Joint report on air quality in the Tri-border region of the Czech Republic, Poland and Germany in 2003 (former Black Triangle region)

Společná zpráva o kvalitě ovzduší v příhraniční oblasti České republiky, Polska a Německa v roce 2003 (bývalá oblast Černého trojúhelníku)

Gemeinsamer Bericht zur Luftqualität im Dreiländereck der Tschechischen Republik, Polens und Deutschlands 2003 (ehemals Schwarzes Dreieck)

Wspólny raport o jakości powietrza w trójgranicznym regionie Republiki Czeskiej, Polski i Niemiec w roku 2003 (były region Czarnego Trójkąta)

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URLs:

Czech:	www.env.cz www.chmi.cz
German:	www.umweltbundesamt.de www.umwelt.sachsen.de/lfug
Polish:	www.jgora.pios.gov.pl/wwm/index.htm

Introduction

About 15 years ago the tri-border region of the Czech Republic, Poland and Germany was called the Black Triangle (covering Northern Bohemia, part of Lower Silesia and Saxony) and was characterised by the highest air pollution in Europe. So it was necessary to find an approach for solving the transboundary air quality problems. Consequently a joint declaration of cooperation in solving environmental problems in the Black Triangle Region was signed by the ministers of environment of former Czechoslovakia, Germany and Poland in June 1991.

Additionally the European Commission was invited to become the fourth partner in this initiative and to assist the region through PHARE project funding worth 13 million ECU. This support was granted also with a view to a future EU membership of Poland and the Czech Republic.

The Joint Air Monitoring System (JAMS) was established and put into operation using PHARE funding. The PHARE Black Triangle project made it possible for both countries to train staff in carrying out measuring methods, data collection and processing in accordance with EU standards and relevant Air Quality Directives. Currently JAMS consists of about 40 monitoring stations.

In September 1996 the three partner countries signed the trilateral Protocol on Air Quality Data Exchange, facilitating an effective exchange of JAMS data. The JAMS activities are supported by a trilateral Working Group consisting of representatives of the Czech Hydrometeorological Institute in Prague and Ústí nad Labem, Saxony's State Authority for the Environment and Geology in Radebeul/Dresden, the Federal Environmental Agency in Berlin and the Voivodship Inspectorate for Environmental Protection in Wrocław and Jelenia Góra. This group evaluates the measuring data from the JAMS network, checks its quality according to EU requirements and is responsible for the "Joint Report on Air Quality in the Tri-border Region of the Czech Republic, Poland and Germany" which will shortly be available at the websites of the participating institutions.

The activities in past years connected with the accession of Poland and the Czech Republic to the EU have influenced the cooperation in the field of air quality substantially in recent years. A new preliminary air quality assessment was carried out in both countries. From this followed a modernisation of the existing air monitoring networks according to the requirements of the Air Quality Directives of the European Commission. In this process, the neighbouring countries informed each other on an ongoing basis. In case of changes concerning JAMS stations the partner countries could take part on the decision making process.

In this context, further PHARE projects were initiated. For Poland PHARE 2001 project PL0105.06.02 is relevant, comprising further modernisation of the air monitoring networks (see chapter 6 point 5 of this report) and establishment of a QA/QC system for air quality assessment in Poland. The QA/QC system will be compliant with the existing requirements of relevant EU Directives. The QA/QC project foresees establishing 4 laboratories in Poland: one in the Central Office of Measurements in Warsaw and 3 regional calibrating laboratories in Provincial Inspectorates for Environmental Protection: in Kraków, Wrocław and Warsaw. The existing calibrating laboratory in Jelenia Góra is used, as before, to meet current needs of the Lower Silesian air monitoring network.

In the Czech Republic, activities in 2003 – 2004 dealt with the innovation of the national air monitoring network, monitoring instrumentation, systems of QA/QC and data transport. Laboratory reconstruction and innovation of laboratory instrumentation were also carried out. Measurement of PM_{10}, heavy metals, benzene, $PM_{2.5}$, NH_3 and PAHs was continued/started. The above activities were carried with the significant support of projects PHARE CZ 0006-0301, CZ 0106-0102, CZ 0106-0101 „Instrumentation for the monitoring of air pollutants covered by Daughter Directives 99/30/EC, 2000/69/EC to the 96/62/EC Directive". The air monitoring network and the laboratory in the Northern Bohemia region profited greatly from these projects.

This publication is the sixth joint trilateral report describing and evaluating air quality in the tri-border region. Following the description of monitoring sites and geographical, climatological and meteorological conditions in the region, the report focuses on concentrations measured in 2003 for atmospheric pollutants. In addition, it describes ozone and PM_{10} episodes in 2003, emission trends since 1989 and changes in ambient air quality since 1996. The monitoring data presented in the report are structured according to major air pollutants. Emissions and concentrations are presented for each air pollutant, followed by a comparison with the EU limit values. The presentation starts with the components of the 1st Daughter Directive (1999/30/EC) – SO_2, NO_x, PM_{10}, Pb in PM_{10}.

In November 2000 the 2nd Daughter Directive (2000/69/EC) entered into force, regulating benzene and carbon monoxide concentrations in ambient air. The Ozone Directive 2002/03/EC (3rd Daughter Directive) was adopted in February 2002.

The report also presents measurement results for polycyclic aromatic hydrocarbons (PAHs) and additional heavy metals (As, Cd, Ni), which are covered by a fourth daughter directive adopted in December 2004.

In addition, the three countries have continued their work to improve QA/QC. Activities to this end include intercalibration exercises in CHMI in Prague and LfUG in Radebeul-Wahnsdorf.

More than 10 years of cooperation have resulted not only in substantial progress but most of all in mutual understanding and trust as well as broad knowledge of the partners‘ work.

The substantial effort undertaken by the three national governments and industry has resulted in a significant improvement of air and water quality in the region of common interest.

1. Geography, economy and climate in the Tri-border region

1.1. Description of the Common Air Quality Monitoring System

The tri-border region became known as the “Black Triangle”, due to the pollution and the damage to health and ecosystems caused by the mining and exploitation of coal in the region during the last several decades. The area consists of Northern Bohemia (CZ), the southern part of Saxony (DE), and the south-western part of Lower Silesia (PL). Table 1 presents information on the area’s structure and population.

Table 1. The tri-border region
Tabulka 1. Příhraniční oblast
Tabelle 1. Das Dreiländereck
Tabela 1. Trójgraniczny region

Country		CZ	DE	PL	Total
Administrative Regions		Relevant border districts of the Karlovarský, Ústecký, Liberecký and Královéhradecký regions	Dresden and Chemnitz districts („Regierungsbezirke“)	South-western part of the Province (Voivodship) Lower Silesia	
Area	[km²]	9 880	14 000	8 500	32 380
Population	[million]	1.38	3.26	1.24	5.88
Population density	[per km²]	140	233	146	182

In terms of industry structure, the Czech and Polish parts of this region can be divided into a western and an eastern part.

The western part is still highly affected by the mining industry in the lignite basins.

Many power stations have been built near lignite mines, among them some of the largest in the Czech Republic and in Poland. They supply electricity not only for the tri-border region, but also to large parts of the Czech Republic and Poland. The chemical industry and electric power plants are the largest pollution sources influencing the state of the environment in the region.

The eastern part of the Czech tri-border region is quite different from the western one with regard to the industrial structure. The consumer goods industry, producing low emissions, is typical for this region. The eastern part of the Polish tri-border region is characterised by small-scale ceramic, glass, textile and paper production, so emissions are kept at a low level.

The Saxon part of the tri-border region is known for its long industrial tradition. In the past centuries mining activities, wood processing, and paper production dominated the region's economic structure utilising its existing natural resources. Later these structures were replaced by a large diversity of economic branches, due to the development of engineering capacities. The region became the centre for textile and vehicle production. Today the region is known for its growing high-tech industry (e.g. microelectronics) and associated services.

At present the Joint Air Monitoring System (JAMS) consists of 36 measuring stations. They belong to monitoring networks of the Czech Republic, Poland and the Free State of Saxony. Comparable criteria and approaches were applied for the selection of Czech and Polish stations: they have to be representative of both mountainous and lowland areas.

A description of the Joint Air Monitoring System is presented in Table 2 and the map in Figure 1.

