STATE AND DEVELOPMENT OF THE ENVIRONMENTAL COMPARTMENTS

AIR

WATER

LANDSCAPE

WASTE

NOISE

B1 AIR

B1.1 METEOROLOGY AND CLIMATIC CONDITIONS

Evaluation of meteorological elements in 2006 in Prague's stations

The year 2006 was above average with yearly average **temperature +9.1 °C** measured at the Station Prague - Ruzyně, which showed variation +1.2 °C above the normal temperature range of the period 1961–1990. The highest positive variation from the normal average temperature (+4.9 °C) was recorded in July, following by autumn months +3.4 °C was reached in September, +2.5 °C in October, +3.1 °C in November, and +3.9 °C in December. The highest negative variation from the normal average temperature (–2.9 °C) was recorded in January. The temperatures account as measured during the year was quite rare. The first three months of the year were bellow average temperatures, for the rest of the year were temperature constantly above the average temperatures (except of August). Abnormal temperatures continued till July 2007. July 2006 has been the warmest month ever since the measuring began. The highest daily temperature on the Prague territory of +36.6 °C was recorded at the Station Prague - Karlov on 20th July and the lowest daily temperature of –17.1 °C was measured at the Station Prague - Uhříněves on 5th February. The highest average daily temperature of +28.9 °C was measured at the Station Prague - Karlov on 20th July. The lowest average daily temperature of –14.6 °C was measured at the Station Prague - Kbely on 23rd January. The long-term absolute extreme daily temperature maximums of the Klementinum Series (measured continuously since 1775) were exceeded on 26th March, 16th June, 19th and 20th July, 27th and 29th October and 15th November. Absolute temperature minimum was not exceeded in Klementinum that year, the minimum was exceed on 1st September 1998 at last.

The total rainfall amount in 2006 was within normal at the Prague stations. In months January, September and October the temperature was high below normal. Above normal values were March, April and August. The total rainfall of 463.2 mm was recorded at the Station Prague - Ruzyně. The highest daily rainfall amount of 31.6 mm on the Prague territory was recorded at the Station Prague - Suchdol on 29th June and at the same station the maximum yearly rainfall amount of 552.2 mm. The highest monthly rainfall of 117.6 mm was recorded in Uhříněves in August. The yearly minimum rainfall amount of 396.9 mm recorded the Station Karlov, the monthly minimum rainfall of 4.4 mm was recorded in Libuše in September.

In the year 2006 the yearly **wind speed** average was within the long-term normal average at Prague stations. The most windy month was with average **wind speed** of 4.5 $m.s^{-1}$. Maximum momentary gust of 34.7 $m.s^{-1}$ was recorded at the Station Prague - Karlov on 20th May. The total yearly **sunshine duration** was abnormal, with positive variations recorded in January and July, and negative variations in August. The average yearly **cloud cover** in Prague was within the normal average. The number of days with **storms** (36) occurred at the station Prague - Ruzyně. The **hailstorms** were recorded most frequently (3 times) at the Station Chodov. Sixty-four days with **snow cover** in the first three months at the Station Prague - Ruzyně represents 176 % of the long-term normal average. The maximum snow cover height of 26 cm was measured on 13th March at the Station Prague - Břevnov represents 150 % of the normal. In the fall of the abnormally warm year the snow cover appeared just for one day (29th December).

A detailed account of selected meteorological elements as measured at the Station Prague - Ruzyně, including their comparison with the thirty-year normal 1961–1990, is depicted in graphics bellow. To make the charts easier to understand, the method of ten-day moving average was employed in most cases (incl. the 4 previous, the day of measurement, and 5 subsequent days). The rainfall chart shows cumulative values starting at the beginning of the year. Monthly values are given in Table below.

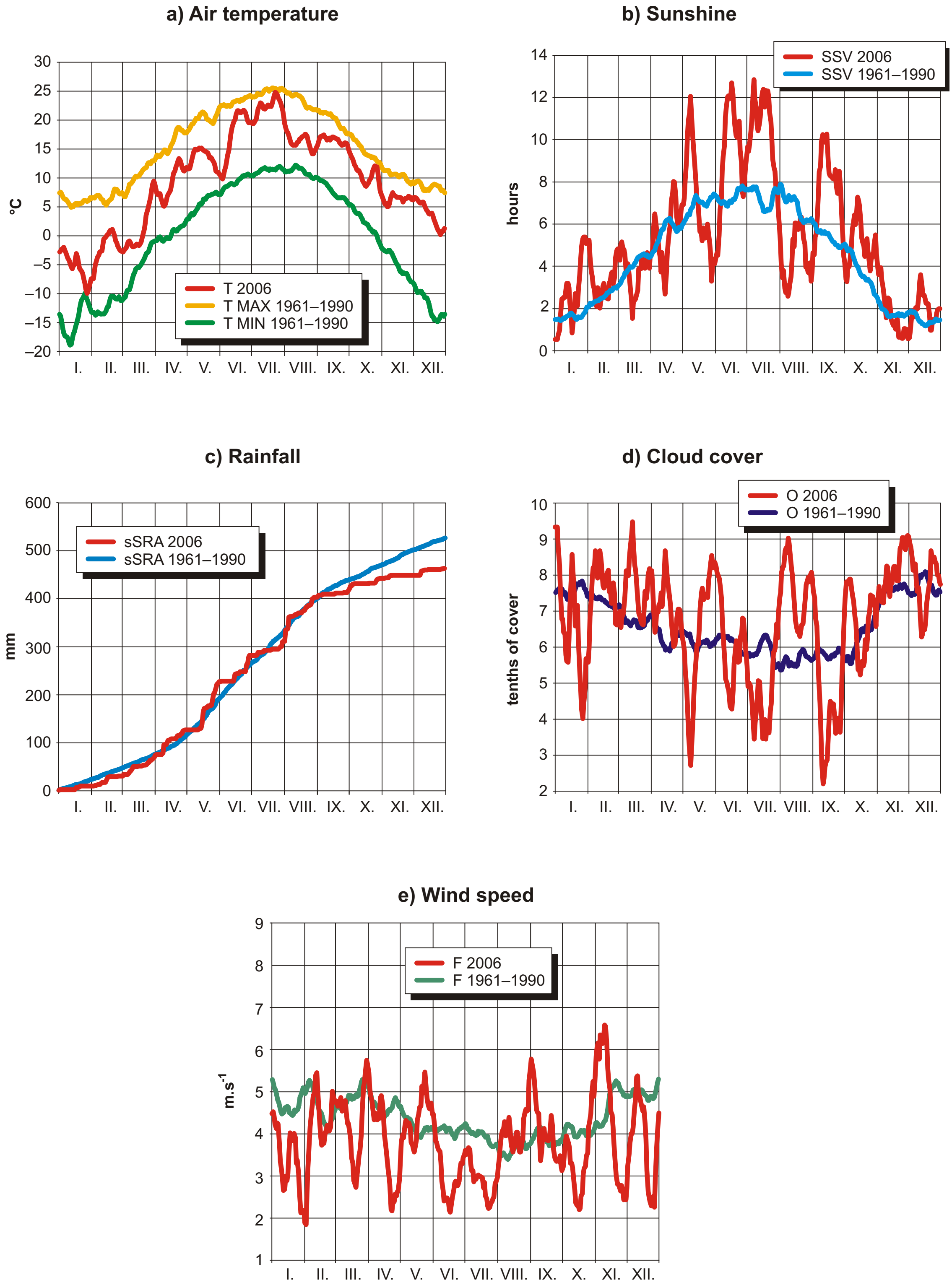
Tab. B1.1.1 Comparison of average monthly values of selected meteorological elements in 2006 with the thirty-year normal average at the Station Prague - Ruzyně

	1	2	3	4	5	6	7	8	9	10	11	12	Year
T 06	–5.3	–2.0	1.2	8.9	13.5	17.7	22.4	15.8	16.7	10.8	6.0	3.3	9.1
T 61–90	–2.4	–0.8	3.0	7.7	12.7	15.9	17.5	17.0	13.3	8.3	2.9	–0.6	7.9
Difference	–2.9	–1.2	–1.8	1.2	0.8	1.8	4.9	–1.2	3.4	2.5	3.1	3.9	1.2
SSV 06	85.7	90.5	115.4	162.6	225.0	273.6	336.6	130.6	243.2	150.7	54.0	60.7	1,928.6
SSV 61–90	50.0	73.6	124.7	167.6	214.0	218.6	226.7	212.3	161.0	120.8	53.6	46.7	1,669.6
% of long-term normal average	171.0	123.0	93.0	97.0	105.0	125.0	148.0	62.0	151.0	125.0	101.0	130.0	116.0
SRA 06	8.3	21.1	37.8	58.3	97.0	58.9	28.7	92.4	10.7	28.5	7.3	14.2	463.2
SRA 61–90	23.6	23.1	28.1	38.2	77.2	72.7	66.2	69.6	40.4	30.5	31.9	25.3	526.6
% of long-term normal average	35.0	92.0	135.0	153.0	126.0	81.0	43.0	133.0	27.0	93.0	23.0	56.0	88.0
O 06	6.6	7.8	7.6	7.3	6.2	6.1	4.5	7.7	4.3	6.9	8.1	7.7	6.7
O 61–90	7.6	7.3	6.8	6.3	6.1	6.1	5.9	5.6	5.9	6.2	7.6	7.7	6.6
% of long-term normal average	87.0	108.0	112.0	116.0	101.0	100.0	77.0	137.0	73.0	112.0	106.0	100.0	102.0
F 06	3.4	4.1	4.4	3.6	4.4	3.0	2.9	4.2	3.9	3.4	4.5	3.9	3.8
F 61–90	4.7	4.6	4.9	4.7	4.2	4.1	3.9	3.6	3.9	4.0	4.8	4.9	4.4
% of long-term normal average	72.0	88.0	89.0	77.0	105.0	73.0	74.0	116.0	100.0	84.0	95.0	79.0	87.0

T average monthly and yearly air temperature [°C]
SSV monthly and yearly sunshine [h]
SRA monthly and yearly total rainfall [mm]
O average monthly and yearly cloud cover in tenths of sky
F average monthly and yearly wind speed [$m.s^{-1}$]

Source: ČHMÚ

Fig. B1.1.1 Daily values of selected meteorological variables in 2006 compared to the thirty-year long-term average at the Station Prague - Ruzyně



a, b, d, e – ten-day moving averages
c – cumulative values

Source: ČHMÚ

B1.2 EMISIONS (AIR POLLUTION SOURCES)

B1.2.1 Categorization of air pollution sources

Sources generating atmospheric pollutants are monitored nation-wide within the so-called Air Pollution Sources Register (the corresponding Czech acronym is REZZO). Sources are classified into respective categories depending on the level of their effects on air quality. Stationary air pollution sources are registered in the databases of REZZO 1–3 the fourth category (REZZO 4) includes mobile sources.

Tab. B1.2.1 Categorisation of air pollution sources

Stationary air pollution sources
REZZO 1 – extremely large and large sources combustion processes with heat-generating capacity above 5 MW and very significant technologies.
REZZO 2 – mid-sized sources combustion processes with heat-generating capacity 0.2–5 MW and significant technologies.
REZZO 3 – small sources combustion processes with heat-generating capacity under 0.2 MW and less significant technologies.
Mobile air pollution sources
REZZO 4 – transportation.

REZZO – Air Pollution Sources Register
Pursuant to Section 13 paragraph 1 of the Act No. 86/2002 Code.

B1.2.2 Stationary air pollution sources

B1.2.2.1 Number of sources

The number of extremely large and large pollution sources (category REZZO 1) is based on data of the Summary Operation Register verified by the Czech Environmental Inspection (ČIŽP). Such emission sources are distributed unevenly across the territory of Prague. The step up increase in the number of sources in between the years 1985 and 1992 was mostly caused by the construction of block heating stations at new Prague housing estates. The increase in the number of sources in 2002 was due to changes to the classification of sources to respective categories according to executive regulations of the Act No. 86/2002 Code, on air pollution control, in which originally mid-sized sources were reclassified to belong to the category of large sources (in the City of Prague these are, first of all, dry cleaning facilities). On the other hand, the decrease in the number of large pollution sources in 1998 to 2001 is a result of the implementation of the largest co-generation project in the whole Europe – the interconnection of heating systems of Mělník and Prague. This system supplies heat to majority of buildings on the right riverbank in the Capital City. The gradual development of the system enabled stand-alone sources and local heating rooms with combustion of heavy oil or coal were decommissioned. In recent years, an important change to more environmentally friendly situation in the Capital City happened mostly in the Jižní Město District where in total 33 block heating stations were connected to the system Mělník - Prague and were retrofitted to heat exchange stations. In the areas of Krč and Modřany where 6 existing gas-fired block boiler units and in the area Lhotka - Libuš were converted into exchange stations and the block boiler unit Modřany was decommissioned (the boiler unit Krč was transferred from year-round operation to the regime of peak consumption support source). In 2004 the heat distribution network of the Invalidovna Boiler Unit was connected top the Mělník - Prague pipeline and the boiler unit was decommissioned. Tin the course of 2005 the area supplied by the boiler units of Horní Počernice 1 a Horní Počernice 3 was also connected to the Prague Heat Supply System.

The number of mid-sized sources (category REZZO 2) is based on data collected by the Department of the Environment of the Prague City Hall (OOP MHMP). The total number of mid-sized air pollution sources has been stagnating in recent years. The highest number of mid-sized sources is located in older buildings in the City centre. A relatively high number of heating stations and heating rooms in the class "Others, including technologies" comprises either technological sources with no fuel combustion (petrol stations, printing houses, painting shops, etc.), either boiler units under reconstruction. Small air pollution sources (category REZZO 3) are not registered individually (only selected types of boiler units).

Tab. B1.2.2 Number of registered air pollution sources in Prague, 1996–2006

Category	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
REZZO 1 – extremely large and large sources, total	249	237	231	221	201	177	237	242	240	246	258
REZZO 2 – mid-sized sources, total	2,753	2,880	2,868	2,923	3,006	3,027	2,866	2,974	3,055	3,098	3,252
Solid fuels	695	500	384	280	202	176	131	117	105	78	62
Liquid fuels	155	127	109	86	81	76	59	50	48	46	45
Gaseous fuels	1,537	1,769	1,931	2,110	2,259	2,291	2,310	2,321	2,406	2,528	2,551
Others incl. technol. sources	366	484	444	447	464	484	366	486	496	446	594

Source: ČHMÚ, ČIŽP, MHMP

B1.2.2.2 Emissions

The quantity of emissions from stationary pollution sources (Categories REZZO 1–3) is nation-wide monitored for fundamental pollutants as follows: particulate matter, sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs – replaced the originally monitored emissions of C_xH_y), ammonia (NH_3), and certain other selected pollutants as heavy metals and persistent organic pollutants. Territorial balances are, as usual, developed only for fundamental pollutants while territorial distribution of NH_3 emissions and VOCs emissions from the solvents usage in small sources and in households can be merely estimated.

The amount of emissions from large and mid-sized pollution sources was determined using the data of the REZZO 1 and REZZO 2 registers. Data on the small pollution sources of REZZO 3 were determined by model calculations employing updated figures from the census carried out in 2001. These data have been continuously updated in co-operation with major fuel and energy suppliers (Prague Gas Utility Company, Prague Energy Utility Company, and Prague Heat Utility Company). The quantity of pollutants emissions furthermore depends on heat consumption and therefore it is influenced by weather conditions in heating periods of respective years. The application of new methodology for the calculations of REZZO 3 sources, employing data from the census 2001, is the reason why small sources emissions demonstrate a relatively significant annual drop in emissions in between 2001 and 2002.

The tables and charts document the **long-term emission reduction** in particulate matter, sulphur dioxide, and nitrogen oxides from stationary sources. This favourable trend results partly from the **decrease in fuel consumption** (higher utilization of heat from the heat supply pipeline Mělník - Prague, heat savings at end consumers, decrease in industrial production output after 1990, etc.), and partly from the **change in fired fuel structure** (replacing solid fuels by gaseous fuels) and efficient operations (reconstruction and modernization of boilers). Furthermore, other important reason is the pressure of economic and legislative measures aimed at the emission reduction from these sources.

In 2006 the largest stationary emission source located on the territory of the City of Prague was the Prague Heat Utility Company – the Malešice Co-Generation Plant. Its dominant share in total emissions has been maintained despite the fact that two low-rank coal boilers were retrofitted to be able to burn a high quality, low-sulphur hard coal in 1997–1999, including the installation of new electric precipitators and a covered fuel stock and so the volume of SO_2 emissions as well as particulate matter emissions were substantially reduced.

Due to high smoke stacks of large emission sources (REZZO 1) their contribution to air pollution is manifested over much larger territory than that of mid-sized sources and small ones, which exert pollution load to their very surroundings. The main share of emissions is accounted, apart from the Radotín Cement Plant and the Malešice Incineration Plant, and several industrial sources generating smaller emission volume, to the plants of the Prague Heat Utility Company.

