	10	11	12
Transportation volume by UPT; In all		39169	38763	39398	40043	39636	38143	38634	37682	37653**	39100**
including:											
- buses*	-	22869	18522	18926	19527	19091	18970	18345	17490	-	20800**
-trolley-buses	4739	6020	8475	8721	8848	8860	8241	8704	8604	8181,1	7319,3
- trams	5695	6000	7540	77527	7495	7506	6738	7369	4354	6982,3	6316,2
- metro	3036	3695	4150	4173	4128	4146	4162	4186	4205	4199,5	4204,7
- river ships	-	28,2	10,0	7,5	12,3	9,1	11,7	13,9	15,7	28,8	28,8
- taxi (incl. suburban communication)	-	557	66	43	33	24	20	16	13	-	-
UPT turnover, bln. pass.; In all	-	223,0	207,5	205,4	206,8	203,4	197,9	194,2	190,4	258,3**	201,4**
including:											
- buses*	-	132,2	108,6	105,4	106,9	102,8	100,8	94,2	87,8	-	16490
-trolley-buses	-	20,5	26,5	27,4	28,0	28,2	26,5	27,9	27,8	26,61	23,42
- trams	-	19,1	25,1	25,3	25,1	25,5	23,6	24,9	23,51,32	21,29	19,58
- metro	-	41,0	46,2	46,6	46,2	46,5	46,6	46,9	0,1	51,29	51,30
- river ships	-	0,3	0,07	0,06	0,08	0,06	0,08	0,09	0,2	-	-
- taxi (incl.. suburban communication)	-	8,9	1,0	0,6	0,5	0,3	0,3	0,2		-	-

*- Excluding use of transport belonging to individuals

** - Taking into account commercial transport and including suburban transport

End of the Table 15

1	2	3	4	5	6	7	8	9	10	11	12
Number of cities and towns which have regular passenger transport, by mode of urban-transport:											
- bus	-	1378	1249	1266	1250	1289	1318	1295	-	-	1268
-trolley-buses	-	85	85	86	87	87	87	87	-	-	89
- trams	-	70	68	68	68	68	68	68	-	-	76
including - speedtram	-	4	-	4	4	4	4	4	-	-	4
- metro	-	5	6	6	6	6	6	6	-	-	6
Number of UPT fleet, thousand											
- buses*)	-	60,3	56,8	56,7	58,4	57,9	55,3	53,9	54,4	-	-
-trolley-buses	-	13,8	13,2	12,7	12,5	12,3	12,2	12,185	12,183	12,147	11,945
- tram wagons	-	14,8	13,3	13,0	12,7	12,4	12,3	12,262	12,053	11,792	11,292
- metro wagons	-	5,2	5,7	5,8	5,8	5,8	5,8	5,781	5,764	5,757	5,871
Number of UPT regular routes, by mode of urban transport:											
- buses*	-	9693	9548	9572	9874	9785	9741	9668	-	-	32011
- trolley-buses	-	910	923	925	932	920	932	946	-	-	
- trams	-	703	677	681	664	649	657	658	-	-	
Number of metro stations	-	-	247	249	250	250	253	256	-	-	267

Table16

Some indicators of efficiency of UPT fleet use in Russia for the period 1990 to 2001

	1990	1995	1996	1997	1998	1999	2000	2001
Coefficient of fleet use								
- Buses	74,9	68,3	68,5	67,3	67,2	66,3	65,3	n/d
- trams	73,7	69,8	69,4	67,8	68,6	69,1	68,3	n/d
- trolley-buses	73,2	76,0	76,4	75,9	76,1	75,3	74,3	n/d
- metro wagons	74,3	81,4	81,7	74,7	75,2	75,4	75,2	n/d
Number of fulfilled trips, mln.								
- buses	254,8	201,6	200,7	193,2	193,7	198,3	172,4	162,4
- trams	-	35,6	34,8	33,2	32,8	33,0	33,5	32,5
- trolley-buses	-	57,9	56,4	53,7	52,7	50,4	50,4	48,4
- metro wagons	-	4,6	5,2	5,2	5,2	5,0	5,0	4,9

Table 17

Some characteristics of Russian metro systems, 2000

City	Volume of transport, mln. people	Number of stations	Operational length of track, km	Number of wagons, units
Moscow	3203	162	264	4154
Saint-Petersburg	799	58	99	1347
Nizhny Novgorod	76	12	14	80
Novosibirsk	52	11	13	76
Samara	27	7	8	54
Ekaterinburg	29	6	7	46

Table 18

Average distance of passenger transport by UPT for general use, km

Type of urban transport	1990	1995	1996	1997	1998	1999	2000
Buses	5,8	5,9	5,6	5,5	5,4	5,3	5,1
Taxi (incl. suburban)	16,0	14,4	14,4	14,4	14,3	14,7	15,2
Trams	3,2	3,3	3,4	3,3	3,4	3,5	3,4
Trolley-buses	3,4	3,1	3,1	3,2	3,2	3,2	3,2
Metro	11,1	11,1	11,2	11,2	11,2	11,2	11,2
River ships	4,1	7,5	7,4	6,2	7,1	6,7	6,5

Table 19

Integral indices of UPT system functioning quality

Index name	Value of index by years:				
	1991	**1996**	**2000**	**2001**	**2003**
Number of urban population in Russia, in thousands.	109345	107607	106113	105081	105703
Number of surface UPT vehicles per 1000 of urban population*)	0.86	0.82 (-4.7%)	0.9 (-8%)	0.80 (-7%)	0.77 (-10%)
Number of surface UPT trips per 1000 of urban population per year	3517	2760 (-21%)	2462 (-30%)	2362 (-33%)	n/d

*) only social sector
n/d – no data

Table 20

Age structure of UPT fleet, %

	1995	**1996**	**1997**	**1998**	**1999**	**2000**
Buses in general use – in all, including in operation, years	100	100	…	100	100	100
up to 2	…	…	…	8	7	8
up to 3	19	15	…	…	…	…
2.1-5	…	…	…	18	16	15
3.1-8	52	50	…	…	…	…
8.1-10	15	18	…	19	19	18
10.1-13	9	11	…	17	20	21
more than 13	5	6	…	9	12	15
Tram wagons – in all including in operation, years:	100	100	100	100	100	100
To 5	15	11	10	6	5	4
5.1-10	38	30	26	24	19	17
10.1-15	32	39	39	39	39	36
15.1-20	11	14	18	22	26	30
more than 20	4	6	7	9	11	13
Trolley-buses – in all including in operation, years:	100	100	100	100	100	100
to 5	33	28	22	12	11	12
5.1-10	54	52	50	50	49	41
more than 10	13	20	28	38	40	47
Metro wagons – in all Including in operation, years:	100	100	100	100	100	100
To 5	19	17	13	12	9	6,5
5.1-10	15	15	17	15	17	18
10.1-15	21	21	22	20	19	17
15.1-20	14	13	15	17	17	20
20.1-25	16	17	16	16	15	13
25.1-30	11	12	10	16	18	19
30.1-35	4	5	6	4	5	6
more than 35	-	-	1	-	0,3	0,4

Fig.15. Investments in rolling stock, mln. rubles

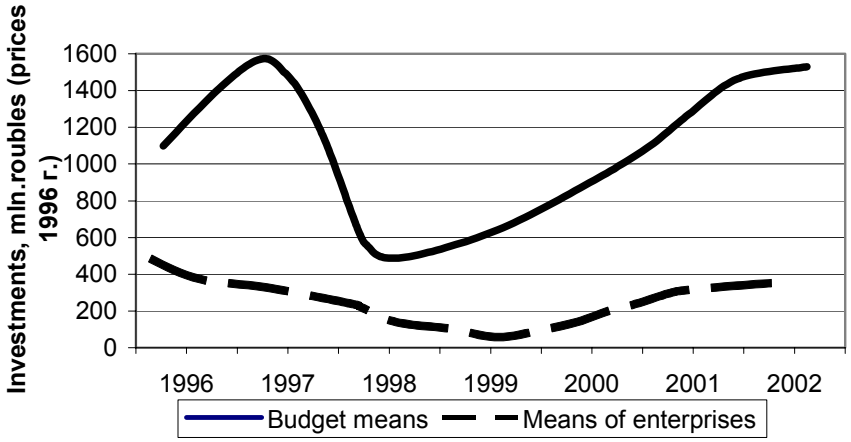


Fig.16. Structure of UPT fleet in social sector,%

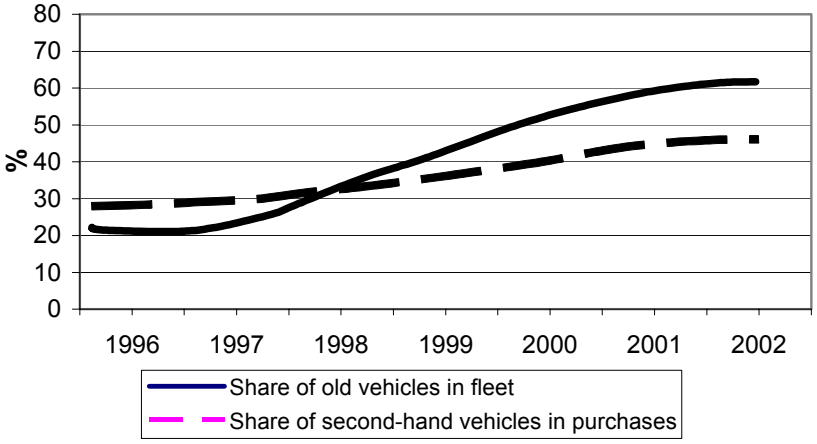


Table 21

Comparison of UPT vehicle use in Russia and some western countries (1996)

Country	Total annual running of UPT vehicles, mln. km	Average distance of passenger trip by UPT vehicle per day, km	Average number of passengers in UPT vehicle
Great Britain	4600	79	9
Italy	5186	91	10
USA	9851	38	10
Germany	4714	58	15
Russia	7536	51	38

Table 22

Indicators of passengers service quality in surface public transport in Moscow (2003, in accordance with "Mosgortrans" data) and in Russia on average (2000)

№	Name of indicator	Value of indicator	
		Moscow	Russia on average
1	Average saloon occupancy in rush-hours (person per m^2 of saloon floor space), including	5.7	n/d
	Bus	5.8	6.5
	trolley-bus	5.5	6.7
	Tram	5.7	6.6
2	Average traffic interval in rush-hours, min.		
	Bus	10.7	12.2 (6.6*)
	trolley-bus	5.9	7.6
	Tram	6.5	7.6
3	Average traffic interval in off-peak hours, min.		
	Bus	12	n/d
	trolley-bus	9	n/d
	Tram	7.9	n/d
4	Average time spent on commuter for trips in city by surface UPT, min.	27	n/d

*) in commercial sector
n/d – no data

Fig.17. Change in passenger waiting time for UPT vehicles in social sector, %

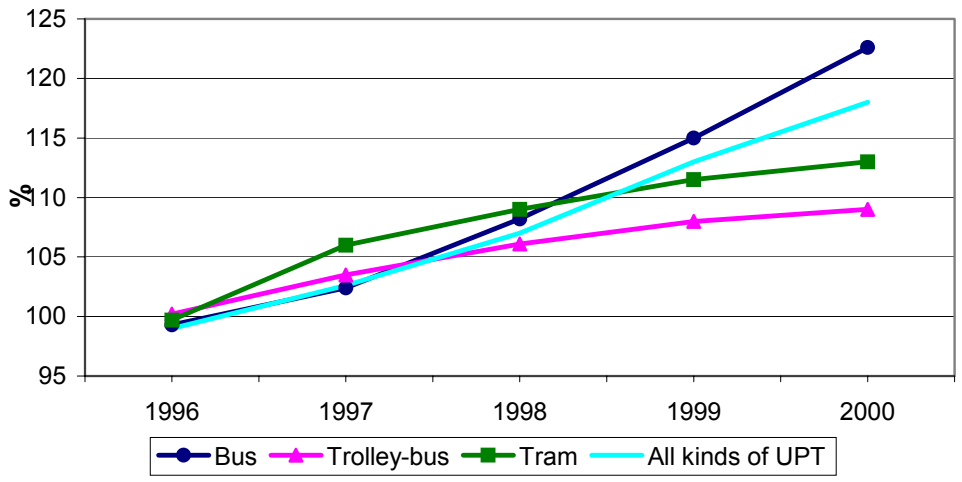
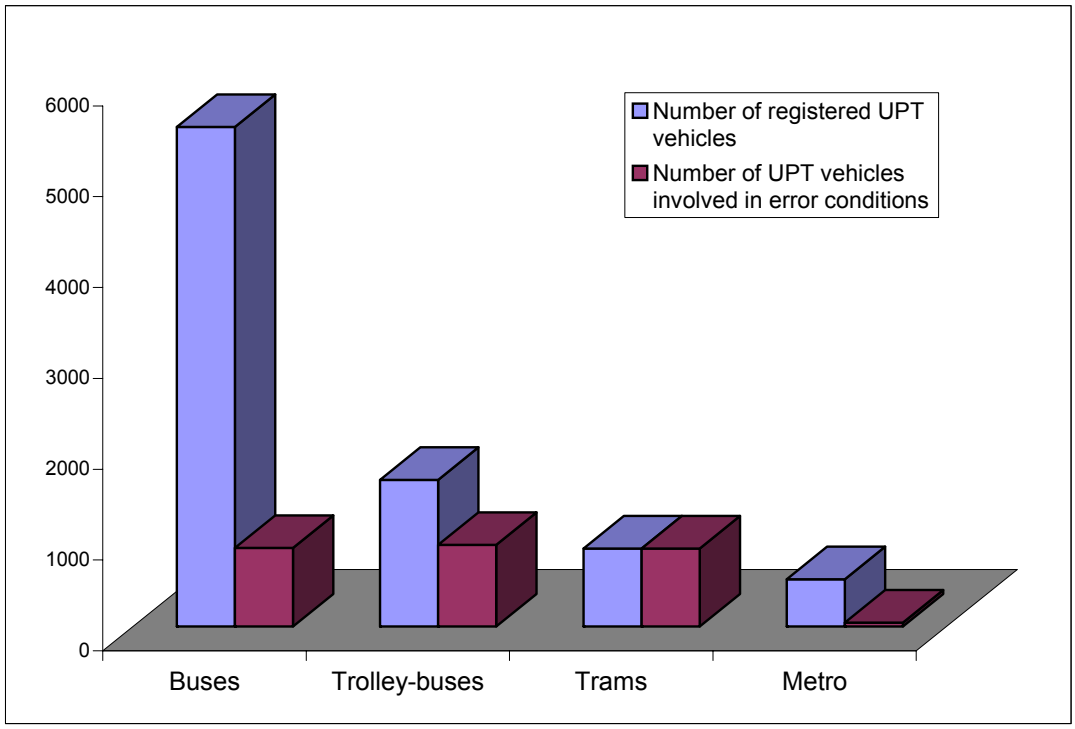


Fig.18. Change of saloon filling for UPT vehicles in social sector, %

Fig.19. Comparative data on a number of UPT vehicles involved in error conditions in Moscow daily



In accordance with the Russian legislation the organization of urban public transport services is the responsibility of local authorities. In practice this results in a considerable variety of both forms and methods of UPT management and strategies for development.

Table 23 presents a comparison of some UPT development indicators in Moscow, St. Petersburg and selected European cities.

Table 23

Comparison of UPT development indicators in some Russian and European cities

	Population, mln.	**Area, km^2**	**Number of UPT vehicles per 1 000 inhabitants**	**Density of UPT route network, km/km^2**
Moscow (2003)	10.38	1091	1.94*)	6.20*)
Saint-Petersburg (2003)	4.54	1439	1.47	5.37*)
Lyon, France (1989)	1.136	609	0.90	1.77
Barcelona, Spain (1991)	2.6	212	n/d	3.65

*) Taking into account commercial buses

The main problems for urban public passenger transport development in Russia at present relate to:

- practical lack at Federal level of the necessary legal base for UPT regulation (regulation of procedures for competitive access of operators into the passenger transport market; regulation of passengers service category concessionary fares; right of local authorities to introduce restrictions on car traffic in some urban territories (including the introduction of different charging schemes); concession to local authorities (municipalities) of concrete rights to manage the UPT route network, and so on);
- unprofitability of UPT enterprises in the "social transport" sphere as a result of the problem of "concessionary fare" trips of those citizens granted this right for social reasons (pensioners, disabled persons, students, and so on);
- inefficiency of UPT management at city level (lack of clear strategies for UPT development and management; frequently inefficient managing structures; poor interfacing of different kinds of UPT and practical absence of multimodal urban passenger transport and so on);
- practical lack of interfacing with adjoining city's management structures (town-planning and traffic management bodies, road-building complex; environmental protection bodies, State Traffic Safety Inspectorate, and so on);
- the need to consolidate transport operators operating in the commercial sector;
- inefficiency of the basic funding system in the municipal sector, which results in high expenditure on vehicle operation, aging of fleet and, as a result, considerable shortage of vehicles (e.g. in Moscow, the State Enterprise "Mosgortrans" was short of more than 4 000 units of rolling stock, at the beginning of 2004).

1.5. Estimated passenger transport volumes by private car in Russia

Growth of the car fleet in Russian cities has resulted in a substantial increase in the share of private cars in passenger transport volumes. When calculating the transport service needs of the population for commuter trips, trips by private car account for the largest share.

From the point of view of the organization of public transport services in cities, car trips are extremely inefficient. In order to transport 1 passenger by car a road area of about 20 m^2 is needed as opposed to about 1 m^2 for urban bus transport. For temporary car parking on one level, 10-12 m^2 are needed per car. Besides this, peak car traffic in practice coincides with peak surface public transport traffic and results in overload of the road (street) network.

At present, when considering UPT development issues, the role of private cars is taken into account in Russia only very approximately. The calculations assume that only a small share of total passenger flows (10-15%) will be accounted for by private car drivers and passengers. Such an approach leads to serious mistakes in development planning for urban transport systems. The methodology for estimating passenger transport by private car, which is described below, helps to avoid these mistakes.

Average daily passenger transport volume by private car per month with maximum use of cars (see Table 24) $\mathbf{Q_c}$ may be defined as:

$$Q_c = N \cdot k_в \, k_{tp} \cdot m_c \cdot \, n, \qquad (1)$$

where: **N** -private car fleet in operation, units.;

$\mathbf{k_в}$ - coefficient of car departure from carparks in given month;

$\mathbf{m_c}$ - average number of car trips per day;
n - average car occupancy, persons;
$\mathbf{K_{tp}}$ - coefficient of technical condition of car fleet (share of cars in good working order).

Further calculations use the values of coefficients $K_в$, m_c, n, obtained from studies conducted by the Passenger Transport Development Department of the Scientific, Research and Design Institute of the General Plan (NIPI Genplan), Moscow.

The coefficient of car departure from carparks $\mathbf{k_в}$ shows the share of cars entering traffic from the total car fleet (Table 24).

Table 24
Coefficient of car departure $k_в$

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
$\mathbf{k_в}$	0,35	0,4	0,45	0,45	0,45	0,45	0,45	0,45	0,5	0,45	0,4	0,35

The average number of trips by car per day $\mathbf{m_c}$ is 4,5 and the average car occupancy **n** is defined by trip purpose:

- work - 1,1 – 1.5
- cultural, for shopping and leisure - 1.8 – 2.5
- to country houses (dachas) - 2.5 – 3.0.

The average value of this index can be obtained from the average car occupancy values differentiated by trip purpose by the following formula:

$$n = \frac{\sum n_i \cdot m_i}{\sum m_i} \qquad (2)$$

where :m_i - number of car trips for purpose ***i***

Average annual passenger transport volume by car $\mathbf{Q_a}$ may be defined as:

$$Q_a = 365 \cdot Q_c \cdot k_u , \qquad (3)$$

where: k_u – coefficient of unevenness of car use.

$$(k_u = \frac{k_в^{av}}{k_в}) \qquad (4)$$

where: $k^{av}_в$ - average annual coefficient of car departures.

The results of the calculation of passenger transport volume by car in Moscow are presented in Table 25. Data on passenger transport volume by urban public transport in Moscow are also available for 2003 (ibid). From these data it follows that about 24% of total passenger transport volumes are carried by private car. Passenger transport by car amounts to about 82% of the volume of transport by buses. This is considerably higher than the values used for forward planning of city transport infrastructure development.

Table 25

Passengers transport volumes by private car and public transport in cities (2003)

Type of transport	Volume of transport, bln.year	Relative share, %
Metro	3.20	28.1
Buses	3.34	29.3
Tram and trolley-bus	1.59	13.9
Private cars	2.5*	24.1
Other	0.52	4.6
In all:	11.40	100

*- NIIAT calculation

Obviously it is not quite correct to apply the estimates of private car transport volumes to other Russian cities. The value of this index depends on: whether there is a metro and its network development; whether there is surface electric public transport; the level of motorization in the city; design of road (street) network and so on. The probable range of values of the relative share

of passenger transport by private car in Russian cities may vary from 15 to 30% of total passenger transport volume in cities.

2. NEGATIVE CONSEQUENCES OF URBAN TRANSPORT OPERATION IN RUSSIA

2.1. Traffic Safety

Traffic safety is one of the most critical social problems in the Russian transport sector. Annually about 30-35 000 people are killed and more than 200 000 injured in accidents on the roads and streets of Russia.

Trends in absolute traffic safety indicators in Russia are presented in Fig. 20. Figs. 21 and 22 also show trends in specific traffic safety indicators (in terms of population or motor fleet) from 1994 to 2003. Figs. 23 and 24 compare these indicators for Russia and selected other countries.

Road accidents in Russia are characterized by their very serious consequences (number of killed per 100 casualties). Trends in accident severity are presented in Fig. 25 and Fig. 26 compares this indicator for a number of foreign countries.

Analysis shows that 80% of all accident casualties fall into two main categories of road users – pedestrians and car drivers (passengers).

In accordance with existing estimates direct damage alone from road accidents in Russia in 2002 amounted to almost 280 bln. rubles (9.6 bln. USD).

The data show that in terms of ensuring traffic safety in Russia, the situation has deteriorated catastrophically. To a considerable extent this process is related to the overall weakening in the country of the machinery of State power in the 1990s and insufficient attention to traffic safety problems by the legislative and executive powers at federal level; lack of effective legislation to ensure road safety and a subsequent decline in general transport discipline; the growth of social inequality with simultaneous weakening of control and enforcement mechanisms and insufficient penalties for traffic violations; and, frequently, ineffective activity of State Traffic Safety Inspection bodies.

Undoubtedly there are also purely "technical" difficulties in ensuring traffic safety in Russia at present:

- poor condition of roads and insufficient density of road network;
- poor design characteristics (primarily from a safety standpoint) of a considerable portion of the motor fleet (passive safety of domestically produced motor vehicles);

Fig.20. Trends in accident rates in Russia (1994-2003)

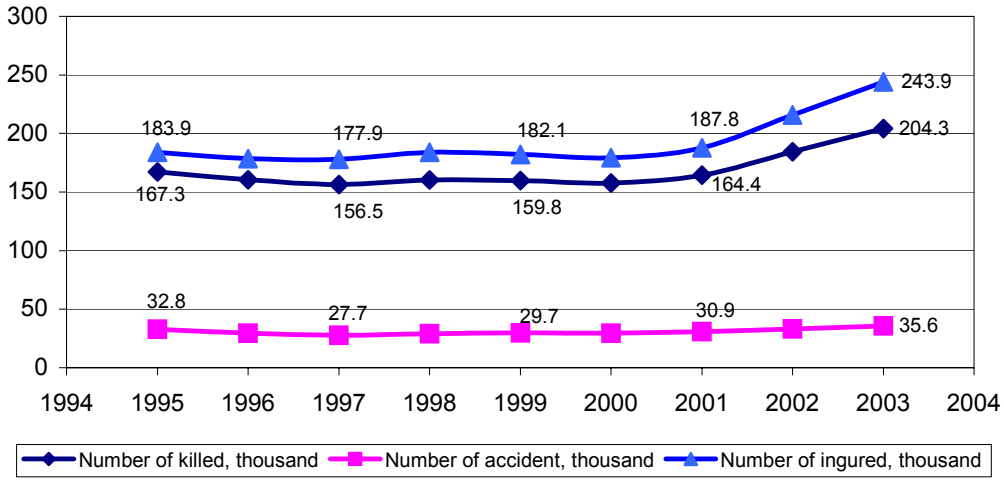


Fig.21. Number of accidents, killed and injured per 100 000 people in Russia (1997-2003)

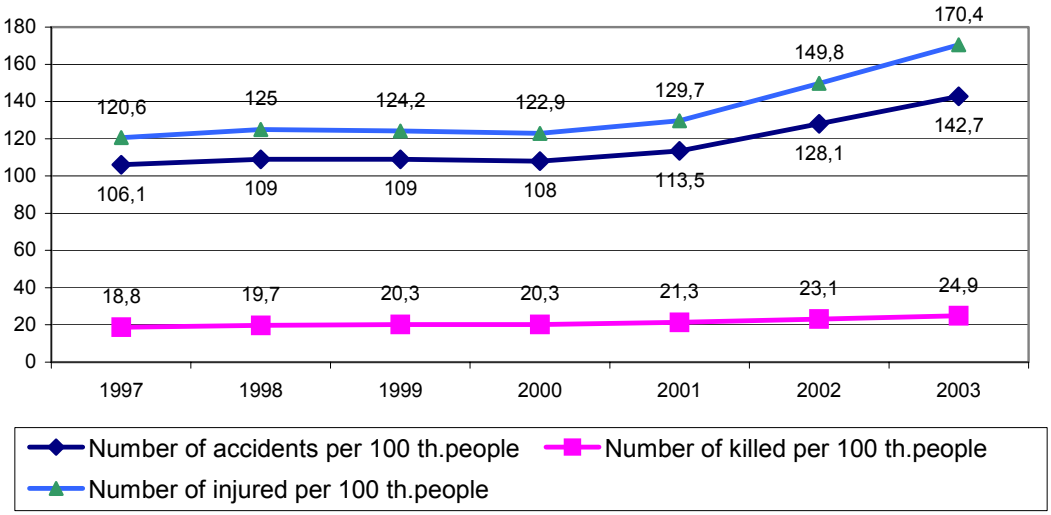


Fig.22. Number of accidents, killed and injured per 10 000 motor vehicles (1996-2002)

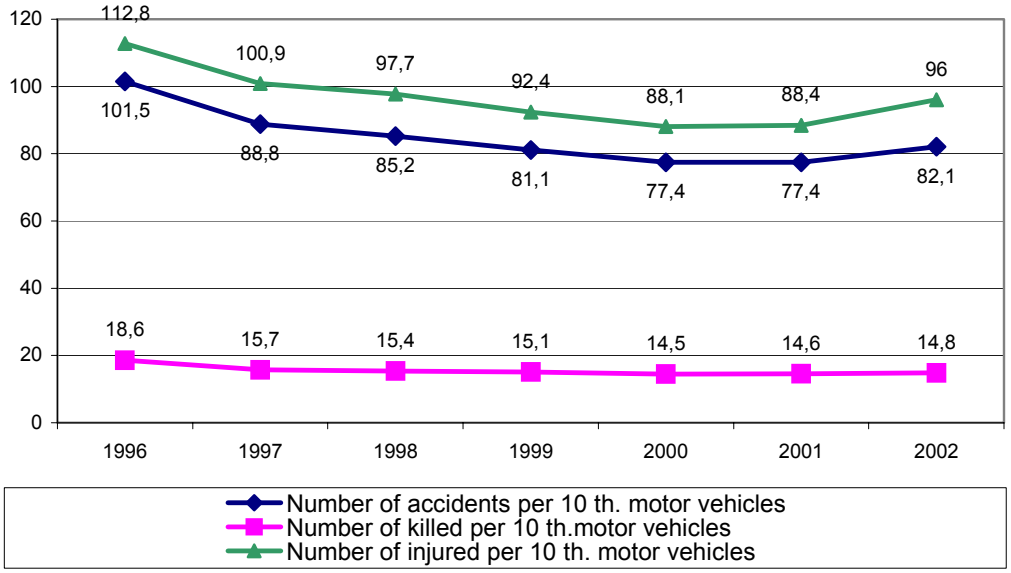


Fig.23. Number of killed per 100 000 in Russia (2001-2003) and selected other countries (2001)

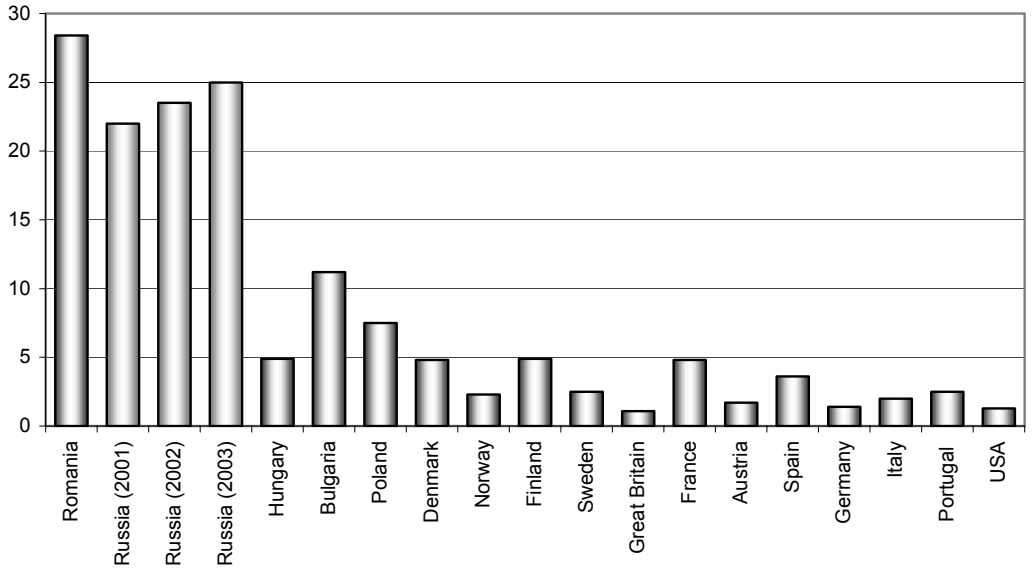


Fig.24. Number of killed per 10 000 motor vehicles in Russia (2001-2003) and selected other countries (2001)