Figure 1	**Joint Air Monitoring System in the tri-border region, 2003**
Obrázek 1.	**Společný systém monitoringu ovzduší v příhraniční oblasti, 2003**
Abbildung 1.	**Das gemeinsame Luftüberwachungssystems im Dreiländereck, 2003**
Rysunek 1.	**Wspólny system monitoringu powietrza (JAMS) w trójgranicznym regionie, 2003**

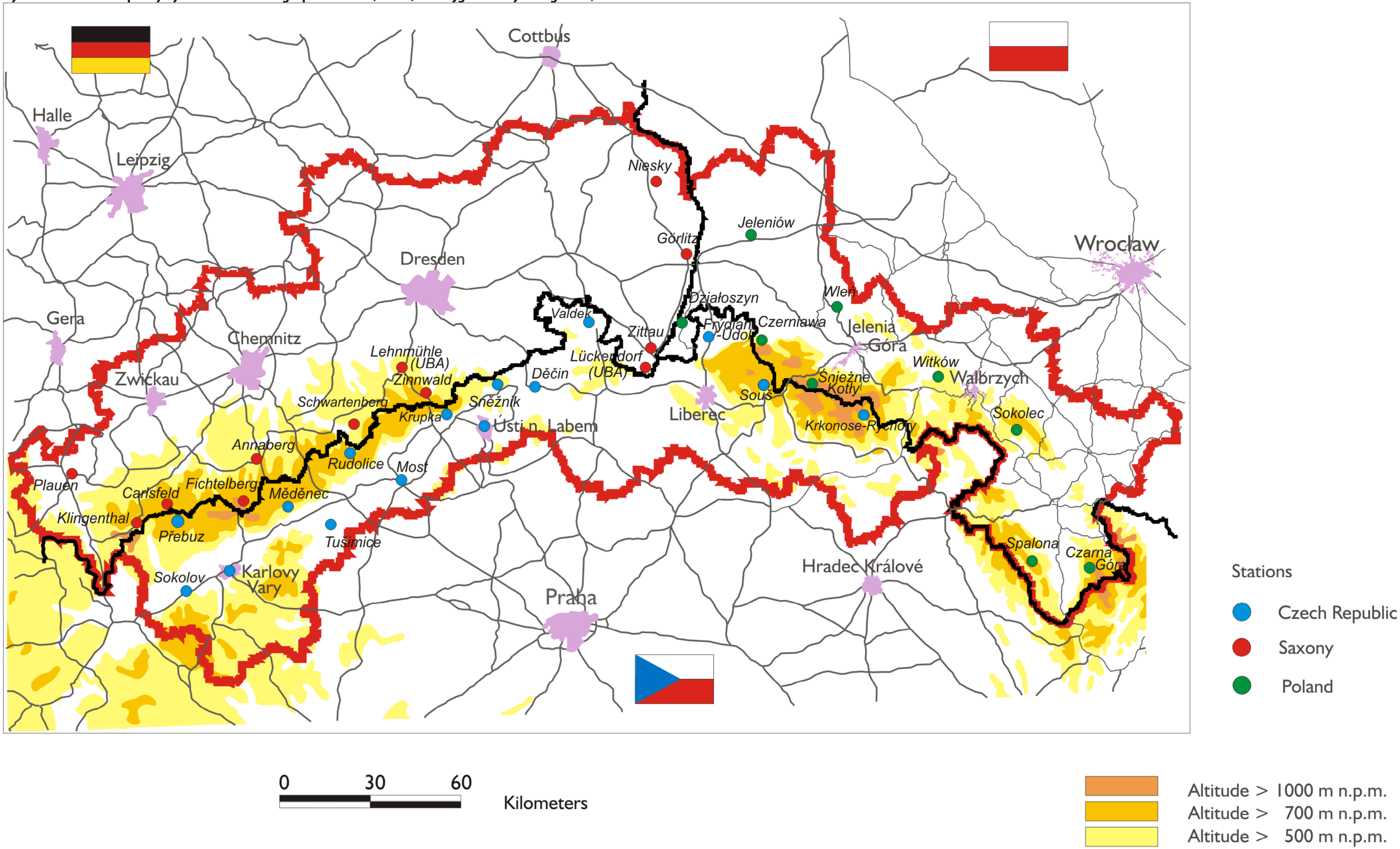


Table 2. Description of the Joint Air Monitoring System in the tri-border region for the year 2003

Tabulka 2. Popis společného systému sledování kvality ovzduší v příhraniční oblasti v roce 2003

Tabelle 2. Beschreibung des gemeinsamen Luftüberwachungssystems im Dreiländereck 2003

Tabela 2. Opis wspólnego systemu monitoringu powietrza w trójgranicznym regionie w roku 2003

	Station name	height m. a.s.l.	EU-classification			Air pollution components													Meteorology					
			type of station	type of zone	characterization of zone	SO_2	NO_2	NO_x	O_3	CO	BTX	BaP in PM_{10}	TSP SPM-L	PM_{10} SPM-L	PM_{10} SPM-H	$PM_{2,5}$ SPM-H	soot SPM-H	Sed.D.	W-Di	W-Sp	Temp	Hum	Pres	SR
CZ	Děčín	131	background	urban	res., comm.	x	x	x		x				x					x	x	x	x	x	x
CZ	Frýdlant-Údolí	381	background	rural	res. agric.	x	x	x						x					x	x	x	x	x	x
CZ	Karlovy Vary	429	background	urban	residential	x	x	x		x				x										
CZ	Krkonoše - Rýchory	1001	background	rural	natural	x	x	x	x					x	x				x	x	x	x		x
CZ	Krupka	533	background	rural	natural	x	x	x		x				x					x	x	x	x	x	x
CZ	Měděnec	827	background	rural	agric., natural	x	x	x		x				x					x	x	x	x		
CZ	Most	221	background	urban	residential	x	x	x	x	x	x			x					x	x	x	x	x	x
CZ	Přebuz	904	background	rural	natural	x	x	x	x					x					x	x	x	x	x	x
CZ	Rudolice	840	background	rural	natural	x	x	x	x		x			x	x				x	x	x	x		x
CZ	Sněžník	588	background	rural	natural	x	x	x	x					x					x	x	x	x	x	x
CZ	Sokolov	476	background	urban	residential	x	x	x	x	x				x	x				x	x	x	x	x	x
CZ	Souš	771	background	rural	natural	x	x	x	x					x	x				x	x	x	x	x	x
CZ	Tušimice	322	background	rural	res., agric.,ind.	x	x	x	x					x					x	x	x	x	x	x
CZ	Ústí nad Labem-město	149	background	urban	res., comm.	x	x	x	x	x				x										x
CZ	Valdek	438	background	rural	res. agric.	x	x	x	x					x					x	x	x	x	x	x
DE	Klingenthal	540	background	urban	res., comm.	x	x		x		x				x				x	x	x	x	x	x
DE	Plauen Süd	343	traffic	urban	res., comm.		x			x	x				x				x	x	x	x		
DE	Annaberg-Buchholz	545	traffic	urban	res., comm., ind.	x	x		x										x	x	x	x	x	x
DE	Fichtelberg	1214	background	rural	natural	x			x										x	x	x	x	x	x
DE	Carlsfeld	896	background	rural	natural	x			x						x				x	x	x	x	x	x
DE	Zittau Ost	230	background	urban	res., comm.	x	x		x						x			x	x	x	x			x
DE	Görlitz	210	traffic	urban	res., comm., ind.	x	x			x	x	x			x		x	x	x	x	x	x	x	x
DE	Niesky *	148	background	rural	natural				x										x	x	x	x	x	x
DE	Zinnwald	877	background	rural	natural	x	x		x									x	x	x	x	x	x	x
DE	Schwartenberg	787	background	rural	natural	x	x	x	x		x	x			x	x			x	x	x	x	x	x
UBA	Lehnmühle	527	background	rural	agricultural	x	x	x	x					x					x	x	x	x	x	
UBA	Lückendorf	490	background	rural	agricultural	x	x	x	x				x	x					x	x	x	x	x	
PL	Działoszyn	362	industrial	rural	agricultural	x	x	x	x	x		x		x	x				x	x	x	x	x	x
PL	Czerniawa	645	background	rural	natural	x	x	x	x			x		x	x				x	x	x	x	x	x
PL	Wleń	303	background	rural	agricultural	x	x	x						x					x	x	x	x	x	x
PL	Śnieżne Kotły	1490	background	rural	natural	x	x	x	x					x					x	x	x	x	x	x
PL	Jeleniów	244	background	rural	agricultural	x	x	x	x	x		x		x	x				x	x	x	x	x	x
PL	Spalona	810	background	rural	natural	x	x	x						x					x	x	x	x	x	x
PL	Czarna Góra	1133	background	rural	natural	x	x	x	x					x					x	x	x	x	x	x
PL	Sokolec	865	background	rural	natural	x	x	x	x					x										
PL	Witków	480	background	rural	agricultural	x	x	x		x				x					x	x	x	x	x	x

