Prepared by Dr. Ivan Narkevitch

City Case Study on Transport in Minsk (Belarus)

1. Historical and geographical background of the Republic of Belarus and Minsk

The Republic of Belarus is situated in the middle of Europe. In 7-9-th centuries Slavic tribes of Dregvjitchs, Krivichs and Drevlians lived on the territory of Belarus. The first statehoods were Polotsk, Turov and Smolensk principalities. Polotsk is the oldest city mentioned in a chronicle in 862. From 13 to 16 centuries the Belarusian lands were a part of the Grand Duchy of Lithuania stretching from the Baltic to the Black Sea. In 1569 the Grand Duchy of Lithuania united with Kingdom of Poland and formed the Rzecz Pospolita.

After several wars on the Belarusian lands in 17-th century the Rzecz Pospolita was divided three times (in 1772, 1793 and 1795) between Russia, Prussia and Austria. As a result, Belarusian lands were incorporated into the Russian Empire.

After the October revolution of 1917 the Belarusian Soviet Socialist Republic (BSSR) was proclaimed in Smolensk in January 1919 with the capital in Minsk. On 30 December 1922 the BSSR joined the Soviet Union.

During the Second World War the territory of Belarus, and in particular, Minsk were considerably destroyed. The restoration works have been started immediately after the war in 1944.

In 1945 the BSSR has been admitted to the United Nations in recognition of its contribution to the victory in the Second World War.

On 27 July 1990 the BSSR Supreme Council adopted the Declaration on State Sovereignty, which became the constitutional law in August 1991. In September 1991 the BSSR was renamed to the Republic of Belarus. In December 1991, when the heads of States and Governments of Russia, Ukraine and Belarus signed the Act on Denunciation of the Union Treaty of 1922 in Visculy (Belovezhskaya Pushcha), the Republic of Belarus gained its independence.

At present the Republic of Belarus borders the Russian Federation (northeast), Ukraine (south), Poland (west), Latvia and Lithuania (northwest). The total length of the state border is 2,969 km (Belarus facts 2006). Belarus presents one of the main Eurasian lines, offering the shortest communication routes from Russia to countries of Western Europe, as well as a connection between regions of the Baltic and Black Seas.

The territory of Belarus is 207,6 thousand square km (Belarus facts 2006). Belarus is a flat and hilly country; it comprises 21 thousand of rivers and 11 thousand of lakes. Forests occupy about 38% of the Republic's territory. Among mineral resources of Belarus the most important are huge deposits of potassium salts, which are commercially produced and exported to many countries. Peat is the main energy source for household fuel. Oil deposit is insignificant in the country and covers only 5% of country's energy supply.

Population of Belarus is 9,750.3 thousand people as of 01.01.06 ((Belarus facts 2006), 72.4% of which live in urban areas.

Republic of Belarus consists of 6 Regions (Oblasts), 118 administrative districts and the city of Minsk, 111 towns, 97 urban-type settlements and 23,973 rural settlements.

GDP in the Republic of Belarus was 22,889 million US$ which is 2.330 US$ per capita, in 2004. (EPR). In 1990s the growth of GDP varied from 3.4 to 11%. In 2004 GDP increased by 11% and in 2005-by 9.2%. About 60% of GDP are related to exports which defines Belarus as an economically well-developed country.

Minsk is the capital of the Republic of Belarus. For the first time Minsk (the old Menesk) was mentioned in 1067 in the Tale of the Bygone Years. It was created as a fortress of the Polotsk principality and was one of its biggest cities.

At present Minsk is an attractive and modern European city. Its population accounts for 1,765.8 thousand people (about 24% of total population of Belarus). It has a special status of an independent administrative and territorial unit. Minsk occupies the area of 306 km2 and is situated in the middle of Belarus on the river Svisloch. Minsk is also the centre of Minsk Region. There are plenty of green parks, public gardens, wide avenues and streets with beautiful monuments in Minsk. It is a clean and safe city. One cannot see any tramps or beggars in Minsk. Minsk is well illuminated by night. According to recent social statistics 86.2% of responders are satisfied by living conditions in Minsk (the Minsk Times, 21 September 2006).

Minsk and its region are playing an important role in economic growth and innovative development in Belarus. Share of industrial output of the city accounts for 21.3% of the total in Belarus. Around 3,900 industrial enterprises and units are situated in Minsk (Ministry of Foreign Affaires (MFA). The following main industries in Minsk and its suburbs should be listed: tractor and freight automobile production, machine- building, non-ferrous metallurgy, power engineering (five heat and power plants), printing facilities, household appliances, construction materials and sanitary ware, footwear and wool processing industry, pharmaceutical and food enterprises, etc. The city has modern infrastructure and organization.

Minsk region is very attractive for development of tourist activities (Berezinsky Biosphere Reserve, chain of Naroch lakes, including the beautiful Blue Lakes, etc.) These activities require further development of road facilities and infrastructure in Minsk and Minsk region.

Minsk has good economic relations with many European countries. The City's foreign trade was estimated to be 14,452.1 million $US in 2005, including export 4,811.7 and import-9, 640.4 million $US (MFA, Opportunities of Business Cooperation). The main export products include means of **transport**, machinery and equipment, textiles, non-ferrous metals, food, etc. Investments to projects on the construction of residential district in Minsk conducted by Moscow city are $500-600 million (the Minsk Times, 28 September 2006)

In 2005 foreign trade of Belarus was 32.7 billion $US which is 8% of increase over 2004 (Belarus, Ministry of Foreign Affaires, 2006). The Republic of Belarus maintains diplomatic relations with 162 countries in the world.