Tab. B1.2.3 Emissions of selected principal pollutants generated by stationary sources in Prague in the period of 1975–2006 [t.year^{-1}]

Year	Category								
	Large sources			Mid-sized and small sources			Stationary sources total		
	Particulate matter	SO_2	NO_x	Particulate matter	SO_2	NO_x	Particulate matter	SO_2	NO_x
1975	17,920	44,600	11,900	13,500	15,500	3,900	31,420	60,100	15,800
1980	19,152	48,402	15,950	9,481	12,304	1,473	28,633	60,706	17,423
1981	19,200	48,100	16,000	13,700	15,500	4,000	32,900	63,600	20,000
1982	12,956	51,569	14,598	9,481	12,304	1,473	22,437	63,873	16,071
1984	17,669	51,975	16,160	6,699	11,912	2,766	24,368	63,887	18,926
1985	15,009	51,207	16,043	10,123	14,900	3,252	25,132	66,107	19,295
1986	12,136	37,963	13,773	15,293	26,607	5,875	27,429	64,570	19,648
1987	11,876	40,109	15,215	15,598	23,120	4,005	27,474	63,229	19,220
1988	10,673	34,786	13,583	16,164	26,801	5,269	26,837	61,587	18,852
1989	7,804	28,959	12,883	14,463	24,117	3,331	22,267	53,076	16,214
1990	5,862	24,361	8,855	15,149	21,006	7,318	21,011	45,367	16,173
1991	5,571	21,424	9,367	15,038	17,690	2,935	20,609	39,114	12,302
1992	3,776	21,484	9,586	14,690	20,128	3,557	18,466	41,612	13,143
1993	4,086	21,179	7,331	9,229	11,809	2,241	13,314	32,988	9,572
1994	1,870	18,344	5,536	9,422	11,978	2,269	11,292	30,322	7,805
1995	1,723	17,061	5,342	5,571	7,661	2,194	7,294	24,722	7,536
1996	2,402	10,488	3,582	3,830	5,020	1,693	6,233	15,508	5,275
1997	1,165	7,295	3,196	2,513	3,266	1,576	3,678	10,561	4,771
1998	236	3,613	2,312	1,462	2,057	1,406	1,699	5,670	3,718
1999	306	1,897	2,830	1,263	1,694	1,399	1,569	3,591	4,229
2000	182	1,291	2,601	1,242	1,626	1,419	1,424	2,916	4,019
2001	247	1,595	2,814	1,134	1,411	1,284	1,381	3,006	4,098
2002	128	1,223	2,397	536	584	849	663	1,807	3,247
2003	107	1,248	2,163	600	620	920	707	1,868	3,083
2004	195	1,789	2,788	596	707	874	791	2,495	3,662
2005*	130	1,752	2,675	448	682	746	578	2,434	3,421
2006	165	1,695	2,669	431	451	759	596	2,146	3,428

* corrected data

Source: ČHMÚ, ČIŽP, MHMP

Tab. B1.2.4 Emissions of principal pollutants (total amount and share in %) generated by stationery sources, Prague 2006

Category	Particulate matter		SO_2		NO_x		CO		NH_3	
	t.year^{-1}	%	t.year^{-1}	%	t.year^{-1}	%	t.year^{-1}	%	t.year^{-1}	%
Large sources	164.8	27.6	1,694.6	79.0	2,668.9	77.9	652.1	30.5	0.05	0.3
Mid-size sources	224.2	37.6	101.0	4.7	419.2	12.2	278.1	13.0	15.2	99.7
Small sources	207.0	34.7	350.2	16.3	339.9	9.9	1,206.8	56.5	0.0	0.0
Total	596.0	100.0	2,145.8	100.0	3,428.0	100.0	2,137.1	100.0	15.2	100.0

Source: ČHMÚ, ČIŽP, MHMP

Tab. B1.2.5 Comparison of total specific emissions generated by stationery sources, Prague – Czech Republic, 2006

Region	Area	Particulate matter	SO_2	NO_x	CO
	[km^2]	t.year^{-1}.km^{-2}	t.year^{-1}.km^{-2}	t.year^{-1}.km^{-2}	t.year^{-1}.km^{-2}
Prague	496	1.20	4.33	6.91	4.31
Czech Republic	78,864	0.39	2.61	1.94	2.88

Source: ČHMÚ, ČIŽP, MHMP

Tab. B1.2.6 Major large air pollution sources (REZZO 1), Prague 2006

Source	Smoke stack height	Particulate matter	SO_2	NO_x
	m	$t.year^{-1}$	$t.year^{-1}$	$t.year^{-1}$
Prague Heat Utility Company, Malešice	160; 95	67.23	1,579.53	772.28
Czech-Moravian Cement, succession company – Radotín	67; 67; 58 + more	59.50	11.01	1,218.36
Plant 14, Plant for power waste utilization Malešice	177	3.21	1.74	156.02
TEDOM Ltd., co-generation plant at the premises of Daewo - Avia Co.	18; 18; 7 + more	2.92	2.01	51.41
Prague Heat Utility Company, Michle	140	8.98	86.59	40.86
Prague Heat Utility Company, Holešovice	100; 70	0.59	0.28	38.07
Prague Waterworks and Drainage Company – WWTP Bubeneč	20; 7	0.72	2.29	33.70
Prague Heat Utility Company, Veleslavín	77	0.45	0.21	33.61
Prague Heat Utility Company, Juliska	38	0.29	0.14	19.60
MITAS – Production Plant, Prague	63; 5; 3 + more	3.20	0.12	17.84
Prague Airports, g. s.	34; 18; 16 + more	0.22	0.11	16.82
OMNICON Ltd. – Central Military Hospital, Prague	60; 20	0.11	0.05	15.66

Source: ČHMÚ, ČIŽP

B1.2.2.3 Fuel consumption

For the purpose of the comparison of fuel consumption in stationary sources of REZZO 1 and 2 the consumption of fuels in physical units (tonnes, 1,000 m^3) was converted, using appropriate calorific values, to the consumption of heat contained in the fuel (expressed in TJ). There are no input data on small sources of REZZO 3. The development trend of the fuel consumption structure, i.e. increase in gaseous fuel consumption at the expense of solid fuel one, results from the changes in the boilers used. The total heat consumption from fuel in the monitored years was also influenced by various weather conditions, higher efficiency of the natural gas combustion, and by the utilization of heat from the heat supply pipeline Mělník - Prague. The total decrease in fuel consumption has also been influenced by lower energy consumption by end consumers, lower output of production, change in customers' behaviour adequate to the environmental development, social conditions, and so on, both in companies and in households.

In recent years the largest share of the decrease in fuel consumption in stationary sources on the territory of Prague went to the account of the retrofitting and reconnecting of 33 block boiler units at Jižní Město and connecting of Krč (incl. the area of Novodvorská) and 6 block boiler units in the area Lhotka - Libuš and the heating plant Modřany to the heat pipeline Mělník - Prague. The stepwise increase in solid fuel consumption in 1999 is the consequence of the completed retrofitting of boilers of the Heating Plant Malešice. The fluctuating consumption of solid fuels in the last years has been caused by the volume of municipal waste incinerated in the Incineration Plant Malešice and the hard coal consumption of the Heating Plant Malešice.

Tab. B1.2.7 Fuel consumption [TJ]

Category	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Fuel consumption, total	52,190	42,730	37,277	37,864	34,589	37,590	36,808	36,318	36,267	35,670	34,957
REZZO 1 – large sources	36,558	27,251	23,561	24,164	21,675	22,111	21,560	20,079	20,613	19,951	18,910
REZZO 2 – mid-sized sources	10,156	9,308	7,733	7,906	6,693	8,300	8,250	8,219	8,298	8,043	8,416
TN EMĚ Prague	5,477	6,171	5,983	5,794	6,221	7,179	6,997	8,020	7,356	7,676	7,631
Solid fuels	11,399	7,850	5,558	7,592	6,545	7,842	8,262	7,685	8,463	8,181	7,966
REZZO 1 – large sources	8,894	6,343	4,708	7,030	6,188	7,511	7,960	7,350	8,213	8,029	7,809
REZZO 2 – mid-sized sources	2,505	1,506	850	562	357	331	302	335	250	152	156
Liquid fuels	5,664	1,495	1,273	1,319	739	789	569	1,012	418	232	412
REZZO 1 – large sources	5,052	1,076	996	1,073	544	597	407	860	271	95	270
REZZO 2 – mid-sized sources	612	419	277	246	195	192	162	151	147	137	142
Gaseous fuels	29,651	27,214	24,464	23,160	21,084	21,780	20,980	19,602	20,030	19,581	18,948
REZZO 1 – large sources	22,612	19,831	17,858	16,062	14,943	14,003	13,193	11,869	12,129	11,827	10,830
REZZO 2 – mid-sized sources	7,039	7,383	6,606	7,098	6,141	7,777	7,786	7,733	7,901	7,754	8,118

Source: ČHMÚ, IMIP, MHMP

B1.2.3 Mobile air pollution sources (REZZO 4 – transport)

Input data for emission calculations

At present the automotive traffic is the most important source of air pollution on the territory of Prague. The emission balance of automotive traffic has been carried out within the regular updating of the ATEM project **"Model air quality assessment on the territory of the City of Prague"**. The emission calculations for transport are provided for:

- **Line sources** (road sections)
- **Crossroads**
- **Special sources** (public transport system terminals, bus depots, pump stations, and large parkings and garages).

The main air polluting emissions sources are urban roads – the **line sources**. The set of line sources includes all sections, for which data from traffic census are available. In the last period the traffic census was expanded for certain roads and the network of line sources employed for model calculations was added in appropriate manner.

For the calculations of traffic emissions the methodology, developed by the Institute of Chemical Technology, Prague and ATEM – Studio of Ecological Modelling within the Project sponsored by the Ministry of the Environment of the Czech Republic in 2000–2002, was employed, which enables to assess a wide spectrum of inorganic as well as organic compounds or their groups. The emission model MEFA 06, developed on the basis of the methodology, enables, in the emission calculations, to take into account effects of respective factors (type of vehicle, composition of traffic flow, speed, slope, etc.) by means of a system of mutually interrelated equations. The methodology employed was published by the Ministry of the Environment of the Czech Republic as the calculation procedure for the traffic emissions assessment. When carrying out emission calculations the composition of fleet characteristic to the City of Prague was taken into account.

Similarly as in the previous phase the traffic emissions calculations included also increased emissions generated at the **cold start of vehicle engine**. In the travelling on the first approx. 5 km after the vehicle start-up there is increased production of emissions compared to the standard operation thereof. Therefore taking the contribution from cold starts into account is significant in emission assessment and immission load from automotive traffic in cities where automobiles are often used for relatively short trips.

In the previous up date A5 were evaluated the PM_{10} dusty elements from passing cars – **the secondary dust generating from automotive traffic**. Quantity of dust threw up by vehicles was quantified pursuant to philosophy US EPA 10. The methodology sets up quantity of threw up dusty elements from consolidated communication to calculate the relation between the number of passing vehicles and their weight. The US EPA 10 takes into account diverse emissive factors for emitted element individual sized fractions. The methodology has shown out, that the amount of threw up dusty elements expressively increases with vehicles weight. That is evident on roads with high intensity of heavy trucks and lorries. To determinate an average weight in variety of vehicles categories were used data from traffic researches of ŘSD project. The methodology changed in previous period in determination of the very small elements $PM_{2.5}$ and particularly to recommended values of dust capacity on roads. In purpose of making distance maps were PM_{10} emissions also analysed, using the same methodology, in 2003.

On the basis of forementioned input data the calculations on the traffic emission production were carried out for the following pollutants and their groups: **PM_{10}, sulphur dioxide, nitrogen oxides, carbon monoxide, and hydrocarbons**. The emission balance for respective groups of sources (line sources, tunnels, crossroads, and special sources) are summarised in the Figures and Table below.

Tab. B1.2.8 Traffic emissions on the Prague territory [$t.year^{-1}$]

	PM_{10}*	SO_2	NO_x	CO	Hydrocarbons	VOC	Benzene
Passenger cars	1,875.0	84.0	8,758.0	32,548.0	18,086.0	17,059.0	679.0
Light trucks and vans	712.0	8.0	976.0	872.0	166.0	157.0	2.0
Heavy trucks and lorries	5,180.0	19.0	6,677.0	3,696.0	824.0	775.0	12.0
Buses	2,698.0	12.0	1,906.0	1,140.0	315.0	297.0	4.0
Buses	10,465.0	123.0	18,317.0	38,256.0	19,391.0	18,288.0	697.0
Tunnels	25.0	1.0	129.0	270.0	134.0	127.0	5.0
Crossroads	7.0	4.0	295.0	2,481.0	233.0	221.0	6.0
Pump and refuelling stations	1.0	0.2	26.0	37.0	16.0	15.0	0.7
Bus stations and terminals	45.0	0.1	25.0	16.0	5.0	5.0	0.1
Parking areas	46.0	0.4	76.0	237.0	156.0	148.0	6.0
Total	10,589.0	129.0	18,868.0	41,297.0	19,935.0	18,804.0	715.0

* Including the secondary dust generation

Source: ATEM

Tab. B1.2.9 Share of respective source groups on total traffic emissions in Prague [%]

	PM_{10}	SO_2	NO_x	CO	Hydrocarbons	VOC	Benzene
Passenger cars	17.7	65.1	46.4	78.8	90.7	90.7	95.0
Light trucks and vans	6.7	6.2	5.2	2.1	0.8	0.8	0.3
Heavy trucks and lorries	48.9	14.7	35.4	8.9	4.1	4.1	1.7
Buses	25.5	9.3	10.1	2.8	1.6	1.6	0.6
Line sources in total	98.8	95.3	97.1	92.6	97.3	97.3	97.5
Tunnels	0.2	0.8	0.7	0.7	0.7	0.7	0.7
Crossroads	0.1	3.1	1.6	6.0	1.2	1.2	0.8
Pump and refuelling stations	0.0	0.2	0.1	0.1	0.1	0.1	0.1
Bus stations and terminals	0.4	0.1	0.1	0.0	0.0	0.0	0.0
Parking areas	0.4	0.3	0.4	0.6	0.8	0.8	0.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: ATEM

Results of the traffic emission calculations on the territory of Prague present:

- that secondary dust generation has crucial share on total PM_{10} emissions from traffic (over 90 %). Amount of threw up dust increases with passing cars weight, which display fact, that high share on total emissions falls on heavy trucks and buses.
- that automotive traffic produces relatively small part of total sulphur dioxide emissions in Prague (only 129 $t.year^{-1}$). Stationery sources have crucial share on sulphur dioxide emissions.
- that the total amount of nitrogen trioxide emissions produced by automotive traffic is nearly 19 $kt.year^{-1}$. Similarly as in the previous years traffic is the crucial source of NO_x emissions in Prague. Approximately 1/2 share on producing NO_x emission generate passenger cars, heavy trucks and lorries produce 35 % of total emissions.
- that passenger cars are the main producer of carbon monoxide (79 %); this fact is primarily caused by increasing production of CO at the cold start of vehicle engine. Quite relevant portion of CO emissions (over 6 %) is produced on territory of crossings, where impaired drive regimes cause increasing CO emissions.
- that hydrocarbon emissions are in wide spectrum produced by petrol combustion process than by oil, what is represented by large number of passenger cars. Total production of C_xH_y emission from traffic reaches nearly 20 $kt.year^{-1}$, of which volatile organic compounds make nearly 19 $kt.year^{-1}$.

B1.3 IMMISSIONS – AIR QUALITY

B1.3.1 Air quality assessment

The level of air pollution is in objective manner determined by means of monitoring of pollutants concentrations in the ground-level strata of atmosphere within the network of measuring stations. The evaluation of ambient air quality first of all compares the determined immission levels with appropriate immission limit values, or potentially acceptable frequency of exceedances of those limit. The limits should not have been further exceeded since the date as stipulated by the legislation on air pollution control. The fundamental legal regulation regulating air quality assessment is the Act No. 86/2002 Code on air pollution control and amending certain other acts (act on air pollution control), later on amended by Acts No. 521/2002 Code, No. 92/2004 Code, No. 186/2004 Code, No. 695/2004 Code, No. 180/2005 Code and No. 385/2005 Code. Detailed information is specified in the Order of the Government of the Czech Republic No. 597/2006 Code, on the air quality monitoring and evaluation. The Czech legislation fully reflects requirements of the European Union as defined in directives on ambient air quality, that means The Framework Air Directive 96/62/EC on ambient air quality assessment and management, and subsidiary directives 1999/30/EC (for SO_2, NO_2, and NO_x, particulate matter, and lead), 2000/69/EC (for benzene and carbon monoxide), 2002/3/EC (for ozone and its precursors), and 2004/107/EC (for arsenic, cadmium, mercury, nickel, and poly-aromatic hydrocarbons).