1.2. Climate and geographical conditions

The tri-border region belongs to the northern moderate climatic zone. The most important geomorphologic factors affecting the climatological and meteorological situation in the tri-border region are mountain ranges extending from south-west to north-east along the Czech-German border and approximately in west-north-western – east-south-eastern direction at the Czech-Polish border. These mountain ranges consist of Slavkovský les, Doupovské hory, Krušné hory (Ore Mountains), České středohoří, Děčínské stěny, Lužické hory, Jizerské hory/Góry Izerskie and Krkonoše/Karkonosze (Giant Mountains) as well as Sowie Mountains and Śnieżnik Massif. The altitude of the Krušné hory mountains decreases from south-west to north-east, amounting to 1000–1200 m above the sea level in the vicinity of Klínovec, Fichtelberg and Auersberg, and 600–800 m a.s.l. near Děčín. The Krušné hory mountains rise steeply on their southern (Czech) side from the Sokolov and Most basins, descending rather gradually to the north on the German side. The Krkonoše/Karkonosze mountains are considerably steeper on the Polish as compared to the Czech side, rising to about 1200 m a.s.l., with the highest peak Sněžka/Śnieżka – at 1602 m a.s.l. Besides the mountain massifs, lowland parts with altitudes of about 100–300 m a.s.l. such as the Dresden, Jelenia Góra, Kłodzko, Sokolov and Most basins also contribute to the complex orography of the tri-border region. This complex orography is the reason for considerable variability in local climates of this region. The annual mean temperature in the lowland parts is about 8°C and does not exceed 10°C. The typical annual mean in the mountains is about 3°C with a minimum of about 0°C on the hill of Sněžka /Śnieżka. Sunshine duration in the mountains amounts to approximately 1600 hours per year, in lower parts the annual total is up to 1800 hours. Annual precipitation levels are distributed unevenly with sharp gradients due to the strong influence of the complex orography. They range from 1200 mm in the mountains to 800 mm in lower parts of the Ore Mountains region, dropping to only 450 mm round Žatec where the "precipitation shadow" occurs. In Krkonoše/Karkonosze above 750 m a.s.l., annual precipitation is even more abundant: 1300–1400 mm.

The prevailing air flow directions in the tri-border region are from the north-west, west and south-west. Jizerské hory/Góry Izerskie and Krkonoše/Karkonosze mountain ranges (spreading west-east) block intrusions of cold air masses from the north to Bohemia. During anticyclonic situations, winds generally blow from the eastern or south-eastern sectors. In such situations temperature inversions and low wind or calm periods occur very often in the poorly ventilated Czech basins under Krušné hory during the winter season, forming unfavourable conditions for the dispersion of pollutants. Local, terrain-influenced flow systems are generated under such circumstances, making analysis and forecast of air pollution transport and dispersion in the tri-border region extremely difficult.

Table 3. Meteorological conditions in the Czech part of the tri-border region – 2003
Tabulka 3. Meteorologické podmínky v české části příhraniční oblasti – 2003
Tabelle 3. Die meteorologischen Bedingungen im tschechischen Teil des Dreiländerecks – 2003
Tabela 3. Warunki meteorologiczne w czeskiej części trójgranicznego regionu – 2003

Month	Air temperature Deviation from long term mean [K]	Precipitation Deviation from long term mean [%]	Sunshine duration Deviation from long term mean [%]
January	non uniform (-0,4 to +0,4)	mostly too wet (-20,6 to +81,5)	non uniform (-25,5 to +44,2)
February	too cold (-5,9 to -2,4)	too dry (-83,8 to -44,7)	above the average (+69,4 to +160,9)
March	too warm (-0,2 to +1,9)	too dry (-77,4 to -43,3)	above the average (+50,4 to +170,6)
April	mostly too cold (-3,5 to +0,5)	too dry (-43,0 to -7,0)	above the average (-1,4 to +64,2)
May	too warm (+0,7 to +2,8)	non uniform (-19,4 to +9,4)	non uniform (-7,8 to +25,8)
June	too warm (+2,3 to +4,9)	too dry (-68,8 to -17,2)	above the average (+8,7 to +83,5)
July	too warm (+1,2 to +2,9)	mostly too wet (-2,5 to +57,8)	mostly above the average (-19,8 to +116,6)
August	too warm (+1,2 to +4,6)	too dry (-88,3 to -29,8)	above the average (+16,7 to +66,4)
September	too warm (+0,5 to +1,4)	too dry (-63,5 to -19,5)	above the average (+14,4 to +52,6)
October	too cold (-6,3 to -2,7)	too wet (+3,5 to +81,3)	non uniform (-19,7 to +20,7)
November	mostly too warm (-0,6 to +2,8)	too dry (-78,2 to -61,4)	above the average (+18,0 to +133,9)
December	non uniform (-0,4 to +1,0)	non uniform (-37,8 to +32,2)	above the average (+17,3 to +202,2)
Year	**too warm (0,3 to 1,1)**	**too dry (-33,8 to -5,0)**	**above the average (+22,9 to +56,5)**

Table 3a. Meteorological conditions in the Czech part of the tri-border region – 1998-2003
Tabulka 3a. Meteorologické podmínky v české části příhraniční oblasti – 1998-2003
Tabelle 3a. Die meteorologischen Bedingungen im tschechischen Teil des Dreiländerecks - 1998-2003
Tabela 3a. Warunki meteorologiczne w czeskiej części trójgranicznego regionu – 1998-2003

Year	Air temperature ** Deviation from long term mean [K]	Precipitation ** Deviation from long term mean [%]	Sunshine duration ** Deviation from long term mean [%]
2003	too warm (0,3 to 1,1)	too dry (-33,8 to -5,0)	above the average (+22,9 to +56,5)
2002	too warm (+0,4 to + 1,2)	too wet (+23,2 to +43,3)	non uniform (-6,9 to +19,9)
2001	normal (-0,2 to +0,5)	too wet (+17,2 to +39,8)	normal (-14,5 to +10,2)
2000	too warm (+0,5 to + 1,9)	too wet (-2,6 to + 29,5)	about normal (-7,3 to +13,0)
1999	too warm (+0,1 to + 1,2)	about normal (-10,6 to + 5,2)	about normal (-6,7 to +12,6)
1998	too warm (+0,4 to + 0,8)	mostly too wet (+19,2 to + 24,7)	mostly above the average (-7,4 to + 8,9)

* Stations: Karlovy Vary airport, Teplice, Ústí nad Labem-Kočkov, Liberec, Pec pod Sněžkou

** reference to 30-year mean value (1961-1990)

Table 4. Frequency of the wind direction and calm in the Czech part of the tri-border region – 2003
Tabulka 4. Čestnost směru větru a bezvětří v české části příhraniční oblasti – 2003
Tabelle 4. Windrichtungsverteilung und Anteil der Calmen im tschechischen Teil des Dreiländerecks – 2003
Tabela 4. Częstości kierunków wiatru i cisz w czeskiej części trójgranicznego regionu – 2003

Sector	From [°]	To [°]	Frequency [%]						
			Cheb	Tušimice	Měděnec	Rudolice	Sněžník	Albrechtice	Souš
N	337,5	22,5	14,09	6,42	2,84	12,37	6,95	22,41	33,04
NE	22,5	67,5	11,76	8,01	2,03	5,25	8,05	4,03	11,77
E	67,5	112,5	7,52	13,39	10,68	7,37	18,23	3,4	4,35
SE	112,5	157,5	5,43	9,25	23,64	24,38	16,64	24,67	15,61
S	157,5	202,5	16,22	3,26	4,61	7,95	8,2	18,94	12,36
SW	202,5	247,5	15,09	16,14	6,69	4,21	8,47	3,48	2,75
W	247,5	292,5	9,04	31	20,45	11,49	15,92	5,4	2,23
NW	292,5	337,5	20,81	12,52	29,03	26,98	16,81	17,52	17,74
calm < 0,5 m/s			0,04	0,02	0,03	0	0,73	0,15	0,15

Table 5. Meteorological conditions in the German part of the tri-border region – 2003
Tabulka 5. Meteorologické podmínky v neměcké části příhraniční oblasti – 2003
Tabelle 5. Die meteorologischen Bedingungen im deutschen Teil des Dreiländerecks – 2003
Tabela 5. Warunki meteorologiczne w niemieckiej części trójgranicznego regionu – 2003