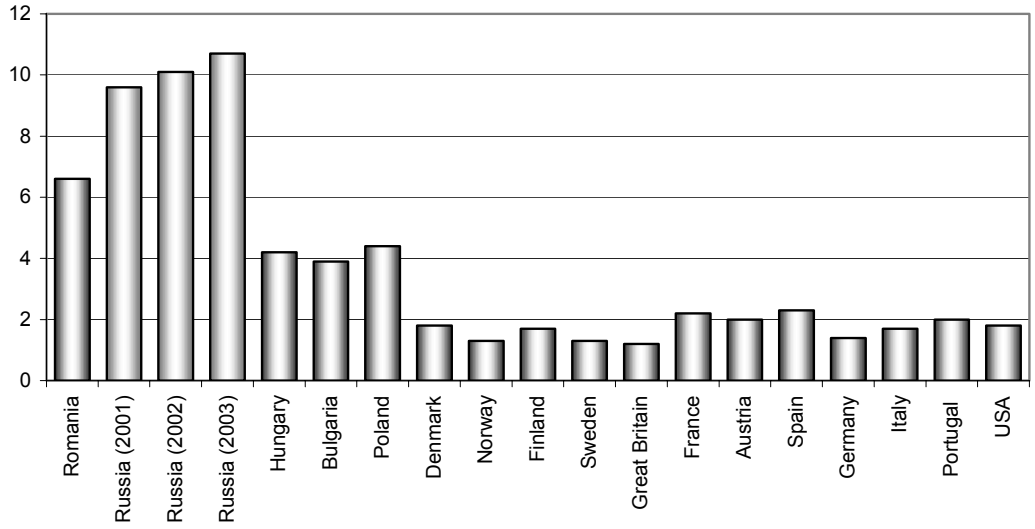


Fig.25. Number of killed per 100 accident casualties in Russia (1997-2003)

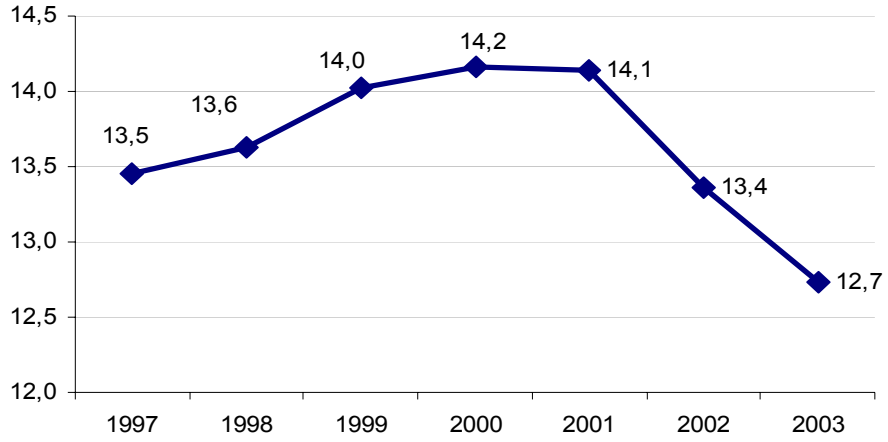
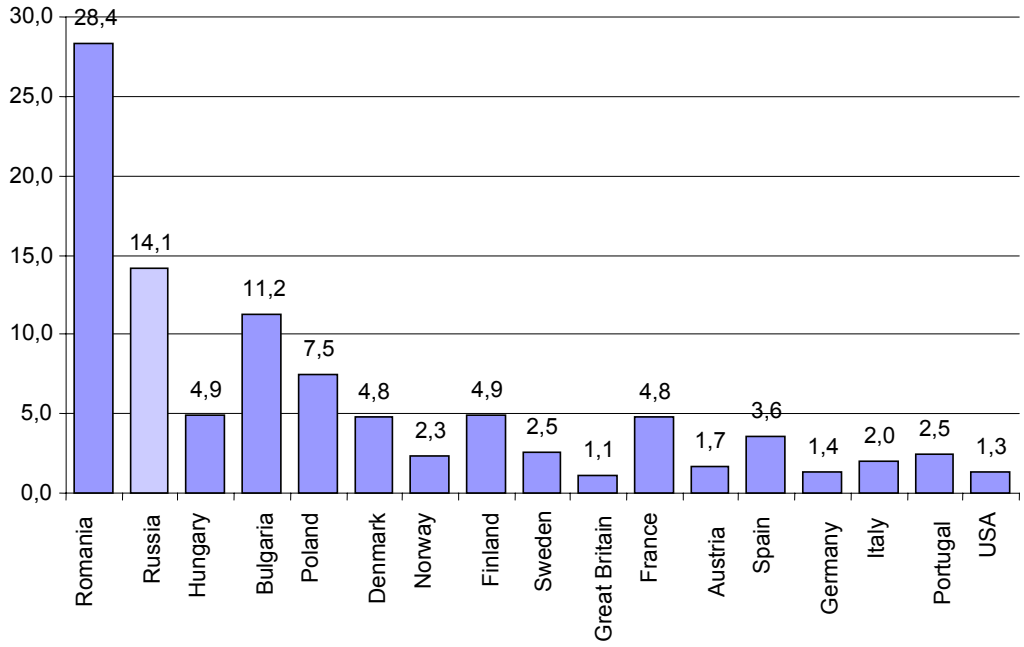


Fig.26. Index of severity of accident consequences in Russia and other countries (number of killed per 100 casualties, 2001)



- current shortcomings of motor vehicle technical inspection;
- poor driver training at driving schools and insufficient controls on admission to driving;
- shortcomings in traffic engineering.

About 70% of the total number of road accidents in the country occur in Russian cities and towns. About 16-18 000 people are killed (49% of all fatalities) and 150-165 000 injured (68% of all injured) in these accidents annually. Per 100 km of urban road there are five times more accidents than on rural roads. Leaving aside quantative differences, traffic accidents in cities have highly specific characteristics. As a result of lower motor vehicle speeds the consequences of accidents in cities are much less serious. Selective studies show that the ratio of accidents with and without casualties ranges from 1:3 on motorways to 1:20 in big cities. Data from Table 26 can be used to analyse the influence of traffic conditions on accident type. Over 60% of the total number of fatal accidents in cities involve pedestrians while half as many accidents on rural roads accidents involve pedestrians.

Table 26

Influence of traffic conditions on accident consequence severity

Kinds of accidents	Share of different kinds of accidents in total number, %			
	in cities		in rural area	
	all accidents	accidents with fatalities	all accidents	accidents with fatalities
Vehicle-pedestrian collision	46,4	63,1	22,1	28,3
Vehicle collision	31,9	17,9	28,5	25,3
Vehicle roll	6,1	5,2	31,0	28,7
Other	26,6	13,8	18,4	17,7
In all	100%	100%	100%	100%

As is shown by the estimates above, in order to approach the traffic safety level reached in highly motorized countries, the most important task for Russia in the immediate future must be to reduce the risk of fatal accidents to 14-15 fatalities per 100 000 population. This will mean saving 8-9 000 people (compared with 2000).

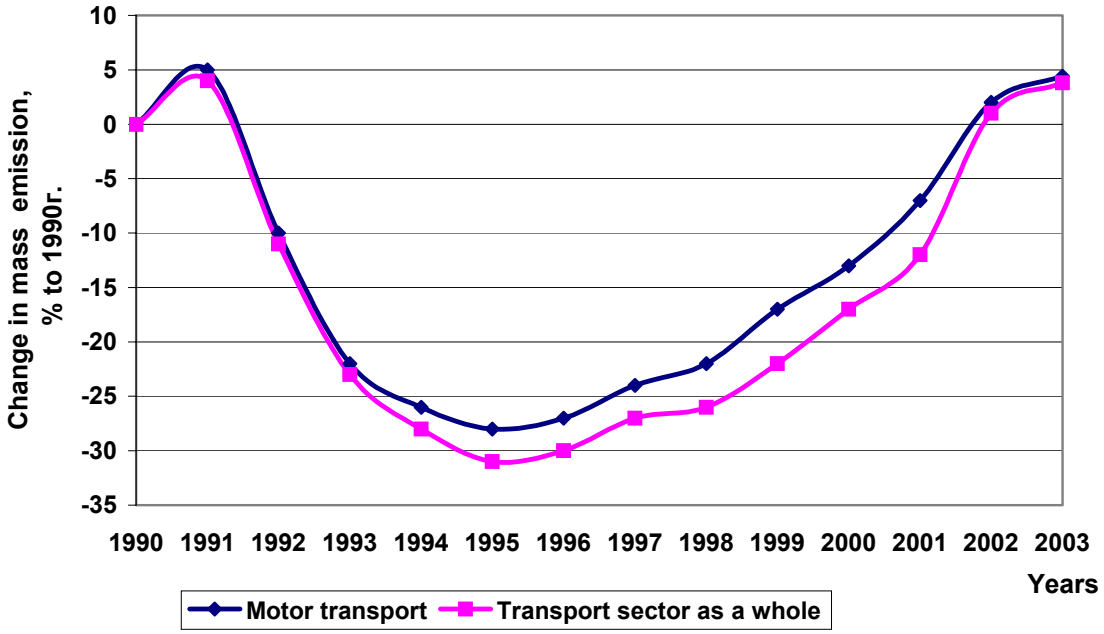
2.2. Air pollution

Transport is the principal source of air pollution in Russian cities. While in the country on average the share of transport in total air pollution is about 43-45%, in cities it reaches 70-75% and in the central parts of the biggest cities – more than 90%. The overwhelming bulk of these emissions (more than 90%) is related to motor transport.

The emission of harmful substances from motor transport in Russia amounted to 14.3 mln. tonnes in 2003, that is higher than in 1990.

The share of stationary sources (transport enterprises, gas stations, maintenance shops and so on) in these emissions is about 7%. Calculations show that the growth of the motor fleet resulted in emissions in 2003 that reached the peak level of motor transport emissions recorded in 1991 – the year in which national economy development indicator values were at their highest (before the beginning of economic reforms). The vast bulk of harmful substance emissions is formed by: carbon monoxide (10.89 mln. t), hydrocarbons (1.53 mln. t) and nitrogen oxides (1.6 mln. t). The great threat to life posed by motor transport is the emission of carcinogenic substances (soot, benzene, lead, 1.3-butadien) and a number of organic substances (formaldehyde, acrolein, toluol, hylol). Trends in motor transport emissions in Russia are presented in Fig. 27.

Fig.27. Trends in mass emissions from Russian transport sector (1990-2003)



In Russia, according to existing estimates the health of about 10-15 mln. city-dwellers is undermined as a result of atmospheric air pollution from motor transport.

Up to 70% of the threat to the health of the population can be attributed to the emission of such substances as nitrogen oxides, acrolein and formaldehyde. Substantial health hazards are also posed by the emission of soot particles, benzene, toluol and other organic substances.

The main reason for the deterioration of the environmental situation year after year in cities is the continuing growth of the motor fleet.

Among other factors contributing to motor transport's adverse environmental health effects both in cities and in the country as a whole are the following:

- poor environmental performances of domestic motor vehicles and motor fuels;
- unsatisfactory technical conditions of the motor fleet in operation;
- insufficient development of road and street network, poor technical conditions;
- non-optimal traffic and transportation management;
- insufficient consideration of transport aspects in town-planning;
- poor environmental training of decision-makers in the transport sector.

Environmental performance of motor vehicles

The level of environmental performance of the motor fleet in Russia lags behind that of Europe. Table 27 presents the time-table for the introduction of international requirements on harmful substance emissions which are used for the certification (type approval) of new models of cars in Russia compared with a similar time-table adopted in the framework of the UNECE Geneva Agreement of 1958. The 4-6 year lag in the dates of introduction of new requirements is doubled by shortcomings in the System for Certification of mechanical vehicles and trailers which at present exist in Russia. These shortcomings are the result of systematic violations of the

established time-table for the introduction of international environmental requirements (norms) for purposes of the "type approval".

Table 27

ECE Regulations	Russia		UN ECE	
	Beginning	**Ending**	**Beginning**	**Ending**
83-01B (EURO 1)	-	-	1992	1995
83-02B,C (EURO 1)	01.01.99	2004-2005	1995	1996
83-03B,C (EURO 2)	2004-2005 (project)	-	1996	2000
83-05F (EURO 3)	2006-2008 (project)	-	2001	2005
83-05B (EURO 4)	2008-2010 (project)	-	2005	-
49-01	01.04.96	31.12.97	1990	1992
49-02A (EURO 1)	01.04.96	01.01.99	1992	1995
49-02B (EURO 2)	01.01.99	-	1996	2000
49-03A (EURO 3)	2006-2008 (project)	-	2001	2005
49-03B (EURO 4)	2008-2010 (project)	-	2005	2008

State Certification bodies issue so-called "temporary permits" to motor-car plants, so the latter can continue producing obsolete motor vehicles even after new environmental requiments (norms) have come into force.

In spite of high rates of motor fleet growth for the last 10 years, the average age of motor vehicles in the country is 10-11 years, which also has a negative influence on the environmental performance of the motor fleet. A breakdown of the existing structure of the Russian motor fleet by environmental performance is presented in Table 28.

Table 28

Motor vehicle Type	**Average share in the fleet of motor vehicles which meet the requirements (%)**			
	EURO 0	**EURO 1**	**EURO 2**	**EURO 3**
Cars	90	5	4	1
Trucks (diesel engines)	85-90	5-8	4-6	< 0,1
Buses (diesel engines)	65-70	25-30	2-5	< 0,1

These data show that the core of the Russian motor fleet consists in motor vehicles with poor environmental performance standards.

In the biggest Russian cities the share of modern motor vehicles is somewhat higher. Thus, in Moscow, according to expert estimates, the number of motor vehicles which meet the EURO1-EURO3 requirements is about 20% of the total Moscow motor fleet. All new municipal buses, which are purchased by the Moscow Government, are equipped with engines certified to correspond to EURO2 and EURO3 norms.

At present Russian motor-car plants produce for the domestic market motor vehicles of different environmental classes (Table 29), however the volumes of production of EURO 1 and EURO 2 motor vehicles is declining, not increasing, and at many motor-car plants the series production of such motor vehicles has not started at all.

Table 29

Car model	Level of environmental performance			
	EURO 0	EURO I	EURO II	EURO III
VAZ 1113 and modification	+	-	-	-
VAZ 2105 and modification	+	+ -	-	-
VAZ 2106 and modification	+	-	-	-
VAZ 2108 and modification	+	+	+	-
VAZ 2109 and modification	+	+ -	+	-
VAZ 2110 and modification	+	+ -	+	+
VAZ 21213 and modification	+	+ -	+	+
GAZ 3110 and modification	+	+	+	-
GAZ 3102 and modification	+	+	+	-
Moskvitch2141 and modification	+ -	-	-	-
IZH 2126 and modification	+	-	-	-
UAZ 31512 and modification	+	-	-	-
UAZ 3160 and modification	+	-	-	-

Note:
+ -series production;
+- -production is stopped;
- -is not in series production.

This situation may be explained by the following:

- the need for considerable expenditure on the organization of new production and the respective increase in car prime cost;
- non-competitiveness of motor vehicles with high environmental performances in the domestic market because of their higher price and complexity of operation;
- poor quality of motor fuels which are sold on the Russian market.

Thus motor-car plants encounter not only problems in producing motor vehicles to environmental performances higher than EURO 0, but also problems with selling them. The simultaneous presence on the market of motor vehicles which have practically the same

operating ability (with the exception of environmental performances) but at higher retail prices, makes consumers opt unambiguously for the cheaper EURO 0 cars. This forces motor-car plants to reduce retail prices for "environmentally cleaner" cars and makes it unprofitable to produce them.

This situation shows how impossible it is to solve the problem using purely administrative instruments. Compliance with current standards requirements regulating the environmental performance of motor vehicles may now result in stoppage of production at practically all motor-car plants in the country. The introduction of quotas on the production of motor vehicles with different environmental performance levels will not help to solve the problem either: besides difficulties in controlling the implementation of established quotas, this decision maintains non-competitiveness in the domestic market for motor vehicles with environmental performances to EURO 1 and higher compared with EURO 0 motor vehicles.

A way out of the existing situation is possible only if a set of regulating measures is adopted at State level including, among others the introduction of a system of economic incentives for car producers to produce "environmentally cleaner" motor vehicles and for car users to use such vehicles.

Environmental performance of motor fuels

The quality of motor oil fuels which are supplied on the domestic market for the present is considerably behind European standards. This is primarily because of an out-of-date normative base (standards, regulations) and poor control of fuel quality at gas stations.

Table 30 presents environmental performance standards for the most widespread brands of trade gasoline and diesel fuel compared with European standards. The data show that Russian fuels lag behind European fuels, first of all in sulphur content standards. In spite of the fact that leading Russian oil companies have the technology to produce better quality motor fuels there are no concrete plans at government level on the transition of the Russian domestic motor fuel market to the use of EURO 3 and EURO 4 fuels in accordance with European classifications for the present.

Maintaining motor vehicle environmental performance in operation

In Russia in the 1990s the process of breaking up large transport enterprises into smaller units and decentralizing the management of motor transport operation resulted in the creation of a great number of small firms under different kinds of ownership providing both freight and passenger transport. This has accentuated the problem of state control of the operation of these firms including environmental aspects. Small firms and individual owners (carriers), as a rule, escape payment of environmental charges and penalties and do not implement environmental measures. All of this results in greater local environmental and health effects from motor transport.

In cities where the motorization level is growing very quickly, the development of a servicing and industrial base has fallen considerably behind because of both a lack of proper infrastructure and the poor level of service they provide to motor vehicle owners. That, in the end, leads to increased air pollution from motor transport.

The country lacks the technical equipment for quality control, maintenance and repair of motor vehicles which meet EURO 1 environmental requirements and higher. Measures on fitting motor vehicles with CNG equipment are not supported by measures on the proper reconstruction

of a technical base for motor transport enterprises, service stations or the development of a network of gas filling stations.

The organization of environmental protection by motor transport enterprises often has a formal basis, but managers' and staff's interest in this activity is insufficient. The level of knowledge of managers and specialists in motor transport enterprises in the field of environmental protection, as a rule, is inadequate.

Table 30
Main environmental performances of Russian oil motor fiels

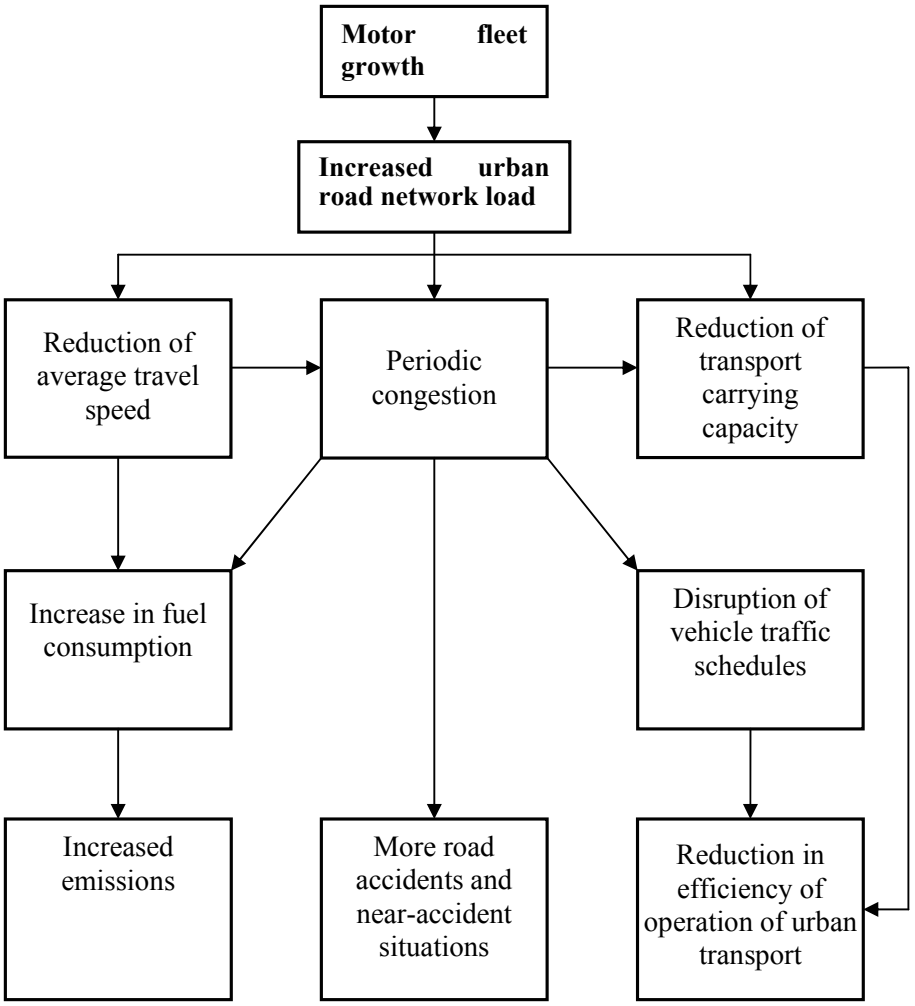
Russian and European norms for petrol				
Fuel	**Standards (Directive)**	**Indices**		
		Sulphur content, ppm	**Benzene content % vol.**	**Aromatic hydrocarbons content, % vol.**
Motor petrols: АИ-92, АИ-93	Russian Standard GOST 2084-77 (in force since 1977)	≤1000	-	-
Motor petrols: Normal - 80 Regular - 91, 92 Premium - 95 Super - 98	Russian Standard GOST 51105-97 (in force since 1997)	≤ 500	≤5	-
Motor petrols with improved environmental performance: АИ-80 ЭК АИ-92 ЭК АИ-95 ЭК АИ-98 ЭК	Technical Conditions "City" TU 38.401-58-171-96 (in force in Moscow and some other regions since 1996)	≤500	≤5	-
Motor petrols in EU:	Directive 98/70/EC, 2000 (EN 228-99) (EURO – 3)	≤150	≤1	≤42
	Directive 98/70/EC, 2005 (EURO – 4)	≤50	≤1	≤5
	Proposal for amending Directive 98/70/EC (year 2011)	≤10	≤1	≤35
Some requirements of Russian Standards and European norms for diesel fuels				
Fuel	**Standards, norms**	**Indices**		
		Sulphur content, ppm	**Cetane Number**	
Diesel fuels Л, З and А*: Type 1 Type 2	Russian Standard GOST 305-82 (in force since 1982)	≤ 2000 ≤ 5000	≥ 45	
Diesel fuels in EU	Directive 98/70/EC, 2000. (EURO – 3)	≤ 350	≥ 51	
	Directive 98/70/EC, 2005 (EURO - 4)	≤ 50	≥ 51	
	Proposal for amending Directive 98/70/EC (will be applied after 2011)	≤ 10	≥ 51	
* Л – for summer conditions; З – for winter conditions; А – for use in arctic regions.				

2.3. Estimated economic losses connected with congestion of the urban road system

All over the world large cities are the first to feel the impact of the negative consequences of motorization. The continued growth of the road vehicle stock, concentrated in a rather small area, inevitably leads to the congestion of city roads and the periodic occurrence of traffic jams.

With traffic jams, the high density and low average speed of traffic flows make it impossible for a city's transport system to work efficiently – it takes longer to deliver loads and passengers, the number of accidents increase, the emission of polluting substances and fuel consumption grow (Fig. 28).

Fig.28. Consequences of urban road network overload



The central areas of Russia's large and largest cities are especially prone to traffic jams. The characteristically high density of the urban road network provides convenient access to residential areas, trading and cultural centres and other attraction points, along with an opportunity for dispersal of transport and pedestrian flows through a ramified network of public transport routes.

On the other hand, the high density of the urban road network in city centres, means the intersection of a significant number of transport and pedestrian flows which require the use of traffic control systems because of the high volumes of traffic, significant delays and the reduction in the average speed of traffic flows. In turn, it brings a general decrease in the overall efficiency of urban transport performance and a corresponding increase in economic losses. According to available estimates, the economic losses caused by increasing traffic jams ranges from 0.5 to 2.85 of GDP (Table 31) in economically developed countries. Producing a similar estimate for Russia as a whole seems to be complicated by the lack of initial information on urban traffic conditions necessary for proper calculations.

Table 31

Estimate of annual damage connected with congestion in EU countries and Switzerland

Country	Damage	
	bln.Euros (1995)	% of GDP
Austria	2,3	1,29%
Belgium	3,93	1,91%
Great Britain	23,17	2,75%
Germany	33,8	1,83%
Greece	1,4	1,60%
Denmark	1,26	0,95%
Ireland	0,23	0,47%
Spain	8,15	1,90%
Italy	16,69	2,01%
Luxemburg	0,26	1,95%
Netherlands	8,62	2,85%
Norway	0,88	0,78%
Portugal	0,73	0,95%
Finland	0,79	0,83%
France	21,21	1,80%
Sweden	1,21	0,69%
Switzerland	3,81	1,61%

The example below presents an estimate of some of the economic losses related to decreased efficiency in urban transport operation in the city of Moscow. The calculation was based on only two constituents of losses:

- time losses to the able-bodied population due to decrease in average speed of car and bus traffic;
- additional fuel consumption due to increased unevenness of car traffic flows connected with congestion.

The daily average value of the constituents of economic losses C can be determined as:

$$C = C_t + C_f, \text{ rubles} \quad (5)$$

where:

C_t - cost of time losses by drivers and passengers of cars and buses, rubles;
C_f - the additional expenses connected to over-consumption of fuel, rubles.

$$C_t = C_{tc} + C_{tb} \quad (6)$$

where:

C_{tc} - cost of time losses by drivers and passengers of cars, rubles;
C_{tb} - cost of time losses by bus passengers, rubles.

The value C_{tc} is determined as:

$$C_{tc} = N_1 \cdot \alpha_1 \cdot \beta_1 \cdot l_1 \left(\frac{1}{\overline{V}} - \frac{1}{V_{opm}}\right) \cdot P_t, \text{ rubles} \quad (7)$$

where:

N_1 - number of cars registered in Moscow;
α_1 - coefficient of car departures from parking spaces;
β_1 - average car occupancy, people;
l_1 - average daily running of car, kilometres;
$\overline{V}$ - average real speed of transport flow in the city, km/h;
V_{opt} - conditionally optimal speed of traffic flow on the urban road network (in line with the value of average speed of vehicle in traffic flow for level of service (volume to capacity ratio) less then 0.45 and traffic saturation coefficient less than 0.8);
P_t - cost of one hour of travel (conditionally is accepted as the ratio of city GRP to size of working population), rubles.

The value C_{tb} is determined as:

$$C_{tb} = N_2 \cdot \alpha_2 \cdot \beta_2 \cdot l_2 \cdot K_2 \left(\frac{1}{\overline{V}_a} - \frac{1}{V_{optb}}\right) \cdot P_t \quad \textbf{(8)}$$

where:

N_2 - number of buses, registered in Moscow;
α_2 - coefficient of bus departures from stations;
β_2 - average occupancy of bus passenger saloon, people per bus;
l_2 - average distance of bus passenger travel, km;
K_2 - average number of bus trips per day;
$\overline{V}_b$ - average real speed of bus in traffic flow in the city, km/h;
V_{oprb} - conditionally optimal speed of bus traffic in line with the value of average bus speed in traffic flow for a level of service ≤ 0.45 and traffic saturation coefficient ≤ 0.8;
P_t - cost of one hour of passenger travel, rubles.

Initial data for the estimate are listed in Table 32.

Table 32

Name of index	Measure	Value	Source of information
Number of cars registered in Moscow, N_1	units	2438019	(1)
Number of buses registered in Moscow, N_2	units	34285	(1)
Coefficient of car departures, α_1	-	0,45	(2)
Coefficient of bus, departures A_2	-	0,6	(2)
Average occupancy, β_1	people	1,4	(2)
Average bus saloon occupancy, β_2	people	21	(2)
Average daily running of car,l_1	km	80	(3)
Average travel distance of bus passenger, l_2	km	5,1	(3)
Average number of bus trips per day, k_2	units	30	estimation
Average real traffic flow speed on urban road network, V	km/h	25	(3)
"Conditionally optimal" traffic flow speed in urban road network, $V_{опт}$	km/h	45	(3)
Average real bus traffic speed on urban road network, V_a	km/h	20	estimation
"Conditionally optimal" bus traffic speed on urban road network, V_{opt}	km/h	35	estimation

(1) – Data from the State Traffic Safety Inspectorate.
(2) – Data from the Scientific and Project Institute of General Plan of Moscow.
(3) – V.N.Lukanin, A.P.Buslaev, M.V.Yashina. Motorways: safety, environmental issues, economy, Moscow, "Logus", 2002

The calculation of the additional average daily expenditure, connected with over-consumption of fuel (C_c) was carried out using the following formula:

$$C_f = \sum_{j=1} M_j \cdot P_j - 10^{-3} \cdot \sum_{i=1} \sum_{j=1} \sum_{k=1} \left(f_{jk} \cdot 1{,}1 \cdot N_k \cdot \bar{l}_i \cdot \rho_j \cdot P_j \right), \text{ rubles.} \qquad (9)$$

where:

P_j – cost of 1 litre of j type fuel, rubles;
M_j – mass of j type fuel, consumed in the territory of the city during the day, tons;
ρ_j – specific gravity of j type fuel, kg/l;
f_{jk} – normative consumption of j type fuel by k – type vehicle, l/km;
N_k – number of registered k type vehicles.

Initial data for obtaining the estimate are listed in Table 33.

The final estimate of relevant economic losses is given in Table 34.

The calculations show that the losses connected with the overall decline in efficiency of the Moscow transport system due to overload of its road network considering only 2 factors exceed 9% of gross regional product (GRP) of the city annually. Taking into account that the GRP of Moscow represents more than 21% of Russian GDP, the losses countrywide may be estimated at more than 1.9% of GDP. It is possible to assume that in Russia's other largest cities in which road network overload is also a current problem the economic losses will also be significant - within the range of 3-7% of GRP annually.

Thus, total losses (damage) connected with urban road networks, in the country as a whole can be estimated at 2.8-3.5% of GDP.