This chapter presents air quality assessment in 2006 according to the Czech legislation requirements. The overview of limit values and limits of tolerance for health protection, upper and bottom assessment thresholds pursuant to the Order of the Government are given in Table below.

Tab. B1.3.1 Overview of immission limits values and margin of tolerance, upper and bottom limit values, target immission limits and long-term limits according the Governments' Order

a) limit values for health protection

Immission limit value

Pollutant	Average time	Assessment threshold [μg.m^{-3}]		Immission limit value [μg.m^{-3}]	Margin of tolerance (2006) [μg.m^{-3}]	Date on which LV shall be attained
		Lower LAT	Upper UAT			
SO_2	1 hour	–	–	**350** max. 24 times/year	–	–
	24 hours	**50** max. 3 times/year	**75** max. 3 times/year	**125** max. 3 times/year	–	–
PM_{10}	24 hours	**20** max. 7 times/year	**30** max. 7 times/year	**50** max. 3 times/year	–	–
	calendar year	**10**	**14**	**40**	–	–
NO_2	1 hour	**100** max. 18 times/year	**140** max. 18 times/year	**200** max. 18 times/year	**40**	31st Dec 2009
	calendar year	**26**	**32**	**40**	**8**	31st Dec 2009
Pb	calendar year	**0.25**	**0.35**	**0.5**	–	–
CO	max. daily 8-h moving average	**5,000**	**7,000**	**10,000**	–	–
Benzene	calendar year	**2**	**3.5**	**5**	**4**	31st Dec 2009

For particulates $PM_{2.5}$ the new draft of EU directive sets the limit for annual average 25 μg.m^{-3}.

Target air pollution limit values and long-term target air pollution values

Pollutant	Average time	Assessment threshold [μg.m^{-3}]		Immission limit value [μg.m^{-3}]	Date on which immission limit shall be attained	Long-term immission target
		Lower LAT	Upper UAT			
O_3	max. daily 8-h moving average	–	–	**120, 25 times** in 3-year average	31st Dec 2009	**120**
Cd	calendar year	**0.002**	**0.003**	**0.005**	31st Dec 2012	–
As	calendar year	**0.0024**	**0.0036**	**0.006**	31st Dec 2012	–
Ni	calendar year	**0.010**	**0.014**	**0.020**	31st Dec 2012	–
BaP	calendar year	**0.0004**	**0.0006**	**0.001**	31st Dec 2012	–

b) limit values for ecosystems and vegetations protection

Pollutant	Average time	Assessment threshold [μg.m^{-3}]		Immission limit value [μg.m^{-3}]	Date on which LV shall be attained
		Lower LAT	Upper UAT		
SO_2	year and winter season (1st Oct–31st Mar)	**8**	**12**	**20**	–
NO_x	calendar year	**19.5**	**24**	**30**	–

Pollutant	Time period	Long-term air pollution target [μg.m^{-3}.h]	Long-term target air pollution values to 31st Dec 2009 [μg.m^{-3}.h]
O_3	AOT40, calculated from 1h values in period from May to July	**6,000**	**18,000** 5-year average

Note: AOT40 means sum of differentials between hour concentration higher than 80 [μg.m^{-3}.h] and value 80 [μg.m^{-3}.h] in given period by using only hour-values measured daily between 8:00–20:00 of Central European Time.

B1.3.2 Network of measuring of air quality monitoring

B1.3.2.1 Overview of monitoring stations

The ground-level air pollution assessment is based on the data archived in the ground-level concentrations of pollutants database of the Air Quality Information System of the Czech Republic (ISKO). The Table below gives measuring stations on the territory of the City of Prague, which in 2006 contributed with their measurement data to the immission database of the ISKO. The station registration update, including the update of types of measurements at the registered stations, is carried out every year. The Table also provides the operator, measured quantities, and measuring methods for given stations.

The distribution of air pollution measuring stations on the territory of the City of Prague in 2006 and shares of monitoring organisations are depicted in Figure below.

Tab. B1.3.2 Overview of measuring points in Prague, 2006

District	Measuring point owner	Classification	KMPL Measuring programme	SO_2	NO_2	SPM	PM_{10}	$PM_{2.5}$	NO	NO_X	O_3	CO	VOC	PAU	BTX	TK
Prague 1	nám. Republiky ČHMÚ	T/U/C	AREPA AMS	UVFL	CHLM	–	RADIO	–	CHLM	CHLM	UVABS	IRABS	–	–	GCH-VOC	–
Prague 1	Národní muzeum ZÚ	T/U/RC	AMUZK komb.	–	TLAM	–	GRV	–	–	–	–	IRABS	–	–	–	AAS
Prague 2	Riegrovy sady ČHMÚ	B/U/NR	ARIEA AMS	UVFL	CHLM	–	RADIO	–	CHLM	CHLM	–	–	–	–	–	–
Prague 2	Legerova (hot spot) ČHMÚ	T/U/RC	ALEGA AMS	–	CHLM	–	–	–	CHLM	CHLM	–	IRABS	–	–	GCH-VOC	–
			ALEGM man.	–	–	–	GRV	–	–	–	–	–	–	–	–	–
Prague 4	Braník ČHMÚ	T/U/R	ABRAA AMS	UVFL	CHLM	–	RADIO	–	CHLM	CHLM	–	–	–	–	–	–

District	Measuring point owner	Classifi-cation	KMPL Measuring programme	SO_2	NO_2	SPM	PM_{10}	$PM_{2.5}$	NO	NO_X	O_3	CO	VOC	PAU	BTX	TK
Prague 4	Libuš ČHMÚ	B/S/R	ALIBA AMS	UVFL	CHLM	–	RADIO	RADIO	CHLM	CHLM	UVABS	IRABS	–	–	GCH-PID	–
			ALIBD PD	–	–	–	–	–	–	–	–	–	PD	–	–	–
			ALIBM man.	IC	GUAJA	–	GRV	–	–	–	–	–	–	–	–	–
			ALIBH PAU	–	–	–	–	–	–	–	–	–	–	QUARTZ-PUF	–	–
			ALIBP PAU	–	–	–	–	–	–	–	–	–	–	QUARTZ-PUF	–	–
			ALIBV VOC	–	–	–	–	–	–	–	–	–	GCH-VOC	–	–	–
			ALIB0 TK-PM10	–	–	–	GRV	–	–	–	–	–	–	–	–	ICP-MS
			ALIB5 TK-PM2.5	–	–	–	–	GRV	–	–	–	–	–	–	–	ICP-MS
Prague 5	Mlynářka ČHMÚ	T/U/RC	AMLYA AMS	UVFL	CHLM	–	RADIO	RADIO	CHLM	CHLM	–	IRABS	–	–	–	–
Prague 5	Smíchov ČHMÚ	T/U/RC	ASMIA AMS	UVFL	CHLM	–	RADIO	–	CHLM	CHLM	UVABS	IRABS	–	–	GCH-PID	–
			ASMID PD	–	–	–	–	–	–	–	–	–	PD	–	–	–
			ASMIM man.	–	–	–	GRV	GRV	–	–	–	–	–	–	–	–
			ASMIH PAU	–	–	–	–	–	–	–	–	–	–	QUARTZ-PUF	–	–
			ASMIP PAU	–	–	–	–	–	–	–	–	–	–	QUARTZ-PUF	–	–
Prague 5	Stodůlky ČHMÚ	B/U/R	ASTOA AMS	UVFL	CHLM	–	RADIO	–	CLHM	CLHM	UVABS	–	–	–	–	–
Prague 5	Svornosti ZÚ	T/U/IR	ASVOK komb.	–	TLAM	GRV	GRV	–	–	–	–	IRABS	–	–	–	–
			ASVOT TK-SPM	–	–	–	–	–	–	–	–	–	–	–	–	AAS
			ASVO0 TK-PM10	–	–	–	–	–	–	–	–	–	–	–	–	AAS
Prague 5	Řeporyje ZÚ	B/S/RA	ARERK komb.	–	TLAM	–	GRV	–	–	–	–	IRABS	–	–	–	AAS
Prague 6	Veleslavín ČHMÚ	B/S/R	AVELA AMS	UVFL	CHLM	–	RADIO	–	CHLM	CHLM	UVABS	–	–	–	–	–
Prague 6	Suchdol ČHMÚ	B/S/R	ASUCA AMS	UVFL	CHLM	–	RADIO	–	CHLM	CHLM	UVABS	–	–	–	–	–
Prague 6	Alžírská ZÚ	T/U/R	AALZK komb.	–	TLAM	–	GRV	–	–	–	–	IRABS	–	–	–	AAS
Prague 8	Kobylisy ČHMÚ	B/S/R	AKOBA AMS	UVFL	CHLM	–	RADIO	–	CHLM	CHLM	UVABS	–	–	–	–	–
Prague 8	Karlín ČHMÚ	T/U/C	AKALA AMS	UVFL	CHLM	–	RADIO	RADIO	CHLM	CHLM	–	–	–	–	–	–
Prague 8	Sokolovská ZÚ	T/U/R	ASOKK komb.	–	TLAM	GRV	–	–	–	–	–	IRABS	–	–	–	AAS
Prague 9	Vysočany ČHMÚ	T/U/CR	AVYNA AMS	UVFL	CHLM	–	RADIO	RADIO	CHLM	CHLM	UVABS	IRABS	–	–	–	–
Prague 10	Průmyslová ČHMÚ	I/U/IC	APRUA AMS	UVFL	CHLM	–	RADIO	–	CHLM	CHLM	–	–	–	–	–	–
Prague 10	Vršovice ČHMÚ	T/U/R	AVRSA AMS	UVFL	CHLM	–	RADIO	–	CHLM	CHLM	–	–	–	–	–	–
Prague 10	Šrobárova ZÚ	B/U/RC	ASROK komb.	WGAE	TLAM	–	GRV	–	–	–	–	IRABS	GCH-VOC	GCH-MS	–	AAS
Prague 10	Jasmínová ZÚ	T/U/RI	AJASK komb.	WGAE	TLAM	GRV	–	–	–	–	–	IRABS	–	–	–	AAS
Prague 10	Uhříněves ZÚ	T/S/I	AUHRK komb.	–	TLAM	GRV	–	–	–	–	–	IRABS	–	–	–	AAS

ČHMÚ – Czech Hydrometeorological Institute
ZÚ – National Institute of Public Health
KMPL – Code of the measuring programme at the given locality

Measuring programme
AMS – automated measuring programme
komb. – combined measurement
man. – manual measuring programme
TK – measuring of heavy metals
PAU – measuring of PAHs
PD – passive dosimetry

Overview of measurement methods applied for the pollutant measurements
AAS – atomic absorption spectrometry
CHLM – chemiluminescence
CLM – coulometry
GCH-MS – combined gas chromatography – mass spectroscopy (for PAHs)
GCH-VOC – gas chromatography – volatile org. compounds
GCH-PID – pgas chromatography with flame-ionizing detector
QUARTZ-PUF – QUARTZ+PUF-GCH
GUAJA – spectrophotometry – guajacol (modif. Jakobs-Hochheiser) method
GRV – gravimetry
IC – ion chromatography
ICP-MS – inductively coupled plasma – mass spectrometry
IRABS – IR correl. absorption spectrometry
RADIO – radiometry – beta ray absorption
TLAM – spectrophotometry – triethanolamine method
UVABS – UV absorption
UVFL – UV fluorescence
WGAE – spectrophotometry with TCM and fuchsin (West-Gaeke method)
PD – passive dosimetry

B1.3.2.2 Air quality assessment in Prague based on limit values for human health protection

The assessment is first of all documented in tables giving stations where the highest immission values were detected as required by legislation for the respective pollutants. Shade highlights in the tables shall mean the following:

Exceedance of the margin of tolerance (LV + MT), or of the limit value LV (in cases without the margin of tolerance).
Exceedance of the limit value (LV).
The measured value is below the limit value.

Abbreviations in the tables:

KMPL – code of the measuring programme at the given locality
pLV – number of LV exceedances
pLV + MT – number of LV + MT exceedances
hot spot – measuring location with heavy traffic load placed right at the road pavement

Classification of Stations pursuant to the Exchange of Information/EoI

Type of the station	T – traffic, I – industrial, B – background
Type of the area	U – urban, S – suburban, R – rural
Characteristics of the area	R – residential, C – commercial, I – industrial, A – agricultural, N – natural, RC – residential-commercial, CI – commercial-industrial, IR – industrial-residential, RCI – residential-commercial-industrial, AN – agricultural-natural

This stations' classification is based on the Council Decisions 97/101/EC on exchange of information (EoI) and criteria for the European network of air quality of EUROAIRNET. Requirements following from the Council Decision 97/101/EC are legally binding for the EU Member States. Further information on the classification of stations is given in the Yearbook of the CHMI "Air pollution on the Czech Republic territory in 2006".

Stations marked as traffic hot spot are focused exclusively on traffic and on the following immission load. These stations comply with criteria for the location of sampling facilities focused on traffic pursuant to the Order of the Government of the Czech Republic No. 597/2006 Code about monitoring and data interpretation of the air quality.

Sulphur dioxide

There is a significant improvement in air quality due to the substantial drop in the sulphur dioxide concentration in all Prague stations till 1999. From 2000 to 2002 a moderate decrease in air pollution with sulphur dioxide followed, then in 2003 there was a fluctuation the decreasing trend, which was interrupted in 2006 by slight increase in sulphur dioxide concentration.

In spite of slight increase in 2006 there was no exceedance of any immission limit value established by the new legislation at any of the stations. The highest yearly concentration at the AMSs was recorded at the AMS Prague 6 - Veleslavín (9 $\mu g.m^{-3}$). The highest hourly concentration of SO_2 were measured at the same AMS (99 $\mu g.m^{-3}$). The highest 24-hour concentration were measured at the AMS Prague 6 - Suchdol (62 $\mu g.m^{-3}$). All these maximum values fell deep below the immission limit.

For the sake of clarity there is Table of yearly average SO_2 concentrations of included here below.

Tab. B1.3.3 Stations with the highest values of the 25th and maximum hourly concentration of SO_2

KMPL	Locality	Classification	Measuring method	pLV	Max. hourly concentration [$\mu g.m^{-3}$]	25th highest hourly concentration [$\mu g.m^{-3}$]
AVELA	Prague 6 - Veleslavín	B/S/R	UVFL	0	99.3	50.9
APRUA	Prague 10 - Průmyslová	I/U/IC	UVFL	0	96.7	54.9
AMLYA	Prague 5 - Mlynářka	T/U/RC	UVFL	0	94.0	42.6
AVRSA	Prague 10 - Vršovice	T/U/R	UVFL	0	90.3	51.9
ASUCA	Prague 6 - Suchdol	B/S/R	UVFL	0	88.1	58.3
ARIEA	Prague 2 - Riegrovy sady	B/U/NR	UVFL	0	86.0	54.1
ABRAA	Prague 4 - Braník	T/U/R	UVFL	0	85.2	41.0
AKOBA	Prague 8 - Kobylisy	B/S/R	UVFL	0	76.7	47.1
AREPA	*Prague 1 - nám. Republiky*	*T/U/C*	*UVFL*	*0*	*74.8*	*44.2*
ASMIA	Prague 5 - Smíchov	T/U/RC	UVFL	0	73.0	48.7
AKALA	Prague 8 - Karlín	T/U/C	UVFL	0	72.7	39.7
AVYNA	Prague 9 - Vysočany	T/U/CR	UVFL	0	70.8	41.3
ALIBA	Prague 4 - Libuš	B/S/R	UVFL	0	57.5	39.1
ASTOA	Prague 5 - Stodůlky	B/U/R	UVFL	0	56.7	46.1

In italics: Insufficient number of measurements for the requirement of the minimum data collection (AREPA). Source: ČHMÚ

Tab. B1.3.4 Stations with the highest number of exceedances of the 24-hour immission limit of SO_2

KMPL	Locality	Classification	Measuring method	pLV	Max. 24-hour concentration [μg.m^{-3}]	4th highest 24-hour concentration [μg.m^{-3}]
ASUCA	Prague 6 - Suchdol	B/S/R	UVFL	0	61.7	45.7
AVELA	Prague 6 - Veleslavín	B/S/R	UVFL	0	46.0	37.2
AKOBA	Prague 8 - Kobylisy	B/S/R	UVFL	0	44.5	35.9
ARIEA	Prague 2 - Riegrovy sady	B/U/NR	UVFL	0	43.7	37.8
AVRSA	Prague 10 - Vršovice	T/U/R	UVFL	0	42.7	36.4
ASTOA	Prague 5 - Stodůlky	B/U/R	UVFL	0	41.0	35.8
APRUA	Prague 10 - Průmyslová	I/U/IC	UVFL	0	40.8	32.8
ASMIA	Prague 5 - Smíchov	T/U/RC	UVFL	0	38.0	34.9
AVYNA	Prague 9 - Vysočany	T/U/CR	UVFL	0	35.7	27.3
AREPA	*Prague 1 - nám. Republiky*	*T/U/C*	*UVFL*	*0*	*34.5*	*32.2*
ABRAA	Prague 4 - Braník	T/U/R	UVFL	0	34.2	27.0
ALIBA	Prague 4 - Libuš	B/S/R	UVFL	0	33.8	30.2
AKALA	Prague 8 - Karlín	T/U/C	UVFL	0	32.1	29.5
AMLYA	Prague 5 - Mlynářka	T/U/RC	UVFL	0	31.6	25.0
ASROK	*Prague 10 - Šrobárova*	*B/U/RC*	*WGAE*	*0*	*16.0*	*11.0*
AJASK	Prague 10 - Jasmínová	T/U/RI	WGAE	0	6.0	5.0

In italics: Insufficient number of measurements for the requirement of the minimum data collection (AREPA, ASROK).