Month	Air temperature Deviation from long term mean [K]	Precipitation Deviation from long term mean [%]	Sunshine duration Deviation from long term mean [%]
January	too cold (-0,3 to +0,1)	too wet (+15 to +50)	non uniform (-21 to +19)
February	too cold (-2,7 to -2,4)	extremely too dry (-81 to -86)	above the average (+70 to +114)
March	too warm (+0,8 to +1,8)	too dry (-32 to -56)	above the average (+44 to +72)
April	too warm (+0,4 to +0,7)	too dry (-22 to -75)	above the average (+35 to +54)
May	too warm (+2,3 to +2,6)	too dry (-13 to -53)	above the average (+9 to +14)
June	too warm (+3,6 to +4,1)	too dry (+6 to -71)	above the average (+37 to +58)
July	too warm (+1,6 to +2,2)	too wet (+31 to +58)	non uniform (-4 to +14)
August	too warm (+3,3 to +4,2)	extremely too dry (-61 to -96)	above the average (+36 to +46)
September	too warm (+0,6 to +1,2)	non uniform (-41 to +57)	above the average (+25 to +31)
October	too cold (-3,6 to -3,3)	non uniform (-22 to +34)	lower than average (-25 to +3)
November	too warm (+1,8 to +2,7)	too dry (-19 to -53)	above the average (+66 to +105)
December	too warm (+0,7 to +1,6)	too dry (-10 to -42)	above the average (+70 to +149)
Year	too warm (0,8 to 1,2)	too dry (-15 to -38)	above the average (+25 to +39)

* DWD stations: Leipzig-Schkeuditz, Chemnitz, Dresden-Klotzsche, Görlitz

Table 5a . Meteorological conditions in the German part of the tri-border region – 1998-2003
Tabulka 5a. Meteorologické podmínky v nemĕcké části příhraniční oblasti – 1998-2003
Tabelle 5a. Die meteorologischen Bedingungen im deutschen Teil des Dreiländerecks – 1998-2003
Tabela 5a. Warunki meteorologiczne w niemieckiej części trójgranicznego regionu – 1998-2003

Year	Air temperature ** Deviation from long term mean [K]	Precipitation ** Deviation from long term mean [%]	Sunshine duration ** Deviation from long term mean [%]
2003	too warm (0,8 to 1,2)	too dry (-15 to -38)	above the average (+25 to +39)
2002	too warm (0,9 to 1,3)	too wet (+12 to +31)	above the average (+2 to +5)
2001	too warm (0,2 to 0,6)	too wet (+3 to +19)	mostly lower than average (-12 to +5)
2000	too warm (+1,7 to + 1,9)	non uniform (-13 to + 7)	above the average (+3 to +18)
1999	too warm (+1,0 to + 1,4)	mostly too dry (-23 to + 5)	above the average (+4 to +13)
1998	too warm (+0,6 to + 1,1)	mostly too wet (-2 to + 15)	normal (-4 to + 4)

Table 6. Frequency of the wind direction and calm in the German part of the tri-border region – 2003
Tabulka 6. Čestnost směru větru a bezvětří v nemĕcké části v příhraniční oblasti. – 2003
Tabelle 6. Windrichtungsverteilung und Anteil der Calmen im deutschen Teil des Dreiländerecks – 2003
Tabela 6. Częstości kierunków wiatru i cisz w niemieckiej części trójgranicznego regionu – 2003

Sector	From [°]	To [°]	Frequency [%]				
			Carlsfeld	Fichtelberg	Zinnwald	Lehnmühle	Lückendorf
N	337,5	22,5	8,8	7,9	11,3	5	28
NE	22,5	67,5	9,6	4,8	8,5	8	3
E	67,5	112,5	5,5	14,7	2,8	3	0
SE	112,5	157,5	14,3	10,4	8,9	6	0
S	157,5	202,5	14,5	7,5	24,9	15	35
SW	202,5	247,5	19,7	12,0	7,9	18	19
W	247,5	292,5	13,8	26,8	16,8	20	3
NW	292,5	337,5	10,2	15,6	18,4	7	5
calm < 0,5 m/s			3.7	0.2	3,6	18	7

Table 7. Meteorological conditions in the Polish part of the tri-border region – 2003
Tabulka 7. Meteorologické podmínky v polské části v příhraniční oblasti – 2003
Tabelle 7. Die meteorologischen Bedingungen im polnischen Teil des Dreiländerecks – 2003
Tabela 7. Warunki meteorologiczne w polskiej części trójgranicznego regionu – 2003

Month	Air temperature** Deviation from long term mean [K]	Precipitation** Deviation from long term mean [%]	Sunshine duration** Deviation from long term mean [%]
January	normal (-0,3 to +0,3)	too wet (+24,1 to +41,8	lower than average (-20,2 to -1,8)
February	too cold (-3,5 to -0,5)	too dry (-76,5 to -16,6)	above the average (+68,1 to +109,8)
March	too warm (+0,6 to +1,5)	too dry (-61,9 to -42,9)	above the average (+40,4 to +66,0)
April	mostly too cold (-0,5 to 0,0)	too dry (-42,9 to -34,9)	above the average (+27,6 to +29,4)
May	too warm (+2,7 to +3,2)	non uniform (–61,1 to +6,1)	above the average (+28,3 to +31,6)
June	too warm (+3,3 to +3,5)	too dry (–69,2 to -42,0)	above the average (+44,3 to +55,2)
July	too warm (+1,5 to +1,6)	non uniform (-47,0 to +15,9)	non uniform (-12,7 to +5,9)
August	too warm (+2,5 to +3,1)	too dry (-74,2 to -26,7)	above the average (+55,5 to +88,1)
September	too warm (+0,1 to +0,8)	too dry (-37,1 to -20,2)	above the average (+25,8 to +40,3)
October	too cold (-4,9 to -3,1)	too wet (+13,9 to +47,8)	lower than average (–32,6 to -19,9)
November	too warm (+1,8 to +3,5)	too dry (-76,5 to -59,5)	above the average (+21,7 to +75,6)
December	too warm (+0,3 to +2,0)	non uniform (-6,6 to +98,8)	above the average (+20,8 to +64,2)
Year	**too warm (+0,6 to +1,1)**	**too dry (–40,0 to -16,6)**	**above the average (+28,2 to +35,9)**

* IMGW stations: Jelenia Góra, Kłodzko, Śnieżka

** *reference to 30-year mean value (1961-1990)*

Table 7a . Meteorological conditions in the Polish part of the tri-border region – 1998-2003
Tabulka 7a. Meteorologické podmínky v polské části v příhraniční oblasti – 1998-2003
Tabelle 7a. Die meteorologischen Bedingungen im polnischen Teil des Dreiländerecks 1998- 2003
Tabela 7a. Warunki meteorologiczne w polskiej części trójgranicznego regionu –1998- 2003

Year	Air temperature ** Deviation from long term mean [K]	Precipitation ** Deviation from long term mean [%]	Sunshine duration ** Deviation from long term mean [%]
2003	too warm (+0,6 to +1,1)	too dry (–40,0 to -16,6)	above the average (+28,2 to +35,9)
2002	too warm (+1,3 to +1,5)	non uniform (–1,5 to +16,4)	non uniform (–2,5 to +9,6)
2001	normal (+0,4 to +0,8)	mostly too wet (–0,4 to +28,7)	normal (-5,9 to +3,1)
2000	too warm (+1,7 to + 1,9)	non uniform (-19 to + 11)	above the average (+7 to +16)
1999	too warm (+0,7 to + 1,3)	mostly too dry (-15,4 to -3,2)	mostly above the average (-2,9 to +13,2)
1998	too warm (+0,5 to + 0,8)	mostly too wet (-2 to + 20)	mostly above the average (-5 to + 11)