Table 33
Initial data for estimating additional fuel consumption

Name of index	Measure	Value	Source
Average price for 1 liter of petrol, P_1	rubles.	11	
Average price for 1 liter of diesel fuel, P_2		9	
Total mass of petrol, used daily in Moscow, M_1	tonnes	7095,1	Data from Nature Use Department of the Moscow Government
Total mass of diesel fuel, used daily in Moscow, M_2		1285,5	
Specific gravity of petrol, ρ_1	kg/l	0,74	
Specific gravity of diesel fuel,ρ_2		0,86	
Standard consumption of fuel by motor vehicle model k, f_{jk}	kg/l	*)	**)
Number of registered motor vehicles of model k, N_k	units	*)	GIBDD statistic (2003)

*) There is too much data to be presented in the Table.
**) Norms of fuel and lubricant consumption for motor transport. RD P3112194-0366-03,Moscow, 2003.

Table 34
Estimate of selected components of annual economic losses connected with urban road network overload in Moscow

Components of losses	Natural index	Monetary estimation, rubles (2003)	% of GDP
Time losses, veh.hours	1 166 556 242	156 312 536 428	8,89%
Over-onsumption of diesel fuel, tonnes	28372	280882628,5	0,02%
Over-consumption of petrol, tonnes	236824	2605068911	0,16%
Total damage			**9,25%**

2.4. Pollution of the city land and water sources by transport waste disposal

Transport is a source of soil and water pollution. Its contribution to total volumes of waste products and polluted water discharges on average are insignificant (respectively 0.3-0.4% and 0.2-0.3%). The data on distribution of these volumes by type of transport for 2002 are shown in Table 35.

Table 35
Discharges and waste from transport sector in Russia (2003)

Type of transport	Volume of polluted discharges, mln.m^3	Mass of pollutants in discharges, th.tonnes		Waste, th.tonnes
		Suspended particles	Oil products	
Motor transport	6,8	60,5	2,15	3660
% to 2002 г.	101,5	102,5	102,4	101,9
Inland water	0,35	0,35	0,02	27
% to 2002 г.	100,0	100,0	100,0	100,0
Maritime	2,95	0,155	0,01	1860
% to 2002 г.	101,7	103,3	100,0	102,6
Air	2,3	0,7	0,15	149,5
% to 2002 г.	104,5	100,0	100,0	105,1
In all	12,4	61,705	2,33	5696,5
% to 2002 г.	102,1	102,5	102,2	102,2

Road transport generates about 50% of solid waste products, 91% of oil waste products and 96% of suspended particles in polluted wastewater discharges by the country's transport industry. It should be noted that in contrast to industrial and power plants, railway, air, river and sea transport, where waste discharges and waste products arise at specific locations, for motor transport wastes are dispersed throughout the relevant territories and frequently are not in any organized way.

This has to do both with enormous range of licensed and unlicensed motor transport activities which are sources of waste and discharges (motor transport enterprises, service stations

gas stations, etc.), as are millions of private cars. As motor transport is substantially (more than 70%) concentrated in cities, the problem of road transport waste products and discharges into water sources is to the greatest degree vital for city and suburban territories.

According to expert estimates, 3-5% of motor vehicles are removed from operation in Russia annually and the country now makes approximately 900-1 500 000 motor vehicles. As a rule, motor vehicles removed from operation are subject to partial disassembly, however they are not recycled. The majority of vehicles belonging to citizens and removed from operation for a long time remain within the borders of residential territories or are sent to unorganized scrap-heaps.

However the most dangerous basic waste products are generated not after removing the vehicle from operation but during operation. This is the main feature of motor transport determining the volumes and structure of waste products and also the complexity of subsequent collection and recycling.

Keeping motor transport vehicles in working condition requires maintenance and repair during which a number of parts, oils and fluids are subject to replacement. As a result on average for the period of operation of a motor vehicle of the most widespread class in Russia, class "C", the following quantities of waste products are generated:

motor oil	-	60-70 litres;
transmission oil	-	10-12 litres;
fluids	-	70-90 litres;
tyres	-	12-16 items;
accumulators	-	3-4 items;
abrasive materials	-	1-2 kilogrammes;
and non-ferrous metals scrap	-	250-300 kilogrammes.

Under the existing practice of collecting of waste products from motor transport activity (MTA) generated during motor vehicle maintenance and repair most waste does not go for recycling and is placed on scrap-heaps. According to various estimates the share of re-used waste products from MTA at present is 10 to 50%.

Table 36 presents an estimate of annual generation of selected motor transport waste products in the Russian Federation.

Table 36
Volumes of selected waste arising in the motor transport sector

Waste	Volumes of annual arisings, th.tonnes	Share of recycling and utilization, %
Used (waste) tyres	1160	14
Ferrous and non-ferrous metals scrap	1400	40
Used accumulators:		
- Lead	200	13-15
- Electrolyte	52	10
Plastic waste	60	n/d
Used (waste) oils, fluids and lubricants	300	10
Abrasive materials	7.6	n/d

A significant amount of solid waste products and liquid pollutants is generated also during technical processes and operations at various locations in the motor transport sector – at motor transport enterprises, service stations, gas stations, garages and carparks, car washing points, cargo and passenger terminals. As a result of operations at these locations various waste products are generated, including:

- silt and dust, removed from constructions for discharge;
- mineral oil;
- ferrous metals (scrap);
- wood, cardboard and fabrics.

Road traffic also generates waste products among which the most basic are

- products of wear and tear of road surface and tyres - about 50 000 tons per year;
- products of wear and tear of brake pads - about 2 000 tons per year;
- de-icing agents - about 350 000 tons per year;
- heavy metals - more than 2.5 000 tons per year;
- everyday waste.

From the environmental point of view, the generation of different waste products, including waste products from motor transport activity, is a complex problem. On the one hand many kinds of waste products can be recycled, therefore landfilling or incinerating them is a waste of natural resources. On the other hand some kinds of waste products (heavy metals, mineral oil, tyres, catalysts, etc.) are hazardous wastes and represent a serious threat to the population and the environment and may cause soil and water pollution.

The poor efficiency of the MTA waste product management system in Russia can be attributed mainly to the following:

- inadequate legislative and normative legal base for regulating the management of MTA wastes;
- disregard and consequently impossibility of collection and re-use of wastes generated by the use of motor vehicles belonging to private individuals;
- inadequate administrative instruments and measures geared to the regulation of waste disposal processes by individuals;
- ineffectiveness of the system of state control of compliance with environmental requirements for waste disposal established by existing normative legal documents;
- lack of effective administrative and economic incentives to encourage citizens to observe the requirements of nature protection legislation when handling wastes generated as a result of motor vehicle use;
- lack of interest from manufacturers of cars and their components in increasing recycling;
- lack of incentives to use waste products instead of landfilling them.

2.5. Influence of urban transport on the health of the population

According to WHO data, the health of the population is 50-60% dependent on the level of social and economic development, 20-30% dependent on the environment and only 15-20% dependent on the development of public health service systems.

Atmospheric air pollution from oil fields continues to be one of the major health risks for the population in Russia. According to information from the Ministry of Public Health of the

Russian Federation the contribution of air pollution to general disease in the population of the country is as high as 44 %.

In 2002, the average annual concentration of harmful substances in air exceeded the maximum permissible concentration (MPC) 201 in Russian cities, with a total population of 65.4 million (61.7% of the urban population of the country). The maximum permissible concentration for NO_2 was exceeded in 103 cities, for benz/α/pyrene in 69 cities, suspended particles in 69 cities, and formaldehyde in 117 cities.

The atmospheric air pollution under (IAP) which records when the maximum permissible concentration for average annual concentrations of several admixtures is exceeded was more than 7 in 130 cities with a total population of 58.5 million in 2002.

Motor transport is the basic source of air pollution in practically all the major cities of Russia. Table 37 lists the biggest cities with very high levels of air pollution (IAP ≥ 14).

Table 37

Big and the biggest Russian cities with very high level of atmospheric air pollution, 2002

City (population)	Substances causing high level of atmospheric air pollution	City (population)	Substances causing high level of atmospheric air pollution
1	2	3	4
Volgograd (977 th.people.)	Formaldehyde, benz/α/pyrene, nitrogen dioxide	Nizhny Novgorod (1333th.people.)	Particles, benz/α/pyrene, nitrogen dioxide, hydrogen fluoride
Ekaterinburg (1251 th.people)	Formaldehyde, acroleine, nitrogen dioxide, benz/α/pyrene	Rostov-on-Don (993th.people.)	Nitrogen dioxide, Formaldehyde, benz/α/pyrene.
Krasnodar (631th.people.)	Phenol, formaldehyde, benz/α/pyrene, particles	Saint Petersburg (4596 th.people.)	Particles, nitrogen dioxide, formaldehyde, ammonia, benz/α/pyrene.
Moscow (southern part) (10382 th.people.)	Nitrogen dioxide, formaldehyde, benz/α/pyrene	Novokuznetsk (564,2 th.people.)	Formaldehyde, benz/α/pyrene, particles, nitrogen dioxide
Barnaul (569,3th.people.)	Benz/α/pyrene, formaldehyde, nitrogen dioxide	Ryazan (519,3 th.people.)	Nitrogen dioxide, formaldehyde, carbon bisulphide
Irkutsk (582,8 th.people.)	Formaldehyde, benz/α/pyrene, particles, nitrogen dioxide	Tomsk (483,6 th.people.)	Formaldehyde, benz/α/pyrene
Kemerovo (486,2 th.people.)	Carbon bisulphide, benz/α/pyrene, formaldehyde, ammonia	Khabarovsk (600,5 th.people.)	Benz/α/pyrene, formaldehyde, nitrogen dioxide, particles
Komsomolsk-on-Amur	Particles, formaldehyde, benz/α/pyrene, nitrogen	Chita (300,0 th.people)	Particles, formaldehyde, benz/α/pyrene, nitrogen

City (population)	Substances causing high level of atmospheric air pollution	City (population)	Substances causing high level of atmospheric air pollution
1	2	3	4
(286,7 th.people.)	dioxide		dioxide
Kurgan (355,2 th.people.)	Formaldehyde, benz/α/pyrene,	Ulan-Ude (367,4 th.people.)	Nitrogen dioxide, benz/α/pyrene, fenol, formaldehyde
Lipetsk (519,6 th.people)	Formaldehyde, benz/α/pyrene, particles, nitrogen dioxide	Magnitogorsk (426,1 th.people.)	Benz/α/pyrene, formaldehyde, nitrogen dioxide, particles

According to data from the Federal Center for State Sanitary Control of the Russian Ministry of Public Health the basic polluting substances in atmospheric air of residential areas in 2002 were: suspended particles, nitrogen dioxide, carbon monoxide, phenol, formaldehyde, hydrocarbons and lead. The total population subject to the health hazards of one or another polluting substance is shown in Table 38:

Table 38

Number of Russian citizens living with hazardous concentrations of harmful substances in atmospheric air (higher than maximum permissible concentration) due to road transport emissions

Name of pollutant	Number of people, mln
Benz/α/pyrene	13.9
Nitrogen dioxide	5.6
Formaldehyde	4.9
Carbon monoxide	4.7
Lead	2.4
Nitrogen oxide	1.5

Transport on average in the country generates 68.4% of CO emissions, 57.7% of NOx emissions and 4.9% of hydrocarbon emissions (for road transport the figures are, respectively 65.6%, 47% and 38%). Almost all emissions of lead are generated by road transport. The share of motor transport in emissions of suspended particles is not significant (19.2 thousand tons) but such emissions occur directly at the level of respiratory organs and consist in fine particulates. The following substances are considered the most hazardous to health - nitrogen dioxide, suspended particles, some of the hydrocarbons (benz/α/pyrene, benzene). The use of leaded petrol was prohibited by law in Russia on 01.07.2003.

A special warning has been sounded by the percentage significant of atmospheric air tests exceeding the maximum permissible concentration on benz/α/pyrene – 11.3% of the total number of air tests in Russia on average (1999).The percentage of tests of atmospheric air exceeding the maximum permissible concentration of benz/α/pyrene is especially significant (17.9%) along motorways passing through residential areas.

Of all harmful substances researched a special warning is triggered by the extremely high concentrations of nitrogen oxides in atmospheric air along the motorways in residential areas. Even the average percentage in the Russian Federation of tests of atmospheric air exceeding the maximum permissible concentration of NO_x amounts to 17.0%. Territories where this parameter is much higher are shown in Table 39.

Parameters for carbon monoxide pollution of atmospheric air along motorways in residential areas are also high. The average percentage of tests of atmospheric air exceeding the maximum permissible concentration is 18.84% in Russia but in a number of regions this parameter is even more significant (Table 40):

Primary morbidity of the adult population of Russia by chronic bronchitis increased by a factor of 1.7 in 2000 in relation to 1996. During the same period, the frequency of consultations by the adult population for bronchial asthma attacks has increased by 30%, bronchial asthma in teenagers has increased by 40%; the number of chronic diseases of the tonsils and adenoids (with the diagnosis established for the first time) in children has increased by 40.5% and in teenagers by 35%.

In the Perm area, the distribution of such diseases as chronic bronchitis and pulmonary emphyzema, bronchial asthma, pneumonia, congenital anomalies and malignant tumours was correlated with a level of atmospheric pollution. Atmospheric air pollution was also correlated with the number of bronchial asthma cases registered in the Volgograd area. An increase in the number of respiratory organ diseases in children, including bronchial asthma and bronchitis was registered in all industrial cities of the country. The average frequency of bronchial asthma cases among children in Russia is 4.3 per 1 000 children.

Table 39

Territories with the highest nitrogen oxide concentrations in atmospheric air along motorways in residential areas

Name of territory	Share of atmospheric air samples exceeding the maximum permissible concentration of nitrogen oxides (%)
1	2
In the Russian Federation on the average	**17,00**
1. Altaj Kraj	59,59
2. Tambovskaya oblast*)	59,13
3. Sverdlovskaya oblast	42,76
4. Novgorodskaya oblast	41,98
5. Krasnoyarski Kraj	39,77
6. Lipetskaya oblast	39,19
7. Novosibirskaya oblast	33,95
8. Kemerovskaya oblast	32,01
9.Sakha Republic (Yakutia)	31,78
10. Kabardino-Balkarskaya Republic	31,68
11. Tverskaya oblast	31,34
12. Moscow oblast	29,72
13. Volgogradskaya oblast	29,52
14. Pskovskaya oblast	29,50
15. Smolenskaya oblast	28,80
16. Saint-Petersburg	28,50

*) oblast=region=area

Table 40

Territories with the highest carbon monoxide concentrations in atmospheric air along motorways in residential areas

Name of territory	Share of atmospheric air samples exceeding maximum permissible concentration of carbon monoxide(%)
In the Russian Federation on the average	**18,84**
1. Tambovskaya oblast	90,22
2. Kurganskaya oblast	53,70
3. Krasnoyarski Kraj	53,57
4. Bryanskaya oblast	42,86
5. Kemerovskaya oblast	38,56
6. Volgogradskaya oblast	34,26
7. Lipetskaya oblast	33,51
8. . Novgorodskaya oblast	32,59
9. Moscow	32,08
10. Vladimirskaya oblast	31,43
11. Kurskaya oblast	29,69
12. Orlovskaya oblast	28,89
13. Vologodskaya oblast	25,89
14. Pskovskaya oblast	24,76
15. Samarskaya oblast	23,21
16. Stavropolski Kraj	22,46
17. Saint-Petersburg	20,56

Emissions from motor transport account for almost 50% of the risk of respiratory diseases in Moscow. According to information supplied by the Ministry of Public Health of Russia, air pollution from motor transport is one of the main causes of the increased incidence of oncological disease in Orenburg. Correlation of atmospheric air pollution by lead, nitrogen oxides and carbon monoxide and benz/α/pyrene with the increase in oncological disease, the frequency of congenital anomalies, respiratory diseases and nervous system disease was demonstrated in the Voronezh area.

Atmospheric air pollution is the main cause of premature death in Russia: not less than 21 000 people (7% of annual deaths) die before their time in Russian cities with the heaviest air pollution.

The primary pollutants of atmospheric air in Moscow are: nitrogen dioxide, carbon oxide and formaldehyde. Pollution of atmospheric air by these substances in concentrations constituting a health hazard for the population are registered in territories of the Central, Northeast and Western administrative districts. The population of Moscow living in zones with polluted atmospheric air is roughly 3.5 million people.

The primary pollutants of atmospheric air in the cities of Lipetsks, Dankov and Yelets (Lipetsk area) are carbon oxide, nitrogen dioxide, hydrogen sulphide, phenol, chloride hydrogen, acrylaldehyde and ammonia. More than 680 000 people live in polluted areas in these cities.

The primary pollutants of atmospheric air in the city of Magnitogorsk in the Chelyabinsk area are nitrogen dioxide, sulphur dioxide, carbon oxide, suspended particles. The population living in polluted zones in Magnitogorsk amounts to more than 424 000.

The population living in zones subject to emissions from industries and motor transport in the Rostov area is more than 702,500 or 16% of the population of this area.

The high level of atmospheric air pollution in cities in Russia have a negative impact on the health of the population.

- **Saint Petersburg** (4 596 thousand people) - calculations of the risk of a major health impact by atmospheric air pollution in the city showed that in 12 of the 46 biggest microdistricts of city the risk exceeds 50% (50 out of every 100 people living in the given territory have experienced this impact), in some microdistricts the risk index has reached 88%.

Among the forms of disease, which, according to the literature, may be related to environmental factors in recent years are: the above average morbidity rate for children in Saint Petersburg for bronchial asthma – higher by a factor of 2.6, dermatological disease, by a factor of 2.5, congenital anomalies of the heart and blood circulation system by 71% and also oncological disease.

The negative health impact may be expressed as coughing, breathing difficulties, non-specific reflex action, deteriorating health connected with unpleasant odours, etc.

The results of research in Saint Petersburg in 2000-2001, have shown that near intersections the concentration of nitrogen dioxide (NO_2) is 25-35 times higher than the maximum permissible concentration, and the concentration of carbon oxide (CO) 12-18 times higher. Emissions into the atmosphere by motor transport of polycyclic aromatic hydrocarbons, many of which are carcinogens, are also significant.

According to information from the Environment Protection Office of the Administration of Saint Petersburg, total emissions of nitrogen oxides, carbon oxides, sulfur oxides and hydrocarbons from all sources of emission exceeded 119,75 thousand tons in 1999, and from mobile sources 56.3 thousand tons (not including emissions from private cars!). Total emissions according to official statistics have increased to 240 000 tons in 2002. The worst location for atmospheric air pollution is in central and adjoining regions of the city owing to intensive road traffic and frequent traffic jams. According to forecasts by the Saint Petersburg Scientific and Research Institute, atmospheric emissions from motor transport and other mobile sources will increase in the near future by 15-20%.

The negative impact of motor transport emissions on health can be transmitted through drinking water and foodstuffs because pollutants are transferred by trophic chains thus increasing the risk of disease. Up to 70% of damage to the health of the population in the Saint Petersburg area is related to emissions of acrylaldehyde, nitrogen oxide and formaldehyde and significant harm is caused by emissions of soot particles, benzene, toluene and other organic compounds.

- **Magnitogorsk** (426,100 people) – carried out investigations within the framework of social-hygienic monitoring there high risk of disease of children and moderate of adults as consequence of influence of multicomponent pollution of atmospheric air for health of the population defined.

- **Volgodonsk** (178,900 people) - experts of the Center of State Sanitary Control established a correlation between atmospheric air pollution in the old part of the city by dust, sulfur dioxide and dysfunctions of immune system of children in age group from 1 - 7 years; between pollution of atmosphere by nitrogen dioxide and diseases of respiratory organs of

children from 7 - 14 years; in a new part of the city causal relationship was revealed between pollution of the atmosphere by dust and nitrogen dioxide and bronchial asthma.

- **Taganrog** (278,300 people) – over the period 1992-1999 congenital malformation increased by a factor of 2.4 (average rate of increase + 13.0% per year) and for children of 0-14 years by a factor of 2.9, with an average rate of increase of + 16.2%. Comparison of the general frequencies of detectability of congenital malformation in newborns for the period under investigation, as a function of atmospheric air pollution, indicates a definite influence on congenital malformations. Typically, the prevalence of congenital malformation in children in the so-called "relatively clean zone" (from the standpoint of atmospheric pollution) is lower than on average in the city. Analysis of the development of congenital defects demonstrates that the highest sickness rates are in the industrial-transport (mixed) zone of the city where the parameters of congenital malformation are higher than in the "relatively clean zone" (from 2.6 to 29.9 times higher).

- **Chuvashia Republic** - results of the comparative analysis of the prevalence of respiratory diseases - chronic bronchitis, emphysema and bronchial asthma shows that atmospheric air pollution has a significant impact on the health of the population. The highest level of child morbidity from bronchial asthma in children was detected in Novocheboksarsk (14.14 cases out of 1 000 children) and in Cheboksary (9.73 out of 1 000). At the same time, child morbidity from bronchial asthma in rural areas of the Republic varied from 3.1 cases in 1 000 (Urmarsky area) to 6.9 (Cheboksarsky area). Thus Cheboksary (population 462.2 thousand) and Novocheboksarsk (population 123.9 thousand) can be classed as territories with an adverse environmental impact owing to the prevalence of bronchial asthma among the child population.

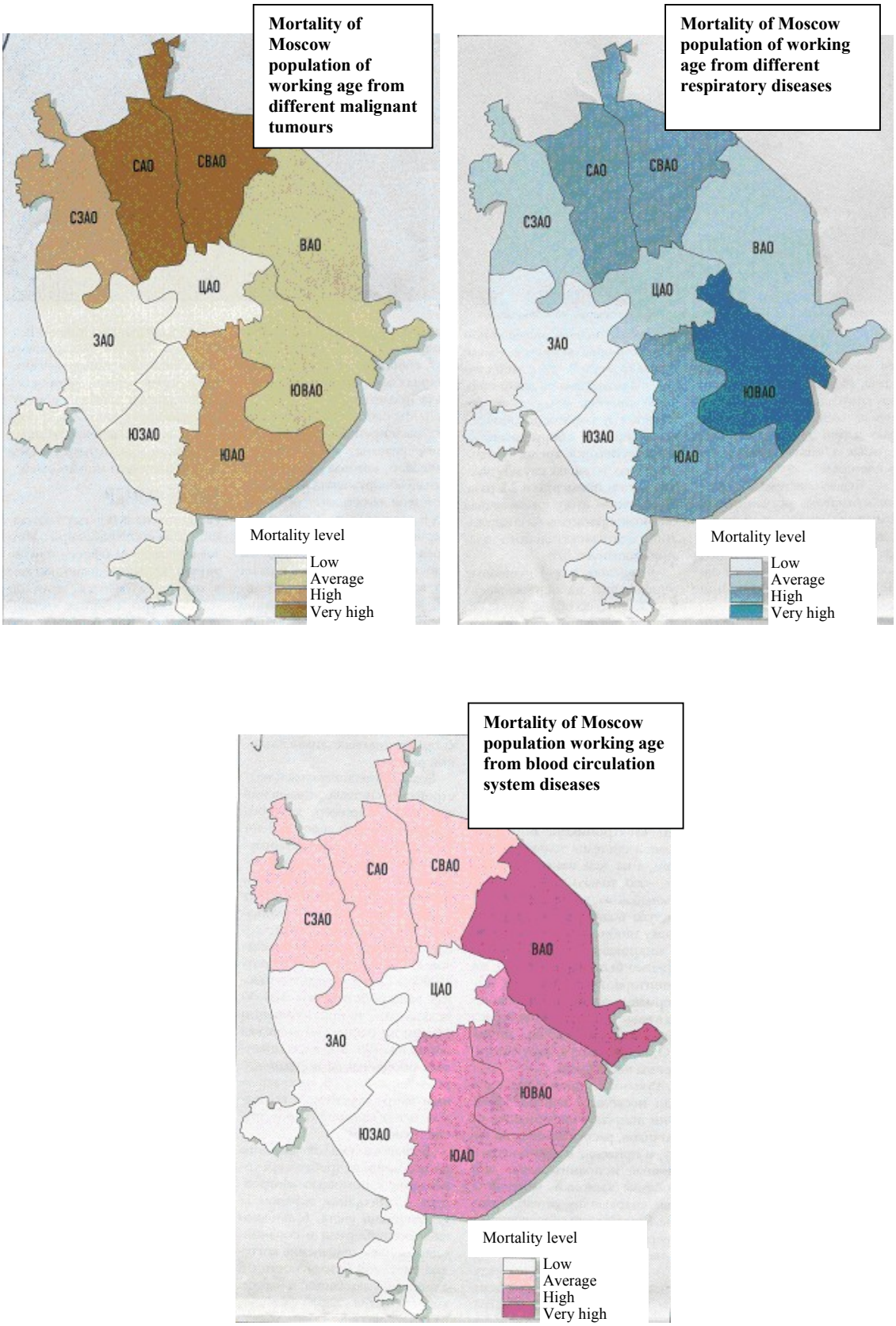
- **Astrakhan area (oblast)** - it was established that pollutants such as dust, nitrogen oxide, carbon oxide and formaldehyde are the primary risk for children residing in areas with a high level of atmospheric air pollution leading to a decrease in non-specific resistance of the organism by a factor of 2-2.5, and increasing the duration of respiratory diseases among the population of the area.

An increase in respiratory diseases among children, including bronchial asthma and bronchitis was established in all industrial cities of the Russian Federation.

Studies in Saint Petersburg have shown that in 12 out of the 46 largest inhabited "microdistricts" the risk of adverse health impacts of total atmospheric air pollution exceeds 50% (i.e. of every 100 persons living in the given territory, 50 feel some impact), in certain microdistricts the impact can be as high as 88%.

Fig. 29 shows the mortality rate of the population of working age from malignant tumours and from respiratory organ diseases in Moscow.

Fig.29 Mortality of Moscow population of working age from different diseases



A more detailed study of the impact of pollution by cancer and non-cancer morbidity was conducted by NIIAT in 1999 for one from the Moscow regions – the North-West Administrative District. This study simulated the impact of motor transport on atmospheric air quality and calculated quantitative indices of cancer and non-cancer morbidity risk for this Moscow region's population. Distribution maps for individual morbidity risk from motor transport emissions were produced.

It was determined that cancer risk levels in the territory under study was in the range $1 \cdot 10^{-4}$ (Pokrovskoe-Streshnevo).

While there is no officially recognized criterion for establishing a safe (acceptable) risk level, suitable for environmental quality management for estimates within the framework of this research in Russia, the criteria accepted in the USA include three alarm levels: at risks less than 10^{-6} (low priority) - no additional action is required; at risks from 10^{-6} up to 10^{-4} (average priority) – it is necessary to notify all interested persons and organizations and take decisions to reduce risk; at risk levels greater than 10^{-4} (high priority) – further estimates of the risk to health and emergency measures to reduce it are required.

It was found that cancer risk levels in a number of the Okrug's territories are rather high (more than $4 \cdot 10^{-4}$) and require special measures directed at reducing the risk .

The results of calculations on cancerogenic risk are shown in the Table 41.

Table 41
Index of carcinogenic risk for population of North-Western Administrative Okrug of Moscow

Municipal district	Average weighted risk	Population risk*	Additional diseases for 10 years	Number of people living in areas with different risk levels, '000 people.		
				$3{,}5\text{-}6 \cdot 10^{-4}$	$6\text{-}9 \cdot 10^{-4}$	$> 9 \cdot 10^{-4}$
Khoroshovo-Mnevniki	$4{,}5 \cdot 10^{-4}$	0,63	7,5	70	16	-
Schukino	$5{,}3 \cdot 10^{-4}$	0,77	6,3	63,2	18,2	-
Pokrovskoe-Streshnevo	$6{,}4 \cdot 10^{-4}$	0,92	3,8	16,8	29,5	1,5
Strogino	$5{,}2 \cdot 10^{-4}$	0,71	8,0	94,6	16,4	-
Mitino	$3{,}6 \cdot 10^{-4}$	0,51	6,1	32,3	12	-
Southern Tushino	$4{,}5 \cdot 10^{-4}$	0,68	5,2	77,1	-	-
Northern Tushino	$4{,}7 \cdot 10^{-4}$	0,68	8,0	118,3	-	-
Note: * - additional cases of cancer per 10^5 people per year.						

The influence of 18 chemical substances emitted by motor transport on the non-cancer morbidity of the NWAO population was also estimated (first for respiratory system diseases).

Table 42 gives a summary index of the relative risk of disease where ***H* is** taken as 1**.** The more the value of ***H*** exceeds one the greater the risk from road transport.

Analysis of the results obtained has shown that as a result of air pollution by road transport in the NWAO, the index of non-cancer morbidity risk exceeds the acceptable level by a factor of 3-25.

Table 42 presents some results from the analysis of maps of non-carcinogenic risk index distribution.

Table 42
Indices of non-carcinogenic disease risk for people living in the territory of North-Western Administrative Okrug

Municipal district	Average weighted index of risk **H**	**Number of people living in areas with different risk level**		
		H **5-15**	***H*** **15-20**	***H*** **> 20**
Khoroshovo-Mnevniki	14,4	52,8	61,3	4,9
Schukino	16,2	10,1	69,7	2,0
Pokrovskoe-Streshnevo	19,4	3,1	23,2	14,5
Strogino	15,5	33,5	75,2	3,9
Mitino	10,5	91,9	25,6	2,8
Southern Tushino	15,4	12,5	61,3	3,3
Northern Tushino	15,3	13,3	105	-
	In all:	217,2	421,3	31,4

Risk indices estimate the potential consequences of air pollution by the chemical substances under study.

Fig. 30 shows the average contribution of the 19 substances studied for the summary index of relative risk of disease.

The level of risk of non-oncological diseases is defined, basically, by the content in air of acrylaldehyde (82%). The percentage of NO_2 is 5.3%; formaldehyde, 4.8%; copper, 1.9%; soot particles, 1.8%; lead, 1.8%. The influence of other substances, including heavy metals and organic subtances in the total does not exceed 2.4%.

Analysis of the results shows that motor transport emissions present a real risk to respiratory organs (93.3% value of risk index). Lead has a small influence on blood disease (0.2%) and air pollution by benzene and toluene affects the central nervous system (1.2%). The

basic threat to respiratory organs is from acrylaldehyde - its share in the total risk is as high as 92%, that of formaldehyde is 3%, and nitrogen dioxide 4.5%.