Transport in Minsk and its problems

Minsk is situated on the strategic European crossroad between East and West and is the most important international road connection between Baltic and Black Sea regions countries. All

European transportation corridors cross Minsk and Belarus: Berlin-Warsaw-Brest-Minsk-Moscow, Baltic States-Minsk-Ukraine. This provides Belarus and Minsk with favorable conditions for the development of road transport and its infrastructure. In addition transport infrastructure of Belarus is transshipment oriented. Minsk, Brest, Baranovichy, Luninets, Zhabinka are the biggest railway junctions in Belarus with transshipping facilities at the border crossings. Container terminals are available in Baranovichy Tsentralnye, Brest Severny and Pinsk.
Pipelines transport is also crossing Belarus.

The public transport in Minsk includes bus, trolleybus, tram and subway connections (Metro). Construction of the Metro has been started in 1997. At present there are three main lines and picturesque metro stations, which are unique works of Belarusian architecture devoted to Belarusian history and culture.

The principal problems in transport use and transport services in Minsk could be summarized as follows:

- Public transport system is not satisfactory: traffic capacity of many roads and streets in Minsk, especially during rush hours is not enough to provide a required flow of transport vehicles, which results in congestions on main roads;

- Road safety requires considerable improvements: there are still numerous accidents occurring in the city;

- Old fleet of private and public transport vehicles: for example, the share of public buses with more than 10 years of age is 52.5%;

- Old fleet problem creates an air pollution problem in the city and outside;

- Equipment used for providing automatic management and control of city traffic, at many points is obsolete (out of date);

- Sharp growth of fleet of private cars results in lessening of public transport users, slowing down public transport's speed, congestions on the roads, reducing road safety and increase of pollutants into atmosphere in the city.

2. Overview of Transport System in Belarus and Minsk and its Impact on the Environment.

Transport use

Transport system in Belarus includes railway, road, air, waterway (river) and pipelines mode of transport. Minsk city's transport is divided into public and private vehicles.
Buses, trolley buses, trams and Metro are used as the means of public transport in Minsk.

Railway transport is used for communications between Minsk and other cities in Belarus as well as with other European countries. It includes passenger and freight transport.

Minsk is one of the biggest and important railway junctions. The main electrified railway is between Brest-Minsk-Moscow which provides passenger and freight train service with 160km/h and 100 km/h accordingly.

In 2004 the railway freight transport turnover was 92.7%, of total turnover of all modes of transport in the Republic of Belarus, it means that 92.7% of freight was carried by rail Grodno and Brest railway junctions provide all transferring facilities and equipment to adapt different track gauges for trains going to Western Europe. There is a large park of containers at these border points.
The Minsk crossing Belarusian Railways jointly with Railways of neighboring countries arrange transportation of goods by container trains from and to Western Europe, Baltic countries, Russia, as well as from and to South Korea, China and Japan maritime ports.

Road transport is the most important mode of transport in Belarus and Minsk.
Road freight:
In 2005 in the Republic of Belarus:

- About 177,000 trucks were in operation;

- About 108,500 (61.3%) trucks are owned by several transport companies of various categories;

- About 68,500(38.7%) trucks were privately owned;

- In 2005 road freight turnover was about 7.0% of total turnover of all modes of transport in the Republic of Belarus, it means that about 7.0% of freight was carried by road;

- Transit road freight traffic from more than 50 states crossing Belarus play important role in its economy.

Freight transportation is carried out mostly by public companies. Privatization of state-owned companies is not promoted. The existing regulations on the import of heavy trucks are unfavorable for private companies which enforces them to suspend their activity (for example, in 2004 by 13%).

Passenger road transport:
-About 4.3 million passengers are served by road transport per day (average);

-About 48,000 runs are made per day;

-There are 38 bus terminals, 110 bus stations, and 115 bus booking offices;

-There are 32 bus companies, 89 mixed transport companies and 9 taxi companies that serve passengers;

-Operational activities of the public transport cover 5,826 itineraries, including 1,435-urban, 3467- commuter and intercity and 81 –international lines.

In 2005 road traffic volumes in Minsk accounted for 1863591 thousand passenger km of which: bus-983704.6 (52.8%), troleybus-750859.6 (40.3%), and tram-129026.8 (6.9%). In

Minsk passenger traffic vehicles fleet includes 1899 buses, 1002 trolleybuses and 159 trams. It should be noted that almost all passenger vehicles used in Minsk are manufactured at national automobile plants: 1017 (53.6%) buses have deen produced by "MAZ" and "AMAZ", all trolleybuses (100%) by "Belcommunmash", "MAZ" and "AMAZ" and 52 (32.7%) trams by "Belcommunmash" (Source: MTC, 2006).

About 90% passengers are carried out by the public transport system: buses/trams/trolley buses owned by the state (national, regional or local authorities or their agencies) and 10% by privately-owned small buses and cars. So far existing financial transport system does not promote the use of private transportation. For example in 2004 operations of private transport companies became more difficult because of stricter permission requirements, the introduction of cash registers and increased import duties for buses.

Inland waterway transport in Belarus is based on navigable rivers: West Dvina, Neman, Berezina, Dniepr, Pripyat and Sozh. Total length of inland waterway is about 2000 km. There are 10 domestic river ports with the facilities for cargo handling. It is used for freight and passenger transportation along the above rivers.
Bug-Pripyat- Dniepr-Black Sea is the international waterway crossing the territory of Belarus.

Air transport is based on three airports in Minsk: two passengers airports (Minsk 1 and Minsk 2) and the cargo airport in Machulishchy. Air fleet includes 14 types of aircraft and 80 airlines connecting of 30 cities of CIS and countries of Europe, America, Asia and Africa, including Austria, Great Britain, Germany, Italy, Cyprus, Latvia, Poland, Sweden, Czech Republic, Ireland, Egypt, and Israel etc. The main air company Belavia provides about 90% of passenger services, including all international airlines. The Belavia cooperates with 48 international air companies on the basis if international agreements and operates the foreign modern aircrafts complying with international safety and environmental requirements/standards.