Source: ČHMÚ

Tab. B1.3.5 Stations with the highest values of annual average concentration of SO_2

KMPL	Locality	Classification	Measuring method	Yearly concentration [μg.m^{-3}]
AVELA	Prague 6 - Veleslavín	B/S/R	UVFL	9.2
ASTOA	Prague 5 - Stodůlky	B/U/R	UVFL	8.7
ASUCA	Prague 6 - Suchdol	B/S/R	UVFL	8.5
AKOBA	Prague 8 - Kobylisy	B/S/R	UVFL	7.8
AVRSA	Prague 10 - Vršovice	T/U/R	UVFL	7.5
APRUA	Prague 10 - Průmyslová	I/U/IC	UVFL	7.0
ALIBA	Prague 4 - Libuš	B/S/R	UVFL	6.5
ARIEA	Prague 2 - Riegrovy sady	B/U/NR	UVFL	6.4
ASMIA	Prague 5 - Smíchov	T/U/RC	UVFL	6.2
AVYNA	Prague 9 - Vysočany	T/U/CR	UVFL	5.5
AMLYA	Prague 5 - Mlynářka	T/U/RC	UVFL	5.4
ABRAA	Prague 4 - Braník	T/U/R	UVFL	4.9
AKALA	Prague 8 - Karlín	T/U/C	UVFL	4.6
AJASK	Prague 10 - Jasmínová	T/U/RI	WGAE	2.4

Source: ČHMÚ

Suspended particulate matter, fractions PM_{10} and $PM_{2.5}$

Particulate matters included in the ambient air can be divided on primary and secondary. Primary particulate matters are emitted right into atmosphere, no matter what from natural or anthropogenic sources. Secondary particulate matters are mainly anthropogenic in origin and they rise from oxidation and further from gaseous substances reactions in atmosphere. Among the main anthropogenic sources are: transport, power stations, combustion sources (industry and households), fugitive emissions from industry, loading and unloading goods, mining and building. Suspended particulate matters are, in consequence of variety of emission sources, of different chemical structure and different size. PM_{10}'s have significant negative impact on human health. Even more negative impact are correlated with $PM_{2.5}$ soft fraction, that was monitored at five station in Prague in 2006.

Till 1999 there is a significant improvement in air quality due to the substantial drop in the suspended particulate matters concentration similar to sulphur dioxide process. After 2000 the development was stopped and a gradually increasing tendency, that was proven again in 2005 and was testified in 2006. Air pollution with suspended particulate matter, fraction PM_{10} has remained one of the major issues of the providing for air quality pursuant to requirements and dates of the new legislation.

In 2006 the immission limit value of the 24-hour concentration of PM_{10} was exceeded over 35 times at all of fifteen Czech Hydrometeorological Institute stations in Prague and at two stations of National Institute of Public Health in Prague.

The yearly immission limit of PM_{10} was exceeded at the AMS Prague 2 - Legerova (61 µg.m^{-3}), Prague 9 - Vysočany (42 µg.m^{-3}), Prague 8 - Karlín (41 µg.m^{-3}) and Prague 5 - Smíchov (40,3 µg.m^{-3}). Prague 5 - Mlynářka (38 µg.m^{-3}), Prague 10 - Vršovice (38 µg.m^{-3}), Prague 6 - Veleslavín (37 µg.m^{-3}) and Prague 10 - Street Průmyslová (37 µg.m^{-3}) were also close below the limit value.

The highest number of exceedances of 24-h immission limit of 50 µg.m^{-3} (164 times) was monitored at hot spot station Prague 2 - Legerova. The second highest number of exceedances (95 times) declared the AMS Prague 8 - Karlín.

For the year 2006 there is table of stations with highest values of yearly average concentration of suspended particulate matters, the fine fraction $PM_{2.5}$. The exceedance of the proposed immission limit of the yearly average concentration of 25 µg.m^{-3} was registered at the AMS Prague 9 - Vysočany and Prague 5 - Smíchov.

Tab. B1.3.6 Stations with the highest number of exceedances of the 24-hour immission limit of PM_{10}

KMPL	Locality	Classification	Measuring method	pLV	Max. 24-hour concentration [µg.m^{-3}]	36th highest 24-hour concentration [µg.m^{-3}]
ALEGM	Prague 2 - Legerova (hot spot)	T/U/RC	GRV	164	448.0	100.0
AKALA	Prague 8 - Karlín	T/U/C	RADIO	95	210.0	76.0
AVYNA	Prague 9 - Vysočany	T/U/CR	RADIO	82	292.5	70.3
ARERK	Prague 5 - Řeporyje	B/S/RA	GRV	73	229.0	65.0
ASMIA	Prague 5 - Smíchov	T/U/RC	RADIO	69	218.5	62.0
APRUA	Prague 10 - Průmyslová	I/U/IC	RADIO	69	189.8	60.9
AMLYA	Prague 5 - Mlynářka	T/U/RC	RADIO	67	219.3	62.8
ASVOK	*Prague 5 - Svornosti*	*T/U/IR*	*GRV*	*66*	*131.0*	*62.0*
AVRSA	Prague 10 - Vršovice	T/U/R	RADIO	65	158.0	61.4
AVELA	Prague 6 - Veleslavín	B/S/R	RADIO	50	257.6	60.6
ALIBA	Prague 4 - Libuš	B/S/R	RADIO	49	220.7	55.3
ASUCA	Prague 6 - Suchdol	B/S/R	RADIO	48	223.5	54.5
ABRAA	Prague 4 - Braník	T/U/R	RADIO	47	196.8	56.0
ARIEA	Prague 2 - Riegrovy sady	B/U/NR	RADIO	39	215.5	54.7
AREPA	*Prague 1 - nám. Republiky*	*T/U/C*	*RADIO*	*39*	*195.3*	*52.8*
AKOBA	Prague 8 - Kobylisy	B/S/R	RADIO	36	173.9	50.2
ASTOA	Prague 5 - Stodůlky	B/U/R	RADIO	36	168.7	50.4
AMUZK	Prague 1 - Národní muzeum	T/U/RC	GRV	30	178.0	47.0
AALZK	*Prague 6 - Alžírská*	*T/U/R*	*GRV*	*20*	*155.0*	*41.0*
ASROK	*Prague 10 - Šrobárova*	*B/U/RC*	*GRV*	*15*	*81.0*	*35.0*

In italics: Insufficient number of measurements for the requirement of the minimum data collection (ASVOK, AREPA, AALZK, ASROK).

Source: ČHMÚ

Tab. B1.3.7 Stations with the highest values of the yearly average concentration of PM_{10}

KMPL	Locality	Classification	Measuring method	Yearly concentration [µg.m^{-3}]
ALEGM	Prague 2 - Legerova (hot spot)	T/U/RC	GRV	61.1
AVYNA	Prague 9 - Vysočany	T/U/CR	RADIO	41.9
AKALA	Prague 8 - Karlín	T/U/C	RADIO	40.6
ASMIA	Prague 5 - Smíchov	T/U/RC	RADIO	40.3
AMLYA	Prague 5 - Mlynářka	T/U/RC	RADIO	37.7
AVRSA	Prague 10 - Vršovice	T/U/R	RADIO	37.6
AVELA	Prague 6 - Veleslavín	B/S/R	RADIO	37.4
APRUA	Prague 10 - Průmyslová	I/U/IC	RADIO	37.2
ARERK	Prague 5 - Řeporyje	B/S/RA	GRV	35.5
ASUCA	Prague 6 - Suchdol	B/S/R	RADIO	33.4
AMUZK	Prague 1 - Národní muzeum	T/U/RC	GRV	33.3
ARIEA	Prague 2 - Riegrovy sady	B/U/NR	RADIO	33.2
ALIBA	Prague 4 - Libuš	B/S/R	RADIO	32.9
ABRAA	Prague 4 - Braník	T/U/R	RADIO	32.9
AKOBA	Prague 8 - Kobylisy	B/S/R	RADIO	32.4
ASTOA	Prague 5 - Stodůlky	B/U/R	RADIO	29.2

Source: ČHMÚ

Tab. B1.3.8 Stations with the highest values of the yearly average concentration of $PM_{2.5}$

KMPL	Locality	Classification	Measuring method	Yearly concentration [µg.m^{-3}]
AVYNA	Prague 9 - Vysočany	T/U/CR	RADIO	28.3
ASMIM	Prague 5 - Smíchov	T/U/RC	GRV	27.2
AMLYA	Prague 5 - Mlynářka	T/U/RC	RADIO	21.9
AKALA	Prague 8 - Karlín	T/U/C	RADIO	18.5

Source: ČHMÚ

Nitrogen dioxide

While monitoring and classification of the ambient air quality we mean mixture of nitrogen monoxide and nitrogen dioxide under the NO_X term. Imission limit value for human health protection is determined for nitrogen dioxide.

More than 90 % of total amount of NO_X in the ambient air is consisted of nitrogen monoxide. NO_2 turns up relatively fast in reaction NO with ground-level ozone or radicals of HO_2 or RO_2 type. In consequence of several chemical reactions, part of NO_X turns up to HNO_3/NO_3^-, that are removed from atmosphere by atmospheric deposition (both wet and dry). The interes tis paid to NO_2 thanks to its impact on human health. It also has a big deal in producing photochemical oxidants.

Sources of NO_X emission are particularly anthropogenic combustion processes. NO forms in reaction between nitrogen and oxide in combusting air and partly in nitrogen oxidation from fuel. The main anthropogenic sources represent: road transport (but air transport and water transport also represent significant part) following by combustion processes in stationery sources. Less than 10 % of total number of NO_X emission is formed directly as NO_2 in combustion processes.

At majority of stations was the visible desceding trend till 2000 and, on the contrary, a slightly increasing trend after this year. In 2003 a more pronounced increase in the nitrogen dioxide concentration occured in Prague. After a moderate drop in 2004 this pollution concentration increased in year after. The increasing trend continued at majority of localities in 2006.

The yearly immission limit value of nitrogen dioxide was mostly exceeded at localities of intensive traffic burden. Out of the total number of seventeen stations, where the valid yearly average was attained in 2006, the yearly immission limit value of, including the margin of tolerance, (48 µg.m^{-3}) was exceeded at three stations as follows: Legerova in Prague 2 (74 µg.m^{-3}), Svornosti in Prague 5 (73 µg.m^{-3}) and Sokolovská in Prague 8 (60 µg.m^{-3}).

The AMS Legerova revealed in 2006 very high number of exceedances of the hourly immission limit of the nitrogen dioxide concentration – 126 times. However in 2006 there were not exceeded the hourly immission limit value of nitrogen dioxide with the margin of tolerance (240 µg.m^{-3}). Results obtained in measurements at this station produce evidence of the great trouble of the City of Prague caused by traffic taken through its downtown.

Tab. B1.3.9 Stations with the highest values of the 19th and the maximum hourly concentration of NO_2

KMPL	Locality	Classification	Measuring method	pLV	pLV + MT	Max. hourly concentration [µg.m^{-3}]	19th highest hourly concentration [µg.m^{-3}]
ALEGA	Prague 2 - Legerova (hot spot)	T/U/RC	CHLM	126	8	272.2	228.4
AVYNA	Prague 9 - Vysočany	T/U/CR	CHLM	3	0	220.7	144.4
AREPA	*Prague 1 - nám. Republiky*	*T/U/C*	*CHLM*	*1*	*0*	*202.4*	*134.3*
AVRSA	Prague 10 - Vršovice	T/U/R	CHLM	1	0	237.8	132.4
ASUCA	Prague 6 - Suchdol	B/S/R	CHLM	0	0	132.0	115.0
AKOBA	Prague 8 - Kobylisy	B/S/R	CHLM	0	0	139.1	121.3
ABRAA	Prague 4 - Braník	T/U/R	CHLM	0	0	143.1	121.1
ARIEA	Prague 2 - Riegrovy sady	B/U/NR	CHLM	0	0	143.3	118.8
ALIBA	Prague 4 - Libuš	B/S/R	CHLM	0	0	143.5	108.5
AVELA	Prague 6 - Veleslavín	B/S/R	CHLM	0	0	144.0	123.4
ASTOA	Prague 5 - Stodůlky	B/U/R	CHLM	0	0	145.4	120.9
AKALA	Prague 8 - Karlín	T/U/C	CHLM	0	0	165.8	117.3
AMLYA	Prague 5 - Mlynářka	T/U/RC	CHLM	0	0	169.9	126.6
ASMIA	Prague 5 - Smíchov	T/U/RC	CHLM	0	0	176.6	141.0

In italics: Insufficient number of measurements for the requirement of the minimum data collection (AREPA). Source: ČHMÚ

Tab. B1.3.10 Stations with the highest values of the yearly average concentration of NO_2

KMPL	Locality	Classification	Measuring method	Yearly concentration [μg.m^{-3}]
ALEGA	Prague 2 - Legerova (hot spot)	T/U/RC	CHLM	74.3
ASVOK	Prague 5 - Svornosti	T/U/IR	TLAM	73.3
ASOKK	Prague 8 - Sokolovská	T/U/R	TLAM	59.8
ASMIA	Prague 5 - Smíchov	T/U/RC	CHLM	47.2
AVYNA	Prague 9 - Vysočany	T/U/CR	CHLM	43.5
AKALA	Prague 8 - Karlín	T/U/C	CHLM	41.4
AVRSA	Prague 10 - Vršovice	T/U/R	CHLM	40.9
ABRAA	Prague 4 - Braník	T/U/R	CHLM	40.6
ARERK	Prague 5 - Řeporyje	B/S/RA	TLAM	39.8
AMLYA	Prague 5 - Mlynářka	T/U/RC	CHLM	39.3
APRUA	Prague 10 - Průmyslová	I/U/IC	CHLM	38.0
ARIEA	Prague 2 - Riegrovy sady	B/U/NR	CHLM	34.8
AVELA	Prague 6 - Veleslavín	B/S/R	CHLM	31.9
ASTOA	Prague 5 - Stodůlky	B/U/R	CHLM	29.2
AKOBA	Prague 8 - Kobylisy	B/S/R	CHLM	29.1
ASUCA	Prague 6 - Suchdol	B/S/R	CHLM	27.2
ALIBA	Prague 4 - Libuš	B/S/R	CHLM	26.3

Source: ČHMÚ

Lead

In 2006 the lead concentrations were monitored in total at 9 stations in Prague. The descending trend in air pollution with this pollutant had been seen for almost ten years in Prague, however 6 localities registered slight increase in 2006 (from 0.6 to 4 ng.m^{-3}).

In the past the source of lead pollution in air was mainly transport – the use of leaded petrol. Other source, which has not been represented in Prague at a significant level, is high-temperature processes, first of all, the fossil fuel combustion and non-ferrous metal smelting.

The established immission limit value was not exceeded at any of 9 localities in 2006. The highest concentration was, the same way as in previous years, measured at the Station Prague 8 - Sokolovská (28.7 ng.m^{-3}), yet even this value is deep below air quality assessment limits.

Tab. B1.3.11 Stations with the highest values of the yearly average concentration of lead in ambient air

KMPL	Locality	Classification	Measuring method	Yearly concentration [ng.m^{-3}]
ASOKK	Prague 8 - Sokolovská	T/U/R	AAS	28.7
ARERK	Prague 5 - Řeporyje	B/S/RA	AAS	23.6
AMUZK	Prague 1 - Národní muzeum	T/U/RC	AAS	16.4
ASVO0	Prague 5 - Svornosti	T/U/IR	AAS	16.2
AJASK	Prague 10 - Jasmínová	T/U/RI	AAS	14.8
AUHRK	Prague 10 - Uhříněves	T/S/I	AAS	13.6
AALZK	Prague 6 - Alžírská	T/U/R	AAS	13.3
ALIB0	Prague 4 - Libuš	B/S/R	ICP-MS	11.9
ASROK	Prague 10 - Šrobárova	B/U/RC	AAS	9.5

Source: ČHMÚ

Carbon monoxide

The anthropogenic source of air pollution with carbon monoxide is process, in which incomplete combustion of fossil fuel may occur. This is mostly transport followed by stationary sources, especially house fireplaces.