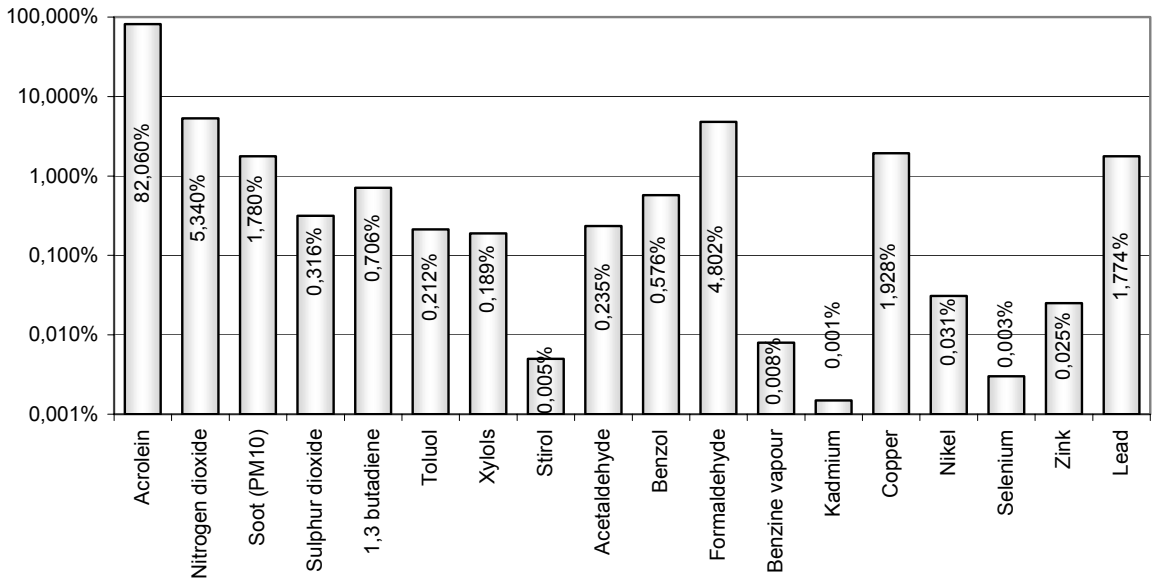
Thus it is possible to assert with a greater degree of confidence, that the basic non-cancerogenic risk to the population is from emissions by motor transport of acrylaldehyde, formaldehyde and nitrogen oxide, which cause diseases of the upper respiratory tract.

2.6. Other negative consequences of urban transport operation

It is also necessary to assess other negative consequences of urban transport operation for the environment and health

- transport noise;
- vibrations;
- electromagnetic radiation.

Fig.30. Contribution of different substances to risk levels of non-carcinogenic diseases connected with atmospheric emissions from road transport in North-Western Administrative Okrug of Moscow



The transport system is the leading contributor to noise pollution in the environment. According to available estimates about 38 million people live in conditions of increased acoustic load from motor, railway and air transport in Russia.

In cities, the basic source of transport noise is motor transport.

So, **in Moscow**, the fast growth of the motor transport fleet has led to increased noise pollution. In individual streets and roadside areas, equivalent noise levels from transport flows at "peak-hours" exceed standards. The width of the zones of noise discomfort from railways at night time extends for hundreds of metres. Noise from the most heavily saturated highways such as the Moscow ring road, the Third Ring, the Garden Ring and others exceeds 80 dBA.

The impact of noise in the city is amplified by the fact that most streets in the central part of city and on its periphery are built with an almost continuous frontage of high-storied buildings, (Tverskaya street, Kutuzovskiy, Leninskiy, Leningradskiy prospects, etc.). In areas with newer buildings there is a problem of noise nuisance for the middle and top storeys of buildings, even if they are set back far enough from the road, because at ground level there is a sharper decline in noise level when moving away from the source due to the sound-absorbing characteristics of the underlying surface (small items of architecture, microrelief, vegetation, etc.). At some distance from the source, the noise level at height begins to exceed noise level at the ground. As a result, the size of zones of noise nuisance at a certain height can be higher than at ground level.

At a rough estimate more than 60% of Muscovites are living in zones subject to noise nuisance from motor transport, that is almost 3 times the average across Russia. This figure increases every year with the growth of the motor fleet and increasing traffic volumes on the city's road network. The central parts of the city (within the limits of the Garden ring) are the most exposed to noise and practically no areas in the centre have noise levels corresponding to the norm. More than 75% of the city is exposed to an acoustic load 5-10 dBA above the norm and 10% of the city to a load 20 dBA and more above the norm.

About 10% of the city of Moscow experiences noise loads above the norm due to aircraft noise. Peripheral "dormitory" areas are most exposed to this impact: Tepliy Stan, Yasenevo, Troparevo, Solntsevo (from Vnukovo airport); Southern Butovo (Ostafevo airport); Molzhaninovskiy, Mitino. Zelenograd (from Sheremetyevo airport).

In **Saint Petersburg** according to the results of acoustic monitoring of noise levels for the last two years permissible levels were exceeded in 68 cases out of 100.

The highest noise levels are registered near highways with high volumes of traffic. More than 60% of the inhabitants of Saint Petersburg suffer from excessive noise. With the existing norms for apartment houses at 45-55 dBA, the average level of noise in the city center is now about 75-80 dBA and near highways reaches 174 dBA. The worst noise levels are in Fontanka street, Nevskij, Liteiniy and Voznesenskiy prospect, Gorokhovaya street, Kamennoostrovskiy prospect and the Bolshoy prospects of the Petrograd district. Overall, the share of motor transport in noise impact on the population is about 85-95%. Noise pollution has an effect on the nervous system and can cause cardiovascular and gastroenteric diseases.

The vibrations from traffic along city highways and both surface and underground electric urban transport, are an appreciable nuisance factor for a substantial section of the population of Russia's large and largest cities.

So in Saint Petersburg the level of vibrating load in the zone of influence of large highways generates 51-66 dBA. The highest intensity is observed in the historic city centre (63-66 dBA) and near highways that carry a lot of freight traffic (for truck traffic the level of vertical vibration varies from 125-134 to 80-86 dBA in the 1-63 Hz range. For buses, the greatest values of vibration reach 135 dBA in the 2-8 Hz range). The highest values of transport vibrations are observed in Gorokhovaya and Sadovaya streets, Admiralteiskiy, Izmailovskiy, Liteiniy prospects, the Obvodnoy channel, Fontanka River, and University quays. Vibration causes an increase in the threshold of excitability of the vestibular system and, changes in the cardiovascular system.

Electromagnetic radiation is also a factor in the negative impact of transport on the environment and health. Electromagnetic radiation from vehicles also has a negative effect both

on transport personnel and on passengers. The basic source of low-frequency electromagnetic fluctuations is overhead electricity transmission lines, electronic equipment and control systems, etc. Electric transport can be a source of both low-frequency electromagnetic fluctuations and fluctuations of high frequency. The human organism absorbs electromagnetic radiation and high-frequency currents have an impact on tissues, leading to the occurrence of oncological diseases and hormonal imbalances. The systems most sensitive to electromagnetic radiation are the nervous, immune, endocrine and sexual systems.

3. BASIC ELEMENTS OF THE STRATEGY TO ENSURE URBAN TRANSPORT SUSTAINABILITY

The primary goal, here, is to outline the modern approach to the problem of ensuring urban transport sustainability that has been developed in recent years within the framework of the activity of various international organizations (OECD, ECMT, UNECE, WHO) and, to some extent, implemented in the transport policy of developed countries.

The term "sustainable development" was first used in 1980 and, later, became widely known through the World Commission on the Environment and Development (the "Brundtland Commission"). At the Conference of the United Nations on the Environment and Development, held in 1992 in Rio de Janeiro (Brazil), "sustainable development" acquired the status of a global goal, to be achieved in all sectors of human activity, including transport in the long term.

The Brundtland Commission defined "sustainable development" as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs ".

For transport, this definition means carrying people and freight in ways that are sustainable from the point of view of environmental, social and economic criteria, i.e., in other words, it means striking a balance between the positive (satisfaction of society's transport needs) and negative (the accompanying losses connected with road accidents, environmental pollution, traffic jams, etc.) results of transport activity.

In order to be environmentally sustainable, transport has to be considered as operating within an environmental framework. One of the first definitions of environmentally sustainable transport was the following: "a system where transport does not endanger public health of population or ecosystems and meets the need for access consistent with (a) use of renewable resources below their rates of regeneration, and (b) use of non-renewable resources below the rates of development of renewable substitutes".

In the framework of the international EST project the following definition of a sustainable transport system was used.

"A sustainable transport system is one that during its full life-cycle of operation:

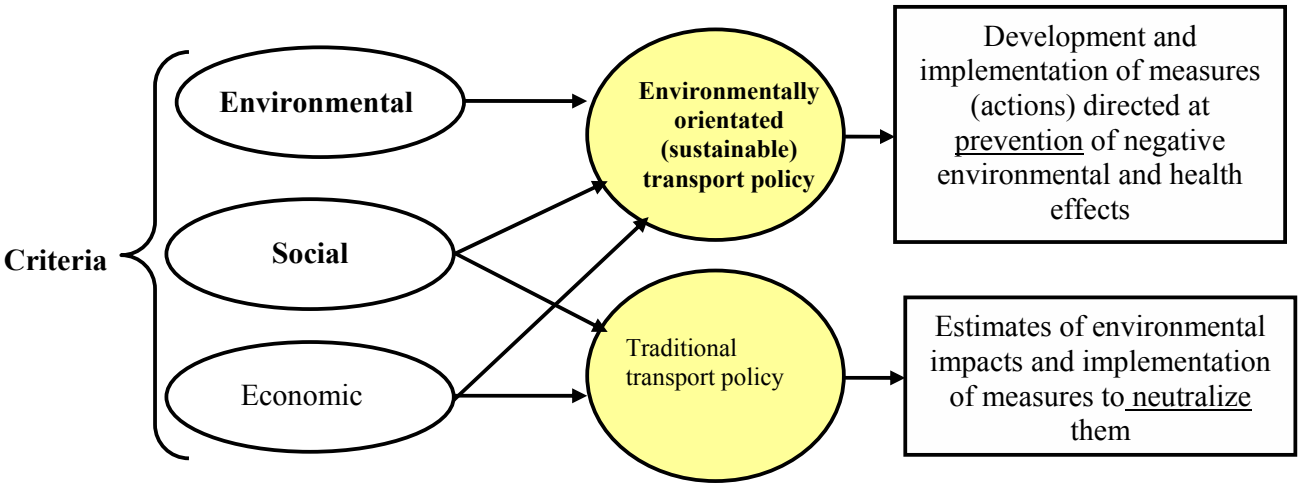
- Allows generally accepted objectives for health and environmental quality to be met, for example, those concerning air pollutants and noise proposed by the World Health Organization (WHO);
- Is consistent with ecosystem integrity, for example, it does not contribute to exceedances of critical loads and levels as defined by WHO for acidification, eutrophication and ground-level ozone; and
- Does not result in worsening of adverse global phenomena such as climate change and stratospheric ozone depletion".

As mentioned in ECMT document CEMT/CM(2001)12 although definitions of and criteria for sustainability differ among countries and cities, most have common objectives for quality of life in urban areas (clean air, the quiet neighbourhoods and economic prosperity without detrimental health and environmental impact and depletion of finite natural resources).

Problems of ensuring the sustainability of transport should be solved by developing and implementing a "sustainable transport policy" (STP) which differs in four respects from traditional policy:

- The objectives of STP should correspond precisely to a number of specific requirements for sustainable development which traditional transport policy regards merely as desirable;
- STP should be aimed at decreasing the environmental impact of transport activity itself instead of decreasing specific isolated parameters of separate elements of the transport system (decreasing the environmental impact per unit of transport performance, per vehicle, etc.). STP should take into full account the increase in adverse impacts that accompany the volumes of transport activity (volumes of traffic);
- Opportunities to curb the growth of the most "environmentally dangerous" types of transport activity must be considered when choosing the measures or tools necessary to achieve the objectives of STP. In contrast, traditional transport policy proceeds on the assumption that a sufficient decrease in the adverse impact of transport can be achieved by measures such as emission control, use of better fuels, improvements in engine efficiency;
- STP should aim more at prevention of the adverse impact of transport rather than at than eliminating these impacts (Fig. 31).

Fig.31. Difference between environmentally orientated (sustainable) transport policy and traditional policy



In spite of the fact that the organization of urban transport, as a rule, is entirely the domain of the relevant local authorities (municipalities), the solution to the problem of ensuring the sustainability of urban transport systems lies far beyond the competence and the responsibility of city transport authorities alone. As foreign experience shows, ensuring effective, economic and safe (in the broadest sense of this term!) operation of urban transport may be feasible only

through the development and implementation of an integrated state policy in the form of mutually agreed policies by city authorities in such areas as transport, town-planning, road construction, public health services, environmental protection, fuel-energy sector, finance, etc., so as to ensure interaction and co-ordination between the different levels and branches of the administrative authorities (national, regional and local).

The following key messages for national governments for implementing sustainable urban transport policies were formulated at the session of the ECMT Council of Ministers held in Lisbon in 2001.

3.1. Formulation of a national policy basis for ensuring the sustainable development of urban transport.

Such a policy should establish mutually agreed objectives and tasks in the field of land use, urban passenger and freight transport, public health and the environment at national, regional and local level, and should establish the conditions for and define the mechanisms of implementation.

3.2. Need for co-ordination and co-operation between various levels of authority and various sectors of transport and the city economy.

- ***Co-ordination of national policy in the field of transport, urban land use and environmental protection.***

  Political approaches to the problem of ensuring urban transport sustainability should be both "internally co-ordinated" (i.e. co-ordination inside the transport sector on questions of investment policy, transport demand management and traffic management policy), and "externally co-ordinated" (i.e. co-ordination of transport policy with land use and town-planning policy, environmental protection and public health policy, and financial policy). The aim should be to aspire to constant communication between transport policy, policy in the field of town-planning and land use, investment and financial policies at national level and the corresponding policy decision-makers at regional and city authority level (Fig. 32).

  Intersectoral ("horizontal") co-ordination of the objectives and strategic tasks of sustainable urban transport at a national level will prevent a narrow departmental approach in the definition of priorities. On the other hand, "vertical" interaction (among levels of government) enables the formulation of the objectives and tasks of sustainable urban transport development at regional and local level in the light of national level objectives and challenges. Priorities and challenges at local and regional levels, in turn, should be considered by the national government when formulating national objectives and taking the necessary policy decisions.

National policy on sustainable urban transport should aim to involve all interested parties, including representatives of the private sector, the construction industry, representatives of environmental associations, etc. in the urban transport decision-making process.

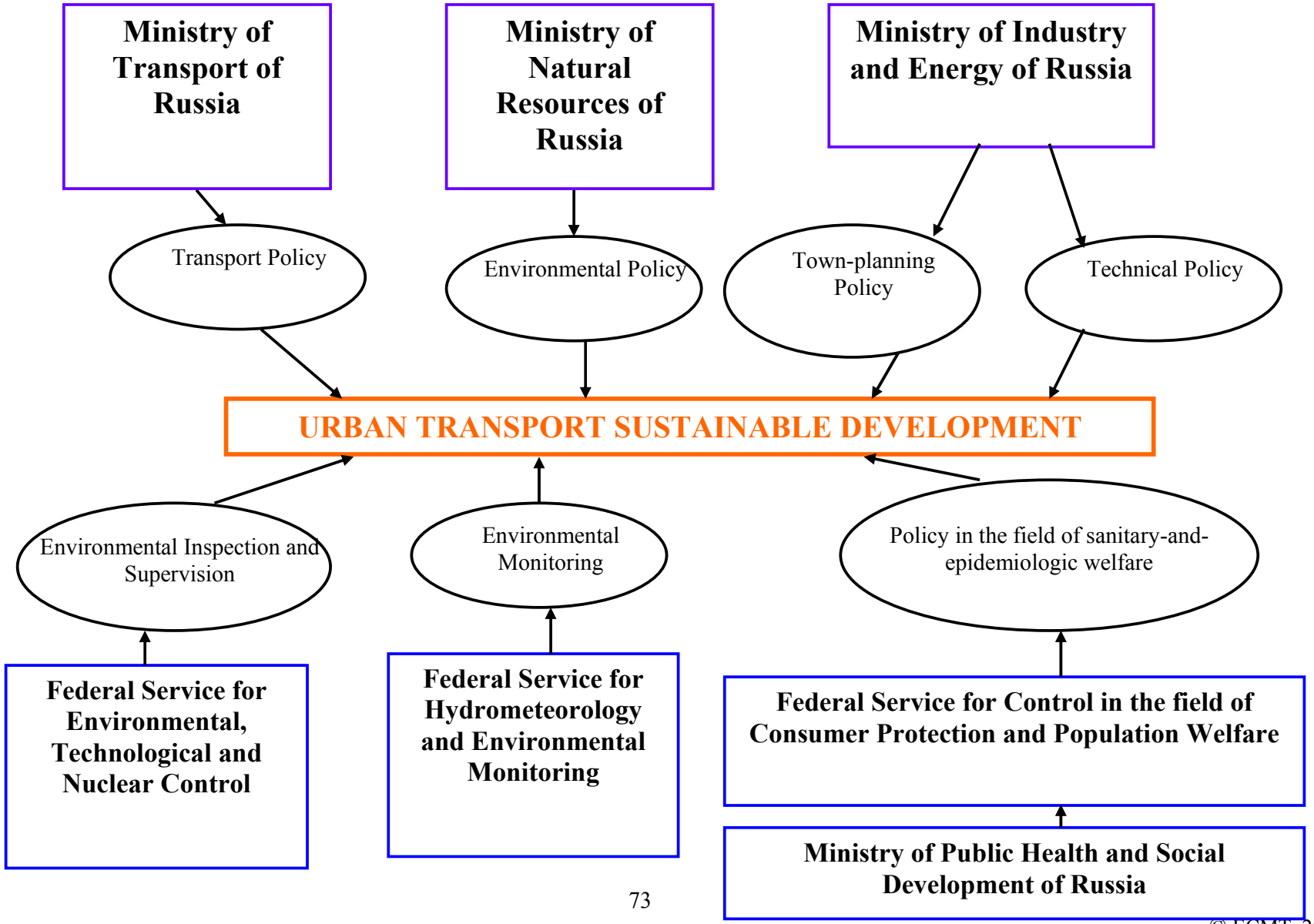
- ***Combination of rational decentralization of urban transport management with delegation to local authorities of the necessary powers, resources and responsibilities.***
  When a national government delegates powers over urban transport management to regional and local levels, it should also delegate control over the corresponding sources of finance giving regional (local) authorities the opportunity to carry out the necessary functions and to bear full responsibility for solving the problem.

  With a view to ensuring successful decentralization of urban transport management, government can take measures to encourage the creation locally (in regions and big cities) of special bodies responsible for the comprehensive planning of urban transport development (in many countries city structures are responsible both for transport management and for planning and development of the city environment).

- ***Establishment by the national government of a stable basis for financing urban transport activity and actions in the field of land use, at the same time creating an attractive climate for local investment in relevant projects***

- ***Distribution at a local level of investments from national governmental funds taking into account the characteristics of all modes of transport (including so-called "non-motorized" modes of transport) and also land use priorities.***

Pic.32. Co-ordination of State policy for the sustainable development of urban transport



3.3. Encouragement of effective public participation in the discussion of urban transport problems, development of various forms of co-operation and interaction.

Involving the public (for example, the mass-media, representatives of various groups, private users of transport system) at the early stages of urban transport development planning and ensuring its active involvement in the implementation and monitoring of these strategies.

- ***Seek co-operation with various structures and players influencing the development of the transport system (enterprises, individual employers, builders in residential and commercial sectors, various associations).***

The successful introduction of a policy in the field of sustainable urban transport development needs much more than action at governmental level. In this connection, it may be extremely important to ensure the early involvement of the above-mentioned structures and persons-representatives of the public sector in ensuring greater sustainability of urban transport system operation, effecting change in trip generation models and in the behaviour of transport users.

- ***Interaction with and informing users of the transport system.***

Any changes in transport user behavior can take place only if the latter are thoroughly aware of the purposes of a given transport policy and understand their part in implementing this policy. In particular, effective interaction with the public for the purposes of gaining its support in implementing policy in the field of transport demand management is vital.

3.4. Ensuring the necessary legislative and regulatory bases for the introduction of a policy on sustainable urban transport development

A legislative and regulatory basis providing guidance at all levels for governmental action to involve the private sector in the provision and award of public passenger transport services is extremely important for the effective introduction of policy in the field of sustainable development of urban transport. Such a legislative and regulatory basis should meet a number of requirements:

- Rules and instructions for public transport should define precisely the roles of the state (municipal) and private sectors in the provision and award of services, ensuring transport infrastructure and financing.

Conditions for financing public transport should be reconsidered in order to ensure efficiency of operation.

- Obligations on the award of public transport services should include monitoring of service quality and the quality of the transport network, concessionary fares and other privileges in the framework of social policy (the latter should be carefully calculated to avoid unfair competitive conditions and negative consequences for public transport enterprises) as well as monitoring of passenger safety requirements. Conditions for attracting the private sector should be precisely defined, including rules of competition, the purchase of rights, service obligations and quality.
- Legislative and regulatory frameworks should facilitate the development of pedestrian and bicycle traffic in cities and the introduction of various tools for

transport demand management such as, for example, employer "mobility plans", "car-sharing" schemes and use of telecommunications opportunities.

- The incorporation in transport and land use policy of goals and targets for air quality, a reduction in emissions of greenhouse gases, noise and other negative impacts on the environment, as well as corresponding standards for vehicles and fuels and provision for strict control of compliance both in the municipal and private transport fleets.

3.5. Ensuring effective taxation and pricing structures

The taxation and pricing structure should "send" the correct cost signal to promote sustainability in all sectors of urban transport.

Discrepancies in the mechanisms of tax policy between the different transport sectors can lead to problems with the introduction of sustainable transport policy in cities, in particular as regards the integration of transport policy and land use policy. The competition between small and large neighbouring cities for tax revenues and workplaces can neutralize the efforts of the authorities to decrease incentives to locate large enterprises in peripheral areas. Intervention at policy level can influence decisions (in particular, by the public) on urban and suburban trips (choice of modes of transport, connections, etc.). National housing policy and policy on real estate can influence people's decisions on where to live, and may conflict with strategies aimed at reducing transport trips, traffic jams and urban sprawl.

3.6. Rationalization of financial and investment flows

The financial flows generated by measures on pricing, investment and other types of financing should be channelled into increasing the opportunities for introducing sustainable urban transport policies. Misdirected financial flows can hamper measures and decisions introduced in order to improve urban transport sustainability.

- It is necessary to ensure that use of revenues from various pricing initiatives in the transport sector (for example, from the introduction of toll roads or "congestion charging schemes", parking fines, etc.) brings positive results for those who bear the corresponding charges. In spite of the fact that making profits from the introduction of charging schemes such as these in many countries was considered to carry a risk for the economic efficiency of the transport sector, in some cases channelling this income to local and regional levels increased political support and facilitated the introduction of such "unpopular" price initiatives. Failure to use these revenues at the point of collection can in some cases undermine the introduction of schemes to promote a reduction in private car trips, hamper the positive perception of the measures by the public and thus have a negative impact on their introduction in other cases.
- It is necessary to ensure the balanced distribution of financing (investments or other sources) between the various modes of urban transport to maximize the efficiency of operation of the urban transport system as a whole and to avoid development of one mode of transport to the detriment of another. Decisions on financing should be based on comparative estimates of the environmental and economic consequences of the variants considered and an assessment of their influence on the conditions of fair competition.

The decision on investment in transport infrastructure should also take full account of the aims of travel demand management.

- It is necessary to balance national investment and financing for capitals and finance for smaller cities. The excessive concentration of national government resources in capitals can lead to the ineffective utilization of funds and, probably more significantly, to the loss of opportunities for real improvements in transport systems in other important urban zones.

3.7. Improvement of data collection, monitoring and scientific research

Accurate and reliable data are the empirical basis for the effective formulation of transport policy and serve as the initial input to analytical research. What is even more important is that they provide an understanding of trends in urban transport and urban mobility and the forces that drive them. It is necessary to assess which combinations of transport policy decisions and measures are best suited to any given problem. Data on the urban transport sector in many cases are inaccessible to national governments. As a result, the potentially important task of developing corresponding criteria at national level is extremely difficult.

- ***Improving the data collection system.***

As shown by the international research carried out by the ECMT in 1992 and 1999, the data concerning urban trips and land use in cities and their interrelation remain extremely limited, inconsistent and, frequently, are of very poor quality. Such data are not collected on a consistent basis and methods of collection are frequently modified by individual cities, which makes the results less comparable.

National governments can initiate or support efforts already under way to improve the system of data collection. It would be extremely useful to develop a unified consistent methodology which could be used in all similar research at international level.

- ***Monitoring the implementation of measures in the field of urban transport and land use and their connection with environmental protection and public health issues.***

Communicating the results of monitoring to elected officials and the public to promote "transparency" in decision-making and responsibility.

- ***Organization and financing of research, development and approval of potential decisions aimed at promoting the sustainability of urban transport and land use.*** It is necessary to encourage the exchange of best experience and best practice between all interested parties at local, national and international levels.

4. PRACTICAL EXPERIENCE AND MAIN PROBLEMS IN IMPLEMENTING ECMT RECOMMENDATIONS ON THE SUSTAINABLE DEVELOPMENT OF URBAN TRANSPORT IN THE RUSSIAN FEDERATION

4.1. Formulation of State policy as a basis for ensuring the sustainable development of urban transport

4.1.1. Transport policy

The formulation of government policy and the development of legal and normative regulations in the field of motor transport, urban electric (including metro) and railway transport are functions attributed by the Russian Government to the Ministry of Transport of the Russian Federation. The formulation of government policy in the field of urban transport at federal (national) level is the responsibility of the Ministry of Transport of Russia. The Statute "Concerning the Ministry of Transport of the Russian Federation" stipulates that the Ministry "conducts its affairs in co-operation with other federal bodies with executive power, governmental bodies of the Russian Regions, local self-government institutions, public associations and other organizations" (Point 4) and also has the right for the purposes of exercising its powers in the established sphere of activity to "create co-ordinating, consultative and expert bodies (councils, commissions, groups, boards) including inter-departmental" (Point 6.4).

As indicated in the foregoing Statute, the Ministry of Transport of Russia exercises its powers on matters within its competence, by means of:

- the submission to Government of draft federal laws, normative legal acts of the President of the Russian Federation and the Government of the Russian Federation and other documents on which the decision of the Government is required;
- independent approval, within the limits of its powers and in accordance with the legislation of normative legal acts within the competence of the Ministry and Federal Services and Federal Agencies subordinated to the Ministry;
- summarizing the practical application of Russian legislation and analysing state policy implementation in the given field of activity.

Unfortunately the Statute "Concerning the Ministry of Transport of the Russian Federation" does not define the concrete tasks of the Ministry as regards state policy formulation on the sustainable development of urban transport. The list of powers of the Ministry does not include ensuring traffic safety. The powers of the Ministry as regards managing the motorization process are not specified.

More positively, the vision of the future transport policy of the state for the period to 2020, is stated in the "Transport Strategy of the Russian Federation" the draft of which was prepared in 2003 by the Working Group of the Presidium of the Council of State of the Russian Federation with the active participation of the Ministry of Transport of the Russian Federation and the involvement of leading Russian scientists and experts.

In preparing the Transport Strategy, foreign experience of development and implementation of state transport policy was widely used (European Union, Germany, US, the Netherlands, Spain, Canada, Portugal, Hungary, Lithuania, the Czech Republic, Romania).

In this document the strategic purpose of the operation and development of the transport system is defined as "the provision by means of transport of economic growth and improved quality of life for the current generation and future generations of Russians".

Among the major issues in developing the Russian transport system the Strategy lists the following:

- restricting the negative impact of the motorization of Russia on society while reaping the greatest possible advantages and benefits from motorization;
- the necessity of basing transport policy on sustainable development principles.

The Strategy defines the role of the State in transport development and regulation of the transport industry. The spheres of responsibility of the State in transport management include, in particular:

- refining the legal basis for transport activity;
- ensuring transport safety;
- development and checking compliance with competition rules and conditions of access to infrastructure;
- development and checking for compliance with safety standards for transport processes and the impact of transport on the environment;
- ensuring minimum standards of transport service for all sectors of the population and regions of the country; target users or operator support when the market cannot provide these standards;
- ensuring conformity of transport infrastructure development with the development of production factors;
- carrying out structural reform of transport.

Among spheres in which the State provides incentives and support for appropriate changes, the Strategy lists:

- development of competition in the transport services market;
- implementation of investment projects which are especially important for elimination of "bottle-necks" and "missing links" in transport infrastructure;
- increasing the accessibility of transport services for people with few material resources and the disabled.

The Strategy defines the regulation system for the country's motorization process as one of the major tasks of state transport management requiring, first of all, the introduction of adequate forms of regulation and control aimed at compliance with safety standards and the environmental sustainability of the transport process for the non-commercial use of vehicles.

The Strategy establishes that the system of taxation in the transport sector and transport-related taxes should be used to promote the use of economically efficient, safe and ecologically-oriented vehicles and technologies.

In this regard, the tax system will gradually have to begin to incorporate the "polluter-pays" principle in accordance with which transport service costs, including taxes, will have to reflect more closely the full costs of transport, taking into account costs connected with the environmental and health impact of motor transport and the use of transport infrastructure.

A special section included in the Transport Strategy of the Russian Federation for the first time is devoted to sustainable development of the transport system. It states that Russian transport policy should integrate, stage by stage, the basic principles of sustainable transport development according to which the solution to the problem of meeting transport needs should not conflict with environmental protection and public health priorities or with the interests of future generations.

Implementing this principle assumes that:

- Decisions in the field of transport system development and transport regulation are assessed both for economic efficiency and for safety and environmental sustainability, which all have equal priority;
- Society and the State should strive for a reasonable reduction in transport needs while preserving the right to free circulation and trade. The ideal result would be slower growth in internal transport compared with growth in GDP (gross domestic product);
- Government bodies and citizens have to take responsibility for making the best (in an environmental sense) decisions in the field of transport. For this purpose, the environmental consequences of management decisions in the field of transport (primarily motor transport) must be taken fully into account;
- In the framework of the "polluter-pays" principle, transport service users must pay the full costs of the negative environmental consequences of providing this service – from resource consumption to recycling of motor vehicles;
- For the regulation of intermodal competition, the necessity of switching freight and passenger flows to "environmentally cleaner" transport modes (rail, water) where reasonable, should also be taken into account;
- In taxation policy, the emphasis has to change from taxing production and trade to taxing resource consumption;
- Efforts on the complex problems of transport planning, improved safety and environmental sustainability are to concentrate, first of all, on major cities and the most successful solutions in this field will subsequently be more widely applied.