The Transaviaexport Company is carrying out inland transportation of goods and cargo (inside of Belarus) and to the countries of Europe, America, Asia and Africa.

Pipelines. Belarus is a strategic crossing country for transportation of oil and gas from the Russian Federation to Western countries. Pipeline network covers national pipelines for gas transportation inside the country and international pipelines connecting Belarus with Russia, Ukraine and Poland. The length of natural gas pipeline from Russia to Lithuania, Ukraine and West European countries is 1,700 km. There are 6 compressor plants on the territory of Belarus.
The length of crude oil high capacity pipeline from Russia is more than 3,000 km. This pipeline is called Druzhba and has several connections: Kuibishev-Unecha-Mozyr-Brest; Unecha-Polotsk-Mozyr-Brody-Uzhgorod; Polotsk-Ventspils and Surgut-Polotsk.
In 2005 87.7 million tons of Russian oil was transferred by Druzhba oil pipeline to European countries.

Energy consumption in transport
In 2005 the use of energy by electric railway transport accounts for 441611750 kWh and for 9 months of 2006 –327332030 kWh.

[In 1999 total energy consumption by transport and its infrastructure was 127.0 ktoe. During 2001-2005 energy saving of 3.4 ktoe per year was envisaged (EPR)].

Vehicle technologies

Today Minsk Automobile Plant produces different kinds of trucks, coaches (buses) and special vehicles. Buses (model MAZ) are widely used as means of passenger transport in Minsk and other Belarusian cities and for intercity connection as well as exported to other countries. They are comfortable modern buses.

As mentioned above, at present 1899 buses are used in Minsk for passenger transportation. The proportion of buses meets EURO standards as follows: 52.8% - EURO-0; 18.7% - EURO–1; 19.2% - EURO-2 and 9.3% – EURO-3.

Emission norms and standards for transport vehicles are developed by BELNIT (Transport Scientific and Research Institute) in cooperation with the MNREP and approved by the National Centre for Standardization and Metrology. Maximum allowable concentration (MAC) of pollutants in exhausted gases is used as regulating standards. At present mostly GOST standards, used in the Soviet time are in use.
Table 1 presents comparison data on emission standards in EU countries, WHO guidelines and existing standards in Belarus.

Table 1: Comparison of Maximum Allowable Concentration (MAC) in the air.

Pollutants μg/m3 (24-hour mean)	EECCA	EU	WHO guidelines	Belarus
Sulphur dioxide	50	125	125	200
Nitrogen oxides	40	40 (annual mean)	40 (annual mean)	100
Carbon monoxide	3000	10000 (8-hour mean)	10000 (8-hour mean)	500 3000(8-hour mean)
Bezo(a)pyrene	0.001			0.001
TSP (Total suspended particles)	150			40 (PM10)

Source: UNECE monitoring database, ECE/CEP/AC.10/2006/3

National Environmental Monitoring System comprises 56 monitoring stations, including sanitary and epidemiological service stations. They are located in 16 cities, including Minsk. From 6 to 32 pollutants are monitored by the system*(UNECE monitoring database).*

Assessment and reporting on urban air quality in EECCA region, including Belarus is carried out according to the so-called IZA-5 index (integrated pollution index) which records the exceeding of MACs of five pollutants: TSP, SO2, NOx, CO and formaldehyde. Annual mean concentrations measured for each of these five pollutants are used in calculating the index. The air pollution is considered “Low” if the index is less than 5, “Elevated” the index is 5-6, “High” if it is between 7-13 and “Very High” if it is more than 13 (ECE/CEP/AC.10/2006/3).

In 2005 in Minsk reported IZA index was 3.2 which is less than for other big cities in Belarus, for example: Vitebsk-10.2, Gomel-7.5, Brest-5.2, Grodno-5.0, Mogilev-4.3. The following

pollutants were used for calculation of the IZA index in Minsk: **SO2, NOx, CO,** ammonia and formaldehyde (Ministry of Natural Resources and Environmental Protection).

In addition, in the Table 2 there is recent useful information for annual average concentration and maximum single concentrations occurred for some air pollutants in Minsk compared with the other big cities in 2005.

Table 2: Annual average and maximum single concentrations occurred for selected air pollutants in big cities in Belarus in 2005 (μg/m3):

City	TSP Annual average/ maximum single (μg/m3)	SO2 Annual average/ maximum single (μg/m3)	CO Annual average/ maximum single (μg/m3)	NO2 Annual average/ maximum single (μg/m3)
Minsk	11/387	<1/17	680/7400	40/840
Brest	26/300	1/206	708/4000	27/985
Vitebsk	84/242	<1/18	793/7300	39/476
Gomel	45/1100	5/61	441/6000	21/115
Grodno	40/436	<1/29	1608/8500	35/295
Mogilev	42/387	<1/277	1098/12500	49/592

Source: Ministry of Natural Resources and Environmental Protection, 2006

Considering air quality and concentrations of principal air pollutants in Minsk, the emissions of air pollutants from stationary sources should be also taken into account.
There is the latest data concerning emissions of air pollutants in Minsk by years (total) and by pollutants in 2005 (Table 3 and 4).

Table 3: Total emissions of air pollutants from stationary sources in Minsk-City.

Year	2000	2001	2002	2003	2004	2005
Total air emissions (thousand tones)	34.2	35.8	36.1	35.9	40,0	38.8

Sources: Statistical Yearbook of the Republic of Belarus, 2006

Table 4: Emissions of principal air pollutants from stationary sources in Minsk-City in 2005.