In 2006 carbon monoxide was measured at in total eleven localities in Prague where the requirement for minimum number of verified data was complied with. The immission limit value of carbon monoxide was not exceeded at any of the Prague's stations. At all AMS stations the maximum daily 8-hour moving average measured was below the air quality assessment limit. The highest concentrations were measured at the locality of the Station Prague 2 - Legerova (3,869.4 μg.m^{-3}).

Tab. B1.3.12 Stations with the highest values of the maximum daily 8-hour moving average concentration of CO

KMPL	Locality	Classification	Measuring method	Max. 8-h concentration [μg.m^{-3}]
AALZK	*Prague 6 - Alžírská*	*T/U/R*	*IRABS*	*3,913.6*
ALEGA	Prague 2 - Legerova (hot spot)	T/U/RC	IRABS	3,869.4
ASOKK	Prague 8 - Sokolovská	T/U/R	IRABS	3,777.0
ARERK	Prague 5 - Řeporyje	B/S/RA	IRABS	3,711.1
ASVOK	Prague 5 - Svornosti	T/U/IR	IRABS	3,594.8
AMLYA	Prague 5 - Mlynářka	T/U/RC	IRABS	3,117.7
ASMIA	Prague 5 - Smíchov	T/U/RC	IRABS	3,096.0
AVYNA	Prague 9 - Vysočany	T/U/CR	IRABS	2,937.6
AMUZK	Prague 1 - Národní muzeum	T/U/RC	IRABS	2,683.0
AREPA	*Prague 1 - nám. Republiky*	*T/U/C*	*IRABS*	*2,441.6*
ALIBA	Prague 4 - Libuš	B/S/R	IRABS	2,237.3
AJASK	Prague 10 - Jasmínová	T/U/RI	IRABS	665.6
AUHRK	Prague 10 - Uhříněves	T/S/I	IRABS	481.3

In italics: Insufficient number of measurements for the requirement of the minimum data collection (AALZK, AREPA).

Source: ČHMÚ

Benzene

As the road traffic intensity increases the importance of the monitoring of air pollution with aromatic hydrocarbons also increases, because they have very often adverse effects on human health. And it is right benzene which is carcinogenic to the human organism.

The decisive source of aromatic hydrocarbons, namely benzene and its alkyl derivatives, emissions into air is especially exhaust gases from petrol combusting motor vehicles. Other important source of these emissions is the loss through evaporation at handling, storage, and distribution of petrol. Emissions from mobile sources represent approx. 85 % of total emissions of aromatic hydrocarbons while the major portion goes to exhaust gas emissions. It is estimated hat the remaining 15 % emissions originates from stationary emission sources where the greatest portion is generated from processes producing aromatic hydrocarbons and processes, in which these compounds are employed for the production of other chemicals.

The data demonstrates that the benzene content in petrol is around 1.5 % while diesel fuel contains a relatively negligible concentration of benzene. Benzene contained in exhaust gases is first of all the benzene contained in fuel which has not been incinerated. Other contribution to the benzene emissions from exhaust gases is benzene generated from non-benzene aromatic hydrocarbons contained in fuel (70–80 % benzene contained in emissions). Partially, the benzene in exhaust gases is also generated from non-aromatic hydrocarbons.

In 2006 in Prague benzene was monitored at four localities, which met the requirement for the minimum number of data for the yearly average concentration calculation. The immission limit value was not exceeded at either of these stations. The highest concentration values, as in the previous years were measured at the station Prague 10 - Šrobárova where the yearly average concentration (3.2 μg.m^{-3}) fell in between the upper and bottom limit values for air quality assessment.

Tab. B1.3.13 Stations with the highest values of yearly average concentration of benzene in ambient air

KMPL	Locality	Classification	Measuring method	Yearly concentration [μg.m^{-3}]
ASROK	Prague 10 - Šrobárova	B/U/RC	GCH-VOC	3.2
ALEGA	Prague 2 - Legerova (hot spot)	T/U/RC	GCH-VOC	2.4
ASMIA	Prague 5 - Smíchov	T/U/RC	GCH-PID	2.0
ALIBA	Prague 4 - Libuš	B/S/R	GCH-PID	1.3

Source: ČHMÚ

Ground-level ozone

In ground-level strata of atmosphere ozone (tropospheric ozone) is formed due to effects of sunshine through a complex system of chemical reactions, namely in between nitrogen oxides (nitrogen dioxide), volatile organic compounds (namely hydrocarbons), and other components of atmosphere. Tropospheric ozone is referred to as a secondary pollutant because it is not emitted primarily from anthropogenic sources of air pollution.

The target immission limit value is defined that maximum daily 8-hour moving average concentration must not exceed more than twenty-five times the value of 120 μg.m^{-3} on average over three years. Out of seven stations, where ground-level ozone was measured, the immission limit value was exceeded at three stations as follows: Prague 6 - Suchdol, Prague 5 - Stodůlky and Prague 4 - Libuš. Compared to monitored years 2003–2005 there was decrease in number of station that recorded the limit exceedance (in last year the exceedance was recorded at six stations from all of nine). Reason for this is the fact that year 2003, that was typical for long-term high temperatures and and so following extremely high levels of the ground-level ozone concentration, dropped out from 3-year monitored period. The target immission limit value must be, pursuant to the Order of the Government of the Czech Republic No. 597/2006 Code, as amended by the following regulations, met by 31st December 2009.

Table below demonstrates exceedances of the special immission limit value (180 μg.m^{-3}) for ozone. Compared to previous two years there was quite warm in 2006, which expressed in significant increase of number of limit exceedances. This limit value was exceeded during period April-September at the station Prague 6 - Suchdol for twenty-four hours, at the station Prague 5 - Stodůlky for nineteen hours, at the station Prague 8 - Kobylisy for sixteen hours, at the station Prague 6 - Veleslavín for twelve hours, at the station Prague 4 - Libuš for 10 hours and at the station Prague 9 - Vysočany for one hour. Almost every exceedance was monitored during really warm July, whose average temperature was +4,2 °C above long-term average.

Significant portion of the Prague territory falls in the sub-limit ozone concentration thanks to high traffic intensity, because traffic emissions in the vicinity of transport roads degrade the high zone concentration (mostly in reactions with NO).

Target immision limit for vegetation protection (exposure index AOTE40) was exceeded at the station Prague 4 - Libuš in year 2006.

Tab. B1.3.14 Stations with the highest values of the maximum daily 8-hour moving average concentrations of ozone

KMPL	Locality	Classifi-cation	Measuring method	n	ppLVn 2004–2006	MAX8h-n 2004–2006 [μg.m^{-3}]	MAXx-n 2004–2006 [μg.m^{-3}]	x	Valid years
ASUCA	Prague 6 - Suchdol	B/S/R	UVABS	2	39.0	203.4	127.4	51	2005–2006
ASTOA	Prague 5 - Stodůlky	B/U/R	UVABS	2	32.5	198.6	124.2	51	2005–2006
ALIBA	Prague 4 - Libuš	B/S/R	UVABS	3	31.3	185.5	123.7	76	2004–2006
AVELA	Prague 6 - Veleslavín	B/S/R	UVABS	3	22.3	187.9	116.6	76	2004–2006
AKOBA	Prague 8 - Kobylisy	B/S/R	UVABS	3	21.7	194.8	117.2	76	2004–2006
ASMIA	Prague 5 - Smíchov	T/U/RC	UVABS	3	5.0	139.5	93.2	76	2004–2006
AREPA	Prague 1 - nám. Republiky	T/U/C	UVABS	2	1.0	127.3	90.0	51	2004–2005

Note:
n – number of valid years for the calculation
x – xth max. daily 8-hour concentration
ppLVn – average number of LV exceedances for n valid years
MAX8h-n – the highest max. daily 8-hour concentration for n valid years
MAXx-n – the highest xth max. daily 8-hour concentration for n valid years

Source: ČHMÚ

Tab. B1.3.15 Number of hours of the ozone information threshold exceedance (180 μg.m^{-3}) per year at selected AIM stations, 1992–2006

KMPL	Station	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AKOBA	Prague 8 - Kobylisy	–	–	–	0	**0**	**1**	**17**	**0**	**4**	**0**	**0**	**20**	**0**	**0**	**16**
ALIBA	Prague 4 - Libuš	39	**22**	**126**	**33**	**0**	**2**	**13**	**0**	**12**	**0**	**0**	**22**	**0**	**4**	**10**
AREPA	Prague 1 - nám. Republiky	0	**162**	**40**	1	0	**0**	**4**	**0**	1	**0**	**0**	**0**	**0**	**0**	0
ASMIA	Prague 5 - Smíchov	–	–	–	–	–	–	–	–	0	**0**	**0**	**0**	**0**	**0**	**0**
ASTOA	Prague 5 - Stodůlky	–	–	–	–	–	–	–	–	–	–	–	–	0	**0**	**19**
ASUCA	Prague 6 - Suchdol	–	–	–	–	–	–	–	–	–	–	–	–	0	**1**	**24**
AVELA	Prague 6 - Veleslavín	–	–	–	–	0	**0**	**8**	**0**	**10**	**0**	**0**	**11**	**0**	**0**	**12**
AVYNA	Prague 9 - Vysočany	0	5	**175**	**39**	**1**	**0**	**9**	**0**	**11**	**0**	**0**	**7**	**0**	**0**	**1**

Note: Bold figures show data for the station/year with the fulfilled condition for the calculation for the valid annual arithmetic average, i.e. the number of daily averages per year > 240 and the longest continuous measurement shut-down < 40 days.

Source: ČHMÚ

Tab. B1.3.16 Stations with the highest AOT40 values of ozone measured at suburban stations

KMPL	Locality	Classification	Measuring method	n	AOT40* [μg.m^{-3}.h]	Valid years
ALIBA	Prague 4 - Libuš	B/S/R	UVABS	5	20,177.0	2002–2006
AVELA	Prague 6 - Veleslavín	B/S/R	UVABS	5	17,754.8	2002–2006
AKOBA	Prague 8 - Kobylisy	B/S/R	UVABS	5	17,675.4	2002–2006

Note:
n – number of years for the calculation (with the valid yearly average)
* average for n years

Source: ČHMÚ

Nickel

Nickel is the fifth most abundant element found in the Earth core, although its percentage representation in the Earth crust is lower. Its anthropogenic source is, first of all, as in the case of other heavy metals, the fossil fuel combustion (heavy fuel oil combustion), and iron production. These sources do not play an important role in Prague. Other sources include waste incineration.

In 2006 nickel was measured at six localities in Prague, where valid yearly average concentration was reached. The immission limit value was not exceeded at any of them. The highest yearly average concentration was measured, same as in last year, at the Station Prague 10 - Šrobárova (6.5 μg.m^{-3}), yet even there the value fell deeply below the bottom limit for the air quality assessment. Compared to the previous year there was a slight increase in concentration at five localities.

Tab. B1.3.17 Stations with the highest values of yearly average concentration of nickel in ambient air

KMPL	Locality	Classification	Measuring method	Yearly concentration [μg.m^{-3}]
ASROK	Prague 10 - Šrobárova	B/U/RC	AAS	6.5
ARERK	Prague 5 - Řeporyje	B/S/RA	AAS	2.9
ASVO0	Prague 5 - Svornosti	T/U/IR	AAS	2.3
AMUZK	Prague 1 - Národní muzeum	T/U/RC	AAS	1.9
AALZK	Prague 6 - Alžírská	T/U/R	AAS	1.3
ALIB0	Prague 4 - Libuš	B/S/R	ICP-MS	1.2

Source: ČHMÚ

Cadmium

The anthropogenic source of cadmium in air is high-temperature processes, especially fossil fuel (namely coal) combustion, which includes cadmium compounds as impurities, incineration plants, then smelting of non-ferrous metals, glass production, and cement manufacturing.

The visible descending trend in air pollution with this compound was not verified in 2006, because a slight increase of the yearly average concentration was recorded at six stations, at two localities there was a slight decrease, and at one locality the same yearly average values were measured. In 2006, as same as in previous year, there was no exceedance of the immission limit value registered at any of the nine localities, where the cadmium concentration was monitored in Prague. The highest yearly average concentration was recorded at the station Prague 8 - Sokolovská (1.3 ng.m^{-3}), yet this value is below the bottom limit of air quality assessment.

Tab. B1.3.18 Stations with the highest values of the yearly average concentration of cadmium in ambient air

KMPL	Locality	Classification	Measuring method	Yearly concentration [ng.m^{-3}]
ASOKK	Prague 8 - Sokolovská	T/U/R	AAS	1.3
AALZK	Prague 6 - Alžírská	T/U/R	AAS	0.9
ARERK	Prague 5 - Řeporyje	B/S/RA	AAS	0.5
AMUZK	Prague 1 - Národní muzeum	T/U/RC	AAS	0.5
ASVO0	Prague 5 - Svornosti	T/U/IR	AAS	0.4
AUHRK	Prague 10 - Uhříněves	T/S/I	AAS	0.4
AJASK	Prague 10 - Jasmínová	T/U/RI	AAS	0.4
ALIB0	Prague 4 - Libuš	B/S/R	ICP-MS	0.3
ASROK	Prague 10 - Šrobárova	B/U/RC	AAS	0.2

Source: ČHMÚ

Arsenic

The anthropogenic pollution with arsenic comes up to 87 % from fossil fuel combustion, namely coal, which contains traces of arsenic compounds.

The map diagram shows that the arsenic concentration in air had significantly descending tendency till 1998, since then it has been stagnating and the concentration values fall deeply below the immission limit value. In previous three years there was a slight increase in the yearly average concentration at the most of the localities. Compared to the previous year there was a slight increase in the yearly average concentration at all of nine localities, that reached sufficient number of data to calculate the valid yearly average in 2006.

In Prague at no of the localities the target immission limit was not exceeded in 2006. Nevertheless the highest yearly average concentration was 5.3 ng.m^{-3} measured at the station Prague 5 - Řeporyje exceeded the upper limit for air quality assessment.

Tab. B1.3.19 Stations with the highest values of yearly average concentration of arsenic in ambient air

KMPL	Locality	Classification	Measuring method	Yearly concentration [ng.m^{-3}]
ARERK	Prague 5 - Řeporyje	B/S/RA	AAS	5.3
ASROK	Prague 10 - Šrobárova	B/U/RC	AAS	4.4
ASOKK	Prague 8 - Sokolovská	T/U/R	AAS	3.6
AMUZK	Prague 1 - Národní muzeum	T/U/RC	AAS	2.9
ASVO0	Prague 5 - Svornosti	T/U/IR	AAS	2.6
AALZK	Prague 6 - Alžírská	T/U/R	AAS	2.1
ALIB0	Prague 4 - Libuš	B/S/R	ICP-MS	2.0
AJASK	Prague 10 - Jasmínová	T/U/RI	AAS	1.8
AUHRK	Prague 10 - Uhříněves	T/S/I	AAS	1.8

Source: ČHMÚ

Benzo[a]pyrene

One of the toxicologically most serious pollutants is benzo[a]pyrene. The reason why its is introduced into atmosphere is the same as for other polyaromatic hydrocarbons (PAHs), which benzo[a]pyrene is the major representative thereof, either incomplete combustion of fossil fuels in stationary and mobile sources, but also certain technologies as the coke and iron production. The stationary sources are mostly represented by household fireplaces. Among mobile sources, first of all, diesel engines are the primary source.

In 2006 three stations monitored benzo[a]pyrene where the valid yearly average was attained as follows: Prague 10 - Šrobárova, Prague 5 - Smíchov, and Prague 4 - Libuš. At each of these stations, as the as the previous year, the immission limit value of 1 µg.m^{-3} was exceeded as much as 2.5 times (at locality Prague 10 - Šrobárova). The figure illustrates that the benzo[a]pyrene concentration has significantly increasing tendency during last three years. Because of its serious impacts on human health (see above) this situation is alarming. This target limit value must be complied with by 31st December 2012.