* IMGW stations: Jelenia Góra, Kłodzko, Śnieżka

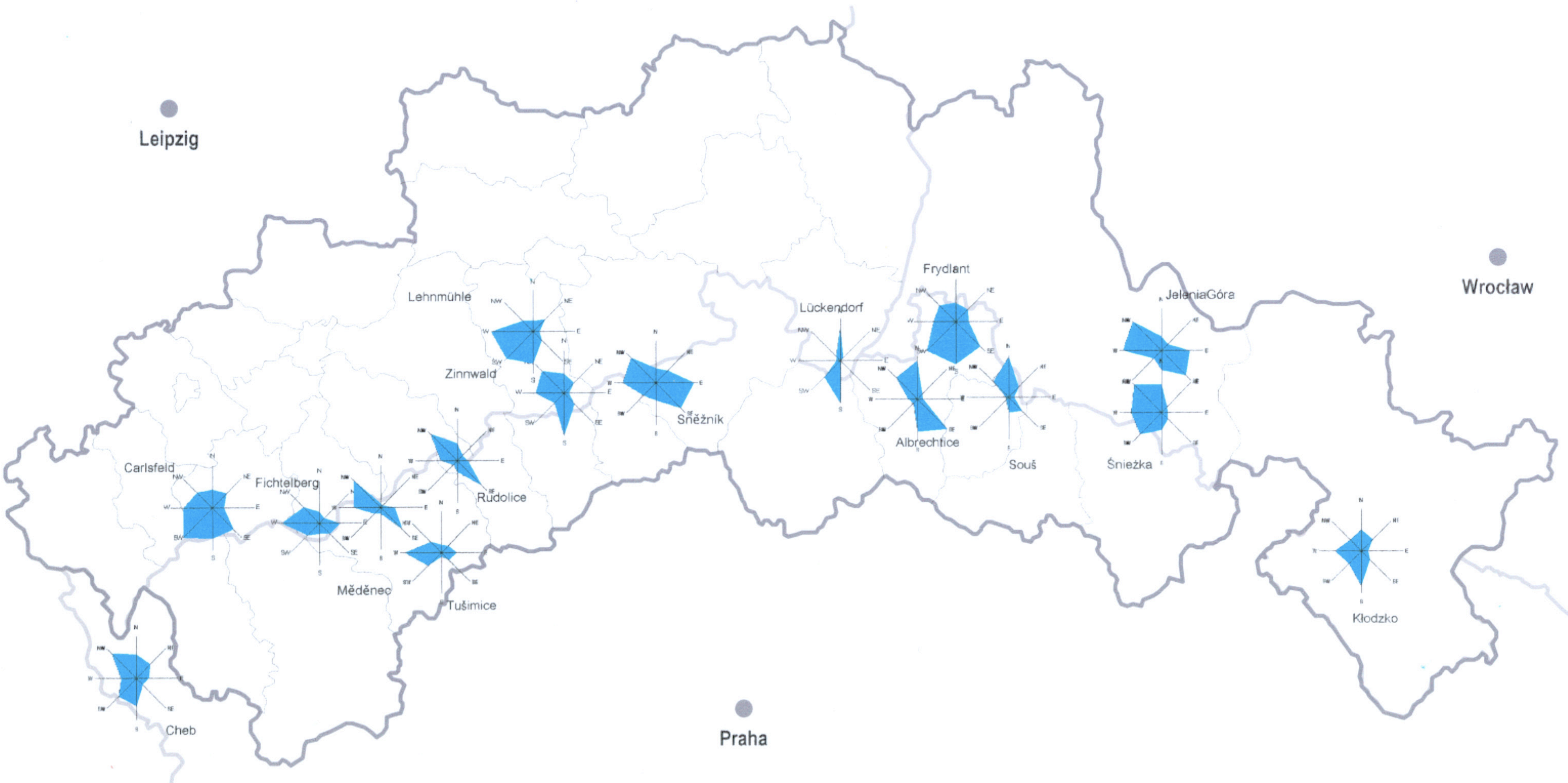
** reference to 30-year mean value (1961-1990)

Table 8. Frequency of the wind direction and calm in the Polish part of the tri-border region – 2003
Tabulka 8. Čestnost směru větru a bezvětří v polské části v příhraniční oblasti – 2003
Tabelle 8. Windrichtungsverteilung und Anteil der Calmen im polnischen Teil des Dreiländereck – 2003
Tabela 8. Częstości kierunków wiatru i cisz w polskiej części trójgranicznego regionu – 2003

Sector	from [°]	to [°]	Frequency [%]		
			Jelenia Góra	Kłodzko	Śnieżka
N	337,5	22,5	5,0	10,1	16,1
NE	22,5	67,5	3,1	7,8	4,5
E	67,5	112,5	10,1	3,2	3,7
SE	112,5	157,5	12,3	6,0	5,1
S	157,5	202,5	6,9	16,3	10,2
SW	202,5	247,5	3,7	8,3	17,8
W	247,5	292,5	13,9	12,6	18,3
NW	292,5	337,5	14,6	7,6	22,9
calm < 0,5 m/s			27,6	28,1	1,4

* IMGW stations: Jelenia Góra, Kłodzko, Śnieżka

Figure 2.	Frequency of wind directions in the tri-border region, 2003
Obrázek 2.	Četnost směru větru v příhraniční oblasti v roce, 2003
Abbildung 2.	Windrichtungsverteilung im Dreiländereck, 2003
Rysunek 2.	Częstości kierunków wiatru w trójgranicznym regionie, 2003



2. Air quality standards

2.1. Czech Republic

Within the framework of the European Union accession process, new legislation on air quality standards based on the EU Directives has been enacted. The new Clean Air Act came into force in 2002 (Law No.86/2002 Act 12.3.2002 and Governmental Ordinance 350/2002 Act 3.7.2002) and fully transposes the EC Air Quality Directives in force (1999/30/EC, 2000/69/EC, 2002/3/EC).

Differences between the air quality standards in the Czech Republic and those stated in the EC Air Quality Directives are as follows: the new air quality standards for human health protection additionally cover annual mean limit values for NH_3, As, Cd, Ni, Hg and BaP. Limit values for 2003 (limit value + margin of tolerance): NH_3 - 140 µg/m^3, As - 11,25 ng/m^3, Cd - 7 ng/m^3, Ni - 34 ng/m^3, Hg - no value for 2003, BaP - 8 ng/m^3. Further information on the air quality standards obligatory in the Czech Republic is given on the websites of the Czech Hydrometeorological Institute (CHMI):

http://www.chmi.cz/uoco/isko/tab_roc/2003_enh/eng/pdf/03kom.pdf

http://www.chmi.cz/UL/akt/oocostr/imisni_limity/imis_limit_cr.htm.

2.2. Germany

The limit values set by the 1st Daughter Directive (1999/30/EC) for SO_2, NO_2/NO_x, PM_{10} and lead in PM_{10}, as well as by the 2nd Daughter Directive (2000/69/EG) for benzene and CO were transposed into German law by the 22nd Ordinance on the Implementation of the Federal Air Quality Control Act (22. BImSchV) of 11 September 2002. The 3rd Daughter Directive (2001/3/EC) and Directive 2001/81/EC on national emission ceilings for certain atmospheric pollutants (NEC Directive) were transposed into German law by the 33rd Ordinance on the Implementation of the Federal Immission Control Act (33. BImSchV) of 13 July 2004. At the same time the 22. BImSchV, which defines air quality values, was updated and the 23. BImSchV was repealed. More information is available on the website of the Federal Environmental Agency:

http://www.umweltbundesamt.de/luft/vorschriften/vorschriften.htm

2.3. Poland

Within the framework of Poland's accession to the European Union, statutory work with regard to environment protection has been carried out, and on 27 April 2001 the new Environment Protection Law was adopted. Relevant execution acts have been issued to support it, among others the regulation by the Minister of Environment regarding the "permissible levels of some substances in the air, alert levels of some substances in the air and the tolerance margins for the permissible levels of some substances" and respecting the "assessment of the substances levels in ambient air", which entered into force on 11 July 2002. Link to the site with the air quality standards obligatory in Poland:

http://www.jgora.pios.gov.pl/wwm/bt/kom/2004/normy.htm.

Differences between air quality standards adopted by Poland and those in the EC directives:

- air quality standards are diversified for: the country area, the health resort areas and areas of the national parks,
- limit values/permissible levels of SO_2 (24 hours), and AOT40 for the vegetation period/target value for the protection of vegetation are set also for transition time; after this period the limit values are the same as in EC directives.

2.4. European Communities

There are currently three daughter directives to Council Directive 96/62/EC on Ambient Air Quality Assessment and Management. These are: Council Directive 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter (PM_{10}) and lead in ambient air; Council Directive 2000/69/EC of 16 December 2000 on limit values for benzene and carbon monoxide in ambient air; and Council Directive 2002/03/EC of 12 February 2002 relating to ozone in ambient air.

These directives define measurement methods and assessment criteria which have to be applied in all EU member states. Member states have to impose penalties for breaches of the Directives' provisions. The limit values of Directives 1999/30/EC and 2000/69/EC will become effective on 1.01.2005 or 1.01.2010. Until that time, the so called margins of tolerance apply, which will be reduced gradually. The limit values are given in Table 9.

Directive 2002/03/EC lays down target values for ozone concentrations in ambient air for 2010 and calls on Member States to carry out measures – under the conditions of national emission ceilings – to meet these targets on a regional scale.

In addition, the general public has to be informed immediately when ozone concentrations exceed the information threshold of 180 $\mu g/m^3$ and warned when concentrations exceed certain alert thresholds for the current air pollutants: 3 hours mean SO_2 - 500 $\mu g/m^3$, 3 hours mean NO_2 – 400 $\mu g/m^3$; one hour mean O_3 - 240 $\mu g/m^3$, respectively.