Pollutant	Total	TSP	SO2	CO	NOx as NO2	VOC	Others
Thousand tones	38.8	3.4	2.5	14.2	7.0	5.9	5.8

Sources: Statistical Yearbook of the Republic of Belarus, 2006

Use of different kinds of fuels presented in the Table 5.

Table 5: Share of different fuels used for motor vehicles in Belarus

Fuel	2000	2001	2002	2003	2004
Petrol (thousand liters)	80,917.2	68,012.6	67,107.2	61,678.4	44598.1
Diesel (thousand liters)	130,863.9	124,428.8	133,502.4	152,854.3	124,848.9
Liquefied oil	11,537.5	9,903.7	8,355.5	8,190.8	8,201

gas (thousand liters)					
Compressed natural gas (thousand cubic meters)	104.6	268.0	118.9	225.0	421.4

Sources: Ministry of Transport and Communications, 2006

Table 5 shows that the use of petrol and its share in total fuel consumption is significantly decreased from 2000 to 2004 due to its high price. The consumption of diesel fuel is almost stable. The use of compressed natural gas is increasing. The consumption of liquefied oil gas was also stable during 2002-2004. The policy of the MTC is to save energy and fuels consumed by transport and its services. For example in 8 months of 2006 consumption of energy and fuels was by 6.5% less than in the same period of 2005 (MTC, 2006). In order to save energy and fuels consumed by transport the following measures are being undertaken: reducing of idle runs of road vehicles; increasing of load-carrying capacities of trucks; using gas as a motor fuel; transferring the heating facilities of auto-services to use natural gas instead of coal for heating boilers; replacing old vehicles .

Content of sulphur in the petrol and diesel fuels is presented in Table 6.

Table 6: Content of sulphur in motor fuels

Type of fuel	Petrol АИ-92	Petrol Normal-80	Diesel Л-02-62	Diesel ecological: ДЛЭЧ-0,005-62 ДЛЭЧ-0,035-62	Diesel ДЗп-0,005
% of sulphur	0.05	0.05	0.2	0.005	0.005

Source: MTC, 2006

So, the content of sulphur in motor fuels is low, except normal diesel (0.2% of S) which is also not high for diesel fuels (Table 6). The production, import and use of leaded petrol are banned in the Republic of Belarus from 1997. This solves the most serious environmental problem of air contamination by lead substances, which takes place in the countries still using leaded petrol.

Vehicle numbers

At present the numbers of all vehicles in Belarus is 275 units per 1000 inhabitants. It is all vehicles. The latest information on the number of private passenger cars for 1985-2005 is presented in the table 7 below.

Table 7: Fleet of private passenger cars in the Republic of Belarus
(thousand units)

Year	1985	1990	1995	2000	2001	2002	2003	2004	2005
Private cars	388.5	580.1	905.7	1385.9	1432.2	1515.9	1620.1	1671.3	1733.3

So in 2005 there was about 178 private passenger cars per 1000 inhabitants in the Republic of Belarus. The table clear demonstrates continuing increase in number of private cars in the Republic. The increase from 1995 to 2005 was about 48%.

Since in Belarus there is no car production, majority of private cars, including second-hand cars are imported from Western countries. In some cases they are rather old cars not equipped with catalytic converters. The differentiated tax scale for imported cars depending on their age is imposed on owners: cars up to 3 years, cars between 3 and 14 years and more than 14 years of age. The tax varies from 0.5 to 3 Euro per cubic cm, the highest tax for the oldest cars (after 14 years) is aimed to reduce import of polluting vehicles**.** The new cars are also imposed to high taxes to gain more profit. There are some figures on import of internal combustion engines (such terminology is used by the Ministry of Statistics and Analysis) are presented in Table 8

Table 8: Imports of internal combustion engines to the Republic of Belarus

Year	2000	2004	2005
Internal combustion engines (total, thousand units) of which:	40.8	40.9	43.2
The Russian Federation	35.9	26.5	25.2
Other CIS countries	0.1	-	-
Germany	2.1	9.9	9.6
Other non-CIS countries	2.7	4.5	9.0

Statistical Yearbook of the Republic of Belarus, 2006

As could be seen from the table above, the imports of internal combustion engines (road vehicles) increased by more than 5% in 2005 compared with 2004. During 2004 and 2005 the imports from Russia declined and imports from Germany and other non-CIS countries increased.

As regards EURO standards about 31.5% of used vehicles meet EURO-2 and-3, of which 12.0% meet EURO-3.

The data on road vehicle stock and road traffic volume in 1998-2003 is shown in table 9 and 10.

Table 9: Road vehicle stock and road traffic volumes in 1998-2003

Road transport	1998	1999	2000	2001	2002	2003
-1000 vehicles	1349.5	1422.2	1492.4	1539.5	1,628.1	1740.8
-% change (1997=100)	112.8	118.9	124.7	128.7	136.1	145.5
-per capita (vehicle/100 inh.	7.5	7.1	6.7	6.5	6.1	5.7
Road traffic volumes:	1998	1999	2000	2001	2002	2003
-freight: million ton km	40,180.0	39,830.0	41,214.0	40,037.0	45,665.0	51,306.0
-% change(1997=100)	100.7	99.9	103.3	100.4	114.5	128.6
million passenger km	27,084.0	31,686.0	32,449.0	30,345.0	29,281.0	28,195.0
-% change(1997=100)	107.2	125.4	128.4	120.1	115.9	111.6