Tab. B1.3.20 Stations with the highest values of the yearly average concentration of benzo[a]pyrene

KMPL	Locality	Classification	Measuring method	Yearly concentration [µg.m^{-3}]
ASROK	Prague 10 - Šrobárova	B/U/RC	GCH-MS	2.5
ASMIP	Prague 5 - Smíchov	T/U/RC	QUARTZ+PUF	1.9
ALIBP	Prague 4 - Libuš	B/S/R	QUARTZ+PUF	1.9

Source: ČHMÚ

Trends in yearly immission characteristics of SO_2, PM_{10}, NO_2 and CO in the period of 1996–2006

The following graphs characterise the trends in yearly immission characteristics of SO_2, PM_{10}, NO_2 and CO in the period of 1996–2006 in the Prague agglomeration. Till 1999 the significant decreasing trend in air pollution with SO_2 and PM_{10} is clear, in the case of NO_2 the decrease was only moderate. In 20001 the still descending trend was stopped and on the contrary there was a slight increase in the concentration of SO_2 and NO_2 and substantial increase in the PM_{10} pollution. In 2004, then pollution was reduced in all pollutant monitored. The reason for the aforementioned drop in 2004, compared to the conditions in 2003, was the high level of pollution in 2003 due to extremely adverse weather conditions (that year was extremely dry). In 2005 the trend is reversed in the case of PM_{10} and NO_2 and a moderate increase occurred. The increasing tendency was verified in 2006, the concentration of SO_2 increased as well. This increase is caused by multiple factors. The exceedances of limit values are first of all related to substantial traffic load and mostly with the fact the roads of heaviest traffic load run right through the downtown. Furthermore, the adverse weather conditions at the beginning of 2006. Results of the measured concentrations of PM_{10}, NO_2, and benzo[a]pyrene provides impulse for the solution of the entirely unsatisfactory traffic conditions in the Prague agglomeration where a significant portion of population suffers from limit-exceeding concentrations of pollutants. Maximum daily 8-h moving average of CO concentration in monitored years fell below the bottom limit values for air quality assessment. But compared to average of whole Czech Republic territory, it is almost slightly higher.

B1.3.3 Atmospheric depositions, rainwater quality

Atmospheric deposition (both wet deposition and dry one) does not rank among the most toxic components of an urban environment. Despite "acid rain" and rainwater pollution have adverse impacts on the quality of surface water and groundwater, building materials, roads and other objects, thus deteriorating the quality of the population environment as well. In urban areas, in addition to the wet deposition also dry deposition generated by the sedimentation of large particles of airborne dust makes an important contribution.

In Prague, atmospheric deposition has been systematically monitored at two stations. The one in Prague - Libuš is operated by the Czech Hydrometeorological Institute (ČHMÚ) and monitors wet atmospheric deposition only while that in Prague - Podbaba is run by the T. G. Masaryk Water Research Institute (VÚV TGM) and monitors the total of both wet and dry depositions.

Sulphates and nitrates constitute the principal components in precipitation, and their content determines the acidity of rainwater. The precipitation pH value in Prague is higher than that in other regions of the Czech Republic because the acidity of rainwater is neutralised by the alkaline component of suspended particulate matter in the Prague air. Atmospheric depositions of sulphur and nitrogen in the territory of Prague exceed the average values for the Czech Republic. It follows from the comparison of the wet and the total deposition values, that the latter is 2 to 3 times higher than the former for most components, especially for the elements originating from soil.

The measured results confirm sulphate concentrations in rainwater have been dropping, which in turn results in the total sulphur deposition being reduced to approximately a half of that of the late 1980s.

Tab. B1.3.21 Quality of precipitation and atmospheric deposition in 2006

Locality		LIBUŠ, Prague 4, ČHMÚ			PODBABA, Prague 6, VÚV TGM		
Quantity	Unit	weighted average	minimum	maximum	weighted average	minimum	maximum
		*rainwater quality			*rainwater quality		
		wet deposition			wet + dry deposition		
Total rainfall	mm	492.6***	4.400	106.200	534.504***	9.000	127.800
Conductivity	μS.cm^{-1}	25.319	11.460	223.348	37.577	19.900	90.000
pH		5.289	5.249	5.423	5.973	5.440	6.880
H_3O**	mg.m^{-2}	2.532			0.569		
Fluorides	mg.l^{-1}	0.010	0.004	0.026	0.033	0.025	0.137
	g.m^{-2}	0.005			0.018		
Chlorides	mg.l^{-1}	0.256	0.101	0.850	2.742	1.620	15.000
	g.m^{-2}	0.126			1.466		
Nitrates	mg.l^{-1}	3.831	1.557	38.451	3.101	2.030	7.480
	g.m^{-2}	1.887			1.657		
Sulphates	mg.l^{-1}	1.687	1.030	3.279	3.759	1.690	11.400
	g.m^{-2}	0.831			2.009		
Sodium	mg.l^{-1}	0.153	0.050	0.628	0.758	0.123	7.590
	g.m^{-2}	0.075			0.405		
Pottasium	mg.l^{-1}	0.069	0.034	0.161	0.472	0.047	1.800
	g.m^{-2}	0.034			0.252		
Ammonia	mg.l^{-1}	0.821	0.231	2.177	2.008	0.674	4.480
	g.m^{-2}	0.404			1.073		
Magnesium	mg.l^{-1}	0.035	0.020	0.065	0.166	0.046	0.425
	g.m^{-2}	0.017			0.089		
Calcium	mg.l^{-1}	0.358	0.206	0.851	2.071	0.640	5.970
	g.m^{-2}	0.176			1.107		

Locality		LIBUŠ, Prague 4, ČHMÚ			PODBABA, Prague 6, VÚV TGM		
Quantity	Unit	weighted average	minimum	maximum	weighted average	minimum	maximum
		*rainwater quality			*rainwater quality		
		wet + dry deposition			wet + dry deposition		
Manganese	μg.l^{-1}	7.481	2.440	29.200	13.049	2.500	39.800
	mg.m^{-2}	3.685			6.975		
Zinc	μg.l^{-1}	25.338	6.965	64.469	26.535	2.500	82.000
	mg.m^{-2}	12.481			14.183		
Iron	mg.l^{-1}	0.096	0.038	0.403	0.182	0.021	0.778
	g.m^{-2}	0.047			0.097		
Aluminium	mg.l^{-1}				0.100	0.050	0.346
	g.m^{-2}				0.053		
Lead	μg.l^{-1}	4.294	0.250	12.369	3.476	1.000	11.600
	mg.m^{-2}	2.115			1.858		
Cadmium	μg.l^{-1}	0.132	0.017	0.216	0.107	0.100	0.310
	mg.m^{-2}	0.065			0.057		
Nickel	μg.l^{-1}	1.011	0.368	2.397	2.695	1.000	3.000
	mg.m^{-2}	0.498			1.440		
Copper	μg.l^{-1}				6.802	3.320	16.500
	mg.m^{-2}				3.636		
Beryllium	μg.l^{-1}				0.007	0.000	0.160
	mg.m^{-2}				0.004		
Chromium	μg.l^{-1}				0.208	0.000	1.070
	mg.m^{-2}				0.111		

* average concentration weighted by total precipitation

** deposition of hydrogen ions

*** yearly total precipitation

Source: ČHMÚ, VÚV TGM

B1.3.4 Dust fallout

Dust fallout is a rather informative but well-recognised indicator of air pollution in Prague. It is measured by the Public Health Service using an estimate settling method where a collecting vessel is placed outdoor and exposed to dust for one month and collected samples are evaluated by means of gravimetry.

Yearly average value of dust fallout in the network of approx. 49 localities is within the range from 1.64 $g.m^{-2}$ per month to 10.44 $g.m^{-2}$ per month. Local maximums are probably due to nearby construction and industrial activities, operations of local pollution sources, traffic, and secondary dust burden.

The average dust fallout in 2006 was 4.26 $g.m^{-2}$ per month. The limit of 12.5 $g.m^{-2}$ per month was exceeded in 3.4 % of cases under observation. It follows from the fallout time course that the overall level of dust fallout in Prague has been reduced considerably since 1985.

B1.3.5 Heavy metals

Suspended particulate matter high in toxic components, such as heavy metals or organic compounds, belongs to the principal pollutants contaminating the urban air.

The data presented here has been provided by several institutions and some variations may be attributable to different methodologies or random contamination. Limit values of heavy metals have not been exceeded in Prague. In the 1990s the lead concentration in Prague air was substantially reduced as a result of the reduction of the lead content in petrol and also much larger share of cars equipped with catalytic converters.

Tab. B1.3.22 Heavy metals in airborne particulate matter, 2006 [$ng.m^{-3}$]

Code	Locality	Org.	Number of measure-ments	As		Cd		Cr		Cu		Mn		Ni		Pb		Zn	
				aver.	max.	aver.	max.	aver.	max.	aver.	max.	aver.	max.	aver.	max.	aver.	max.	aver.	max.
036	Alžírská	H	26	2.050	5.300	0.912	11.400	4.369	11.200	11.038	35.800	8.723	20.200	1.296	2.400	12.881	29.900	51.327	131.100
041	Sokolovská	H	26	3.420	9.400	1.769	10.600	19.873	35.200	173.781	428.000	64.408	134.000	8.763	26.600	28.504	54.400	563.654	981.100
060	Svornosti	H	25	2.580	7.300	0.420	1.500	8.700	19.200	47.120	108.300	21.952	65.000	2.356	7.600	15.684	35.700	94.636	184.600
061	Muzeum	H	26	2.827	10.300	0.442	1.500	4.723	9.600	17.235	46.100	13.973	29.900	1.831	3.400	16.154	38.000	64.962	147.600
094	Libuš	M	152	1.974	10.700	0.289	1.440			9.802	166.000	7.476	27.600	1.225	22.000	11.752	43.800		
109	Řeporyje	H	26	5.246	18.200	0.504	2.000	3.215	9.700	10.596	29.600	9.088	32.000	2.915	43.900	23.438	56.400	101.631	604.700
154	Uhříněves	H	26	1.677	4.900	0.388	1.100	12.792	187.100	46.331	79.300	13.769	33.900	4.147	28.300	13.323	22.700	503.804	874.300
457	Šrobárova	Z	26	4.363	11.480	0.205	0.700	11.313	28.000			5.935	14.290	6.473	37.300	9.490	28.830		
1476	Jasmínová	H	26	1.765	5.600	0.373	1.000	3.165	5.700	53.892	103.600	8.723	17.600	2.342	3.800	14.454	26.400	476.185	830.200

Source: ZÚ Prague (H), SZÚ (Z), ČHMÚ (M)

B1.3.6 Organic compounds

B1.3.6.1 Monitoring of ozone precursors in air

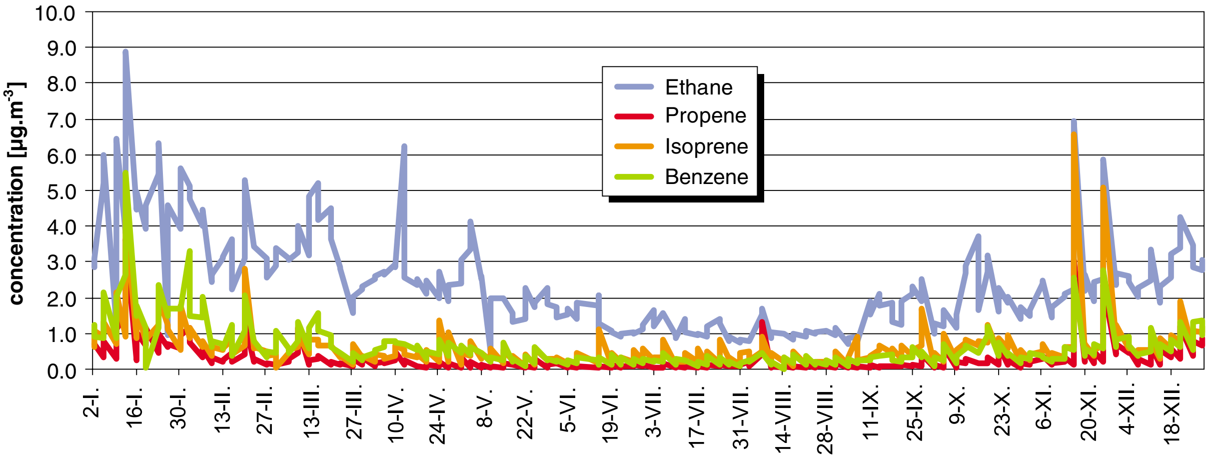
The ozone precursor compounds first of all include volatile organic hydrocarbons, which at certain sunshine intensity, temperature, relative humidity in air, and other factors may induce, in the ground-level strata of atmosphere, photochemical process yielding ozone as a reaction product. The chemical process kinetics is significantly affected by the concentration of airborne precursors. The ground-level ozone has adverse effects on human health, namely on respiratory system, and therefore the Member States of the European Union has been paying a great attention to the presence of precursors in air.

In 1994 the regular monitoring of airborne precursors was started at the CHMI Monitoring Station Prague - Libuš. The sampling there is carried out twice a week all-year-round always on Mondays and Thursdays at 14:00 CET. Samples are collected into special containers for the period of three minutes. Immediately after the sampling they are analyzed by a gas chromatograph. In a year there are over 100 air-composition analyses carried out in order to obtain the yearly average one. Results of analyses for respective hydrocarbons are stored in a database of the CHMI Laboratory of Organic Analysis and form a part of the complete CHMI database and the CHMI Yearbook.

Comments on the graphs:

The graph represents the year-round course of the concentration of selected hydrocarbons. It is clear from the graphs that the concentration of precursors reaches its maximum in winter months when inversion conditions are frequent in occurrence. In summer season, on the contrary, the concentration drops, except for isoprene, which is formed in the decomposition of isoprenoid compounds in foliage and needles. In winter the isoprene concentration is almost negligible. The concentration of every volatile organic compound (VOC) is substantially depending on wind direction and dispersion conditions. It is also seen from the graphs that the concentrations of selected hydrocarbons mutually correspond – decrease or increase of the concentration always happen in the whole group of selected hydrocarbons (alkanes, alkenes, aromatic hydrocarbons, etc.) at the same time.

Fig. B1.3.24 Concentrations of selected precursors at Station Prague - Libuš, 2006



Source: ČHMÚ

B1.3.7 Air pollution measurements using a passive sorption method

Like in previous years in 2006 year-round measurements of average concentrations of sulphur dioxide and nitrogen dioxide using a passive sorption method were conducted in Prague (SVÚOM, a. s. and PRAGOCHEMA, s. r. o.). This simple method is based on the spontaneous sorption of the gaseous substances mentioned above onto suitable adsorbents and in a subsequent laboratory analysis. The measurements do not require any source of power and are, due to their principle, of continuous nature. Values given in tables were obtained at approx. 30-day exposure and therefore they show directly average monthly concentrations.

The measuring station allocation depends primarily on requirements of the parties ordering (local and district authorities, government institutions). Therefore the stations are often located in the vicinity of kindergartens and elementary schools, or potentially near protected historical monuments. The network of samplers can be also used as an immission study (measurements of nitrogen dioxide in Horní Počernice).