The Transport Strategy establishes that increased traffic safety is considered as a national priority. The main task in this field over the next few years will be to reverse the trend in road accidents and their increasing severity and halve road accident casualties to 14-15 per 100 thousand by 2015.

Among immediate State actions to reduce the number and severity of road accidents are:

- Educating the public to see road accidents as a national problem, significantly expanding educational activity to increase the "road safety culture" of Russian citizens;
- Improving technical regulations on motor and urban surface electric transport in order to ensure the safe construction of vehicles;
- Improving professional skills and responsibility for vehicle drivers and persons responsible for their training and admission to driving;
- Development and improvement of the road network, training in traffic management and engineering;
- Improving control-supervision of traffic safety;
- Bringing administrative and criminal liability sanctions for violations of Traffic Regulations into line with the degree of danger to the public of such violations;

- Significant increase in resources for the technical supply of a traffic safety system for traffic management, driver training and retraining, creation of communication systems, timely detection of road accidents and delivery of first aid for victims.

The document notes that the State should do its utmost to provide the safety guaranteed by the Constitution, i.e. the protection of life and public health. The main principle of rulemaking at State level should be the principle of State responsibility for traffic safety, which would have to be accompanied by a radical change in attitudes and much stricter accountability – from official responsibility up to criminal liability – for any person whose actions create a threat to the life and health of Russian citizens.

In the Strategy, a special section is devoted to the problem of urban passenger transport development and reform. "Urban passenger transport" traditionally in Russia means only urban public transport. The Strategy states that urban public transport (UPT) is one of the most important elements of the transport system in that it ensures the daily transport mobility of two-thirds of the Russian population.

Despite the fact that the organization of transport services in cities and suburban areas is not a prerogative of federal executive bodies, creating the right conditions for the economic reform of UPT operation requires a number of decisions which may be taken only at federal level.

Municipal UPT undertakings are facing growing competition from initiatives by private firms and individual businessmen working on UPT routes. This sector as a whole is seeing more competition because of the growth in the number of cars in private use, which has an impact both on viable demand levels for UPT services and on traffic conditions for UPT vehicles in city streets.

UPT competitiveness will be defined by its service quality and price accessibility for the majority of population.

UPT reforms are designed to establish a sustainable, economically efficient system of urban and suburban passenger transport that is accessible to the majority of the population.

The economic content of the UPT reforms relates to increasing the economic efficiency of transport operators, creating equal conditions for operators under different forms of ownership, fostering competition and the transition from covering operator losses to market relations between operator and transport customers.

The reform is based on the following principles:

- municipal responsibility and powers (local government has full responsibility for the organization of transport services, but at the same time is the owner of the infrastructure and route network and also has all the necessary powers under federal legislation);
- free choice of reform model by the regional or local managing body;
- gradual standardisation of transport provision levels in different cities on the basis of common social standards;
- federal support of UPT reforms (the principle of "subsidies and grants in exchange for reforms");
- development of competition with free choice of competition model;
- separation of UPT management from transport operations.

UPT reform is accompanied by improvement of the social mandate system, elimination of unfunded fare privileges and the implementation of mechanisms for guaranteed funding of the remaining privileges.

In the biggest cities where the saturation of the road network by private car traffic creates serious difficulties for public transport operation, UPT reforms have to be accompanied by the use of legal, administrative and economic instruments which reasonably restrict the use of private cars where there is an alternative, high-quality public transport service.

As the standard of living will improve, UPT reform measures have to be accompanied by the development of taxi services and other services that offer a higher comfort level.

The basic goals of motor transport development and reform as outlined in the Transport Strategy are:

- maximum use of motor transport opportunities to increase public mobility and speed up goods traffic;
- reduce costs related to motor transport activity;
- reduce the negative consequences of motorization.

Among the primary goals of motor transport development in Russia, the Transport Strategy emphasises:

- improvements in territorial and urban planning taking into account forecasts for motor fleet and traffic volume growth;
- creation of a legislative basis for the reasonable restriction of automobile use;
- the use of differentiated taxation as an instrument for managing motor fleet growth, its structure, motor fuel consumption and the characteristics of motor vehicle operation;
- the development of public passenger transport systems as an alternative to private car use;
- increase and standardise requirements for carriers of any organizational form and ownership status. Removal of unscrupulous and unreliable entrepreneurs from the market by improving licensing and certification systems and toughening administrative control procedures;
- unification of taxation for carriers carrying out the same kinds of transport;
- development and implementation of measures to protect for-hire carriers from competition from unlicensed vehicle owners;
- development of a system of liability and risk insurance for the motor transport industry;
- completion of the privatization process in the motor transport sector;
- improvement of statistical monitoring system for motor transport by shifting to regular sample surveys;
- completion of the legislative and regulatory base governing motor transport operations;
- the share of transport in environmental pollution is to be reduced by a factor of 1.9 to 22% (in 2003 – 42%, in developed countries – less than 20%).

As noted in the Transport Strategy, the co-ordination of all sectors and levels of authority, business and groups will ensure the most effective use of transport opportunities in the interests of the social and economic development of Russia.

It is expected that as a result of implementing the Transport Strategy to 2025:

- population mobility will increase by 50% (in 2003, 4 100 km per capita per year, in advanced countries – more than 10 000 km);
- the majority of settlements will have all-year-round access to the basic communication links;
- eight out of ten Russian households will be able to have the use of a car (as of 2003, every second household, Western Europe – about 1.5 cars per family);
- the index for "the number of fatalities per 1 000 motor vehicles" will decrease by 50% (2003г, – 1.2; in developed countries, about 0.3).

It is expected that the Transport Strategy will be implemented through:

- strategic and tactical actions designed to implement its provisions;
- a Plan of Transport Strategy priority actions;
- development of a system of indicators of State transport policy productivity;
- an update of the Special Federal Programme (SFP) "Modernization of the transport system of the Russian Federation", which is considered as one of the instruments for implementing the basic provisions of the Transport Strategy.

The draft Transport Strategy has been approved by the Council of State of the Russian Federation 29.10.2003 and the Board of the Ministry of Transport of Russia 10.12.2003.

In December 2003, the Transport Strategy was reviewed by the Government of the Russian Federation and was approved overall. The Ministry of Transport of the Russian Federation was requested to finalise the document in line with comments and proposals. Unfortunately, administrative reform of federal executive authorities has delayed the process of approval by the Government. The new strategic tasks of a fundamentally restructured Government will obviously require the modification of the draft Transport Strategy, in particular, as regards the acceleration of economic development through transport provision and the established goals (doubling of gross domestic product by 2012, raising industrial production output to 210% from its 2002 volume by 2012).

These changes, unfortunately, may be fundamental in character and there is every probability that only transport infrastructure development will have priority in the final edition of the strategic transport document for the period to 2010 and that problems of ensuring the efficiency and safety of transport systems will not be among the first priorities.

Now, on the instructions of the President, the Government of Russia considers it necessary to develop strategies for developing the main sectors of the national economy and industry for the period to 2010 based on the priority directions of the Russian Government, which are:

- improved living standards, assistance for development of "human capital";
- elimination of structural restrictions of economic growth;
- assistance to the competitiveness of Russian companies;
- social and economic development of the regions of the Russian Federation;
- rational integration of Russia into the global economy.

The Ministry of Economic Development and Trade of Russia has prepared recommendations for the ministries and departments in which it identified "system problems" that hamper the performance of the national goals of doubling gross domestic product in 10 years, poverty reduction and improved living standards.

The resolution of these "system problems" should become the basic strategic goal of authorities until 2010.

One of the problems identified by the Ministry of Economic Development is the "restriction of economic growth owing to transport infrastructure capacity". Such an approach seems to reverse the basic premises of the earlier draft Transport Strategy of Russia.

The practical implementation of the main provisions of the Transport Strategy will be carried out within the framework of the Special Federal Programme, **"Modernization of the Transport System of the Russian Federation (2002-2010)".**

This document, adopted as far back as 2001 is considered the key instrument for implementing national transport policy and co-ordinating transport system development. This approach to inland, waterway and air transport development and their co-ordinated operation is the keystone of the programme actions.

It should be noted that the initiatives and projects in the Programme will go some way to improving the safety and sustainability of transport. It includes projects and initiatives for the development of transport logistics, intermodal transport, containerization of goods transport systems, development and modernization of the road network (in particular, completion of the construction of Saint Petersburg ring road) and increased efficiency of public passenger transport operation.

Among the priorities in the Programme framework is the "comprehensive improvement of environmental sustainability, the economy and transport system safety".

Unfortunately this priority is still not sufficiently supported by concrete measures and projects.

At present, two subprogrammes directly focused on motor transport problems are included in the Programme:

- the subprogramme on "Reforming public passenger transport";
- the subprogramme on "Traffic safety".

It should be noted, however, that in its existing form the Programme itself and its subprogrammes do not in full measure reflect common principles of transport system sustainability (See Section 3). In particular, they lack special indices defining the goals of the motor transport sector for the reduction of the negative impact of transport system development (in particular the motorization process), with the exception of traffic safety indices. They also lack measures to improve co-ordination and interaction of the Ministry of Transport with the executive bodies responsible for policy in the fields of town-planning, urban construction, environmental protection, public health and the development of the motor and oil-refining industries.

The issue of completing the legislative and regulatory basis for the sustainable development of urban transport is given practical consideration in the Programme from only two standpoints: improving the financial sustainability of operation and quality of urban public passenger transport and improving traffic safety.

The wide range of problems connected with the motorization of the country and, primarily with private car fleet growth (environmental and health effects of urban transport; the increasingly adverse impact of road network saturation; the increase in budget expenditures for the repair and maintenance of the road network, etc.) is virtually absent from the Programme vision.

The Special Federal Programme and its subprogrammes barely touch upon the questions of using national taxation and pricing systems to implement the principle of internalizing external costs, i.e. the creation of effective economic instruments to improve transport system safety.

The foregoing shows the need to change the existing Programme for the "Modernization of the transport system of Russia" to incorporate both the basic principles of the Transport Strategy of Russia and the main elements of the transport system sustainability strategy (including the urban transport system) in line with world practice (See Section 3).

4.1.2. Environmental protection policy

The Government of the Russian Federation has assigned the development of **state policy** and legal regulation in the field of environmental protection to the **Ministry of Natural Resources of the Russian Federation.** The Statute concerning this Ministry requires it to submit to the Government draft federal laws, acts of the President of the Russian Federation and the Government of the Russian Federation, and other documents on environmental protection which require Government approval. No concrete powers of the Ministry to protect the environment from the negative impact of transport are specified in the Statute. The only specific task of the Ministry which is important for the development and implementation of sustainable urban transport policy, is the development of "rates and methods of calculation for environmental damage".

The duties of **the Federal Service of Environmental, Technological and Nuclear Supervision,** directly subordinate to the Government of Russia include the **adoption of normative legal acts, control and supervision in the field of environmental protection as concerns limitation of the negative impact of technology**. Under the relevant Statute (Governmental Order № 401 of 30.07.2004) the Federal Service is a specially authorized body in the field of air quality protection and environmental inspection.

The list of powers of the Federal Service includes submitting to the Government of the Russian Federation projects of federal laws, normative legal acts of the President of the Russian Federation and the Government of the Russian Federation on issues which are within its powers. The Federal Service independently adopts regulatory requirements defining, in particular:

- The structure and contents of documents concerning assessment of the impact of technology on the environment;
- Instructions on the calculation and definition of harmful (polluting) substances emitted to air.

The Federal Service checks and supervises compliance with requirements of Russian environmental and atmospheric air protection legislation (State environmental control) that fall within its competence.

The Federal Service issues permits for pollutant emissions to the air and the environment and keeps state records.

It also carries out inspections to check compliance with Russian legal and regulatory requirements, norms and rules in the established field of activity.

The Federal Service organizes and carries out State environmental review of:

- projects under overall and targeted federal social, economic, scientific, technical and other programmes, which may have an impact on the environment;
- development schemes for sectors of the national economy of the Russian Federation;
- projects under intergovernmental investment programmes with the participation of the Russian Federation and Federal investment programmes;
- feasibility reports and projects for the construction, reconstruction, expansion, modernization, preservation and liquidation of organizations and other objects of economic infrastructure of the Russian Federation which may have a negative impact on the environment, or on the environment of adjacent states;
- the safety basis for licensed activities which may have a technological impact on the environment;
- engineering specifications on new technologies and techniques;
- other kinds of documentation concerning economic and other activity, which may have a direct or indirect negative impact on the environment (with the exception of nature reviews).

The Government of the Russian Federation has appointed **the Federal Service for Hydrometeorology and Monitoring of the Environment** as the federal authority for environmental and pollution monitoring. The latter Federal Service is also directly responsible to the Government of the Russian Federation.

The basic **legislation** setting forth the bases of State policy in the field of environmental protection are:

- the Environmental Doctrine of the Russian Federation and the Plan of Action on its Implementation for 2003-2005;
- the Special Federal Programme "Environment and Natural Resources of Russia (2002-2010)".

The Environmental Doctrine of the Russian Federation was adopted by Order of the Government № 1225-p of August 31, 2002. It defines the purposes, directions, issues and principles of a uniform state policy on environmental protection for the long term in the Russian Federation.

It defines the strategic purpose of state policy in the field of environmental protection as the preservation of natural systems, ensuring their integrity and life-supporting functions for the sustainable development of society, improving the quality of life, improving the health of the population and the demographic situation and ensuring the environmental safety of the country.

Ensuring a cleaner environment as the necessary condition for improving the quality of life and health of the population, in particular, is among the primary tasks for achieving the above-stated purpose.

Among the main principles of state policy on environmental protection, the following are mentioned:

- sustainable development, with equal attention given to its economic, social and environmental components while recognising the impossibility of social development at the expense of the degradation of nature;
- prevention of negative environmental consequences as a result of economic activities, including remote environmental consequences;
- rejection of economic and other projects with an impact on natural systems if their consequences are unpredictable for the environment;
- use of natural resources on a user-pays basis and compensation to the public and the environment if damage results from infringement of the legislation on environmental protection;
- transparency of environmental information;
- participation by civil society, independent institutions and the business community in the preparation, discussion, approval and implementation of decisions on environmental protection and the rational management of natural resources.

Reducing environmental contamination while preserving resources is one of the basic aims of the state policy in the field of environmental protection.

Under this heading, one of the main aims is the reduction of environmental pollution by transport sources with a view to achieving normative water, soil and atmospheric air quality through:

- the modernization and development of environmentally safe modes of transport, transport communications and fuels including non-carbon fuels;
- switching to environmentally safe public transport - the main means of transport in big cities;
- the development of the use of secondary resources, including recycled waste products.

The Doctrine considers the issue of establishing **environmental priorities in public health services** as one of the major aims of environmental safety in the Russian Federation. Improving the quality of life, health and lifespan of the population by reducing the adverse impact of environmental factors and improving environmental standards are defined as the primary goals.

With this aim in view, the Doctrine stresses the necessity of:

- estimating and reducing environmental risks for public health;
- ensuring air and water quality in line with the established standards;
- redeveloping residential and industrial zones with a view to improving the living environment.

It defines the basic ways and means of implementing state policy on environmental protection as follows

- development of system of environmental protection and management and the management of natural resources;
- regulatory requirements for the corresponding activity and law enforcement;
- economic and financial mechanisms;
- environmental monitoring, information and scientific support;
- environmental education;
- development of civil society;
- implementation of environmental protection policy at regional and local level.

For the effective state management of environmental protection and use of natural resources the Doctrine identifies the need to:

- precisely delimit powers and responsibilities between federal and regional authorities and institutions and local governments regarding control of the use of natural resources and the state of the environment;
- ensure state, departmental, industrial, municipal and public environmental control and improve licensing and certification systems;
- develop state standardization and quality audit of the environment and establish uniform requirements for management (enterprises);
- improve the mechanisms and strengthen the role of state and public environmental review, including the review of projects, technologies and state programmes;
- introduce strategic environmental impact assessment procedures and analysis of the state of the environment at country and regional levels.

In the regulatory field the primary tasks are defined as:

- elimination of contradictions between environmental protection legislation and regulatory norms in other spheres of activity;
- ensuring implementation of the legislation by approving the secondary legislation necessary for the full-scale application of federal laws;
- incorporation into the legislation of a compulsory environmental assessments for project competitions, tenders, auctions, etc. and in selecting projects;
- development of state standards on environmental protection, incorporation of international environmental standards to reduce the impact of human activity on the environment into the legal system of the Russian Federation;
- harmonization of the legislation of the Russian Federation on environmental protection with international law in this area within the framework of the Russian Federation's obligations under International Agreements;
- development and activation of judicial mechanisms to resolve conflicts of interest between the public, economic interests and the State in the field of environmental protection;
- strengthening the system of public prosecutor supervision and implementation of measures in the field of environmental protection;
- improvement of methods of calculation and payment of compensation for damage resulting from environmental infringements and/or the conduct of environmentally harmful activities.

Regarding the introduction of economic and financial incentives for the reduction of the environmental impact, environmental protection and the attraction of the necessary funds for nature protection, the Doctrine identifies the need for:

- full scale application of the "polluter-pays" principle with payment for emissions and discharges proportionate to volume and commensurate with the danger to the environment and public health;
- development of a scientifically sound method for defining the amount of compensation for damage to the environment and the health of citizens by economic activity, man-made or natural events, and as a result of environmentally dangerous activity; ensuring compulsory compensation for damage to the environment and public health;
- creation and implementation of a system of taxes and duties which foster the use of non-polluting technologies, goods and services irrespective of the country of manufacture;
- establishment of a mechanism of financial guarantees for possible adverse environmental impact (including ecological insurance);
- promotion of environmental audit of enterprises and developmental business undertakings in the sphere of environmental protection and voluntary certification;
- introduction of market instruments for environmental protection, including incentives for the reutilization and recycling of industrial wastes.

An analysis of the main provisions of the Doctrine shows that, on the whole, it takes into account modern approaches to the environmental sustainability of social development. At the same time, transport as such and as a sector of the economy and a key factor for the life of society is barely reflected in the document at all. In this respect it appears to oversimplify the problems in reducing transport pollution and resource consumption by transport and does not reflect the most effective approaches for improving the environmental sustainability of transport systems.

Concerning the practical implementation of the Doctrine, it is necessary to note that it provides for the development of concrete Plans of Action at federal, regional and sectoral levels.

The draft Plan of Action on environmental protection and rational environmental management in the Russian Federation for 2003-2005 – which is in fact the first stage of implementation of the Ecological Doctrine of Russia -- was prepared by the Interdepartmental Working group created by the Ministry of Natural Resources of Russia at the end of 2002.

In a final version of this national Plan, adopted on behalf of the Government of Russia by the Ministry of Natural Resources of Russia there are initiatives aimed at improving the environmental safety of transport (Table. 43).

Regional environmental protection Action Plans (prepared and approved for 2001-2003 in many regions of Russia) do not contain any overall approach to the problem of ensuring the environmental sustainability of transport and are limited, as a rule, to a set of standard actions of technical and organizational character (environmental control of motor vehicles, improvement of environmental characteristics of fuels, improving traffic management, etc.).

In 2001, the Government of Russia adopted a Special Federal Programme, "Ecology and natural resources of Russia (2002-2010)", which was co-ordinated by the Ministry of Natural Resources of Russia.

Unfortunately, in spite of the fact that the country's transport system is the biggest polluter of the environment, the issue of improving its environmental sustainability is not considered in this Programme .

Table 43

Actions in the field of the transport, included in the National Action Plan on Environmental Protection and Rational Environmental Management in the Russian Federation for 2003-2005

	Name of action	Final document	Term of performance	Results
1	**Development of the Concept of an environmental policy in the transport sector**	Concept	2003	The document has been drafted and co-ordinated. The issue of its further development and use is unresolved
2	**Development of the draft of the Concept of the Law on ensuring the environmental safety of motor transport**	Concept	2004	Work is not financed
3	**Development of a package of legislative regulations on procedures for the control of pollutant emissions to atmospheric air from vehicles**	Regulations	2004-2005	Legislation prepared and transferred for further co-ordination and adoption
4	**Development methods for the calculation of pollutant emissions from vehicles harmonized with international design procedure technique EMEP/CORINAIR**	Regulations	2004-2005	Regulations are prepared and transferred for further coordination and adoption

4.1.3. Town-planning policy

The Ministry of Industry and Energy of the Russian Federation was appointed by the Government of Russia as the federal executive body to develop State policy and legal regulations in the field of town planning.

The Ministry of Industry and Energy submits to the Government of Russia drafts of federal laws, normative legal acts of the President of the Russian Federation and the Government of the Russian Federation and other legislation in the field of town planning which require the approval of the Government. The Ministry also develops and adopts:

- the order of development, co-ordination, examination and adoption of the town-planning legislation;
- federal norms and rules on town planning, designing and engineering research;
- the order of development, registration, approval, introduction and revision of state town planning norms and rules.

4.1.4. Public health policy

The Government of the Russian Federation has assigned the functions of developing state policy and legal regulation in the field of public health and ensuring the sanitary-and-epidemiological well-being of the population to the **Ministry of Health and Social Development of the Russian Federation**.

The Ministry of Health and Social Development of the Russian Federation carries out co-ordination and control of the activity (within its jurisdiction) of the **Federal Service for Supervision and Protection of Consumer Rights and Well-being**.

The Ministry of Health and Social Development of the Russian Federation is authorized to submit to the Government of Russia drafts of federal laws, normative legal acts of the President of the Russian Federation and the Government of the Russian Federation and other legislation concerning questions within the jurisdiction of the Ministry and the Federal Services subordinated to it which require the decision of the Government of the Russian Federation.

The Federal Service on Supervision and Protection of Consumer Rights and Well-being is the authorized federal enforcement body under the jurisdiction of Ministry of Health and Social Development of the Russian Federation for, in particular, control and supervision functions in the sphere of ensuring the sanitary and epidemiological well-being of the population.

The powers of Service concern, in particular:

- supervision of compliance with sanitary legislation;
- informing bodies of the Government of the Russian Federation, bodies of the Government of Regions of the Russian Federation, institutions of local government and the population about the sanitary and epidemiological situation and about accepted measures on ensuring the sanitary and epidemiological well-being of the population;
- the organization of social hygiene monitoring in accordance with the established order;
- the organization of activity of the state sanitary and epidemiological service of the Russian Federation;

- implementation in accordance with the established order of inspection of the activity of legal persons, individual businessmen and citizens to ensure compliance with the requirements of sanitary legislation.

4.1.5. Regional and local policy

The main purpose of state policy on urban transport at regional level within jurisdiction of Regional Administrations is to issue legislative and normative acts in the field of

- urban passenger transport for general use;
- road construction;
- improvement of traffic safety;
- improvement of motor fuel quality and use of alternative fuels;
- organization of motor transport environmental control.

In the biggest cities, which have the status of regions of the Russian Federation (Moscow and Saint Petersburg), the administrations (Governments) also implement State regulation in such spheres, as:

- traffic management;
- parking policy;
- requirements of rolling stock used in their territories.

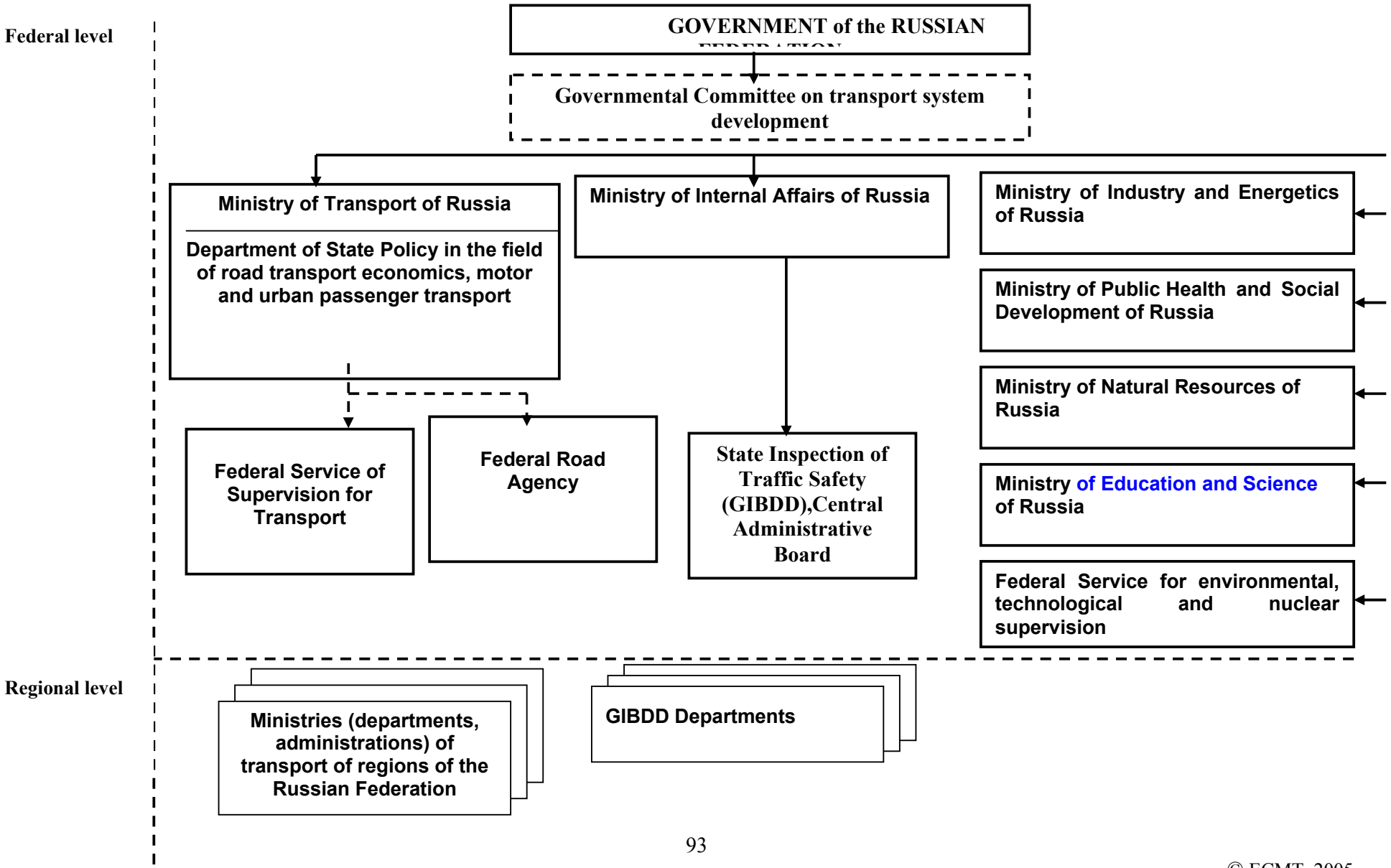
Administrations of regions of the Russian Federation, within the limits of their powers, also implement State policy in areas directly influencing the provision of motor transport operation at regional level, such as environmental protection, town planning and the sanitary and epidemiological well-being of the population.

Institutions of local government under the Federal Law,"Concerning the General Principles of Local Government Organization in the Russian Federation" regarding the implementation of transport policy at local level are authorized to issue municipal legal documents (not contradicting the relevant provisions of federal laws or other normative documents of the Russian Federation or laws or normative documents of regions of the Russian Federation) concerning local problems which, in particular, include:

- establishing conditions for transport service provision to the public and the organization of that transport service inside the particular area (municipal area, urban district);
- planning of area development, territorial zoning the establishment of land use rules and city district development;
- organization of environmental protection measures inside the city district and between the boundaries of residential areas;
- the organization and implementation of environmental control of industrial and social infrastructure in municipal areas (city districts) except those where environmental control is ensured by federal bodies;
- establishment of tariffs on services provided by municipal enterprises and institutions (if not otherwise stipulated by federal laws);
- adoption and organization of the implementation of municipal plans and programmes and collection of statistics describing the state of the economy and the social sphere of the municipal area.

An overview of the structure of the state government's motor transport sector in Russia is presented in the Fig. 32.

Fig. 32. Structure of State government's motor transport sector in Russia



4.1.6. Conclusions

The following conclusions can be drawn from an analysis of the existing division of functions between federal executive bodies for the development of State policy and the implementation of State policy at regional and local level:

- The basis of State policy for ensuring the sustainable development of urban transport in the Russian Federation is not yet complete. This is borne out by the following:
  - the insufficient priority given at State level to reducing the negative impact of transport activity against a background of the wider problems of economic development and transport maintenance;
  - the insufficient attention of transport authorities at federal and regional level to the problems caused by increasing motorization (except, perhaps, to problems of road safety);
  - the lack of mutually agreed objectives and tasks that have been approved at the level of the Government of Russia in basic strategic documents of federal executive bodies determining policy in the field of transport, town-planning, environmental protection and the sanitary and epidemiological well-being of the population, etc.;
  - the practical lack at State, regional and local level of concrete working instruments (legal, administrative, economic) aimed at ensuring the sustainability of urban transport systems;
  - at all levels of transport management, the problem of the safety and environmental sustainability of transport are considered as separate technical problems not related to the broader problems of transport system and transport activity management;
- Certain prospects for the development of policy on the sustainable development of urban transport are dependent on the adoption of the Transport Strategy of Russia by the Government of Russia (whether provisions on the safety and environmental sustainability transport are kept in the final version) and on the related Plans (Programmes) of Action that will implement the basic provisions.

4.2. Improving co-ordination and co-operation between various levels of authority, various sectors of transport and the municipal economy

4.2.1. "Horizontal" co-ordination at federal level

Mutual co-ordination of the activity of federal executive bodies of the Russian Federation is based on:

- the consideration of relevant questions at sessions of the Government of Russia and adoption of government decisions;
- the creation of interdepartmental coordination, consultative and expert bodies (councils, commissions, groups, boards) on given problems;
- co-ordination with other federal ministries and departments of decisions and documents prepared under the jurisdiction of a given ministry (department) on behalf of the President, the Government or on the initiative of the given ministry (department).

Interdepartmental co-ordination at federal level is an absolute prequisite for the official entry into force of interdepartmental and departmental normative legal, normative and

methodological documents that concern the interests of several sectors of the economy or the population. Only when there is such co-ordination between the relevant interested ministries and departments are similar texts issued by the Government of Russia or registered by the Ministry of Justice of Russia.