Source : Environment Performance Reviews of Belarus (EPRs), 2005

Table 10: Traffic volumes (turnover) by mode in 1998-2005

Traffic volume	1998	1999	2000	2001	2002	2003	2004	2005
Freight: million ton km, of which:	40,180	39,830	41,214	40,037	45,665	51,306	54,531	58,763
Rail	30,636	30,529	31,425	29,727	34,169	38,402	40,331	3,559
Road	9,686	9,232	9,745	10,241	11,40	12,740	13,969	15,055
Air	12	13	18	28	37	34	49	59
Inland water	112	56	26	41	59	160	182	90
Passenger: (million pass. Km) of which:	27,084	31,686	32,449	30,345	29,281	28,195	28,171	24,354
Rail	13,268	16,874	17,722	15,264	14,349	13,308	13,893	10,351
Road	8,752	9,312	9,235	9,493	9,397	9,768	9,382	9,231
Air	729	578	513	546	553	565	674	684
Inland water	2	3	2	2	2	2	2	2

Sources : Environment Performance Reviews of Belarus (EPRs), 2005; MTC, 2006

As could be seen from Table 9, during the last 5 years the volumes of road passenger km has decreased by 13 % in 2003 (28,195.0) compared with 2000 (32,449.0) which is explained by the increase of fleet of private cars. “Road transport” includes passenger private and public cars, buses, trolley buses and trucks. The numbers of public fleet vehicles (buses and cars) have been decreased during 2000-2004 which resulted in a decline ofotal road transport volumes At the same time the numbers of private cars and buses increased. The data collecting system of data for public transport is well-developed, but so far, not for private cars and buses. The data for private cars and buses are calculated on the basis of fuel consumption. At present this system is not effective, as road transport volumes for private cars and buses are not fully taken into account.

The introduction of subway transport (Metro) in Minsk has also significantly contributed to the decline of road surface transportation.

Table 11 presents the dynamic of numbers of vehicles under the Ministry of Transport and Communications (MTC) and its bodies in 200-2004.

Table 11: Numbers of vehicles under the MTC and its bodies in 2000-2004.

Modes of vehicles	2000	2001	2002	2003	2004
Trucks	13,545	11,786	12,085	9,030	7,770
Buses	6,829	6,582	6,593	7,935	6,037
Passenger cars(taxi and service)	2063	1,280	860	1,337	349
Cars of special purposes	677	669	814	704	604
Boats of water fleet transport (total),	1,041	956	938	868	767
Of which: transport fleet	386	368	373	326	313
Total	24,155	21,273	21,290	19,874	15,527

Sources: Ministry of Transport and Communications, 2006

As demonstrated in Table 11 the numbers of total vehicles under auspices of the MTC, meaning the state owned transport has decreased by 36% during 2000-2004. These figures for taxi and service cars present 83% and for trucks (freight transport) - 43%. Such decrease occurred due to increase of private vehicles used in particular, as taxi, servicing cars and freight transport cars.
Table 12 shows the trends in change of numbers of vehicles by age under MTC in 2000-2004.

Table12: Numbers of vehicles by age under MTC (units).

	2000		2001		2002		2003		2004	
Vehicles used from the date of their production:	Trucks	Buses	Trucks	Buses	Trucks	Buses	Trucks	Buses	Trucks	Buses
Up to 3 years inclusive	636	550	377	548	615	590	187	1074	360	1044
From 3 to 5 years inclusive	503	227	629	415	1066	429	381	611	217	409
From 5 до 8 years inclusive	1356	264	593	224	765	384	627	593	651	503
From 8 to 10 years inclusive	3736	1052	1451	432	825	224	477	207	281	145
From 10 to 13 years inclusive	4784	2419	5512	2296	4573	1721	3154	1143	1417	384
More than 13years	2530	2317	3224	2667	4241	3245	4204	4307	4844	3552

Source: Ministry of Transport and Communications, 2006

As could be seen from the Table 12 the majority of vehicles in use are old; for example, in 2004 about 60% of vehicles were of more than 13 years old. This creates air pollution problems, since emissions from old motor vehicles are 50-70% higher compared with vehicles of 3 years of age.

The Ministry makes efforts to replace old vehicles by new ones in order to mitigate overall social and environmental problems caused by transport in Minsk (Table 12). In 2004 about 47% of old motor vehicles were substituted by new ones, in 2001 this replacement was only 14% (Table 12). Such policy is continuing. During 9 months of 2006 the MTC purchased 794 new buses for public passenger transport, including 316 buses are used in rural areas.

Table 13: Dynamic of new vehicles delivered and old vehicles removed from service in 2000-2004 under the MTC

	2000		**2001**		**2002**		**2003**		**2004**	
	Delivered new	Removed old	Delivered new	Removed old	Delivered new	Removed old	Delivered new	Removed old	Delivered new	Removed old
Trucks	103	1387	48	1436	137	1481	72	929	238	860
Buses	182	538	186	530	206	624	451	440	475	630
Service cars	96	70	25	20	27	41	7	46	12	5

Taxi (cars)	166	209	21	130	0	130	1	163	0	118
Special cars	17	30	26	29	65	151	10	50	49	44
Total % of replaced	564 (25%)	2234	306 (14%)	2145	435 (18%)	2427	541 (33%)	1628	774 (47%)	1657

Source: Ministry of Transport and Communications, 2006.

Vehicle impacts

The main environmental problem of transport is air pollution. Exhaust gases of motor vehicles release to the atmosphere about 200 different pollutants, including such toxic substances as carbon monoxide, sulphur dioxide, nitrogen oxides, hydrocarbons, including benzo(a)pyrene ($C_{20}H_{12}$) as well as carbon dioxide (greenhouse gas). Diesel vehicles release less carbon monoxide and hydrocarbons than vehicles using unleaded petrol but they release 25 times more particles (smoke) than vehicles using unleaded petrol**.**

Trends in total emission of pollutants from transport in the Republic of Belarus from 1998 to 2005 are presented in table 14, and emissions by pollutants in 1995-2005 in table 15.

Table 13: Total emissions from mobile transport sources in the Republic of Belarus.