Tab. B1.3.23 Average monthly concentrations of SO_2 in 2006 measured by the passive adsorption method using passive samplers type SVÚOM – Pragochema

Monthly average concentration of SO_2 [µg.m^{-3}] in respective months of 2006															
No.	Locality		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average
001	P 7	U Měšťanského Pivovaru	19.0	14.0	9.5	9.1	16.8	6.7	7.9	15.9	9.6	14.5	9.1	18.2	**12.5**
101	P 22	Pragochema	13.5	8.0	4.4	8.1	5.5	5.4	5.8	4.2	4.1	6.7	5.0	3.3	**6.2**
243	P 16	Radotín	14.6	6.8	7.5	8.1	5.5	6.7	4.8		3.7	7.0	3.5		**6.8**
342	P 14	MŠ Vybíralova 968	20.1	11.4	8.9	6.2	1.8	7.0	5.0	4.9	4.7	6.4	5.6	6.6	**7.4**
343	P 14	MŠ Doležalova 105	17.4	11.4	7.2	6.2	3.2	4.5	4.3	3.0	4.3	6.7	5.6	5.0	**6.6**
344	P 14	MŠ Chvaletická 917	20.2	10.6	5.4	6.9	2.7	4.9		3.4	5.1	5.9	3.1	4.5	**6.6**
347	P 14	MŠ Vlčkova 1067	18.3	10.8	5.2	6.1	1.9	8.0	2.9	5.7	2.9	6.4	4.0	6.1	**6.5**
355	P 11	K dubu Street	11.6	7.6	6.8	12.4	8.4	5.9	4.4	7.8	5.4	10.2	6.5	8.6	**8.0**
356	P 11	District Authorities Prague 11, Vidimova Street	16.8	9.6	9.7	12.6	13.8	7.5	11.5	8.0	7.1	5.0	11.5	12.1	**10.4**
365	P 18	Malkovského	15.1	6.0	6.6	5.2	2.2	5.7	4.7	3.9	4.5	4.6	3.5	3.4	**5.5**
366	P 18	Bukovecká	14.1	5.8	6.1	4.3	2.1	4.3	3.2	4.7	2.7	5.0	3.4	2.0	**4.8**
368	P 14	Hostavice	15.5	9.2	7.4	5.9	2.7	6.5		2.5	5.4	5.4	2.8	3.4	**6.1**
369	P 14	Allotments	17.4	8.8	11.7	8.1		4.9	3.0			3.1	3.7	4.6	**7.3**
371	P 14	MŠ Jahodnice	15.0	11.1	7.6	7.6	1.3	6.7	3.6	3.3	3.7	5.5	11.4	6.6	**7.0**
372	P 14	Kyjský Cemetery										7.2	9.2	9.2	**8.5**
397	P 14	ZŠ Hloubětínská 600	17.6	11.2	7.7	7.6	3.1	8.2	3.4	4.0	5.3	5.0	4.7	5.1	**6.9**
409	P 14	ZŠ Bratří Venclíků	20.1	12.2	9.4	8.8	3.2	7.3	5.4	3.9	5.2	7.2	4.4	6.2	**7.8**

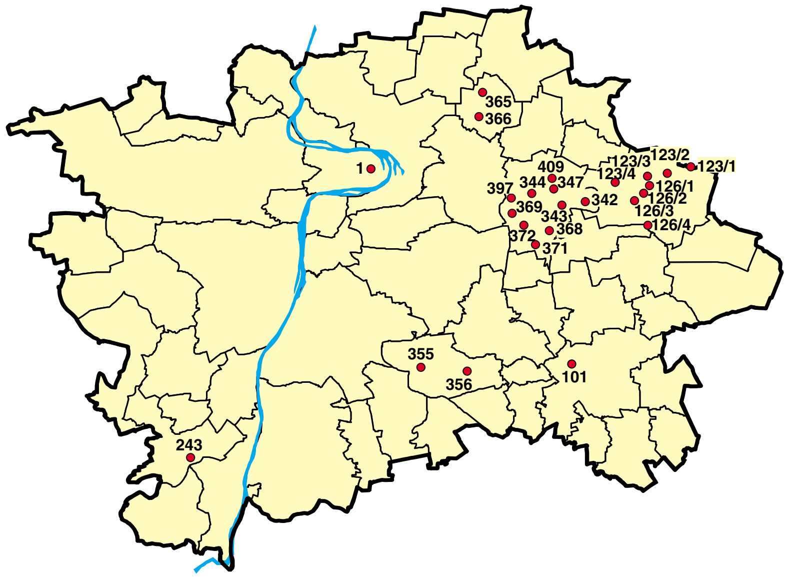
Notes: MŠ = kindergarten, ZŠ = elementary school Source: SVÚOM, a. s., Pragochema, s. r. o.

Tab. B1.3.24 Average monthly concentrations of NO_2 in 2006 measured by the passive adsorption method using passive samplers type SVÚOM – Pragochema

Monthly average concentration of NO_2 [µg.m^{-3}] in respective months of 2006															
No.	Locality		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average
001	P 7	U Měšťanského Pivovaru	56	53	44	41	39	35	31	29	40	53	46	50	**43.2**
101	P 22	Pragochema	50	44	44	41	43	45	41	30	37	40	38	35	**40.8**
243	P 16	Radotín	50	42	48	41	43	50	46		51	43	36		**45.0**
342	P 14	MŠ Vybíralova 968	44	36	33	38	22	31	33	30	33	39	36	37	**34.3**
343	P 14	MŠ Doležalova 105	42	37	31	34	21	30	31	31	28	38	35	38	**32.9**
344	P 14	MŠ Chvaletická 917	45	39	32	39	24	37		31	32	41	37	38	**36.0**
347	P 14	MŠ Vlčkova 1067	44	40	36	36	26	31	34	31	30	39	38	39	**35.3**
355	P 11	K dubu Street	42	28	35	51	42	38	46	39	44	43	43	44	**41.2**
356	P 11	District Authorities Prague 11, Vidimova Street	48	15	19	30	25	26	27	23	26	28	35	43	**28.8**
365	P 18	Malkovského	45	38	31	33	24	32	31	26	28	41	34	37	**33.3**
366	P 18	Bukovecká	44	40	33	38	22	32	33	28	28	40	37	37	**34.1**
368	P 14	Hostavice	43	41	31	33	26	28		28	29	36	35	39	**33.4**
369	P 14	Allotments	45	41	32	40		28	35			32	36	36	**36.2**
371	P 14	MŠ Jahodnice	45	39	36	39	30	37	35	29	32	41	38	38	**36.6**
372	P 14	Kyjský Cemetery										42	42	48	**44.3**
397	P 14	ZŠ Hloubětínská 600	49	47	42	43	30	43	35	34	32	43	39	41	**39.7**
409	P 14	ZŠ Bratří Venclíků	46	44	39	41	25	38	36	34	32	40	39	42	**38.0**
123_1	P 20	ZŠ Bártlova	54	22	30	44	27	27	42	31	38	40	41	41	**36.6**
123_2	P 20	Theatre Pohoda	46	26	36	39	25	25	45	30	39	42	42	41	**36.2**
123_3	P 20	District Authorities Horní Počernice	67	27	52	63	42	42	61	47	59	55	60	53	**52.3**
123_4	P 20	Chvalský Chateau	51	26	42	47	31	31	49	30	37	44	52		**40.0**
126_1	P 20	ZŠ Ratibořická	52	23	31	34	20	20	20	25	29	35	37	35	**30.2**
126_2	P 20	Sokol	53	23	32	39	23	23	43	26	33	39	42	50	**35.5**
126_3	P 20	Open Air Theatre	57	22	31	37	24	24	36	28	34	38	43	44	**34.8**
126_4	P 20	Swimming baths	49	21	27	31	19	19	37	26	24	29	36	37	**29.5**

Notes: MŠ = kindergarten, ZŠ = elementary school Source: SVÚOM, a. s., Pragochema, s. r. o.

Fig. B1.3.25 The network of monitoring stations, passive sorption method



Source: SVÚOM, a. s., Pragochema, s. r. o.

B1.4 EVALUATION OF THE SMOG WARNING AND CONTROL SYSTEMS ON THE TERRITORY OF THE CZECH REPUBLIC IN 2006

In Prague and in the Central Bohemia region was the yearly average temperature 8.2 °C in 2006. That is +0.7 °C of long-term normal. The prime three months of year 2006 and in August average monthly temperatures were bellow the normal. Substantially cold weather with deviation –3.4 °C of long-term average was in January 2006. There were abnormal temperatures in period March–July and in September. Significantly abnormal temperatures with deviation +4.2 °C were in August. Also in period September–December were substantially abnormal with deviations from +1.9 °C in October to +3.1 °C in December 2006. In 2006 the yearly total rainfall was not different from long-term normal. Concerning precipitation February to June 2006 were above normal, in April and August monthly total rainfall exceeded 140 % of long-term average normal. The maximum exceedance of long-term normal average was in March 2006, when the total rainfall was 61 mm, which represents 171 % of long-term normal average.

The anticyclone weather conditions occurred in 146 days in 2006, that represents 40 % of year. The maximum frequency of the anticyclone weather conditions in the single months of the year 2006 was in August with 25 days (80,6 % of days per month). Lower relative frequency there was in January with 61.3 % and in September with 56.7 %. Substantially minimum days with anticyclone weather conditions occurred August (just 3 days, which represent 9.7 % days per month). This classification is confirmed ozone concentration curve in July and August. In July the anticyclone weather conditions distinctly dominated, temperatures were abnormal and concentrations of tropospheric ozone exceeded upper limit values. The cyclone weather conditions strongly dominated, the temperatures were subnormal, total rainfall was abnormal and concentrations of tropospheric ozone compared to the season were very low.

Although there were meteorological conditions with adverse dispersion conditions potentially threatening of increased concentration of pollutants no smog conditions developed and therefore **no smog warning signal was given**. At the Station Prague - Legerova in March for one time, in April also for one time, in October for four times and in December for two times in the period of 3 to 7 hours the nitrogen oxide concentration measured was above 200 $\mu g.m^{-3}$ with the highest value of 256 $\mu g.m^{-3}$ on 19th October 2006. Unique exceedance in the period of 1 to 2 hours occurred at stations Vršovice, Vysočany and Náměstí Republiky. Considering that exceedance occurred mostly at merely one station and pollutants' concentration always dropped within a short period of time and thus conditions for giving the signals of the SWRS were not met. Changes in hourly average concentration of nitrogen oxide at the monitoring Station Prague - Legerova in the period from 1st January 2006 to 31st December 2006 are demonstrated on Figure.

In periods 10th to 14th January and 1st to 4th February 2006 there was distinctly increase in concentrations of suspended particulate matter on whole territory of Czech Republic except of mountain areas. Maximum concentrations were measured in Moravia-Silesian region, where at the Věřňovice Station the hourly concentration reached 941 µg.m^{-3}. Here and there in Ústecký region and in Prague were measured PM_{10} concentrations over 400 µg.m^{-3}. As mentioned before anticyclone weather conditions dominated in our region, in the aforementioned months there was significantly inversion of air temperature.

Concerning the occurrence of maximum daily temperatures measured at station Prague - Libuš was the period from 1st April to 31st August 2006 slightly abnormal with deviation +1.9 °C from long-term normal, but strongly unstable in temperatures. Deviations from long-term normal temperatures varied from +12.6 to –10.1 °C. The monthly average temperature deviations showed the biggest difference between July and August with deviations +6.0 °C and –2.4 °C, when 25 days with temperature above +30 °C occurred. The maximum value of +35.1 °C was measured on 27th July 2006.

The weather conditions were in favour of the generation of tropospheric ozone particularly in July. The highest concentration above 200 µg.m^{-3}, maximum value of 241 µg.m^{-3} was measured in five days in at Station Lom on 19th July 2006. Concentrations above 180 µg.m^{-3} in period of three hours were marked in six days of this month. So the special limit for tropospheric ozone was exceeded.

On 19th July and 20th July 2006 and on best part of 21st July the edge of higher atmospheric pressure of cyclone 1,023 hPa with centre above the North Sea lately above the Norwegian Sea interfered our region. Very warm air flew in its tail to Central Europe. On 21st July in the late afternoon cold front was passing through Bohemia to the East. During 22nd July aforementioned front passed through Moravia and separate cyclone of 1,020 hPa appeared temporary at our territory. The cyclone decomposed the next day and another stronger anticyclone came to Czech Republic from the West.

There was cloudless and somewhat cloudy with maximum temperatures 31 to 37 °C on 19th July and 20th July 2006 and on best part of 21st July. Rainfalls appeared only in South-West Bohemia with daily total rainfalls to 0.3 mm. In late afternoon on 21st July there was cloudy with rainfalls in which total rainfalls reached 1 mm, and sporadically 9–13 mm. Maximum daily temperatures increased in 33–37 °C. On 22nd July was somewhat cloudy and in the North-West Bohemia cloudy with rainfalls to 5 mm. Maximum daily temperatures were 32–35 °C. The following maximum hourly concentrations of tropospheric ozone exceeding 180 µg.m^{-3} were measured in these days in Prague:

19th July 2006 Kobylisy 212 µg.m^{-3}, Libuš 208 µg.m^{-3}, Stodůlky 225 µg.m^{-3}, Suchdol 223 µg.m^{-3}, Veleslavín 208 µg.m^{-3}, Vysočany 184 µg.m^{-3},

20th July 2006 Stodůlky 181 µg.m^{-3}, Suchdol 191 µg.m^{-3},

21st July 2006 Kobylisy 204 µg.m^{-3}, Libuš 197 µg.m^{-3}, Stodůlky 214 µg.m^{-3}, Suchdol 227 µg.m^{-3}, Veleslavín 204 µg.m^{-3}.

In period from 26th July to 28th July 2006 the cyclone of 1,023 hPa with centre above the North Sea was slowly moving to the North to Spitzberben territory and with the edge of high air pressure it reached up to Mediterranean. The tide of very warm air to our region culminated on its tail. In the afternoon on 28th July anticyclone came to Bohemia and at night it came to Moravia, it was followed by rainfalls and gust wind.

On 26th and 27th July 2006 and on best part of 28th July there was somewhat cloudy with increasing temperatures up to +37 °C. On 28th July in the afternoon was cloudy weather in Bohemia and occasionally overcast with rainfalls. The total rainfalls in the West and North-West were till 20 mm, sporadically 42 mm. The next day there was cloudy weather with total rainfalls of 2–10 mm, in mountains up to 40–60 mm. Maximum daily temperatures reached up to +26 and +30 °C in Bohemia +28 to +34 °C in Moravia. The following maximum hourly concentrations of tropospheric ozone exceeding 180 µg.m^{-3} were measured in these days in Prague:

26th July 2006 Stodůlky 189 µg.m^{-3},

27th July 2006 Kobylisy 200 µg.m^{-3}, Stodůlky 202 µg.m^{-3}, Suchdol 206 µg.m^{-3}, Veleslavín 191 µg.m^{-3},

28st July 2006 Kobylisy 186 µg.m^{-3}, Stodůlky 189 µg.m^{-3}, Suchdol 214 µg.m^{-3}, Veleslavín 192 µg.m^{-3}.

The exceedances of the special immission limit value (180 $\mu g.m^{-3}$) for ground-level ozone had been recording on the territory of Czech Republic since March, but these situations were rare with period shorter than three hours. During months May and June the special limit for ground-level ozone was exceeded in nine resp. in six days, over again the exceeding were short-time (less than 3hours). In July the limit was exceeded in 14 days and the exceedances longer than three hours were registered in these days: 19^{th}–21^{st} July and 26^{th}–28^{th} July 2006. The special limit was not exceeded on the entire territory of Czech Republic during the months August and September.

The option for giving information to the public, within the Smog Warning and Control System, for the case of forecast formation of smog conditions. This information valid for Bohemia was given for 13^{th} July and for entire territory of the Czech Republic was given for 19^{th} and 20^{th} July 2006. The signal was prolonged to 29^{th} July 2006. In the former the special immission limit for ground-level ozone was exceeded just at station Rudolice v Horách, where the concentration of 191 $\mu g.m^{-3}$ was measured. In the latter the maximum concentration exceeded repeatedly special immission limit value on 19^{th}–21^{st} July and 26^{th}–28^{th} July. In days 22^{nd}–24^{th} July the limit value of 180 $\mu g.m^{-3}$ was exceeded sporadic with period shorter than 3 hours.

The time advance for the issuing of information to the public, which is acquired by the application of the Smog Control Rules provision on the potential issuing as early as in the case of predicted smog conditions without waiting for the immission limit value exceedance, makes a counterbalance of the unavoidable hazard of “false alarm”. The preference of this approach is, moreover, enabled by the fact that the issuing of the information is not bound to any organisationally demanding measures with economic impacts.

B1.5 AIR – OTHER ACTIVITIES AND PROJECTS

B1.5.1 Air quality modeling

B1.5.1.1 Model-based evaluation of air quality on the territory of the City of Prague – Project of ATEM

The Project "Model-Based Assessment of Air Quality on the Territory of the City of Prague" (the Project of ATEM) has been running in Prague since 1992. In 1994 the so-called basic level of the Project was completed, then the emission and immission conditions in Prague have been assessed on regular basis in two-year periods Outputs of these assessments are regularly used for purposes of the City and City Districts authorities or for assessment of effects of all assumed changes on a respective area on air quality.

In 2006 the emission balance of all pollutant sources was conformably to the actual data (2005) completely updated. **Update A6 – 2006** follows the previous stages of the model evaluation including the new calculation methods, developed in the period 2000–2006. The continuous updated project objectives are to give the information about the air quality development in city and to provide bases for classification of territory changes while using alternative model calculations (AMC). In this way the ATEM system provides to connect actual information about emission balance of pollution sources and complete immission background with an effective tool for the evaluation of impacts of investment and conceptual plans as well as remedial measures for air quality.

Suspended particulate matter PM_{10}, sulphur dioxide, nitrogen oxides, carbon monoxide and benzene were assessed as model pollutants in Update A6 – 2006. Adding the PM_{10} matters, which were evaluated for the first time in previous decade, is very important. Secondary dust has the significant part on PM_{10} immission burden. The secondary dust evaluation cannot be provided by standard model tools. That is why in 2003 the Prague City Hall as a part of Model-Based Assessment of Air Quality project worked out the methodology for secondary dust evaluation, whose provides for PM_{10} adequately including into model-based assessment of air quality.

The evaluation of immission situation in Prague is performed in the high-capacity file of 8,647 base points in regular triangle network with span of 250 m. Base point (BP) represents a point in territory, where air pollution characteristics are assumed for single sorts of pollutants. The shares of base sources, area sources, transport, distant pollution transfer parts and other detailed data outputs (as well as other detail outputs serving to make the detail analysis of separated localities) are evaluated in all points except of basic immission values (yearly average and maximum hourly values).