At the same time, the necessary level of co-ordination and co-operation between federal executive bodies in implementing the sustainable development of urban transport may be assured only if:

- the problems of ensuring the sustainable operation of urban transport and the corresponding reduction in its negative impact on the economy, environment and public health is given priority by the state at the level of the Government (within the framework of the corresponding Legal Act, the normative legal document of the President or the Government of the Russian Federation, Special Federal programme, etc.);
- if concrete targets for specific problems in the short and long term are defined;
- at government level, the division of duties and responsibilities between the separate federal executive bodies is precisely established.

At present, co-ordination of state policy on transport, city land tenure and town-planning, environmental protection and the sanitary-and-epidemiological well-being of the population, and of the corresponding objectives and strategic problems at federal level cannot be said to be sufficient.

4.2.2. "Horizontal" co-ordination at regional and local level

At regional and local level co-operation and co-ordination between corresponding executive bodies based on:

- the consideration of questions by Administrations (Governments) of regions of the Russian Federation (or Municipalities) and adoption of necessary decisions;
- the creation of interdepartmental coordination, consultative and expert bodies for preparation of corresponding decisions;
- mutual co-ordination of prepared decisions and documents by the interested authorities before their adoption by the Administration (Government) or Municipality.

It should be noted that problems of urban transport (including its impact on the economy, environment and public health) are considerably more pressing for the administrations of the largest and large cities than for federal and regional authorities, which makes for greater co-ordination and co-operation between the relevant city governing bodies. However, the level of this co-ordination and interaction cannot be said to be totally sufficient as it usually does not provide for co-ordination of objectives and strategic tasks of sectors of the city economy in ensuring the sustainability of urban transport, the definition of priorities and investment policy.

4.2.3. "Vertical" co-ordination and interaction between executive bodies at federal, regional and local level

Insufficient co-ordination and interaction between federal, regional and local authorities is the most serious problem in ensuring the sustainability of urban transport systems. First, in this regard it is necessary to note:

- the lack of sufficient legal frameworks for the regulation of road transport activity, urban passenger transport and other processes connected with motorization, at federal level;
- at federal level, the lack of a legal basis to allow decision-making by administrations of the largest and large cities on the introduction of various forms of justified restrictions on the operation of motor transport and car traffic, on parking policy, etc.;
- lack of delegation of necessary powers, resources and responsibility to local authorities in view of the decentralization of urban transport management;
- at a federal level, a lack of mechanisms for the steady attraction of investment and other sources of financing for urban transport and actions in the field of land use;
- lack of an effective system of monitoring and informing federal executive bodies about the transport services market in cities, mobility of the population, demand for various types of transport (including personal) and the negative impact of urban transport.

4.2.4. Co-ordination and interaction between the various modes of transport

Co-ordination and interaction between the various modes of urban public passenger transport at federal level is provided by the development of a common policy on road and urban electric transport (including undergrounds) by the Department of State Policy in the field of Road Transport Economics, Road and Urban Passenger Transport of the Ministry of Transport of the Russian Federation. At the same time, problems in developing a policy on the management of motorization processes and the development of non-motorized transport are not within the sphere of competence of the Ministry of Transport; so one cannot speak of an integrated approach to ensuring urban transport sustainability.

There is also a common management approach to urban public passenger operation at regional and local (city) level in Russia. The sphere of competence of city transport authorities also includes dealing with problems of urban traffic management, and developing and maintaining an efficiently functioning transport infrastructure. However, co-ordination of the various modes of urban transport at city level is limited by the development of complex schemes of public transport services for the population and urban traffic management schemes.

There are practically no municipal authority activities aimed at sustainable urban transport, such as:

- development of multimodal urban passenger transport;
- managing of private car use through the introduction of various fiscal and administrative mechanisms in connection with the development of urban road network capacity and improving the quality of public passenger transport services;
- integrated planning of the development of urban transport and land use;
- development of programmes and promotion of development of non-motorized modes of transport (bicycles and pedestrians).

4.3. Establishing the necessary legislative and regulatory bases for introduction of a policy on the sustainable development of urban transport

Policy on the sustainable development of urban transport is a complex issue since its cuts across the regulatory spheres of several sectors of the economy (transport services, transport

engineering industry, oil refining industry, etc.) and also several spheres of social and economic life (town-planning, environmental protection, public health, taxation).

At the same time, Russian legislation is such that the legislation is generally enacted on a sector-specific basis (according to the various areas of social and economic life). As a result, very important intersectoral relations and interactions often cut across the existing boundaries of legal regulation, which poses a major problem for the implementation of sustainable urban transport.

Another important feature of Russian legislation is that, in practice, very often the framework proposals set out in Federal Laws are not properly anchored and expanded in lower-tier legislation, which makes many legal regulations ineffective.

As a result, the legal basis required for the practical implementation of policy on the sustainable development of urban transport in Russia is somewhat fragmented and not focused on achieving appropriate state goals at either the federal, regional or local levels.

This is very likely the main reason that city administrations are, in practice, unable to implement such a policy successfully at present. A brief assessment of the extent to which existing Russian laws perform the main tasks of providing legislative and regulatory support for the sustainable development of urban transport confirms the observation that the existing legal regulatory system is inadequate in this area.

Table 44 presents a list of some of the existing federal laws in the transport sector that establish limits for the implementation of separate elements of policy on the sustainable development of urban transport systems.

A draft of the Federal Law concerning the general principles of organization of a transport service for the public by road and urban overground electric passenger transport on "regular service routes in the Russian Federation" was prepared by the Ministry of Transport of Russia and is currently under consideration by the Russian Government.

The aim of the draft is to reform passenger transport and harmonize the passenger transport management system with the standards of market-economy countries. It aims to remove legal uncertainty and contradictions in federal legislation concerning the organization of transport services to the public, primarily on regular service routes.

The draft precisely defines the powers of the regions of the Russian Federation and institutions of local government regarding the organization of transport services to the public. At the same time, given the need to protect the interests of carriers, the proposed draft limits local authorities' powers to regulate this market.

If the draft is adopted, it will regulate, in particular, the following aspects of the organization and provision of passenger transport on regular routes:

- the establishment of standards of transport service provision to the public on regular routes;
- the division of powers among authorities regarding the organization of transport services to the public on regular routes;
- the organization of regular service routes (opening, change, closing, registration, arrangement);

Table 44

№№	Name of Federal Low	Sphere of legal regulation
1	2	3
1	**Federal Law on traffic safety (1995)**	**Establishes a basis for implementing traffic safety in Russia.** **Defines common principles and courses of action for traffic safety.** **Establishes the powers of government bodies in the field of traffic safety.** **Specifies the types of activity which have to be licensed for traffic safety purposes.** **Establishes common traffic safety requirements for:** **- roads;** **- motor vehicles;** **- motor vehicle owners;** **- traffic engineering;** **- driver training.**
2	**Federal Law "On the obligatory insurance against civil liability for vehicle owners" (2002)**	**Establishes a legal basis for vehicles owners' liability in the event of a road accident.** **Specifies the procedure for authorizing or refusing permission to operate a vehicle.** **Establishes the mandatory nature of the periodical inspection of motor vehicles by the State.** **Defines the conditions for issuing driver's licences.** **Defines the rights and responsibilities of road users.**
3	**Federal Law "On the bases for technical regulation in the Russian Federation" (2003)**	**Establishes legal bases in the field of:** **- adoption, application and execution of mandatory safety and environmental requirements for transport vehicles, fuels, technologies works and services;** **- procedures for the assessment of production's conformity;** **- responsibility of those subject to regulations.**

Table 44 (continuation)

1	2	3
4	**Federal Law on the licensing of certain activities (2001)**	**Establishes a legal basis for regulatign interactions between federal and regional governmental bodies, bodies corporate and individual businessmen in connection with the licensing of:** **- passenger transport by motor transport (more than 8 people);** **- passenger transport on a commercial basis by car (taxis);** **- freight transport by motor transport (more than 3.5 tonnes).** **Defines the main principles for executive government bodies' and licensing bodies' powers, mechanisms of distribution and applicability of licences .** **An activity has to be licensed if it may cause "damage to the rights, legal interests or health of the public".**

- the organization of regular transport, including the selection of carriers by competition and the use of bus stations and terminals;
- contract requirements for regular transport, regulations on contracts between authorized bodies and carriers, conditions and cancellation;
- control of regular transport provision by the authorized bodies;
- guarantees of the rights of carriers.

The Federal Law on the charter for road transport in the Russian Federation, which if approved would establish a legal framework for a common market in the road transport sector, the relations between carriers regulated by the legislation and consignors, consignees and other consumers of the services of this mode of transport, is now nearing completion.

In terms of the legal regulation of protection of the environmental from the impacts of road transport, the most fully developed section of the corpus of environmental legislation in the Russian Federation are the technical standards for pollutant emissions established by the national standards body (GOST) and harmonized with international requirements (UNECE Regulations). These standards are implemented within the framework of working Rules for the system of certification of mechanical vehicles and trailers authorized by Decision of the Gosstandart of Russia of April 1, 1998 № 19 and registered in the Ministry of Justice of Russia on May 15, 1998 (introduced on October 1, 1998). However the system does not fully meet current needs for the following reasons:

- the system of certification uses an ambiguous regulatory and procedural base which allows scope certify new types of motor vehicle that do not meet the full list of requirements but a reduced list which enables manufacturers to supply motor vehicles to lower environmental performance standards to the domestic market than under the official requirements;
- the type approval tests do not always include confirmation that the motor vehicle's environmental parameters remain stable in operation;
- the system does not have enough test centres to carry out type approval testing to meet current needs.

The Russian Federation has not yet drawn up schedules and principles for the introduction and revision of environmental specifications; mechanisms for ensuring compliance; the order of application of new technologies and fuels, improving technical environmental performance levels; principles for economic incentives and of penalties for manufacturers and owners of vehicles. One might say there is a legal vacuum in this area. Decisions on these issues are approved at the departmental, sectoral or regional levels. They are frequently approved without the necessary scientific and technical justification and are ineffective without the corresponding legal support at federal level.

The key to more effective legal mechanisms to improve the environmental safety of **motor vehicles** is put in place as secure a basis as possible for these mechanisms at the legislative level, as is the case in most developed countries. The executive authority and specially authorized bodies will thus have greater responsibility to satisfy the established requirements and procedures.

Table 45 presents a comparison of the main provisions of Russian and foreign legislation on the environmental safety of motor vehicles which shows that motor vehicles with a

demonstrable impact on the environment and health of the population that is considerably greater than the impact from stationary sources remain outside the sphere of legislative regulation.

Motor fuels. From the point of view of improving the environmental sustainability of urban transport legislation must also be introduced to improve the quality of used motor fuels. Now these issues are barely addressed in the legislative base. In particular, the following legal provisions which do not appear in Russian legislation should be established (Table 46):

- compulsory state control of motor fuel quality at filling stations;
- liability for refueling vehicles with an inappropriate fuel;
- prohibition of the use of fuel additives which represent a danger to the environment and the health of the population;
- regulation of requirements for the sale of motor fuel with improved environmental performances.

In the case of stationary structures in the transport sector (including the urban road network), mechanisms for regulating environmental protection have been sufficiently developed in the Federation's legal base (Laws on environmental protection, air protection, environmental assessment, sanitary and epidemiological welfare of the population, the Town-planning Code, industrial safety). However the process of breaking up transport undertakings into smaller companies and the decentralization of transport sector management which took place in recent years has led to the presence of a great number of small enterprises under various forms of ownership. Consequently, it has become more difficult to control their activity, including environmental protection activities. As a result, environmental protection, for example, by transport enterprises, is frequently a mere formality and employees are not interested in this kind of activity. Decision-makers, as a rule, are inadequately trained.

The basic areas in which the legislation regulating legal aspects of environmental safety applicable to transport infrastructure requires completion are:

- introduction of procedures for strategic environmental assessment and health impact during preparation of large transport plans, programmes and projects for infrastructure development, and the adoption of relevant decisions at the political level;
- introduction of environmental requirements in the list of requirements for the licensing of types of transport and ancillary activities which are envisaged by the Federal Law on the licensing certain activities;
- tighter control over the organization of environmental protection activities by transport enterprises;
- environmental certification and "passports" for transport enterprises and introduction of environmental protection management systems (in accordance with ISO 14001);
- ensuring professional training and retraining of managers of transport enterprises and organizations in the maintenance of environmental safety and subsequent certification.

Table 45

Comparison of the main provisions of Russian and foreign legislation on the environmental safety of motor transport

Legal provision	Laws of the Russian Federation			USA	Canada	Sweden		Germany
	Environmental Protection	Air Protection	Sanitary and Epidemiological welfare of Population	Clean Air Act	Environment Protection Law	Law on Pollution Emissions from Motor Vehicles	Regulations on Pollutant Emissions from Motor Vehicles	Regulations on licensing motor vehicles for use on the roads StVZO
1	2	3	4	5	6	7	8	9
Regulation of the order of rate setting for motor vehicle environmental performance with indication of timetables for the introduction of new requirements (standards) and their period of validity	-	-	-	Article 201 **Article 203** Article 204		Article 3	Article 5	Paragraph 47
Ban on the licensing for use on the roads of motor vehicles whose environmental performance does not meet existing regulatory requirements	-	-	-		Article 22.1		Article 5	Paragraph 47

Table 45 (continuation)

1	2	3	4	5	6	7	8	9
Introduction of environmental classification of motor vehicles	-	-	-	Article 201 (trucks)		Article 2a	Article 8	Paragraph 47
Establishment of requirements for motor vehicle environmental performance stability and manufacturer's guarantee that this stability will be maintained	-	-	-	Article 209		Article 6	Article 14	Paragraph 47a
Establishment of responsibility of motor vehicle owners to ensure compliance with existing operational standards	-	Article 30.2	-	Article 228	Article 23.1	Article 6		Paragraph 47a
Ban on the dismantling or changes to the design of exhaust after-treatment systems	-	-	-		Article 22.3			

Table 45 (continuation)

1	2	3	4	5	6	7	8	9
Regulation of order of motor vehicle environmental performance inspections and banning of vehicles from use	-	Article 17.4 (only as concerns inspection regularity)	-			Article 7	Article 7	Paragraph 47a
Restriction of use of motor vehicles with a poor environmental performance rating, including imports	-	Article 17.3 (restrictions may be introduced for all motor vehicles without taking into account their environmental performance)	-					Paragraph 47
Regulation of timetable for using motor vehicles not in use	-	-	-		Article 61 Article 62 Article 63			
Establishment of sanctions for infringements of legislative requirements during motor vehicle production and operation	-	-	-	Article 228A	Article 48.2	Article 7		Paragraph 47a

Table 46

Comparison of the main provisions of Russian and foreign legislative acts on the "environmental safety" of motor fuels

Legal provisions	Laws of the Russian Federation			USA legislation
	Environmental protection	Air protection	Sanitary and epidemiological population welfare	Clean Air Act
Compulsory state inspection of motor fuel quality at retail outlets	-	-	-	Article 213
Establishment of liability for refueling motor vehicles with poor-quality fuel	-	-	-	Article 215
Ban on sales of leaded petrol	-	-	-	Article 220
Regulation of the sale of motor fuels with improved environmental performances	-	-	-	Article 219

Comment: - legal provision is not defined.

In the Russian Federation there are two basic Federal Laws "On environmental protection" (2002) and "On air protection" (1999) which define the general framework for the powers of state governmental bodies; the general requirements for environmental protection and air quality in the performance of different kinds of economic activity; mechanisms for regulating emissions through environmental standards and emission permits, the principles underpinning the reporting and measurement of emissions from different types of economic activity and the principles applicable to payment for emissions and other types of pollution and responsibility for non-compliance with legal requirements.

With regard to environmental protection in the transport sector, the Federal Law "On air protection" makes the following specific provisions:

- ban on the manufacture and operation of vehicles whose pollutant emissions exceed the technical standards in force;
- obligation of federal and regional authorities to carry out measures to reduce atmospheric emissions of pollutants from the operation of vehicles and other mobile sources.

Unfortunately, at the time of adoption of Federal Law № 122 of 22.08.04 “On amendments to the Laws of the Russian Federation and recognition of the invalidity of some Laws of the Russian Federation with regard to Federal Laws", “On the amendments and additions in the Federal Law", “On the general principles relating to the organization of the legislative (representative) and executive authorities of the government of the areas of competence of the Russian Federation" and "On the general principles relating to the organization of local government in the Russian Federation”, the following major provisions were omitted:

- regulation within the limits of competence of government bodies of territorial entities within the Russian Federation relating to vehicle movements in corresponding territories with a view to reducing emissions of pollutants;
- the right of regional authorities to restrict, within the limits of their competence, the entry of vehicles to urban areas , recreational areas and tourist destinations, and also to regulate vehicle movements.

The Federal Law "On environmental protection" establishes that in the planning and building of urban settlements, the design, construction, reconstruction and operation of industrial facilities, and the manufacture and operation of vehicles, measures need to be put in place to ensure compliance with the requirements set out in standards with regard to physical impacts (vibration, electromagnetic, and other radiations, etc.). Exceeding the levels specified in standards is not permitted.

The basic Law of the Russian Federation on land use at the federal level is the Town-planning Code of the Russian Federation adopted in 1998.

This document regulates legal provisions on land use planning, town-planning, building, improvement of urban and rural settlements, development of engineering, transport and social infrastructures, rational natural resources management, conservations of historical monuments and cultural heritage, as well as protection of the natural environment, with a view to safeguarding the living conditions of the population.

The Code regulates issues relating to town-planning, including the specification of special provisions with regard to certain territories where the largest cities of Russia are located. The Code also sets out environmental protection requirements applicable to town planning. In particular, it specifies that the drafting of town-planning documentation, and the construction and reconstruction of urban and rural settlements, buildings and constructions, must meet requirements relating to environmental protection, environmental safety, health and sanitation in due regard for the provisions relating to the territories where urban and rural settlements are located and restrictions in the field of the environmental safety established by territorial plans for the protection and management of natural resources and also the adverse impacts of economic and other activities on the environment and the health of the population.

The Code provides that territories where urban and rural settlements are located must have the requisite transport and communications infrastructure to provide access to places of work and leisure activities, as well as to social and cultural service centres, for all categories of the population, irrespective of the place of residence of inhabitants.

The development of state and municipal transport infrastructure, as well as modes of transport, is covered by town-planning regulations and addressed through special transport infrastructure development schemes and projects.

The Code specifies the powers of government bodies (federal, regional and local) in the field of town planning (in particular, with regard to the adoption and implementation of engineering, transport and social infrastructures development schemes and projects at different levels).

One important aspect of the town-planning policy regulated by the Code is the zoning of territories for town-planning purposes.

Zoning is designed to safeguard the natural environment, protect territories from extreme natural and man-made conditions, avoid excessive densities in residential and industrial land use, prevent environmental pollution, protect and make proper use of natural areas such as landscapes, historical and cultural sites, agricultural land and forests.

One type of territorial zone established by the Code consists in a transport engineering and infrastructure zone. Territorial zones can include general-purpose territories occupied by squares, streets, passages, roads, quays, parks, avenues, basins and other facilities. General-purpose territories in urban and rural areas are designed to meet the general interests of the population. Local government authorities decide on the timetable for the development of general-purpose territories.

Transport engineering and infrastructure zones are intended for the construction and operation of rail, road, river, sea, air and pipeline transport services, communications and infrastructure.

To ensure that there is no adverse impact on the environment, transport engineering works and infrastructure must be located at the requisite distance from areas used for residential purposes, public business or leisure activities in accordance with state town-planning rules and regulations and also with special building rules and regulations.

Transport, communications and engineering infrastructure whose operation has a direct impact on the safety of the population must be sited outside urban and rural settlements.

The legislative basis for policy-making in the field of sustainable development of urban transport at the regional level is set out in legislation at the level of the Russian Federation, and also, in cases where there is no conflict with federal legislation, in regulatory texts adopted by administrations of the regions concerned within the framework of their powers.

In particular, a large amount of the legislation adopted by the Russian Federation has now been transposed into regional laws in the field of public passenger transport. The administrations dealing with these subject areas also adopt regulatory texts on issues relating to:

- land use;
- traffic management (including parking policy);
- technical inspection of motor vehicles (including environmental inspections);
- use of alternative (natural gas) and other "non-polluting" fuels.

The legal bases for a policy towards the sustainable development of urban transport have certainly been established (or, at least, should be established!) in a variety of general, juridical, social and economic legislation in force in Russia.

This legislation must be implemented:

- The Code of the Russian Federation about administrative offences which sets out the:
  - general legislative provisions on administrative offences;
  - list of types of administrative sanctions and rules for their application;
  - administrative responsibility on federal issues, including the administrative responsibility for infringement of rules and norms stipulated under federal laws and other regulatory texts of the Russian Federation;
  - procedure for administrative offences, including measures to ensure execution of affairs relating to administrative offences;
  - procedure for taking decisions regarding administrative sanctions.
- The Tax Code of the Russian Federation establishing the system of taxes and dues assigned to the federal budget, and also the general principles of taxation in the Russian Federation, which should define the legal bases for introducing various economic tools to ensure the sustainability of urban transport systems;
- The Federal Laws “On amendments to the acts of the Russian Federation and recognition of the invalidity of some acts of the Russian Federation in connection with the adoption of Federal Laws", “On amendments and additions to the Federal Law", “On the general principles of organization of the legislative (representative) and executive authorities of the governments of territorial entities within the Russian Federation" and "On the general principles of organization of local government in the Russian Federation” which, in particular, provides for replacement of most natural rights (including in the transport sector) by monetary payments and which defines the conditions applicable to the corresponding financial provision of authorities at different levels;
- The Federal Law "On the principles and demarcation of managerial responsibilities and powers between the bodies of the government of the Russian Federation and the bodies of territorial entities within the Russian Federation"

(1999), article 9 of which states that "the issue of providing the relevant bodies of government with the financial, material and other resources required by them to exercise their powers shall be resolved by specifying the scope of managerial responsibilities and powers".

The degree to which the primary legislative and regulatory objectives for implementation of a policy of sustainable development in the urban transport sector, as described in Chapter 3, is reflected in existing federal laws is summarized in Table 47. This summary clearly illustrates the inadequacy of existing legal provisions in this area.

The creation of an appropriate regulatory basis in the transport sector tailored to the emerging social and economic situation in the country, combined with the gradual harmonization of this legal base with EU legislation, is the main prerequisite for further development of the transport system and for ensuring that it is sustainable (including urban transport systems). In this respect, it is first necessary to draw up and enact a number of basic laws in the field of road and urban transport:

- The Federal Law "On road transport and road transport activity";
- The Federal Law "On urban transport".

The creation of effective economic and administrative mechanisms capable of ensuring the sustainability of urban transport requires amendments and additions to the Tax laws (Tax Code), the Code on administrative offences and to a number of other acts.

The rights of regional and local executive authorities to take justifiable measures to restrict private car traffic (or car use) in cities should be also determined at the legislative level (within the framework of the above-listed laws).

Furthermore, a legislative base also needs to be created for the transport sector by applying uniform and coordinated standards and by introducing requirements to ensure the safety and competitiveness of the various modes of transport.

There is also a vital need to put in place the full range of regulatory texts ("lower-tier" legislation) that allow the implementation of legal regulations incorporated into federal laws (decisions of executive bodies, technical regulations, standards and rules, instructions, etc.).

Table 47

Legislative and regulatory provisions to ensure implementation of a policy of sustainable development in the urban transport sector	Federal Law "On traffic safety"	Federal Law "On the bases of technical regulation"	Federal Law "On licensing"	Federal Law "On the obligatory insurance for civil liability"	Federal Law "On environmental protection"	Federal Law "On protection against air pollution"	Town-planning Code of the Russian Federation	Draft Federal Law "On the common principles of organizing transport services for the population"	Federal Law "On amendments to the legislative acts of the Russian Federation" of 30.08.2004 (Law on the monetarization of privileges)	Federal Law "On the principles and demarcation of competences and powers between governmental bodies…" (1999)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Definition of the role of the state (municipal) and the private sector in:										
- supply of transport services;	-	-	-	-	-	-	-	P	-	+
- provision of infrastructure;	-	-	-	-	-	-	-	P	-	+
- financing.	-	-	-	-	-	-	-	P	-	+
Definition of public transport financing	-	-	-	-	-	-	-	-	-	-
Definition of public service obligations with regard to supply:										
- preferential fares;	-	-	-	-	-	-	-	P	-	-
- safety requirements;	-	-	-	-	-	-	-	-	++	-
- obligations regarding the nature and quality of PT services;	+	-	+	+	-	-	-	P	-	-
- supervision of services and route network quality	-	-	-	-	-	-	-	P	-	-

Continue table 47

1	2	3	4	5	6	7	8	9	10	11
Rules of competition and purchase of rights	-	-	-	-	-	-	-	P	-	-
Aid for the development of bicycle and pedestrian traffic in cities	-	-	-	-	-	-	-	-	-	-
Implementation of instruments of transportation demand management	-	-	-	-	-	-	-	-	-	-
Inclusion in transport policy of goals and tasks in the field of:										
- air quality;	-	-	-	-	+	+	-	-	-	-
- GHG emissions;	-	-	-	-	-	-	-	-	-	-
- noise abatement, etc.	-	-	-	-	-	-	-	-	-	-
Strict enforcement of compliance with environmental standards regarding:										
- municipal transport;	+	+	-	-	-	+	-	-	-	-
- private transport	+	+	-	-	-	+	-	-	-	-

Table notation:

+++, ++, + - Very good, good and satisfactory legal base

P - Planned introduction of legislative regulations

\- - Lack of legal base

4.4. Setting up effective taxation and pricing structures

One of the main reasons for the high level of adverse impacts from the transport sector on the environment and health of the population in the Russian Federation is the absence of the economic instruments needed to influence both the transport market and the manufacturers of transport systems, motor fuels, accessories, operational equipment, etc., despite the fact that in a market economy, as the role of the central administration decreases, priority should be given to the key role that economic instruments can play in ensuring the environmental sustainability of the transport system, as has been shown from past experience.

The economic instruments that are used in the transport sector consist in taxes, duties, charges and fines. They should be used with a view to regulating transport activity to ensure sustainability.

The economic instruments that have been developed in other countries to protect the environment from the adverse impacts of transport use fiscal measures to regulate and fund environmental protection.

The fiscal approach consists in using taxes and dues to fund budgets at different levels. To meet “environmental” goals, higher rates of taxes and dues may be levied on motor vehicles and fuels with poor environmental performances.

The fiscal measures used to regulate the transport sector consist in the granting of tax benefits to transport market operators and vehicle owners who take action to reduce the negative impact of transport on the environment, and also by introducing differentiated rates of vehicle and fuel tax according to their environmental and health impact.

The funding aspect of the economic instruments consists in assigning the "environmental" levies introduced to special funds aimed at increasing transport efficiency and safety.

The majority of the taxes and charges used in developed countries to increase transport sustainability combine all the abovementioned functions. In the case of road transport, the following economic instruments are used:

- Taxes on sales of vehicles and fuel;
- Customs duties;
- Charges for the use of road infrastructure, aimed at encouraging the production and operation of environmentally-safer vehicles and fuels, introduction of more effective transportation technologies, etc.;
- Taxes, charges, fines aimed at ensuring that the road transport waste product collection and processing system for road transport wastes functions properly.

To illustrate the economic instruments used in European countries, the taxes levied on commercial trucks are presented in the Table 48.

In the Russian Federation, solely the fiscal function of taxation is currently more or less effectively in place. The use of such taxation for regulation and funding is virtually non-existent at present.

In particular, the lack of differentiated tax rates based on environmental performance criteria for the automobile manufacturing and oil refining industries has a very negative impact on supply in the Russian market for modern motor vehicles and fuels. The main reason for the lack of success of initiatives to introduce differentiation lies in the fact that executive bodies traditionally view taxes as a purely fiscal and not as a regulating instrument, despite the fact that proposed schemes of differentiation are generally fiscally neutral, i.e. don't result in reduced tax revenues to budgets.

The transport tax introduced within the framework of the Tax Code of 01.01.2003 solely takes account of vehicle type and engine rating (table 49). However, from the point of view of vehicle's impact on air quality, the most important characteristics are not the above but rather the size of the engine and its environmental performance. The latter are not taken into account when calculating tax rates, which gives motor vehicles owners no incentive to purchase "environmentally-safer" vehicles, to equip them with catalytic converters or other devices to reduce emissions, and to maintain them in working order. At the same time, this tax could easily be transformed into an instrument to promote motor fleet renewal. The possibility of using the transport tax as a tool to enhance the environmental safety of motor transport depends upon both the scope to increase (reduce) the base rates presented in table 49 as categorized in the Russian Federation (item 2, Article 361, Part II, Tax code), and the scope to differentiate between different categories of vehicle according to the length of time they have been in use (item 3, Article 361, Tax Code).

Present rates of excise duty on vehicles and fuels do not currently depend upon a level of environmental safety: environmental performance of vehicles; types of gasoline and diesel fuel produced and sold according to their sulphur, aromatic hydrocarbon, other toxic components and additives content (table 50). On the contrary, the rate of excise duty applicable to the "dirtiest" types of petrol appears to be lower than that for petrols distilled to a higher level. As a result, vehicles and fuels that are objectively more expensive and "environmentally safe" are forced out the market by the production of poor quality vehicles and fuels.

Import duties on imported cars traditionally take account of solely the age and volume of the engine, and do not take into account environmental performance. As a result of the lack of appropriate economic incentives, many second-hand motor vehicles with low environmental performance ratings are imported to Russia.