Year	1998	1999	2000	2001	2002	2003	2004	2005
Emissions Th. tons/year	1373.7	1047.0	952.8	926.9	928.0	955.3	944.7	1014.7
% of total air emissions	76.82	73.67	71.05	70.30	71.00	71.98	69.46	71.63

Source: Ministry of Transport and Communications, 2006

Table 15: Air emissions from transport by pollutants

Emissions, thousand tons per year	1995	2000	2003	2005
Carbon monoxide	1,156,6	634.0	637.0	698.7
Nitrogen oxides	140.7	84.5	84.4	94.2
Sulfur dioxide	57.1	36.4	36.2	1.3
VOCs	296.9	171.4	171.4	
Dust	41.1	26.5	27.0	
Carbon dioxide(total in million tons)	65.2	52.4		

Sources: For 1995-2003: Environment Performance Reviews of Belarus, and for 2005: Ministry of Transport and Communications**.**

As could be seen from the above data, transport contributes about 70% of total air pollutants in the Republic. In 2005 amount of air pollution from transport was 1013 thousand tons, which included: carbon monoxide-698.7 thousand tons, sulfur dioxide-1.3 thousand tons, nitrogen oxides-94.2 thousand tons, hydrocarbons-190 thousand tons, dust-29.7 thousand tons, benzo(a)pyrene-812 kg. Ratio of the above pollutants was similar in the previous years.

The total emissions of air pollutants in 2005 decreased by 27% compared with 1998 in spite of the fact that the number of motor vehicles, and in particular private cars has

considerably increased. The main reasons for such a situation are: the ban on the use of leaded petrol (since 1997 leaded petrol is not produced in the country and is not imported); restructuring of the transport sector has resulted in the increase of small and less fuel consuming private cars, trucks and buses used by enterprises, use of natural gas as a fuel and strict state control of exhaust emissions from transport. The policy of restructuring of the transport sector is based on the replacement of old fleet of public and private vehicles by new and less fuel consuming private and public cars, buses and trucks; more use of natural gas as a fuel and enforcement of state control of exhaust emissions from transport. The emissions tests for vehicles are carried out annually and could be also done randomly at the roadside.

As regards greenhouse gases their total emissions from all sources in Belarus, including Minsk is about 55-60 million tons per year in terms of carbon dioxide. Transport sector contributes about 8.3% of total CO2 emissions (Mintrans).

Belarus has ratified the Framework Convention on Climate Change (2000) and Kyoto Protocol (2005). The Government of Belarus annually provides the information on implementation of both legal international agreements, including statistical data on emissions of greenhouse gases. The following activities have been undertaken to fulfill necessary commitments under the Convention and the Protocol to reduce emissions of greenhouse gases in the Republic and Minsk :

- Inventory of total emissions of greenhouse gases: national cadastres of greenhouse gases were prepared for 1990, 1995, 1999, 2000, 2001, 2002, 2003, and 2004 years**;**

- Implementation of technological measures (modification of technological processes releasing greenhouse gases, their removal by absorbtion/adsorbtion and other technological methods) in order to reduce emissions of greenhouse gases, in particular CO2, including transport sector;

- Facilitating the conditions for absorption of greenhouse gases by natural ecosystems such as forest, bogs, wetlands and lakes.

Vehicle costs

Costs of private cars widely vary from 500 to 25,000 (new imported cars, for example Mercedes) $US depending on their model, age and country of origin. Use of private cars is very expensive because of high prices of motor fuels and auto-services. In Belarus, including Minsk not everybody can afford it. In spite of this, people with good income use private cars in the cities to go to work and outside of cities, in particular during weekends. As a general trend, the prices of cars, especially new ones, are increasing.

At present the costs of vehicles used for public transport in Minsk are as follows: buses-1,197,507; trolleybuses-694,621 and trams 467,768 thousand rubles.

Costs of fuels are: petrol АИ - 95 is 1,840 rubles or about 0.84 $US, АИ - 92 is 1600 rubles or 0.74 $US and diesel is also 1600 rubles or about 0.70- 0.74 $US, depending on the type.

Transport fare in Minsk for all modes of public transport (bus, trolleybus, tram and Metro) is 500 rubles or 0.24 $US.

Road safety and accidents

The state of the roads could be considered as good, especially in Minsk where roads/streets are being repaired and renovated.

Road safety is one of the most important priority issues for the Ministry of Internal Affaires and Ministry of Transport and Communications. The 19-th Symposium on National Programme on Road Safety, Concepts and Practice was held on 26-27 October 2006. Experts from other countries also took part in the Symposium.

With the growth of quantity of transport vehicles in the Republic and Minsk the number of road accidents was increasing during the last years.
During the last 10 years more than 18,000 people were killed and more than 70,000 people were injured. (See also diagrams on accidents during 1960-2005 in Annexes - Symposium data).

In 2005 total quantity of accident in the Republic was 7700 and during 9 months of 2006-5572 cases. During 2005, 1673 persons, including 117 in Minsk, were killed and 8047 persons, including 1396 in Minsk, were injured and during 9 months of 2006, 1083 persons, including 71 in Minsk, were killed and 6100 persons, including 1066 in Minsk, were injured (Mintrans).

Damage from to road accidents is many times higher than damage caused by rail transport, fires and other human made disasters. Only in 2005 estimated total economic damage from transport accidents accounts for 300 million $US. Average damage for one person killed in the accidents is 120,000 $US and for one person injured is 900 $US. This has also an enormous moral and demographic impact.

The main accident causes are: alcohol, violation of Driving Road Regulations by pedestrians, speed exceeding by drivers, violation of road crossing in cities, not ad equated skills of drivers.