Generally there were evaluated input data for 8,391 point sources, area sources and line sources of air pollution in Update A6 – 2006. In ATEM they are divided into four groups:

1. Point sources

- 872 large stationery sources of air pollution (smoke stacks) at the territory of the City of Prague (REZZO 1)
- 158 select mid-sized sources (REZZO 2).

2. Area source

- 2,167 area sources – squares of 500 × 500 m, where the emission from these sources were aggregated:
  - mid-sized source REZZO 2 not classified as point sources (represented by 2,943 mid-sized sources)
  - registered boilers REZZO 3 (136 sources)
  - heating of physical units (local furnace)
  - field consumption of coating compositions and solvents.

3. Automobile transport

- 4,144 line source in Prague (automobile transport)
- 480 relevant crossings, of which number 54 are overpass crossings and number 426 are level crossings
- 23 bus stations and terminals
- 183 pump and refueling stations

- 14 tunnel gateways and expirations (Mrázovka, Strahovský, Zlíchovský, Letenský and Těšnovský Tunnel)
- 360 large parkings and garages.

4. Transfers

- Distant air pollutants transfer from air polluting sources outside the territory of Prague (including outland).

All data inputs as well as results of model calculations were compiled in geographic information system (GIS). In ATEM project CIS represents the main tool for compiling, gathering, verification and data archiving with possibility of further connection with another city information systems. Using GIS the compiler or user can for example monitor and evaluate pollution sources and the air quality in select locality. He can also determine localities, where the exceedances of the immission limits are to appear and he can also get the data for the evaluation of long-term impacts of air pollution on human health etc.

ATEM practice proved that the alternative model calculations are the most important practical application of the project. The alternative model calculations provide fundamental basis for the air protection decision making. They support finding effective solutions from several options. The solution impact may be objectively explored in advance. The most frequently assessments are stated in following review:

- Assessment of efficiency of corrective solutions – for example installing the separators in technological plants, applying the adulterate paints instead of organic solvents, circumferential highway development, elevating the traffic fluency etc.
- Assessment of expected effects of new investment on the air quality, assignment the criteria for their construction on the part of the inhabitants immission burden.
- The analysis of the urban development influence on the air quality.
- The analysis of impacts of investment, urban and conceptual intention in preliminary projects.
- Assessment of efficiency of the resources given on air quality proving.

Results of model calculations

Results of model calculations give detail information about contemporary state of air quality in view of six pollutants: sulphur dioxide, nitrogen dioxide, nitrogen oxides, carbon monoxide, benzene and particulate suspended matter PM_{10}.

As the same as in previous years Update 2006 has noted bottom immission values of **sulphur dioxide** in yearly average concentrations in the entire territory of Prague. In contrast to previous stage immission limit was omitted from legislative:

- In suburban parts of Prague the values generally go on below the value 6 $\mu g.m^{-3}$. In dowmtown there were calculated values over 10 $\mu g.m^{-3}$.
- The highest values (over 10 $\mu g.m^{-3}$) were calculated particularly at locality to the north-west from Malešice heating station. Malešice station is the biggest SO_2 emission source at the territory of Prague (Malešice heating station's share on total amount of SO_2 emission makes 97 % of all large sources (REZZO 1)).
- Another locality with increased concentration is the centre of city, especially Nové Město, Vinohrady vicinity of Vršovice and Žižkov, where the influence of sour-face sources is expressed in upper emissions. Values 8–10 $\mu g.m^{-3}$ have been calculated for this locality.

The crucial share on nitrogen dioxide pollution has automobile transport, which is dominated source of nitrogen oxides on the territory of Prague (more than 80 % of total emissions). On the other hand the significance of point sources and area sources (industry and heating) constantly declines. According to emission balance results the automobile transports' emissions decreased in last two years, because of the rolling stock renovation. This has managed to balance increasing intensity of automobile transport.

Immission limit with the margin of tolerance has been set at the yearly average concentration of nitrogen dioxide on value 48 $\mu g.m^{-3}$ for 2006. According to results of model calculation the imission limit has been exceeded at following localities:

- Barrandovský Bridge and surrounding
- Jižní spojka in between Barrandovský Bridge–Švehlova

- Street K Barrandovu in section contiguous to Barrandovský Bridge
- Nové Město and contiguous parts of Vinohrady, Karlín, Holešovice, Smíchov and part of Hradčany as well. It is concerned especially to Street Wilsonova and its surrounding, further area around Street Legerova, through Karlovo Square to Smíchov as far as southern gateway of Strahovský Tunnel
- Radotín cement factory and its close surrounding
- Several separated point near heavy burdened crossings or communications (Kbelská × Cínovecká, Kbelská × Kolbenova, Průmyslová × Jižní spojka).

The highest values of yearly average concentrations of NO_2 in range 60–80 $\mu g.m^{-3}$ can be expected at wider surroundings of Barrandovský Bridge, Jižní spojka (in between streets Na Strži and Chodovská), at surroundings of Radotín cement factory and also in central part of the city (Street Wilsonova in between Street Křižíkova and Rohanské Quay). There are calculated values over 80 $\mu g.m^{-3}$ at the heaviest burdened localities.

Concentrations from 40 to 60 $\mu g.m^{-3}$ were measured along the entire segment of Jižní spojka from Barrandovský Bridge to crossing with Street 5. května continue to crossing with Street Průmyslová, further on central part of Prague, at sustained locality including almost entire Nové Město, Staré Město with Josefov as well as surrounding parts of Nusle, Vinohrady, Žižkov, Karlín, Holešovice, Hradčany, Malá Strana and Smíchov. Locally were the same values calculated also at localities of high capacity communications crossings as for example Průmyslová × Poděbradská or Cínovecká × Kbelská.

Increased values of maximum hourly concentrations of nitrogen dioxide can be expected especially along the main communications and in close surroundings of the most considerable point sources. The exceedance of immission limit (240 $\mu g.m^{-3}$) has been calculated particularly for surroundings of Jižní spojka and Barrandovský Bridge, Street Brněnská, further more for city centre (along north-south arterial, Street Milady Horákové and Street Plzeňská), and around crossing of Jižní spojka–Průmyslová and also for wide surrounding of Radotín cement factory.

Nitrogen oxides as a sum of concentrations of nitrogen monoxide and nitrogen dioxide, have stated limit just for natural ecosystems protection, scilicet 30 $\mu g.m^{-3}$ for yearly average. For health protection there has been stated immission limit only for NO_2 concentrations. Protected Landscape Area Český kras extends to southwestern part of the City of Prague. The part of city, where the immission limit for natural ecosystem protection stands, is approximately 335 ha large and it extends to localities Zadní Kopanina and Radotín. Spatial zoning of NO_x immission zones is similar to case of yearly average concentrations of nitrogen dioxide:

- The highest concentrations has been calculated nearby Barrandovský Bridge and Jižní spojka. In surrounding of these communications the values over 150 $\mu g.m^{-3}$ could be expected. Values over 150 $\mu g.m^{-3}$ has been also calculated at close surrounding of Radotín cement factory.
- Concentration over 50 $\mu g.m^{-3}$ has been calculated on almost entire territory of the city.
- At the Landscape Protected Area Český kras, which extends to the Prague territory, the concentrations according the results of model calculations oscillates between 20–82 $\mu g.m^{-3}$ (depending on distance from Radotín cement factory).

Carbon monoxide is one of the most common air pollutants, that is produced by combustion of carbonaceous materials. Carbon monoxide produce is characteristic by high values of so called natural background. That means generating CO concentration without any influence of anthropogenic pollution sources:

- The concentrations lay below the 600 $\mu g.m^{-3}$ limit at the major part of city (except wider centre).
- The highest values (over 800 $\mu g.m^{-3}$) could be expected in centre of Prague, especially at locality Nové Město, partly at Holešovice, Smíchov, Vinohrady, Žižkov and Karlín. Increased CO concentrations here are caused by worse traffic fluency and by density of heavy burden level crossings, which belong among typical CO emission sources (as evident from model field lay-out).

The **benzene** immission field respective its spatial arrangement is mostly influenced by traffic and solid fuels heating. But in the event of benzene the automobile traffic influence expresses itself in different way than for example in the event of nitrogen dioxide. The increasing concentration is characteristic for downtown on the other side concentration of benzene decreases along capacitive ring ways. That is why the benzene emissions are higher at low speed roads and slow-moving traffic. Production of organic matter (compared to NO_X) are much more influenced by cold starts of parked vehicles, that are most frequently in housing estate and the least frequently on ring ways. Also heavy trucks and lorries have quite small impact on benzene production. On the other side trucks strongly contribute by NO_X emissions. The share of heavy cargo-carrying traffic is the greatest capacitive roads and the smallest in downtown (where this category of vehicles is regulated). The yearly immission limit of benzene concentration had been stated value 9 $\mu g.m^{-3}$ for 2006.

- The highest concentrations (more than 5 $\mu g.m^{-3}$) could be expected (according to results of model calculations) in centre between streets Ječná, Žitná, Sokolská and Karlovo Square, further more at locality between Štefánik's Bridge a Těšnovský Tunnel and also in surrounding of crossing streets Svatovítská and Milady Horákové.
- Values between 3 to 5 $\mu g.m^{-3}$ could be expected at coherent locality from Janáček's Quay through Vltava, Karl's Square to Tyl's Square and in direction of Václavské Square, along Wilsonova Street through Hlávka's Bridge to Kapitán Jaroš's Quay. Locally the similar values were calculated also at locality between Milady Horákové Street and Edvarda Beneš's Quay, between Vítězné Square and Milady Horákové Street, in surrounding of Veletržní Street in Holešovice and also at locality where Modřanská Street leads to Barrandovský Bridge. Concentrations higher than 2 $\mu g.m^{-3}$ were calculated on almost entire territory of wider centre.
- At the suburban part of city were the benzene concentrations calculated between 0.5 to 1.0 $\mu g.m^{-3}$ (with increased values at localities with higher share of solid fuel – Suchdol, Radotín, Řeporyje and more).

Air pollution with **suspended particulate matter, fraction PM_{10}** has remained one of the major issues of the providing for air quality in Prague.

As mentioned before the level of concentration suspended particulate matter is based on both emission from combustion and technological sources at the area of interest and transfer from neighbouring areas as well as amount of dust threw up by wind, traffic, construction etc (secondary dust effects). The amount of secondary dust changes in dependence on large amount of local conditions as the type of a cover, land usage manner, plot maintenance, road maintenance, wind speed etc. Concentrations of PM_{10} can be fundamentally higher at significant source of secondary dust than classic model calculations assign. For these reasons methodological project aimed was worked out in 2003. The project was intended on the secondary dust influence examination and on PM_{10} immission burden assessment in general level at entire territory of Prague. Designed methodological process was utilized at last two stages of updates.

- The highest calculated values of yearly average concentrations of suspended particulate matter fraction PM_{10} reach from 60 to 80 $\mu g.m^{-3}$ (locally over 80 $\mu g.m^{-3}$) and they were calculated along the highest capacitive communications (Barrandovský Bridge, Jižní spojka between Vídeňská and Záběhlická, Brněnská in Chodov, crossings of Jižní spojka and Průmyslová Street).
- Similar concentrations of PM_{10} occur also at areas where high intensity of transport is connected with high intensity of secondary dust (for example shopping centre in Zličín near Prague ring way) or in surrounding of plants as Řeporyje stone-pit. The stone pit is situated nearby Prague ring way and yearly PM_{10} emission value is about 73 tons for this area.
- Values in range from 40 to 60 $\mu g.m^{-3}$ can be expected along all capacitive communications (Jižní spojka in contiguous zone from Barrandovský Bridge thorugh crossing with 5. května Street to Průmyslová Street and further along Východní spojka, Strakonická Street, K Barrandovu Street, Prague Circle, Kbelská Street and Wilsonova).
- PM_{10} concentration in range from 30 to 40 $\mu g.m^{-3}$ could be expected already at the major part of city centre and also at other locations in wider surrounding of capacitive communications. Concentrations between 25–30 $\mu g.m^{-3}$ already tend to majority of other areas (including suburban localities).

B1.5.2 Selected activities of the Prague City Hall

B1.5.2.1 Air pollution charges

In compliance with responsibilities as set in the Act No. 86/2002 Code on air pollution control, in wording of the following regulations, the Department of Environment of the Prague City Hall kept the registration and issued decisions of charges both for large and extra large air pollution sources as well as for mid-sized ones in 2007.

Within the agenda of charges for air pollution from mid-sized stationary air pollution sources, there were 3,466 mid-sized stationary air pollution sources, out of that 2,872 combustion installations and 594 so-called technology installations, as, for instance, pump stations, paint shops, printing houses, etc., registered by the end 2007.

Within the agenda of charges for air pollution from extra large and large stationary air pollution sources, there were 319 sources registered by 31st December 2007, out of that number 134 were combustion installations and 185 were technology installations.

Charges for air pollutants emissions to the operators of extra large, large, and mid-sized stationary air pollution sources by 31st December 2007 totalled the amount of CZK 6,309,000.

Tab. B1.5.1 Air pollution sources subject to charges of the Prague City Hall, data of 31st December 2007

	Number of mid-sized sources	Number of extra large and large sources
Combustion units	2,872	134
Technology units	594	185
Total	3,466	319

Source: MHMP

B1.5.2.2 The Programme of subsidies of the City of Prague for heating systems conversion and the use of RES

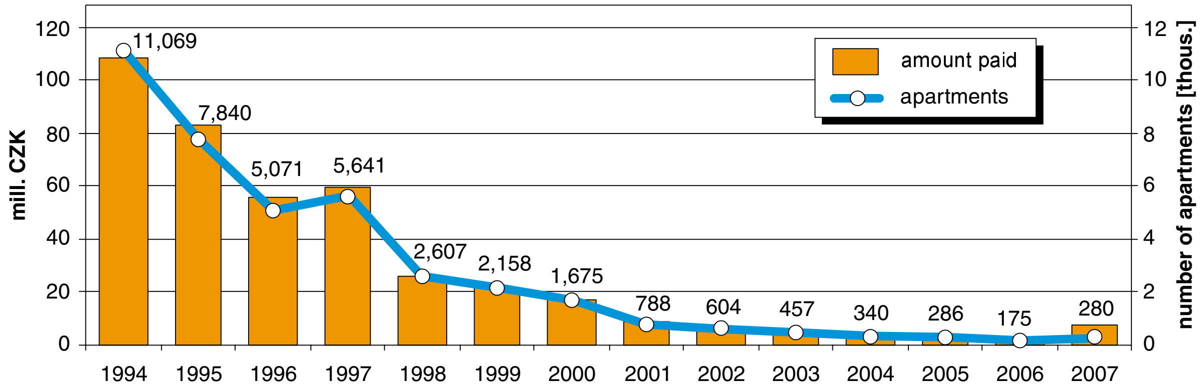
The Programme of subsidies of the City of Prague for heating systems conversion and the use of renewable energy resources on the territory of the City has been running since 1994. The objective of subsidies provided is to motivate owners or users of apartments to convert their original heating systems (namely the solid fuel fired) into using environmentally friendly fuels and renewable sources of energy.

The household solid fuel-fired heating has still indispensable extent on the total production of polluting emissions. In spite of extensive gas a heat renovation the part of household estate is still not connected to CZT system, because solid fuels heating still belongs among the cheaper. Further more the investments to heating systems conversion require high financial expenses. That is why the subsidies for non-ecological heating systems conversion to their ecological form is desired and it should continue till the total displace of solid fuel-fired systems from city.

In last years even more citizens concern on employing the renewable energy sources for apartments heating, warm water heating and also for electricity production. These systems bring costs savings for household, but high initial expenses can represents the handicap for not installing these sources. In this case the hypothetical subsidies are on the spot.

Overview of the Subsidies program procedure is worked out in table and chart.

Fig. B1.5.5 Subsidies program procedure in 1994–2007



Source: OOP MHMP

Tab. B1.5.2 Complete overview of submitted applications for subsidies in 1994–2007

Year	Number of applications in respective year			Apartments	
	Registered	Granted	Amount paid [CZK]	Number of apartments	Average subsidy per apartment [CZK/ap.]
1994	6,335	3,186	108,220,940	11,069	9,777
1995	7,036	3,562	83,238,513	7,840	10,617
1996	2,398	1,692	55,657,126	5,071	10,976
1997	2,404	1,977	59,528,854	5,641	10,553
1998	1,144	982	25,997,010	2,607	9,972
1999	956	844	21,554,464	2,158	9,988
2000	769	728	17,415,627	1,675	10,397
2001	429	396	8,693,928	788	11,033
2002	251	240	5,837,606	604	9,664
2003	225	207	5,040,345	457	11,029
2004	140	123	3,659,870	340	10,764
2005	150	140	3,361,000	286	11,752
2006	94	87	2,180,000	175	12,457
2007	140	135	7,460,920	280	26,646
Total	22,471	14,299	407,846,203	38,991	–

Source: OOP MHMP