The 4th daughter directive, relating to metals and PAHs in ambient air, has been adopted in December 2004, and has entered into force in January 2005.

Table 9. EC Directives
Tabulka 9. Směrnice EU
Tabelle 9. EU-Richtlinien
Tabela 9. Dyrektywy UE

Pollutant Directive number /date to be met	Averaging time	Air quality value	Number of exeedences	Margin of tolerance	Limit value + margin of tolerance [µg/m³] or *[ng/m³]										
SO_2 1999/30/EC					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
limit value for the protection of human health SO_2 [01.01.2005]	1h	350 µg/m³	24	150 30/5 years/	500	470	440	410	380	350	350	350	350	350	350
limit value for the protection of human health SO_2 [01.01.2005]	24 h	125 µg/m³	3	-	125	125	125	125	125	125	125	125	125	125	125
limit value for the protection of ecosystems SO_2 [19.07.2001]	Calendar year (October- March)	20 µg/m³	-	-	20	20	20	20	20	20	20	20	20	20	20
Alarm value* [19.07.2001]	3 consecutive hours	500 µg/m³	-	-	500	500	500	500	500	500	500	500	500	500	500
NO_2/NO_x 1999/30/EC					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
limit value for the protection of human health NO_2 [01.01.2010]	1 h	200 µg/m³	18	100 10/10 years/	300	290	280	270	260	250	240	230	220	210	200
limit value for the protection of human health NO_2 [01.01.2010]	Calendar year	40 µg/m³	-	20 2/10 years/	60	58	56	54	52	50	48	46	44	42	40
limit value for the protection of vegetation NOx [19.07.2001]	Calendar year	30 µg/m³	-	-	30	30	30	30	30	30	30	30	30	30	30
Alert threshold* [19.07.2001]	3 consecutive hours	400 µg/m³	-	-	400	400	400	400	400	400	400	400	400	400	400
PM_{10} 1999/30/EC					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
stage 1 - limit value for the protection of human health [01.01.2005]	24 h	50 µg/m³	35	25 5/5 years/	75	70	65	60	55	50	50	50	50	50	50
stage 1 - limit value for the protection of human health [01.01.2005]	Calendar year	40 µg/m³	-	8 1,6/5 years/	48,0	46,4	44,8	43,2	41,6	40	40	40	40	40	40
stage 2 - limit value for the protection of human health [01.01.2010]	24 h	50 µg/m³	7	-	-	-	-	-	-	-	-	-	-	-	50
stage 2 - limit value for the protection of human health [01.01.2010]	Calendar year	20 µg/m³	-	10 2/5 years/	-	-	-	-	-	30	28	26	24	22	20

Pollutant / Directive number /validity date	Averaging time	Limit value (target value)	Number of exeedences	Margin of tolerance	Limit value + margin of tolerance [µg/m³] or *[ng/m³]										
Pb in PM_{10} 1999/30/EC					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
limit value for the protection of human health	Calendar year	0,5 µg/m³	-	0,5 0,1/5 years/	1,0	0,9	0,8	0,7	0,6	0,5	0,5	0,5	0,5	0,5	0,5
limit value for the protection of human health **	Calendar year	1,0 µg/m³	-	0,5 0,05/10 years/	1,5	1,45	1,40	1,35	1,3	1,25	1,20	1,15	1,1	1,05	1,0
CO 2000/69/EC					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
limit value for the protection f human health [01.01.2005]	max 8h average/day	10000 µg/m³	-	6000 2000/5 years/	16000	16000	16000	14000	12000	10000	10000	10000	10000	10000	10000
Benzene 2000/69/EC					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
limit value for the protection of human health [01.01.2010]	Calendar year	5 µg/m³	-	5 1/5 years/	10	10	10	10	10	10	9	8	7	6	5
Ozone 2002/03/EC					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Target value for the protection of human health [01.01.2010]	8 h rolling basis	(120 µg/m³)	25	-											
Target value for the protection of vegetation	AOT 40 (May- July)	(1800 µg/m³/h)	-	-											
Long-term objective for the protection of human health	8 h														
Long-term objective for the protection of vegetation	AOT 40 (May- July)	6000 µg/m³/h													
Long-term objective for the forest protection	AOT 40 (Apr.- Sep.)	20000 µg/m³/h													
Information threshold	1 h	180 µg/m³													
Alert threshold	1 h	240 µg/m³													
As in PM_{10} 2004/107/EC (15.12.04) *1					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
target value for the protection of human health [01.01.2013]	Calendar year	(6 ng/m³)	-	-	-	-	-	-	-						(6)*
Cd in PM_{10}					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
target value for the protection of human health [01.01.2013]	Calendar year	(5 ng/m³)	-	-	-	-	-	-	-						(5)*
Ni in PM_{10}					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
target value for the protection of human health [01.01.2013]	Calendar year	(20 ng/m³)	-	-	-	-	-	-	-						(20)*
BaP in PM_{10}					2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
target value for the protection of human health [01.01.2013]	Calendar year	(1 ng/m³)	-	-	-	-	-	-	-						(1)*

* should be measured at locations representative of air quality over at least 100 km² or an entire zone or agglomeration

** in the immediate vicinity of specific industrial sources of cities

3. Ambient air quality characteristic

The characteristic of ambient air quality in the tri-border region are based on measurement results obtained in 2003 at all stations of the tri-border region monitoring network.

For the purpose of air quality description, daily and annual means as well as exceedances were determined for sulphur dioxide, nitrogen dioxide, particulate matter (PM_{10}), carbon monoxide and ozone concentrations, and lead in PM_{10}-fraction, following the reporting requirements of the Daughter Directives. A similar approach was taken for nitrogen and sulphur annual wet deposition, expressed as N and S equivalents, further heavy metals (cadmium, nickel, arsenic) and PAHs (polycyclic aromatic hydrocarbons) contained in PM_{10}.

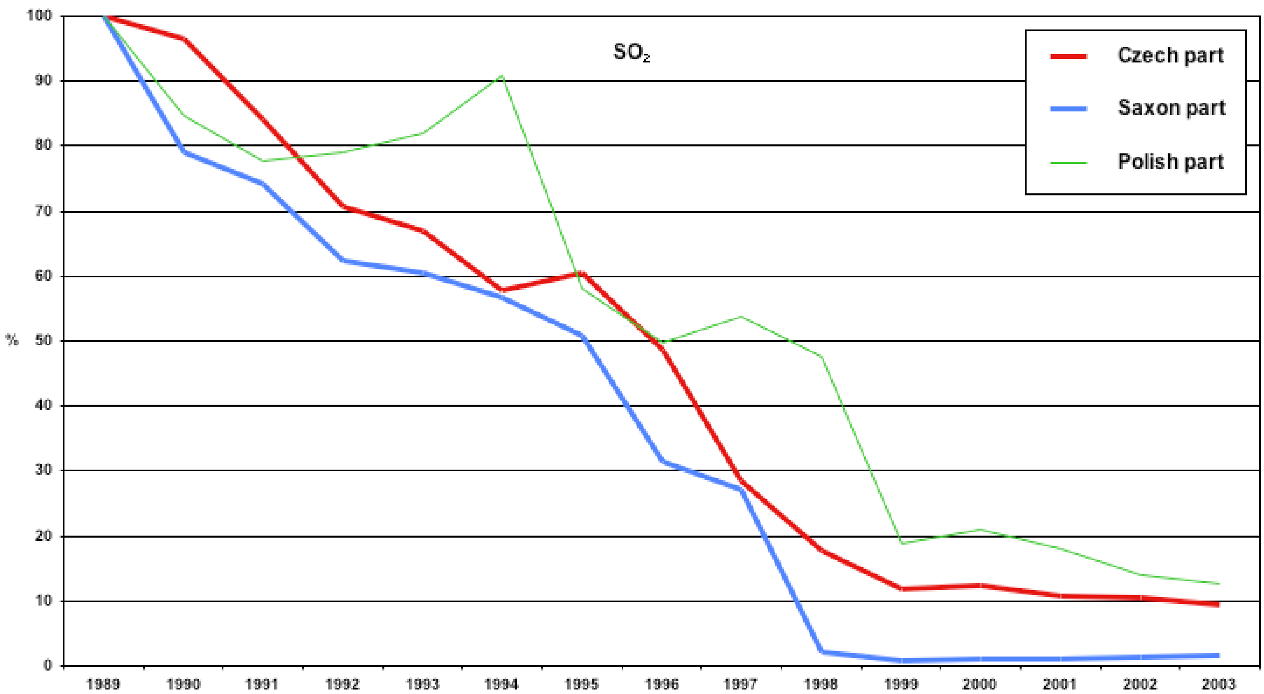
Concentrations of sulphur dioxide, nitrogen dioxide, ozone and carbon monoxide were converted from ppb/ppm into $\mu g/m^3$ at a temperature of 293 K and pressure of 101.3 kPa.