Measures undertaken to reduce a number of accidents and improve road safety as a whole include the following:

- Minsk belt road was reconstructed and equipped by modern road technique to allow transport traffic traversing Belarus to avoid crossing Minsk;

- New Driving Regulations were introduced by the Decree of the President of the Republic of Belarus on 28.11.2005, No 551;

- Concept on Road Safety was developed and approved by the Council of Ministers (14.06.2006, No.757). According to the Concept it is envisaged to save not less than 500 lives by 2015. The year 2007 is proclaimed as a “Year of Road Traffic Safety in the Republic of Belarus”. Its task is to reduce the number of people killed by 100 persons (-100) during the year;

- Use of computer technologies for accident preparedness and prevention;

- Photo-video registration of road safety violence on national roads, there are 90 registration points in the Republic of Belarus, including a few in Minsk;

- Improvement of the technical state of transport vehicles, road infrastructure and road traffic;

- Improvement of professional skills of drivers (introduction of additional training activities for drivers);

- Public awareness and education related to road safety.

As regards **Noise** in Minsk, measures have been undertaken concerning the air transport. According to the State Programme for the Development of Aviation for the period 2006-2010, the existing fleet of planes is being replaced by new modern planes meeting the European standards on noise and pollution emissions. According to the Decree of the President of 23.04.2003 No 165 on future development of Minsk, it is planned to move all noise-making works of the reparation of aviation, outside of the City as well as to shut down the airport Minsk 1 situated almost in the city boundaries.

Infrastructure and its state

In the Republic total length of the public motor road network is 82,958 km, including 15406 km of National roads. (7.4 km of roads for 1000 inhabitants).
Length of the public transport network in Minsk is: for buses - 2589.4 km; for trolleybuses – 1425,9 km and trams – 194.2km
About 87,5% of roads have solid covers and about 55.3 % have improved covers.
In general there is no congestion on the national motor roads.

In order to reduce air pollution, avoid congestion and improve traffic road safety in Minsk, the Minsk belt road was rehabilitated and reconstructed into modern triple-triple thoroughfare road. There are 29 new bridges and elevated roads, 25 underground and aboveground passages which were installed during reconstruction. For safety reasons all belt road crossings are equipped with signs of road orientation, noise shields and untidazzlings. The road has computer-aided management system which comprises several weather stations, sensors of traffic intensity and truck weighing points.

Operational length of Belarusian railways is 5.5 thousand km that includes passenger and freight transport. According to the Programme on the Development of Belarusian Railways up to 2010 (adopted by the Council of Ministers on 24.06.2006 No 801), a partial replacement of old trains by modern ones is envisaged. The construction of new railways are not foreseen, only rehabilitation and reparation of existing railways.

In order to reduce environmental impact of the railway transport, the Government carries out extensive electrification of railways, resulting in the reduction of release of pollutants in the atmosphere.

At present a project on the electrification of the 9-th Kritskogo corridor: Ocipovichi-Zhlobin is under development. The construction will start in 2007/8. Electrification of railway Molodechno-Gudogai-Vilnius is under discussion with Lithuanian authorities. Project on Increasing of the capacity of electric rail freight traffic between Ocipovichi and Molodechno is under implementation. In Belarus domestic energy resources account for 16% of total energy requirements. There are small resources of hydrocarbons, sufficient resources of wood and wood waste, and peat. At present Belarus imports 84% of total energy requirements: 70-

75% of oil, 95-98% of gas and 20-25 % of electricity (almost all energy resources are imported from the Russian Federation).

According to a National energy programme for the period until 2015, energy policy of Belarus is to secure energy supply by increasing the domestic share from 16 to 25% and diversifying the energy mix. The policy also includes the decrease of energy intensity, in particular in industry which consumes about 60% of electricity.

The use of energy for electrification of railways is one of the priorities of governmental policy. BELENERGO is the state owned concern which includes all power stations and produces almost all electricity in the Republic of Belarus (EPR, 2006).

As regards investment in the transport, the MTC's policy is to increase it, in particular to replace old public vehicles fleet. During 9 months of 2006 transport investment reached 698.8 billion rubles, which is by 27.3% higher than for the same period of 2005. This resulted in renovation of 12.1% of buses used for public passenger transport.

3. Overview of environmental policy in the transport sector in Belarus and Minsk

National transport policy, programmes and plans

National policy for the development and use of transport taking into account environmental issues is introduced in several recently approved strategies, laws, programmes and plans in Belarus, including Minsk.

National Strategy for Sustainable Social and Economic Development of the Republic of Belarus for the period until 2020 was approved by the Council of Ministers in June 2004 (Protocol No 25) and is aiming as the first stage at the further improvement of living standards based on the principles of sustainable development. Following this strategy, the main objective of environmental policy in Belarus, among others, is improving and maintaining environmentally safe living conditions for people in urban and rural areas. This objective includes as the first priority a clean air in big cities and, especially in Minsk, where the majority of urban population lives.

The following Laws of the Republic of Belarus are the legal basis for environmental protection, and in particular for air quality and use of transport:

- On Environmental Protection, last version 17 July 2002, No126-3;
- On Air Protection, with amendments No 59-3, 10 July 1997:
- On Automobile Transport and Freight Traffic, with amendments No 134-3, 24 July 2002;
- On Motor Roads.

Recently a Sectoral (transport) Programme On Environmental Protection for the Period 2006-2010 (STPEP) was developed by the Ministry of Transport and Communications in cooperation with the Ministry of Natural Resources and Environmental Protection.
The main objectives of the Programme are: reducing environmental impact of transport sector, improvement of environmental safety of transport vehicles and services, and maintaining clean environment.