Table 48. Taxes and other charges on road haulage in some European countries (in Euros), 2001
(in accordance with "Reforming transport taxes", ECMT, 2002)

Tax (charge) / Country	Vehicle tax, €/year (tax)	Fuel duties €/(diesel) (Excise duty)	Add. environ taxes €/l (Ecotax)	Euro-vignette €/year	Others vignettes €/year	Tolls (highways) €/km (mean)	Tunnels passes, bridges, €/single case	User charges as €/t-km	VAT on diesel (%) (tax)	VAT on tolls (%) (tax)	VAT Refunds	Rebates
				Flat rate basic								
1	2	3	4	5	6	7	8	9	10	11	12	13
Austria	2747	0,28	-	-	1400 [2]	-	109 Brenner	-	20	-	✓	-
Belgium	818	0,29	-	1400[1]	-	-	-	-	21	-	✓	-
Switzerland	2063	0,51	-	-	[3]	-	112 Gd Saint Bernard	0,011[5]	7,6	-	✓	-
Czech Rep.	1300	0,24	-	-	354	-	-	-	22	-	✓ [6]	✓
Germany	1881 (Euro 1)	0,42	-	1400	-	-	-	-	16	-	✓	-
Spain	600, incl. bus tax	0,27	-	-	-	0,16	20 Cadi	-	16	16	✓	-
France	707 Axle tax	0,38	-	-	598 [4]	0,18	143 Mt. Blanc	-	19,6	6; Refund since 01	✓ diesel only	✓ axle tax
Finland	1555	0,26	0,0003	-	-	-	-	-	22	-	✓	
Hungary	642	0,31	-	-	-	0,19	-	-	25	12	✓	✓ Toll refund
Italy	697	0,38	-	-	-	0,10	-	-	20	n.a.	✓	-
Netherlands	940	0,33	0,02	1400	-	-	-	-	19	-	✓	-
Norway	1177, incl. env. tax	0,34	0,06	-	-	0,12 urban	-	-	24	n.a.	✓	-
Poland	910	0,26	-	-	-	0,2	-	-	22	7	✓	-
Sweden	2202	0,18	0,18	1400	-	-	-	-	25	-	✓	-
1	2	3	4	5	6	7	8	9	10	11	12	13
Great Britain	2008	0,74	-	-	-	-	3,36 Dartford Bridge	-	17,5	-	✓	

[1] Obligatory yearly vignette for vehicles registered in Belgium.
[2] Euro 1 Category.
[3] Former RTPL was replaced in 2001 by a distance-weight related charge (HVF, see below)..
[4] In the case the axle tax does not apply
[5] 40 t. Euro Category
[6] No refund for c2 trucks when hauling abroad.

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Table 49

Basic transport tax rates in the Russian Federation (applicable to motor vehicles)

Taxable vehicle	Tax rate (roubles/1 hp)
Cars with engine rating:	
Up to 100 hp inclusive	5
From 100 hp to 150 hp inclusive	7
From 151 hp to 200 hp inclusive	10
From 201 hp to 250 hp inclusive	15
Over 250 hp	30
Trucks with engine rating:	
Up to 100 hp inclusive	5
From 100 hp to 150 hp inclusive	8
From 151 hp to 200 hp inclusive	10
From 201 to 250 hp inclusive	13
Over 250 hp	17
Buses with engine rating:	
Up to 200 hp inclusive	10
Over 200 hp	20

Table 50

Tax rates for excisable goods in the Russian Federation

Excisable goods	Tax rates, in roubles per unit
Cars	
Cars with engine rating up to 90 hp inclusive	0 roubles per hp
Cars with engine rating from 90 hp to 150 hp inclusive	14 roubles per hp.
Cars with engine rating over 150 h/p/	142 roubles per hp
Motor fuels	
Petrol with octane rating up to “80” inclusive	2460 roubles per tonne
Petrols with other octane rating	3360 roubles per tonne
Diesel fuel	1000 roubles per tonne
Unrefined petrol	0 roubles per tonne

In addition, the size of import duties on imported technical and scientific equipment, ancillary products and materials which are not produced the Russian Federation but which are necessary for the manufacture and testing of modern transport vehicles and motor fuels, in accordance with current international environmental requirements, does not promote technical progress in this area.

Economic instruments aimed at improving the system for the disposal of waste products in the transport sector also has a role to play. Road transport is one of the largest sources of hazardous solid and liquid wastes of various degrees of toxicity. At present, administrative methods can only be used to manage, reasonably efficiently, the waste produced by legal persons. Wastes generated by private car owners can only be managed in a civilized way by means of economic regulators. The idea of such regulators consists in creating a system for the collection and disposal of waste products which would place a minimal burden on potential

"polluters" in terms of waste delivery (including scrap cars). In economically developed countries, there are a variety of schemes applicable to the material and financial streams in the waste management system. However, as a rule, all of these schemes are based on taxes or duties on manufacturers and importers, revenue from whomh is then used to organize the collection and disposal of the waste products generated by these activities. This is the basic approach adopted in EU Directive 2000/53/EC.

The Russian Federation does not currently have such economic regulators in place, which has very negative consequences for the environment.

The only economic mechanism currently in place in Russia is the collection of a payment for environmental pollution. However this instrument does not work efficiently.

Introduced under Government Order № 344 of the Russian Federation "On the specification of charges for atmospheric emissions of pollutants from stationary and mobile sources, discharge of pollutants to surface and subsurface water resources, storage of manufacturing and consumer wastes" of June 12, 2003, the rates of payment are insignificant and disproportionate to the real damage rendered by transport to the environment (Tables 51, 52). At present, payments for environment pollution are added to tax revenues in the budget; however, the legislation makes no provision for using the revenue from such payments to enhance environmental protection or reduce pollution by the transport sector.

Table 51

Atmospheric emission charge rates for mobile emission sources and different kinds of fuels

Kind of fuel	Unit	Charge rate, roubles per unit
Unleaded petrol	Tonne	1.3
Diesel fuel	Tonne	2.5
CNG	Thousand. m^3	1.2
LPG	Tonne	1.2

Table 52

Atmospheric emission charge rates for stationary sources, roubles per tonne of harmful substance (for specified substances)

Harmful substance	CO	CH	NO_2	Soot	SO_2	Pb
Within the limits of established admissible norms	0,6	1,2	52	41	40	6833
Within established coordinated limits	3	6	260	205	340	34165

In the final drafts of the new law on payments for environmental pollution, no provision has been made for the payment of compensation by physical persons/private car owners for the various types of damage they cause. The attempt by the authorities in Moscow to resolve this

problem by levying an additional tax on motor fuel has been challenged through the courts as being in contradiction to federal legislation.

Our analysis shows that there are currently no effective economic instruments in place to increase the environmental sustainability of urban transport in Russia. In view of the wide range of adverse impacts that transport can have on the environment, legislating in this field must be one of the main priorities for the future.

"Greening" the taxation system (or making it more environmentally friendly) is an effective means of improving the environmental sustainability of transport in that it offers the possibility of influencing transport prices and thereby shaping demand.

Russian hauliers currently base their prices on the costs of vehicle operation and depreciation, wage costs, administrative overheads, insurance, transport taxes, etc. These costs are included in the price of transport services and paid by the consumer. They are usually referred to as "internal" costs.

Accordingly, the price of transport service RP is expressed by:

$$RP = MC_{int} + T + P, \qquad (10)$$

where: MC_{int} – internal costs of carrier;
T –taxes not included in the cost price;
P – carrier's profit.

At the same time, as it has been shown above, the provision of transport services and related activities generates a number of additional costs which are currently not taken into account in the formation of transport prices. These costs are usually referred as "external" costs.

In the road transport sector, the following are counted as external costs:

- losses in terms of the environmental and health impacts of motor transport (emissions, noise, etc.);
- losses from time spent in traffic and additional expenses as a result of traffic jams;
- losses in terms of people killed and injured in road accidents;
- a share of the losses relating to road wear which is not paid for by road users.

The current basis used to establish the price of transport services in Russia does not take account of external costs, and since market conditions do not affect carriers' profits they are not interested in reducing those external costs. The consumer, in turn, is not interested in reducing external costs as they are not reflected in the prices for transport services, and therefore have no impact on costs. In this respect, it is necessary to make carriers take account of such external costs in the calculation of transport prices to ensure that market operators and vehicle owners have a vested interest in reducing externalities. Including external costs in production prices (services) is usually known as internalization.

Internalization should:

- encourage the purchase of more fuel-efficient and environmentally-friendly vehicles;
- optimize transport movements and, through the application of modern logistics technologies, rationalize transport operations while ensuring that all the existing transport needs of society are properly;
- encourage a reduction in the transport requirements of society and the economy;
- encourage the use of bicycles, telecommunications, etc.

Diagram 33 shows supply and demand curves for the transport market.

As the experience of other countries has shown, it is possible to include external costs in the price of transport services by:

- increasing and differentiating vehicle taxes according to their environmental class;
- increasing and differentiating fuel excise duties according to their environmental quality;
- introducing vehicle entry charges to certain territories according to their environmental characteristics;
- introducing parking fees for vehicles in city centres and environmentally sensitive areas;
- introducing road pricing based on vehicle characteristics.

The use of similar instruments would make it possible to apply the “polluter-pays" principle, which at the World Summit in Rio de Janeiro in 1992 was recognized as one of the basic principles of a nature protection policy. Applying this principle means that all costs relating to environmental pollution and traffic safety must be borne by the person causing the pollution (carriers in the case of transport).

In setting transport tariffs, carriers impose additional costs on their clients.

Thus the "polluter-pays" principle is transformed into the consumer of transport services – pays” principle. To take this into account, provision must be made in the internalization process for mechanisms to compensate the additional costs incurred by low-income group consumers of transport services.

Diagram 33 illustrates the main stages in the internalization of external costs.

The monetary value of the external costs relating to road transport can be calculated as follows:

$$MC_{ext} = MC + MC_H + MC_A + MC_E, \qquad (11)$$

где MC_{ext} – external costs (losses) relating to road transport activity;
MC – economic losses relating to pollution of the environment by road transport;
MC_H – economic losses relating to the impact of road transport on the health of the population;
MC_A – economic losses relating to deaths and injuries in road accidents,
MC_E – other economic losses relating to the reduced overall efficiency of transport, growth in transport costs, wear on transport infrastructure which is not compensated by consumers.

At present in Russia there are methods to estimate the monetary value of the damage relating to the impact of road transport impact on the environment and to deaths and injuries as a result of road accidents. At the same time there is a need to develop:

- a method for estimating the monetary value of the losses relating to the impact of road transport on the health of the population;
- a method for estimating the monetary value of the losses arising from to the growth in congestion of urban road network and the number of traffic jams.

Various instruments of economic regulation among those listed above (taxes, excise duties, charges, environmental charges, mandatory insurance against civil liability, etc.) can be used to incorporate the estimated monetary costs of transport externalities.

At the same time, under the existing Tax Code of the Russian Federation, government bodies at all levels have no right to introduce additional taxes or mandatory deductions other than those stipulated in the legislation of the Russian Federation.

The mandatory insurance against civil liability, introduced under the Federal Law "On mandatory insurance against civil liability " № 40-ФЗ of April 25, 2002, which provides for the differentiation of insurance tariffs according to the size of the insurance risk, can be used as a tool for internalizing costs in order to reduce the economic losses arising from accidents. Accordingly, insurance costs can be included in the cost of transport services (or the operating costs of vehicle owners).

The taxes and charges which may be used as an instrument to internalize the external costs of transport in Russia (from the standpoint of the environmental impact of transport) include (Table 53):

- fuel excise duties;
- transport taxes;
- payments for environment pollution.

Diagram 33: Successive stages in internalization

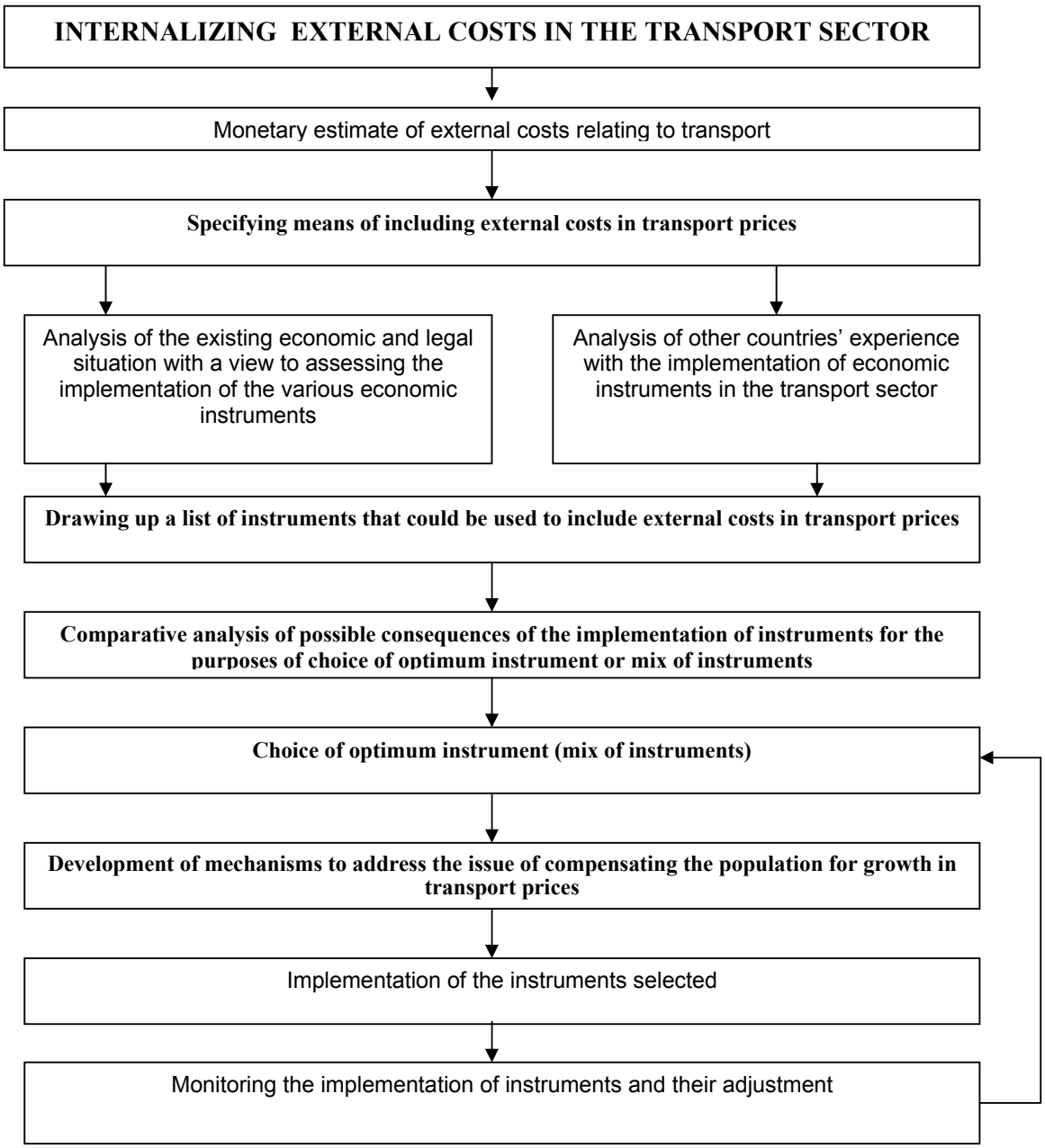


Table 53

Common description of taxes and obligatory charges which may be used for internalization

Name of tax or charge	Type of tax of charge	Body which may introduce tax (charge)	Body which defines tax (charge) base	Body which defines tax (charge) rate	Use of revenue collected
Fuel excise	Federal tax	Federal Government bodies in all territory of Russia	Federal Government bodies in accordance with the Taxation Code	Federal Government bodies in accordance with the Taxation Code	Federal budge t– 40 %, Regional budgets – 60 %
Transport tax	Regional tax	Government bodies of territorial entities within the Russian Federation (regions)	Federal Government bodies in accordance with the Taxation Code	Government bodies of subjects of the Russian Federation in the framework of federal restrictions	100 % consolidated regional budget
Environmental charge	Form of compensation of environmental damage (fee of a non-fiscal nature)	Federal Government bodies in all territory of Russia	Federal Government bodies	Federal Government bodies	80 % - Federal budget, 20 % - Regional budgets

Table 54 presents an analysis of the advantages and disadvantages of economic instruments from the standpoint of their efficiency in internalizing external costs in Russia.

Table 54. Common description of taxes and obligatory charges which are paid by transport entrepreneurs and motor vehicle owners in the Russian Federation

	Name of tax or charge	**Type of tax or charge**	**Document which determines the tax (charge)**	**Body which introduces the tax (charge)**	**Tax (charge) base and body which defines it**	**Body which defines tax (charge) rate**	**Use of revenue collected**
Taxes and charges which are included into transport service prime cost	Registration fees *)	Fee of a non-fiscal nature	Order of the Ministry of Internal Affairs № 59 «On the procedure of motor vehicles registration »	Federal Government bodies	Motor vehicle, Federal Government bodies	Federal Government bodies	Local budgets
	Transport tax*)	Regional tax	Taxation Code	Government bodies of territorial entities within the Russian Federation (regions)	Engine power (hp), Federal Government bodies	Government bodies of territorial entities within the Russian Federation in the framework of federal restrictions	100 % consolidated budget of territorial entities within the Russian Federation

	Tax on organization's property	Regional tax	Taxation Code	Federal Government bodies	Balance cost of motor vehicle, Federal Government bodies	Government bodies of territorial entities within the Russian Federation in the framework of federal restrictions	Regional and local budgets in shares defined by the budget legislation of subjects of the federal restrictions
	Obligatory insurance of third-party liability	Insurance fee	Federal Law "On the obligatory insurance of third party liability (civil liability)" № 40-ФЗ from 25.04.2002	Federal Government bodies	Insurance period, motor vehicle engine volume, Federal Government bodies	Federal Government bodies	Insurance funds
	Environmental charge	Form of compensation of environmental damage (fee of a non-fiscal nature)	Governmental Decree № 632	Federal Government bodies	Volume of pollutants emission calculated on the base of: - fuel consumption; - indices of motor transport work. Federal Government bodies	Federal Government bodies	Federal budget -19 % , Regional budget - 81 %
	Fuel excise*)	Federal tax	Taxation Code	Federal Government bodies	Type, brand and volume of fuel. Federal Government bodies.	Federal Government bodies	Federal budget - 40%, Regional budget – 60%.

	Licensing fee	Fee of a non-fiscal nature	Governmental Decree . N 402 from 10.06.2002 "On the licensing of freight and passenger transportation by motor transport"	Federal Government bodies	Kind of licensing activity	Federal Government bodies	Regional budgets – 100%
Taxes which are not included into transport service prime cost	VAT	Federal tax	Taxation Code	Federal Government bodies	Cost of goods (work, services) with the exception of sale tax. Federal Government bodies	Federal Government bodies	Federal budget - 100 %
	Profits tax	Federal tax	Taxation Code	Federal Government bodies	Profits of organization from goods (works, services) sale and other profits in accordance with the Taxation Code	Federal Government bodies define the rates for those parts of tax which enter to federal and legal budgets and also the maximum rate for tax rate for part of tax which enters to regional budgets	Federal budget – 5%, Regional budgets – 13-17%, Local budgets – 2%.

*).Taxes (charges) which are paid by private car owners.

The direct environmental charges (i.e. charges whose who size is directly proportionate to the volume of emissions of polluting substances) currently levied in Russia on road haulage firms are for atmospheric emissions of pollutants, discharges of sewage into reservoirs, etc. They are covered by the Government Order of the Russian Federation № 632 "On the approval of the Order on charges for pollution of the environment, disposal of waste products, and maximum charging rates for other kinds of adverse impacts on the environment" of 28.08.92. The charges currently levied are specified in Governmental Order № 344 "On the specification of charges for atmospheric emissions of pollutants from stationary and mobile sources, discharge of pollutants to surface and subsurface water resources, storage of manufacturing and consumer wastes" of June 12, 2003**,**. However, analysis of current charging rates has shown that, to ensure that environmental damage is reflected more accurately in the price of transport services, these rates should be increased. It is also possible to differentiate these rates according to the environmental class of a vehicle and place where it operates.

The next set of environmental taxes and charges may be levied indirectly (i.e. without reference to the parameters of pollution sources): charges for the use of road infrastructure, according to the loading applied by a vehicle; excises on fuel; transport tax on owners of vehicles; charges for entry to city centres; parking fees, etc.

Table 55 presents the advantages and disadvantages of these economic instruments from the standpoint of their efficiency in internalizing external costs.

When choosing economic instruments (or mixes of instruments) to apply to the traffic and road haulage conditions encountered in practice, it is first necessary to assess the legal, technical and economic consequences of their application.

On the basis of the analysis it is possible to draw the following basic conclusions:

1. Internalizing external costs is the most radical and effective tool to apply to the environmental impacts of transport.
2. At present in Russia there are no direct environmental taxes, and environmental charges levied on transport do not properly reflect the cost of the damage to the environment.
3. Analysis of the experience of other countries shows that there are no universal tools of economic regulation suitable for all types of transport system.
4. The choice of appropriate tools or their combinations should be made with reference to the social and economic situation in the country (region, city) on the basis of a complex technical, economic and legal analysis.

4.5. Technical aspects of ensuring urban transport sustainability

The amount of pollutants emitted primarily depends on the quality of the exhaust gas filtration and neutralization systems fitted to vehicles, the proportion of fleet vehicles fuelled by diesel or LPG, as well as the roadworthiness of vehicles.

The main means of reducing emissions is to fit filters and catalytic converters to vehicles. Data on the efficiency of systems to neutralize exhaust gas emissions from petrol-driven cars are presented in Table 56.

Table 55

Comparative analysis of economic instruments from the standpoint of their efficiency in internalizing external transport costs

Economic instrument	Advantages	Disadvantages
Excise duties on fuel	does not require additional technical facilities (equipment)	**- does not take account of difference in the environmental performance of motor vehicles;** - are not related to the territory where the fuel is consumed
Transport tax	- does not require additional technical facilities (equipment); - tax rates can be differentiated according to the environmental class of the vehicle	Tax is linked to vehicle ownership but not to its use
Environmental charges (for air pollution, discharging polluted water, waste disposal)	- is directly related to environmental impact; - extra-budgetary mechanisms can be introduced for collecting charges	- difficulties of emission monitoring
Parking fees	**- creation of economic instrument which gives the possibility to restrict access by car to some urban areas;** - fee scales can be set at the local level; - extra-budgetary mechanisms can be introduced for collecting charges	− does not address transit traffic; − need for additional technical equipment; − problem of lack of urban territories
Congestion charges	- tax rates can be differentiated according to the environmental class of the vehicle; - fee scales can be set at the local level; - extra-budgetary mechanisms can be introduced for collecting charges	Technical problems with implementation

Table 56

Relative values of running (specific) emissions and fuel consumption of cars with petrol engines fitted with different exhaust gas after-treatment systems

Type of exhaust gas after-treatment system	Fuel consumption, %	Pollutants emission, %				
		CO_2	CO	CH	NO_X	SO_2
Basic model (without catalytic converter)	100	100	100	100	100	100
Exhaust gas recirculation system	98.5	98.5	114.3	103.7	51.4	98.5
Exhaust gas recirculation system + oxidizing catalytic converter	106.5	106.5	45.7	13.9	47.1	106.5
Three-way catalytic converter	100.0	100.0	16.4	13.3	16.0	100.0

Diesel-powered vehicles are fitted with particulate filters and neutralizers (catalytic converters), whose efficiency ratings are given in Table. 57

Table 57

Relative values of running emissions from motor vehicles with diesel engines fitted with a soot filter and oxidizing catalytic converter

Type of exhaust gases after-treatment system	Specific emission (%)				
	Particles	CO	CH	NO_X	SO_2
Basic model (diesel engine)	100	100	100	100	100
Soot filter	15.6	100	100	100	100
Oxidizing catalytic converter	100	30	40	100	98,1

Table 58 shows the relative values of emissions from buses and trucks driven by:

- diesel fuel (a base parameter - 100 %);
- liquefied oil or compressed natural gas;
- dual-fuel power supply systems (gas-diesel engines).

Table 58

Comparative values of running emissions from buses and trucks driven by different kinds of fuel (%)

Kind of fuel	Pollutants running emission, %				
	CO_2	CO	CH	NO_X	Particles
Diesel engine	100	100	100	100	100
LPG	98	105,2	99,4	196,2	7,8
CNG	89	65,75	118,0	163,4	11,1
CNG + catalytic converter	88	6,4	24,8	6,4	4,4
Dual-fuel engine (CNG + diesel)	126	336,4	780,0	86,7	2,5

Analysis of the data presented shows that it is preferable to use a gas-combustion engine with an oxidation-reduction system for neutralizing exhaust gases and also that an increase in CO and CH emissions from dual-fuel engines, compared with diesel engines, is acceptable.

Table 59 (NICIAMT data) presents the estimated changes in engine running emissions due to incorrect adjustment of engine parameters to urban driving conditions.

Table 59
Impact of engine parameters on running emissions from vehicles in urban traffic conditions

Type of failure	Change in running emissions (%)			
	CO	CH	NO_X	Smoke
SPARKING IGNITION ENGINES				
Incorrect carburetor tuning	+100…+300	+10…+100	-5…-25	-
Faulty ignition dwell angle	+10…+50	+5-…+300	-50…+100	-
Faulty sparking plugs	-50…+50	+100..+900	+10…+50	-
DIESEL ENGINES				
Maladjusted high-pressure fuel pump	+50…+50	+5…+25	-25…+25	+50…+100
Failure of angle of injection advance	+5…+50	0…+25	-100…+100	-25…+50
Failure of fuel-injection nozzles	+25…+50	+5-…+100	0…-25	-25…+25
Higher strength at air intake and at exhaust gases outflow	+50…+100	+50…+100	0…-50	0…+100

Fuel savings and reduced CO_2 emissions in the road transport sector can be achieved by reducing the weight of vehicles through the use of lighter materials in vehicle construction and by improving the aerodynamic qualities of vehicles.

More efficient fuels and the use of special additives can also help to significantly reduce the volume of pollutant emissions from mobile sources.

The use of engine heating systems (gas or electric), as well as fluids to improve engine starting during cold weather, can reduce emissions of incomplete fuel combustion products by reducing the time required for the engine to warm up.

Pollutant emissions from motor vehicles can therefore be reduced through the following actions (see Table 60):

- Renewal of motor fleet by manufacturers and imports of environmentally safer vehicle models to meet future standards;
- Use of new kinds of fuel, blends, lubricants and specialty fluids;
- Use of different types of exhaust gas after-treatment systems, and also other designs and technologies to reduce pollutant emissions;

- Introduction of new equipment and improvement of diagnostic procedures, maintenance and repair services.

Table 60

List of air protection measures in motor transport enterprizers and their possible effect

№№	Measure	Expected effect
1	Replacement of petrol-driven vehicles with diesel-driven vehicles	90% reduction in CO emissions 75% reduction in HC emissions
2	Replacement of petrol-driven vehicles with CNG powered vehicles	50% reduction in CO emissions 70% reduction in HC emissions
3	Regular servicing, diagnostics, maintenance and repair of vehicles	70% reduction in CO, HC and C emissions 90% reduction in SO_2 and NO emissions
4	Construction of heated parking spaces for winter storage of vehicles	3-5% reduction in CO and HC emissions
5	Fitting of catalytic converters to fleet vehicles	50% to 90% reduction in CO and HC emissions

- Use of engine heating systems in open-air car parks during the cold period of the year and systems to speed up engine starting;
- Use of lighter materials in vehicle construction and improvement of vehicle aerodynamics.

Technical measures aimed at increasing the environmental sustainability of urban transport should undoubtedly be accompanied by other measures such as:

- Further development in cities of electric-powered surface transport (trams, trolley-buses) and underground railway systems;
- Provision in urban areas of other modern mass transit systems (monorail, high-speed trams, light metros), and also development of multimodal passenger transportation.

Implementing the above mentioned technical measures would reduce pollutant emissions from the transport sector would require significant investment. The choice of an optimum mix of measures should be based on a realistic assessment of the resources available and the benefits that could be expected ("cost-benefit" analysis).

4.5.1. Measures to improve the environmental performance level of vehicles manufactured domestically or imported to Russia

At present, the bulk of Russia's vehicle fleet consists of vehicles whose environmental performance is rated at the EURO 0 level (see Table 28).

As a contracting party to the 1958 Geneva Agreement "Concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be fitted and /or be used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions", all vehicles manufactured in the Russian Federation should comply with the international standards and UNECE Regulations specified in

the above mentioned Agreement, as well as the latest amendments to these Regulations. However, the schedule for the official introduction of these standards in Russia still lags behind the UNECE schedule used in most European countries (Table 27).

The largest Russian car-manufacturing plants are ready to produce (and already do!) motor vehicles that will meet EURO 2 and even EURO 3 requirements (Table 31). However, the absence of the requisite administrative and economic instruments precludes any possibility of offering sufficient incentives to either the manufacturers or purchasers of modern motor vehicles. This significantly limits the scope for introducing these motor vehicles on the Russian market. Measures to solve this problem have been set out in the "Russian car-manufacturing industry development plan" adopted by the Russian Government in 2003.

To improve the environmental performance of vehicles manufactured in Russia and imported vehicles, in September 2002 the Russian Government adopted a Decree "On the environmental performance of diesel-powered trucks and buses" under which the manufacture and importing of vehicles with EURO 0 emission levels will cease.

To improve the environmental safety of motor fuels, in 2003 the Government adopted a Federal Law "On the prohibition of production and sale in Russia of leaded petrols". At present, a draft Governmental Decree "On the improvement of the environmental safety of motor vehicles first registered in the territory of the Russian Federation" and draft Technical Regulations concerning the "Environmental safety of motor vehicles first registered in the territory of the Russian Federation" have been drafted and submitted to the Government for discussion.

These documents provide for the following:

- Introduction of an environmental classification for motor vehicles manufactured in or imported to Russia (Table 61);
- Fuel quality standards that take account of the needs of modern vehicle fleet (Table 62);
- Co-ordination of existing economic instruments (environmental pollution charge, transport tax, etc.) with motor the environmental class of vehicles;
- Introduction of a ban on imports to Russia of motor vehicles which fail to meet the environmental classification requirements in force at the time of submission of the customs declaration.

Among the measures to improve the environmental performance of new motor vehicles adopted by executive authorities at the regional (city) level, mention should be made of the action taken by the Moscow authorities to introduce buses fitted with EURO 3 engines ("Caterpiller" engines) to the city's bus fleet. Calculations show that specific emissions of pollutants by buses fitted with EURO 3 engines are 2.8 times lower than those from buses with EURO 0 engines (Table 63). Table 64 illustrates the estimated environmental impact of renewal of the city's bus fleet by the replacement of EURO 0 and EURO 1 buses with EURO 3 vehicles, and Table 65 presents the estimated technical and economic impacts of this measure.