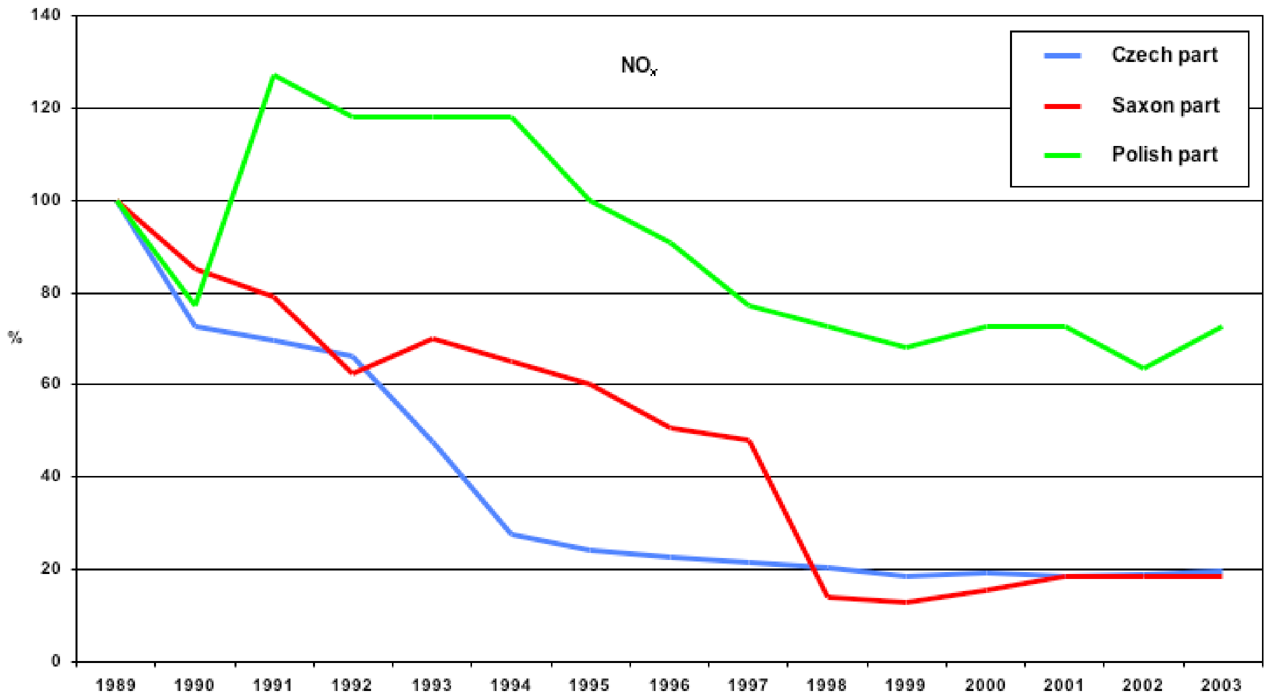
3.1. Emission trends

The main sources of air pollution in the tri-border region are power plants, industrial facilities, residential heating units and road traffic.

Due to different availability of data in the three countries, Figure 3 and Table 10 below, showing the development of emissions between 1989 and 2003, only cover emissions from stationary sources: in the Czech Republic sources >0.5 MW, in Saxony large sources (so called „Großfeuerungsanlagen“) >50 MW (solid fuels) and >100 MW (gaseous fuels), in Poland >50 MW. It has to be emphasized that in Saxony road traffic is now responsible for about twice the NOx emissions of these mentioned sources. In Poland and the Czech Republic conditions are almost the same.

Figure 3. Relative emission trends in the tri-border region 1989–2003, basic year 1989 = 100% (see text for details)
Obrázek 3. Trendy poměrných emisní v příhraniční oblasti v období 1989-2003, vztaženo k roku 1989 = 100% (podrobnosti jsou uvedeny v textu)
Abbildung 3. Relative Emissionsentwicklung im Dreiländereck 1989 – 2003, Basisjahr ist 1989 = 100% (Details siehe Text)
Rysunek 3. Tendencje emisji względnych w trójgranicznym regionie 1989–2003, rok bazowy 1989 = 100% (patrz szczegóły w tekście)




NO$_x$
Czech part
Saxon part
Polish part
%
140
120
100
80
60
40
20
0
1989
1990
1991
1992
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1994
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1996
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2002
2003

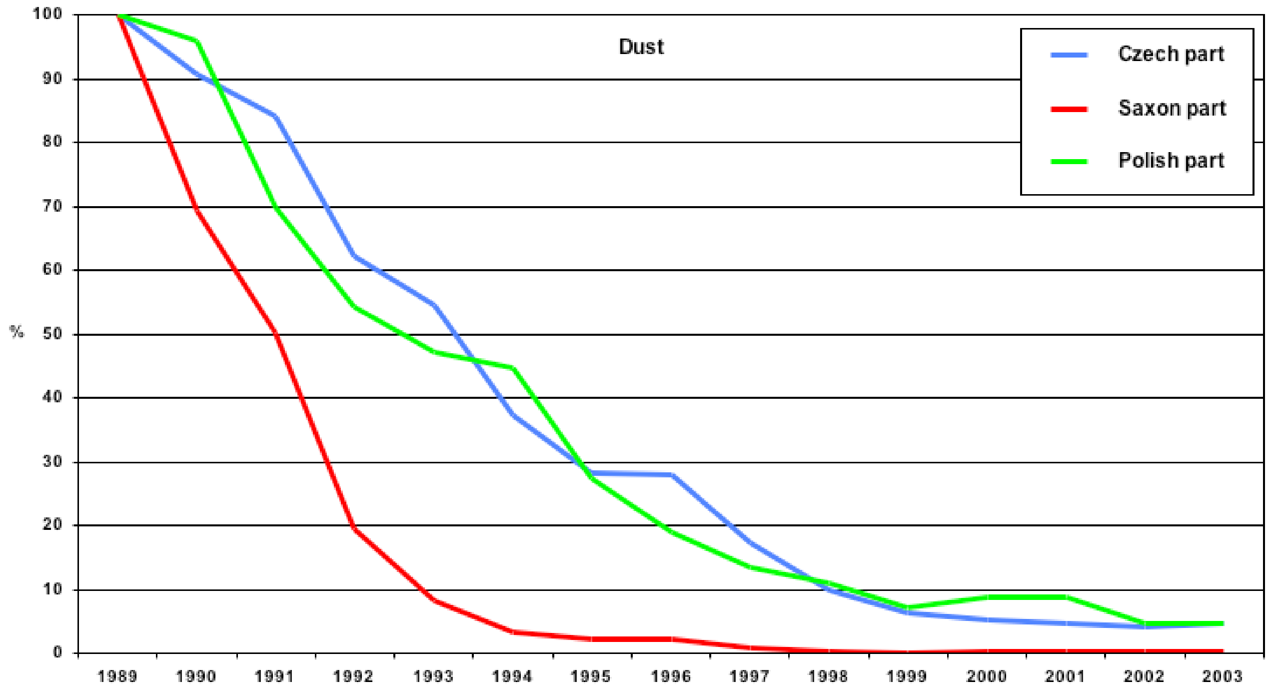

Dust
Czech part
Saxon part
Polish part
%
100
90
80
70
60
50
40
30
20
10
0
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003

Table 10. Emission trends in the tri-border region 1989 – 2003
Tabulka 10. Emisní trendy v příhraniční oblasti 1989 – 2003
Tabelle 10. Entwicklung der Emissionen im Dreiländereck 1989 – 2003
Tabela 10. Tendencje emisji w trójgranicznym regionie 1989 – 2003

Czech Republic

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
SO_2	882	852	741	624	590	509	533	430	250	157	105	110	94	92	84
NO_x	292	211	203	193	139	81	70	66	63	60	54	56	54	55	57
Dust	174	157	146	108	94	65	49	48	30	17	11	9	8	7	8

Emmisions from the Czech sources contributing mostly to air pollution in the Tri-border area. Traffic emissions are not included.

Saxony

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
SO_2	805	636	598	501	487	457	409	254	219	18	6	8	9	10	12
NO_x	71	60	56	44	50	46	43	36	34	10	9	11	13	13	13
Dust	183	126	92	35	15	6	4	4	1	0.4	0.2	0.3	0.4	0.4	0.4

Large sources (> 50 MW hard fuel and > 100 MW gaseous fuel). Traffic emissions are not included.