Programme contains concrete measures to be undertaken by transport authorities for its implementation. They, inter alia, cover the following directions: improvement of environmental protection (air, water resources, including reducing contamination of surface and underground water, land and soil, waste treatment and disposal), improvement of existing

system of environmental regulations, norms and standards, providing scientific and technical basis for environmental protection, training of staff involved in environmental protection and providing information concerning environmental protection.

The STPEP includes the following important policy issues:

- Revision and improvement of existing emission standards to adapt them to international requirements and preparation of manual containing environmental norms and standards for transport;
- Reducing adverse impact of transport on the environment includes, inter alia, improvement of fuel quality and use of alternative fuels: liquefied oil gas, methanol and ethanol, gas condensates and rape oil;

- Carrying out an analysis of Belarusian car market in order to impose the restriction on the imports of old cars polluting the environment(step by step). There is also a plan to equip existing cars by catalyzing system and to import more cars possessing such system;

- Reducing emissions from transport includes the use of rape oil as alternative fuel (STPEP);

- Reducing the use of older more polluting cars. According to the Decree of the President of the Republic of Belarus of 24.11.2005, No 547, the taxes on import of old cars which are more than 10 years old were increased by 25%, and for cars of more than 14 years old by three times. It is also an answer to the previous question concerning older more polluting cars;

- Introducing one-way traffic for certain streets and in particular for the narrow ones;
- Creating favorable conditions for the development of public transport and Metro to reduce traffic of private cars, especially during rush hours;
- Restricting traffic of freight vehicles in the centre and some important streets;
- Wider using belt road around Minsk;
- Promoting cycling and walking in the city;
- Promoting the use of old cars. According to the recent practice, old used cars are collected by the enterprise “BELVTORCHERMET”. Plastics and textile parts are separated and the rest is pressed and transferred to the Belarusian metallurgical plant in Zhodino(15-20 km from Minsk).

The programme on Roads of Belarus for the Period 2006-2015 contains national measures for the construction of new and rehabilitation of existing roads to improve traffic safety and fast communications.

4. Conclusions and way forward (recommendations)

Conclusions

Minsk (Belarus) is situated on the strategic European crossroad between West and East. Transport ways (road, rail, air, water and pipelines) crossing Minsk connect Russia with West European countries and with important ports on the Baltic and the Black Seas.

Transport is one of the important and dynamic sectors of Belarusian economy, the contribution of transport to GDP is 9% of total (the second after the industry). Sustainable development of transport, including its sustainable consumption is the main factor of welfare of people and the clean environment.

Therefore, the Government of Belarus, in particular the Ministry of Transport and Communications in cooperation with other Ministries and bodies concerned are carrying out activities aiming at promotion of sustainable development of transport system in the Republic and Minsk, including the reduction of adverse transport impact on the environment (reduction of air pollution, ban of leaded petrol, etc).

Development and sustainable use of transport in the Republic and, particularly, in Minsk is one of the priorities of governmental policy reflected in many national strategies, legislation, policy documents, programmes and plans. A good example of such documents is the Sectoral (transport) Programme on Environmental Protection for the Period 2006-2010 recently developed by the Ministry of Transport and Communications in cooperation with the Ministry of Natural Resources and Environmental Protection. Overall goals of the programme include, inter alia, the reduction and mitigation of environmental impact of the transport sector, improvement of environmental safety of transport vehicles and services, and maintaining the clean environment. Concrete measures set out in the programme are practical tasks for future sustainable development and use of transport.

Certain measures are being carried out for the improvement of infrastructure of all modes of transport, rehabilitation of existing and construction of new roads (new Minsk belt road), regular strict inspections of passenger and freight vehicles, improvement of automobile service, renovation of passenger and freight vehicle fleet, improvement of road safety (Annual Symposia on Road Safety are organized by the Ministry of Internal Affairs and the Ministry of Transport and Communications), etc.

Priority policy issue of MTC is fuel and energy saving in transport and its service network.

In spite of measures undertaken at present, serious problems are still faced in transport and its use in the Republic and Minsk: the rapid growth of private cars results in an increase in the proportion of old cars which don't meet environmental requirements; congestions during rush hours caused by insufficient road traffic capacity and not adequate traffic organization in Minsk; air pollution, in particular from diesel vehicles and old cars; use of outdated emission standards (GOST standards from the Soviet time are still applied); high taxes on the import of new cars and passenger buses from western countries are the main barrier to renewal of private cars fleet and buses used by private companies servicing international passenger transportation; insufficient road safety (numerous accidents occur because of non-adequate road organization, high speed, insufficient skills of drivers, lack of discipline of pedestrians); insufficient number of direction signs and special traffic safety appliances.

Recommendations (way forward)

In order to improve the situation and solve or mitigate the above problems, the Ministry of Transport and Communications in cooperation with Minsk city's authorities, other Ministries, governmental and private bodies involved should:

- Continue to pursue a policy for rational consumption of fuels and energy in transport ant its infrastructure as well as for the use of transport in sustainable manner;

- Further implement existing sectorial programmes and plans, and in particular, the Programme on Environmental Protection for the Period 2006-2010;

- Introduce new and revise existing environmental norms and standards used in transport in accordance with the EU standards and enforcing of existing regular inspections of passenger and freight vehicles to meet European technical and emissions standards;

- Reduce taxes on import of cars and buses from western countries;

- Improve traffic capacity in Minsk during rush hours by better traffic arrangements, for example: to introduce one way traffic on narrow streets and streets of important connections;

- Improve road safety by implementing the following measures:

  - Introduce more traffic of direction signs on the cities roads and outside; in addition, intercity roads with two traffic ways should be equipped with special safety posts having luminescence material and indicating edges (curbs) of roads;

  - Extend and improve training activities for professional and private cars drivers and reinforce requirements for issuing driver's licenses;

  - Launch campaign on public awareness concerning traffic regulations and their application, among population, in particular in Minsk and other big cities.