4.5.2. Measures to improve the environmental safety of the existing vehicle fleet

Among the technical measures designed to improve the environmental safety of the existing vehicle fleet at the regional level, it is worth noting the following:

- Moscow Municipal Authority's experience with the fitting of oxidizing catalytic converters to its vehicle fleet.
  Moscow Municipal Authority spent about 330 million roubles on this measure over the period 1997-2001. As a result, 11 036 trucks and 2 047 buses with diesel engines, as well as 4 804 trucks, 1 418 buses and 3 658 cars with petrol engines, have been equipped with oxidizing catalytic converters. However, calculations show that this measure is only cost-effective in the case of petrol-driven vehicles, which account for an increasingly small share of the municipal vehicle fleet. Fitting oxidizing catalytic converters to diesel-powered trucks and buses does not appear to be cost effective (Table 66). This programme has therefore been suspended by Moscow Municipal Authority.

Table 61

Environmental classification of wheeled vehicles according to the level of pollutant emissions

Environmental class of wheeled vehicle	Categories and sub-groups of wheeled vehicles	Regulatory texts setting out requirements for the environmental performance of wheeled vehicles/technical standards on pollutant emissions	EU standards (for information)
1	**2**	**3**	**4**
0	M1, M2 with a maximum laden weight of 3 500 kg, N1 with petrol and diesel engines	CE Regulations № 83-02A, 83-03A, 83-04A	**Euro-0**
	M1 with a maximum laden weight of over 2 500 kg, M2, M3, N1, N2, N3 with diesel engines	CE Regulations № 49-01	
	M1, M2 with a maximum laden weight of over 3 500 kg, M3, N2, N3 with petrol engines	CO – 85.0 g/kWh; CmHn – 5.0 g/kWh; NOx – 17,0 g/kWh -regime testing cycle)	
1	M1, M2 with a maximum laden weight of 3 500 kg, N1 with petrol and diesel engines	ECE Regulations № 83-02D,C	**Euro-1**
	M1 with a maximum laden weight of over 3 500 kg, M2, M3, N1, N2, N3 with diesel and gas engines	CE Regulations № 49-02A	
	M1, M2 with a maximum laden weight of over 3 500 kg, M3, N2, N3 with petrol engines	) – 72.0g/kWh; CmHn – 4.0 r/0g/kWh; NOx – 14.0 g/kWh -regime testing cycle)	
2	M1, M2 with a maximum laden weight of 3 500 kg, N1 with spark (petrol and gas) and diesel enginess	CE Regulations № 83-04 B,C,D	**Euro-2**
	M1 with a maximum laden weight of over 3 500 kg, M2, M3, N1, N2, N3 with diesel and gas engines	CE Regulations № 49-02 B	
	M1, M2 with a maximum laden weight of over 3 500 kg, M3, N2, N3 c with petrol engines	CO – 55.0g/kWh; CmHn – 2.4 0g/kWh; NOx – 10.0 0g/kWh (testing in accordance with ECE Regulations № 49-03, 49-04, cycle ESC)	

Environmental class of wheeled vehicle	Categories and sub-groups of wheeled vehicles	Regulatory texts setting out requirements for the environmental performance of wheeled vehicles/technical standards on pollutant emissions	EU standards (for information)
1	**2**	**3**	**4**
3	M1, M2 with a maximum laden weight of 3 500 kg, N1 with spark (petrol and gas), diesel and hybrid engines	CE Regulations № 83-05A	Euro-3
	M1 with a maximum laden weight of over 3 500 kg, M2, M3, N1, N2, N3 with diesel and gas engines	CE Regulations № 49-04 A	
	M and N all-terrain vehicles with diesel engines with a maximum power rating of 18 to 560 kW	CE Regulations OOH № 96-01	
3	M1, M2 полной массой более 3500 кг, M2, M3, N2, N3 с бензиновыми двигателями	CO – 20/0 g/kWh; CmHn – 1,1 g/kWh; NOx – 7.0 g/kWh (testing in accordance with ECE Regulations № 49-04, cycle ESC)	Euro-3
4	M1, M2 with a maximum laden weight of 3 500 kg, N1 with spark (petrol and gas), diesel and hybrid engines	ECE Regulations № 83-05B	Euro-4
	M1 with a maximum laden weight of over 3 500 kg, M2, M3, N1, N2, N3 with diesel and gas engines	CE Regulations № 49-04 B1	
	M1, M2 with a maximum laden weight of over 3 500 kg, M2, M3, N2, N3 with petrol engines	CO – 4,0 g/kWh; CmHn –0,55 g/kWh; NOx – 2,0 g/kWh (testing in accordance with ECE Regulations № 49-04, cycle ETC)	
5	M1 with a maximum laden weight of over 3 500 kg, M2, M3, N1, N2, N3 with diesel and gas engines	CE Regulations № 49-04B2	Euro-5

Table 62

Main requirements for motor fuel quality and dates for their entry into force

Characteristics	Regulatory requirements		
1	**2**	**3**	**4**
Environmental requirements for motor vehicles	Class 2 (Euro 2)	Class 3 (Euro 3)	Class 4 (Euro 4)
Date of entry into production of low sulphur fuels	In force	from 01.01.2006	from 01.01.2008
Petrol			
Content of hydrocarbons, %vol. max: - Aromatic hydrocarbons - Olefinic hydrocarbons	 - -	 42 18	 35 18
Benzol content, %vol. max	5	1,0	1,0
Sulphur content, mg/kg, max.	500	150	50
Oxygen content, %mass, max.	-	2,7	2,7
Vapour pressure, kPa	35-100	60/70	60/70
Lead content mg/l.,max.	10	5	Отс.
Diesel fuel			
Polycyclic aromatic hydrocarbons, % mass. max	-	11	11
Sulphur content, mg/kg, max.	500	350	50
Cetane number, min	49	51	51
Density under temperature 15°C, kg/m^3	820-860	820-845	820-845
Fractional content 95% of volume is distilled under temperature °C, max.	360	360	360
Lubrication ability, mk max.	460	460	460

Table 63
Specific pollutant emissions from buses by environmental class

Pollutant	Toxicity rating of pollutant	Running emissions in urban conditions , (g/km)	Annual kilometrage	Annual emissions of pollutants, (kg/year)	Relative emissions of standard tonnes of CO
Especially large EURO 0 class buses					
CO	0.4	6.23	60 000	375	0.15
HC	0.7	2.06		124	0.09
NO_x	16.5	14.32		862	14.22
PM	33.5	1.16		67	2.33
			Total	**1428**	**16.79**
Especially large EURO 1 class buses					
CO	0.4	2.50	60 000	150	0.06
HC	0.7	0.95		57.2	0.04
NO_x	16.5	7.96		479.2	7.90
PM	33.5	0.53		31.9	1.07
			Total	**718.3**	**9.07**
Especially large EURO 3 class buses					
CO	0.4	1.19	60 000	79.4	0.03
HC	0.7	0.56		33.7	0.02
NO_x	16.5	5.73		345	5.69
PM	33.5	0.15		9.03	0.30
			Total	**467.1**	**6.04**

Table 64
Potential environmental impact of renewal of the Moscow bus fleet

Bus replacement option	Indices		
	Emissions avoided (standard tonnes/year)	Savings from prevented Damage prevented (roubles/year) (2004)	Environmental efficiency (%)
EURO 3 instead of EURO 0	10.75	3 913	65
EURO 3 instead of EURO 1	3.03	1 103	33

Table 65
Environmental and economic impacts of bus fleet renewal

Bus replacement option	Additional costs of bus purchases (thousand roubles)	Additional costs of raising the environmental class of buses (thousand roubles)	Damage avoided during period of bus operation, (thousand roubles)	Economic impact of measures, (thousand roubles)	Specific cost of reducing emissions (roubles per standard tonne
EURO 3 instead of EURO 0	1 750	577	31.4	-545.6	6 709
EURO 3 instead of EURO 1	9 49	313	8.8	-304	12 913

Table 66
Environmental and economic impacts of fitting buses with catalytic converters

Engine environmental class	Bus model	Annual damage avoided by 1 bus (roubles/year)	Damage prevented during period of use of a catalytic converter (roubles)	Specific cost of reducing emissions (roubles/standard tonne
EURO 0	Ikarus 260	115.94	193.62	65 742.50
	Ikarus 280	124.16	207.34	61 392.17
EURO 1	Ikarus 260	49.95	83.42	152 601.59
	Ikarus 280	53.54	89.42	142 360.56

4.5.3. Measures to improve the quality of motor fuels and introduction of new alternative fuels.

The quality of the motor fuels available for sale has a significant impact on the environmental situation in cities, and can also limit the scope for using modern vehicles with improved environmental performances. Recently, in the absence of measures at the federal level to improve the quality of motor fuels, some government bodies of territorial entities within the Russian Federation try to make necessary decisions at their own level. Over the past 7 years, the Moscow Municipal Authority has made great efforts to change the system and place it on a new footing and have adopted a number of regulatory texts relating to the quality of fuel available on the market in Moscow.

- Moscow Municipal Law № 33 (of 14.06.1999 as amended on 17.03.2004) "On liability for producing motor fuel which fails to meet environmental class 1 requirements", under which fines of up to 2 000 times the minimum monthly wage can be imposed on legal persons;
- Order by the Mayor of Moscow № 483-RM, establishing technical requirements for the quality of fuels sold on the Moscow market, etc.

Employees of the Department of Natural Resources Management and Environmental Protection of the Moscow Municipal Authority, the Moscow Transport Inspectorate and the Moscow Trading Inspectorate, working in close co-operation, carry out inspections of petrol stations in Moscow. As an incentive to petrol station operators who comply strictly with environmental protection legislation, a system of special distinctive signs has been introduced in Moscow. As a result, the quality of the fuels available in Moscow petrol stations is now much higher and the chances of being sold fuel of dubious origin are well below the average for the country.

A major effort is currently being made to promote the sale of alternative fuels. A number of Government Orders aimed at increasing the use of natural gas as a fuel for public transport have been issued. In April 2004, the Moscow Municipal Authority issued Order № 5-15-37 "On the organization of work to introduce dimethyl ether for use in the transport sector as an environmentally-safe alternative fuel". 10 experimental ZIL-5301 vehicles powered by this fuel, are currently being operated by a Moscow firm in a pre-production trial operation. Studies on expanding the manufacture of dimethyl ether and setting up a distribution network are currently in progress.

5. THE POLICY CONCEPT OF THE SUSTAINABLE DEVELOPMENT OF URBAN TRANSPORT IN THE RUSSIAN FEDERATION

5.1. Need for a policy towards the sustainable development of urban transport

The increased well-being of urban populations in Russia and growth in urban economies generates sustainable and increasing demand for urban transport services. At the same time, however, growth in the transport sector, primarily in terms in car ownership, has been accompanied by growth in the **negative impacts** of urban transport which has led to a significant loss of **quality of life for the population and rising economic losses** as a result of the overall decline in efficiency of the urban transport system.

The economic damage caused by air pollution, road accidents and the deterioration of transport services as a result of congestion in the road network in the major cities in the country amounts to 10-15% of total regional (city) products. This estimate does not take into account important factors such as:

- Disease and premature deaths in the population attributable to air pollution, noise and vibration generated by the transport sector;
- Losses to urban economies as a result of rising transport costs for freight deliveries to trade and industry;
- Damage caused by the pollution of city water sources and soils, loss of land to transport infrastructure.

The key issues which the President of Russia brought before the Government of the country – namely improving the quality of life of the population, maintaining high rates of economic growth and creating the potential for the future development – directly depend on the

sustainable development of urban transport systems because recognizing and meeting this need will improve the quality of life of urban populations and at the same time reduce the losses to urban economies attributable to transport and thereby increase their rate of growth.

5.2. Obstacles to the introduction of a policy on the sustainable development of urban transport in the Russian Federation

The introduction of a policy on the sustainable development of urban transport in the Russian Federation is now encountering the following problems:

At federal level:

- Insufficient priority given to improving the environmental sustainability of urban transport against a background of other federal priorities at State level (development of the economy, struggle against terrorism and ensuring public safety, etc.). Lack, in this connection, of the necessary objectives (target indices) at the level of the Government of Russia and responsible authorities for their achieving those objectives.
- Lack **for the present moment** of strategic texts defining **State policy (!)** on the complex decision-making required to resolve transport problems in cities, providing for first, co-ordination and agreement on decisions and measures approved in the various sectors of the economy and society (co-ordination with industrial policy, environmental policy, policy in the field of public health, town-planning policy, financial and economic policy) approved by the Government of Russia.
- Lack at federal level of the necessary legislative basis in the field of road and urban transport and of provisions of federal legislation, giving powers to local (city) authorities to introduce restrictions on road traffic (including private car traffic) in certain city areas.

At local (city) level:

- Insufficient understanding by the authorities of the complex nature of the problem of ensuring the sustainability of urban transport resulting in attempts to solve it only through fairly simple engineering or administrative measures and decisions (environmental inspection of motor vehicles of environmentally “clean” fuels, fitting of motor vehicles in use with catalytic converters and other exhaust gas aftertreatment devices, etc.).
- Uncoordinated efforts and actions of various city authorities in tackling the different aspects of the problem of ensuring urban transport sustainability.
- Failure to taking into account at federal level the management of the motorization process which often results in conflicting legislative initiatives by local (city) administrations and federal (and constitutional) legislation.
- Prevalence in the transport policy of city administrations of approaches and decisions aimed at increasing road network capacity which, in turn, leads to increasing demand from road users and, accordingly, to the further growth of traffic volumes (so-called "induced traffic"). At present, city administrations, to all intents and purposes, practically ignore a range of restrictive measures, frequently unpopular among owners of road transport.
- Insufficient interdepartmental preparation and co-ordination of decisions to ensure the sustainable operation of urban transport.

- Not enough working with the population with a view to explaining the problems and tasks of sustainable transport policy, the necessity of different decisions in the transport sector (including – unpopular decisions). In many cases – lack of a system of monitoring and influencing public opinion on problems relating to sustainable urban transport operation.

5.3. The goal and tasks of policy in the field of sustainable development of urban transport

The goal of policy on the sustainable development of urban transport is the State regulation of the activity of transport market actors in cities, owners of vehicles (including personal cars), and allied sectors of economy (social and economic relations) at a federal, regional and local (city) level such that decision-making at all levels of management takes into account in equal measure both the efficient satisfaction of the needs of the economy and the public and the safety of transport for the environment and public health.

The tasks of policy on the sustainable development of urban transport are:

- ensuring full, high-quality satisfaction of goods and passenger transport needs, possibly with simultaneous adoption at State level of efforts aimed at rationalizing and reducing the transport needs of both the public and the urban economy;
- ensuring accelerated (in relation to growth rates of urban transport volumes) development of transport infrastructure in cities (primarily the road network), improving and bringing it to world standards, the development of modern traffic schemes and traffic management control systems for purposes of creating favourable conditions for the development of urban economies, ensuring transport accessibility for all groups of the population and improving transport service quality;
- co-ordination and integration at federal, regional and city level of transport policy with policy on natural resource use and environmental protection, energy policy, policy in the field of public health, town-planning, policy on production, distribution, taxation and customs policies;
- completing the legislative and normative legal base for State regulation of the activity of transport market actors, owners of vehicles (including – personal cars) and allied sectors of the economy so as to reflect in requirements relating to the impact of transport on the environment and public health in the relevant standards, procedures, etc.;
- introduction of administrative and economic instruments designed to promote the manufacture and use in cities of safer and "environmentally clean" transport vehicles, fuels and equipment etc. (in particular, at federal level - mechanisms for certification and licensing, State control instruments, mechanisms of taxation and customs policies; at local (city) level - mechanisms of town-planning policies and policies on local taxes, fare policy, etc.;
- creation of conditions for the priority development of public passenger transport (first of all - in the large and largest cities) with simultaneous adoption of measures aimed at the reasonable restriction of private car traffic in city centres;
- the introduction of compulsory procedures for strategic environmental and health impact assessment of urban transport when preparing decisions and measures (projects) to complete the urban transport network, the development of transport infrastructure and the road network, town-planning projects, etc.;
- creation of conditions for the priority development of multimodal urban transport with the use of electric surface urban transport, underground, high-speed tram, light

metro and other mass passenger transit systems, including suburlan/urban railways and urban river links, development of modern logistic technologies and transport systems that decrease transport costs and improve the efficiency of urban transport use;

- ensuring accessibility of public transport for all categories of the population. The lack of accessible public transport forces people either to change behaviour or satisfy their needs for transport by purchasing and using cars or by changing place of residence (or work). All this is detrimental to the quality of life of the population, not least because it saturates the road network with private cars and overloads existing public transport lines;
- promoting the introduction on urban transport of modern information and telecommunication technologies, satellite navigating systems, etc.;
- carrying out regular surveys on population mobility, urban transport, characteristics of transport flows and their environmental and health impacts.

5.4. Main principles and priorities of the policy on the sustainable development of urban transport

The main **principles** of policy on the sustainable development of urban transport should be:

- **Satisfying and balancing the transport service needs of the city economy and the public**;
  Phased transition to full payment by consumers of transport services of the negative impacts of transport (the "internalization of external costs“ of transport, i.e. inclusion in the price of services of monetary estimates of the negative impacts which are not paid by the consumer now);

- **Ensuring interdepartmental interaction and interaction between governmental authorities at different levels.** The problem of reducing the negative impact of urban transport on the environment and health should not be considered the sole problem of the Ministry of Transport of Russia and regional (local) transport authorities. It should be treated as complex and multifaceted character because it cuts across the interests and decision-making processes of various federal executive government bodies and administrations of the regions of the Russian Federation and institutions of local government. As domestic and foreign experience shows, problems of similar scale and complexity can be solved by developing and implementing long-term national, regional and city target programmes.

- **Full and comprehensive account should be taken of all negative consequences of transport activity (including account of costs) when adopting any administrative decisions on urban transport.** Based on the best available world experience, ensuring the environmental sustainability of urban transport should not be considered as a separate task, it should be introduced into all spheres of decision-making in the transport sector (both at federal, and at regional and city levels), carrying out the necessary estimates and adopting the necessary preventive decisions and measures. It should be remembered that improvements in the environmental sustainability of urban transport in many cases result from increased operating efficiency of the transport system itself (for example, due to the development of logistics, improvements in traffic management, the development of public transport, increased fuel efficiency of vehicles, etc.). On the other hand, the problem of achieving the environmental objectives established by the State, as a rule, fosters the development and implementation of new and more effective

technologies and technical decisions in the transport sector. In turn, this gives a push to technical progress in all allied sectors of the economy and allows the creation of new manufacturing bases and new workplaces.

- **Ranking environmental criteria in the transport sector.** Targets for the reduction of the negative impact of transport on the environment and health should be established by federal executive government bodies responsible for environmental protection and public health on the basis of strategic documents issued by the Government and existing federal target programmes. On the basis of these targets, the Ministry of Transport of Russia should adopt its own targets for each mode of transport and kind of impact for the regions of Russia using them as a basis for developing sectoral programmes for reducing the negative impact of transport activity or for including the necessary blocks of actions in all-transport programmes. Regional targets should become the basis for corresponding regional and local (city) programmes.
- **Ensuring the interaction of various modes of urban transport, development** of multimodal (combined) transport so that the maximum volume of goods and passenger transport switches to the most "safe" modes of transport.
- **Priority of measures to rationalize town-planning and land use policies and develop logistic systems** for the purposes of reducing the transport needs of the urban population and the city economy. The implementation of the principle lies partly outside the sphere of competence of the Ministry of Transport and regional (local) transport authorities and requires relevant actions from bodies of the **Ministry of Industry and Energy of Russia and local authorities**;
- **The interests of society as a whole take priority over the interests of separate sectors of the population and professional groups** (in particular, road hauliers, motorists, etc.);
- **A step-by-step priority ranking approach to environmental problems in ensuring the sustainability of urban transport systems** (problems to be dealt with; beginning with the most significant negative impacts of transport, and with the most congested city territories);
- **Publicising of decisions adopted on the development of the urban road network and urban transport infrastructure,** and on measures and decisions aimed at improving the sustainability of urban transport operation;
- **Compulsory technical-environmental-economic assessments** (so-called "cost - benefits" analysis) of **any measures and decisions which are taken in the field of improving urban transport sustainability.**

The basic priorities of State transport policy as concerns the sustainable development of urban transport for the period to 2010 should be:

- Completion of the legislative and legal basis for urban transport and for protecting the environment from transport impact in order to:
  * establish a legal obligation to take into account all of the negative consequences of transport activity (including in monetary form) when making any administrative decisions connected with the development and functioning of city transport systems at federal, regional and local levels;
  * stricter liability (including - economic) for violating safety requirements (including – environmental safety) for urban transport operation;
  * establish legal bases for full implementation of the "polluter-pays" principle both for urban transport activity as a whole and for private motor vehicles;

    * define the legal bases for the introduction of restrictions on the import and use in the cities of vehicles (including – private cars) and fuels not satisfying certain environmental requirements and for the establishment of access charging in some city areas characterized by a saturated road (street) network and/or adverse environmental conditions, etc;
    * establish a system of environmental requirements for vehicles (new and older), fuels harmonized with existing international requirements;
    * create conditions for reducing the transport needs of urban economies and the urban population and the total volumes of goods and passengers transport (including by private car) by rationalizing land use and town-planning policy and developing transport logistics;
- establishing target norms for the reduction of the negative impacts of urban transport (by component and factor of impact) and monitoring their implementation;
- creation of effective economic instruments (taxes, charges, excises, etc.), to promote environmental protection in the transport industry the manufacture and use of vehicles and fuels with improved environmental performances and the reduction of the transport needs of the population and the economy;
- choice of measures and decisions (administrative, organizational, technical) aimed at restricting and reducing transport impacts on the environment and health based on an analysis of their technical, ecological, and economic efficiency; development of recommendations on the preparation of relevant regional and local programmes;
- introduction of methods for the strategic assessment of environmental and health impact of decisions, programmes and projects in the field of urban transport development;
- preparation and adoption of programmes designed to ensure the sustainable and environmentally safe development of urban transport, monitoring the implementation of these programmes;
- ensuring effective functioning of the system of State control of compliance with environmental and safety requirements in the transport sector (including in cities).

In the short term (to 2008), the basic emphasis should be the following:

- Development of mechanisms to improve the sustainability of urban transport systems operating in the largest cities of Russia;
- Reducing the negative impact of transport on the environment and health in Russia's large and largest cities;
- Improving the environmental and traffic safety of road transport as the main polluter of the city environment and potentially the most dangerous kind of urban transport.

5.5. Priority directions in ensuring the sustainability of urban transport systems for the administrations of Russia's largest cities

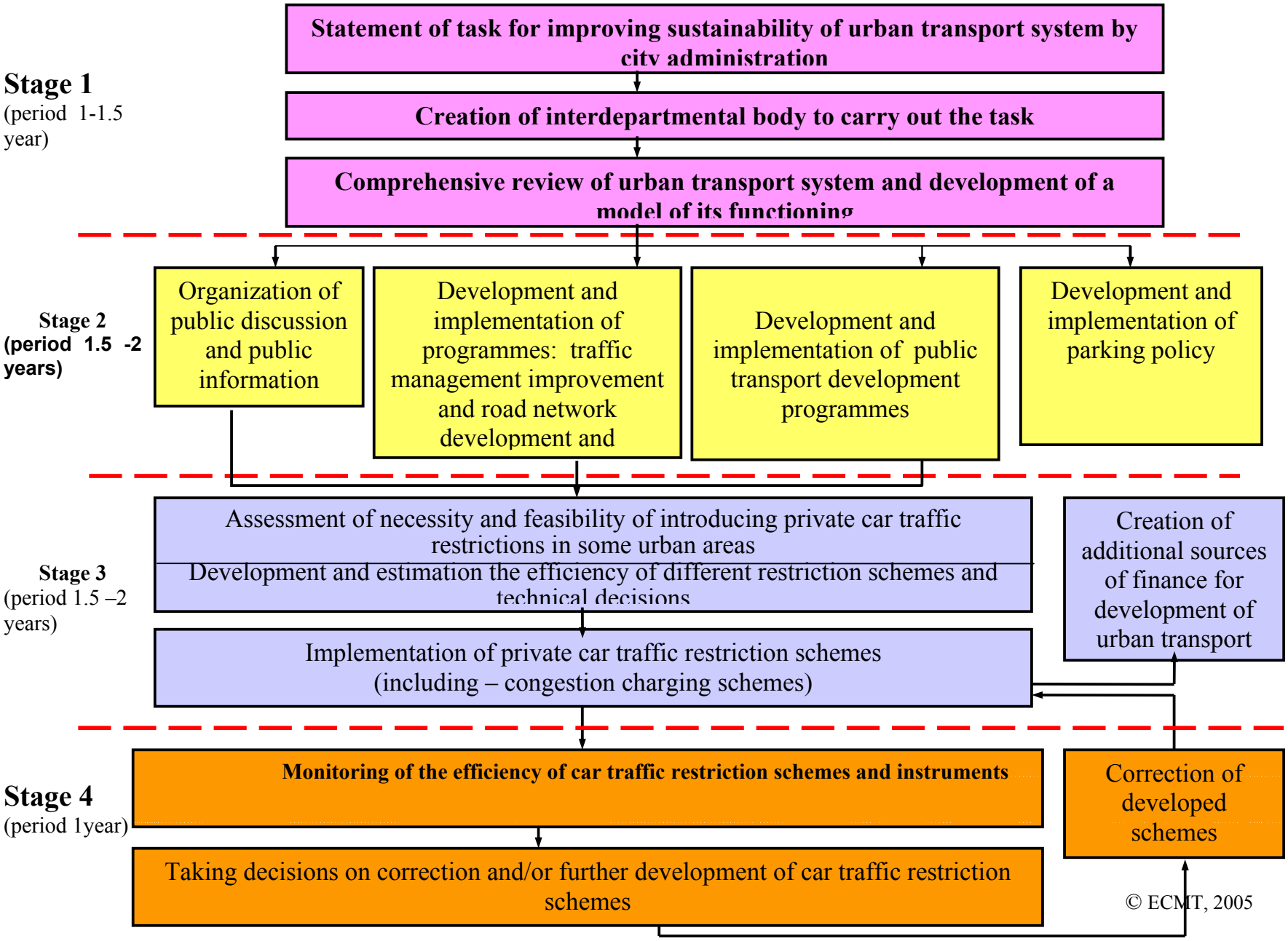
The policy of administrations of the largest cities on the sustainable development of urban transport should include the following basic elements:

- Creation of interdepartmental bodies (commissions, working groups, etc.) for the joint development and implementation of policy on the sustainable development of urban transport, including responsible representatives and experts from the transport sector, environmental protection, town-planning and financial bodies and State sanitary inspection bodies.
- Creation of a system for monitoring the operation of urban transport systems. The organization and implementation of regular (not less than once every 4-6 years) comprehensive reviews of urban transport system operation, including:
  - estimation of traffic volumes on the main road network;
  - mobility surveys of various groups of the population (purpose and number of trips, length, modes of urban transport used;
  - review of public passenger transport;
  - identification of the most congested sections of the urban road network and the major factors limiting its capacity.
- Simulation of the impact of transport on the environment and health using the results of surveys of traffic and passenger flows on the urban road network. Obtaining the necessary forecast estimates.
- Development and implementation of traffic management improvement programmes on the most congested sections of the urban road network providing alternative schemes and decisions for consideration, assessing the expected impact and expenses; programmes for the construction and reconstruction of the urban road network.
- Introduction of schemes and systems for ensuring the priority public passenger surface transport (public transport (PT) priority traffic lanes with physical separation from the main carriageway, introduction of priority traffic lights, creation of "bays" and acceleration lanes for PT traffic stops, etc.)
- Development and introduction of parking policy (legal bases, zoning of city areas, the organization and fit-out of parking lots, introduction of mechanisms for payment collection, stricter penalties for violating parking rules and Traffic Regulations, etc.).
- Development and realization of programmes for urban public passenger transport development and for improving the transport service to the population (development and introduction of standards of transport service quality, optimization of PT route network, introduction of modern transport technologies including multimodal technologies, improving the technical level and environmental safety of PT rolling stock, introduction of control systems and telematics, etc.).
- Development and phased implementation of schemes to restrict private car traffic in separate city areas, including congestion charging schemes in the centre of the largest cities (research and simulation of different car traffic restriction schemes, assessment of their potential impact and consequences, development of legal bases for the introduction of these schemes, development and introduction of technical systems for traffic control and fee collection for entry to selected urban areas.

- Creation and introduction of the legal, administrative and economic instruments promoting:
  a) the renovation of the motor fleet by purchasing and operating vehicles to modern international standards;
  b) the manufacture and delivery to market of motor fuels, to modern international standards;
  c) the use of alternative fuels and new energy sources for urban transport;
  d) further development of systems of urban overground electric passenger transport (trolley-buses, trams, high-speed trams, light metro, monorail) and the underground.
- Wide introduction in urban transport of environmental certification and audit (in accordance with the requirements of ISO standards), introduction of compulsory of strategic assessment of the environmental and health impact of programmes, projects and decisions of executive government bodies in the field of transport and transport planning in urban areas.
- Wide development of public debate on programmes, projects and decisions of executive government bodies in the field of transport and transport planning in urban areas alongside the use of mass media for widely informing the public about the problems of urban transport development and the transport policy of .executive government bodies.

Fig. 34 presents one possible general scheme for organizing activity in the field of ensuring the sustainability of urban transport system operation in the largest Russian cities.

Fig. 34


Statement of task for improving sustainability of urban transport system by city administration
Stage 1
(period 1-1.5 year)
Creation of interdepartmental body to carry out the task
Comprehensive review of urban transport system and development of a model of its functioning
Stage 2
(period 1.5 -2 years)
Organization of public discussion and public information
Development and implementation of programmes: traffic management improvement and road network development and
Development and implementation of public transport development programmes
Development and implementation of parking policy
Stage 3
(period 1.5 –2 years)
Assessment of necessity and feasibility of introducing private car traffic restrictions in some urban areas
Development and estimation the efficiency of different restriction schemes and technical decisions
Implementation of private car traffic restriction schemes (including – congestion charging schemes)
Creation of additional sources of finance for development of urban transport
Stage 4
(period 1year)
Monitoring of the efficiency of car traffic restriction schemes and instruments
Taking decisions on correction and/or further development of car traffic restriction schemes
Correction of developed schemes
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