Poland

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
SO_2	229	194	178	181	188	208	133	114	123	109	43	48	41	32	29
NO_x	22	17	28	26	26	26	22	20	17	16	15	16	16	14	16
Dust	127	122	89	69	60	57	35	24	17	14	9	11	11	6	6

These values contain emissions of pollutants from large plants located in the Polish part of the Tri-border region. Traffic emissions are not included.

Data from 1989-1993 are taken from the Statistic Annual Manual by the Central Statistical Office (GUS) in Warsaw. Emissions from 1994-2003 include large sources (over 50 MW - hard fuel).

The new methodology of emission calculating from combustion sources is obligatory in Poland since 1991, thus nitrogen dioxides emission from 1989-1990 are expressed as N_2O_5 and since 1991 as NO_2, but including both NO and NO_2.

3.2. Changes in air pollution 1996–2003

Sulphur dioxide SO_2

Annual average sulphur dioxide concentrations show, in general, a downward trend in the years 1996 – 1999 and a stable level or an increase in the years 2000 – 2003, as illustrated by data from selected stations. Annual average concentrations since 1999 have been revolving around 10 $\mu g/m^3$.

Nitrogen dioxide NO_2

Annual average nitrogen dioxide concentrations in the years 1996 – 1999, presented on the basis of the selected rural background stations, first fell slightly, and later increased gradually in the years 2000 – 2002 up to 20 $\mu g/m^3$, then decreased to 15 $\mu g/m^3$ in 2003. At the traffic stations, concentrations in the period of 1996 – 2000 first were at 35 $\mu g/m^3$, then slowly fell to 30 $\mu g/m^3$ in the years 2000 – 2002 to rise to 33 $\mu g/m^3$ in 2003.

Particulate matter PM_{10}

Annual average concentrations of particulate matter PM_{10} fell slightly in the years 1999 – 2001 , then increased in the years 2002 - 2003 to 22 $\mu g/m^3$ at the selected background stations of the rural zone and to 34 $\mu g/m^3$ at the traffic station.

Lead

Data are available from the following stations: Czech Republic - Ústí n.L.-Kočkov, Rudolice, Sokolov, Souš; Germany – Schwartenberg; Poland – Jeleniów, Działoszyn. The first Daughter Directive defines a limit value of 0.5 $\mu g/m^3$, to be complied with from 2005. Lead concentrations in the PM_{10} fraction decreased at the rural background stations starting in 1998, then rose slightly in the year 2003 to a level of 12 ng/m^3. At the station in Jeleniów lead concentration grew to 30 ng/m^3 between 1999 and 2002, then fell to 24 ng/m^3 in 2003.

Ozone O_3

Annual average concentration values for ozone at rural background stations rose slightly in the years 1996 – 2003. At the stations located high in the mountains they significantly exceed the level of 80 $\mu g/m^3$.

Carbon monoxide CO

Considerable changes in annual average concentrations of carbon monoxide in the years 1996 – 1999 were observed at the traffic station in Goerlitz. At the Polish and Czech rural background stations, concentrations of carbon monoxide remained, in general, unchanged.

Summing up, annual average concentrations of sulphur dioxide, ozone, nitrogen dioxide and PM_{10} in 2003 were lower than those in 2002 at some stations (e.g. PM_{10} in Czerniawa and NO_2 in Jeleniów) or higher than those in 2002 at others.

Benzene

At present benzene is measured at 5 monitoring sites in the tri-border region:

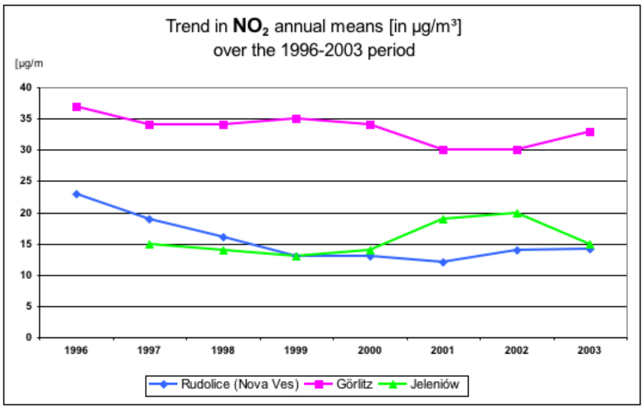
DE – Görlitz, Schwartenberg, Zittau

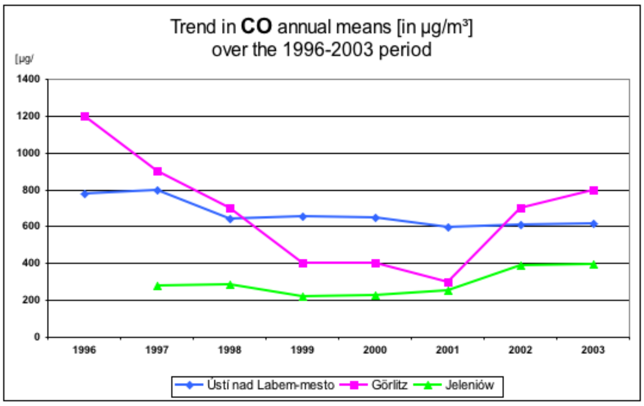
CZ – Most, Rudolice v Horách

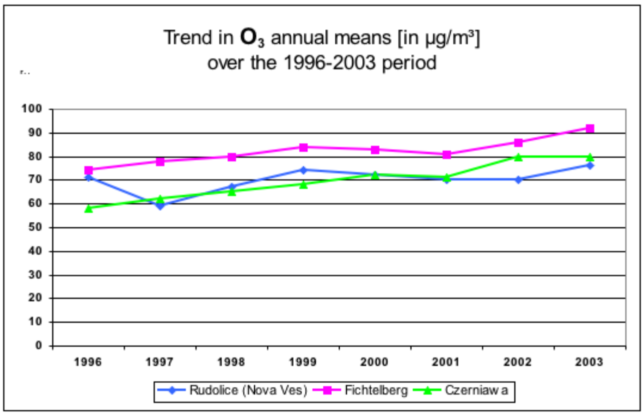
PL – not measured at present

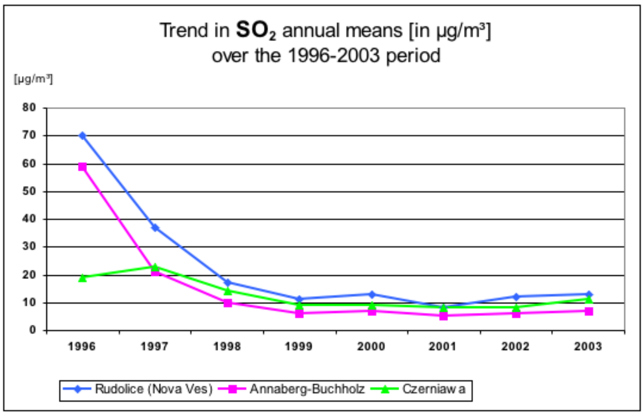
As expected, more traffic related stations show higher concentrations than rural stations. At present none of the stations exceed the current limit value of 10 $\mu g/m^3$. For the last five years benzene concentrations have been decreasing steadily, as shown for Görlitz. This is due to the reduction of the benzene content in gasoline, following legal requirements. In the year 2003 an increase in the benzene concentration to 3.8 $\mu g/m^3$ was observed at the monitoring site in Most.

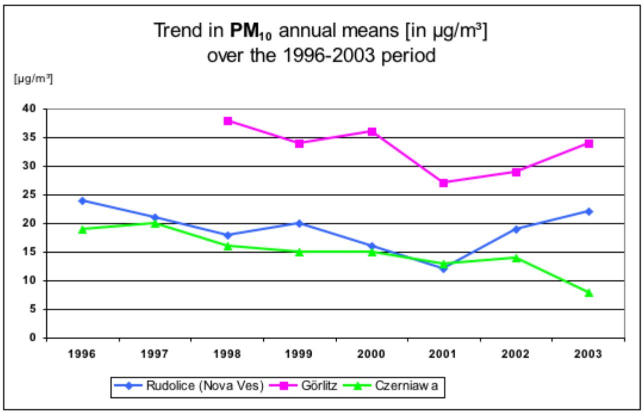
Figure 4.	Changes in annual mean concentrations (1996–2003)
Obrázek 4.	Změny ročních průměrných koncentrací (období 1996–2003)
Abbildung 4.	Die Entwicklung der Jahresmittelwerte (1996 bis 2003)
Rysunek 4.	Zmiany stężeń średniorocznych (okres 1996–2003)

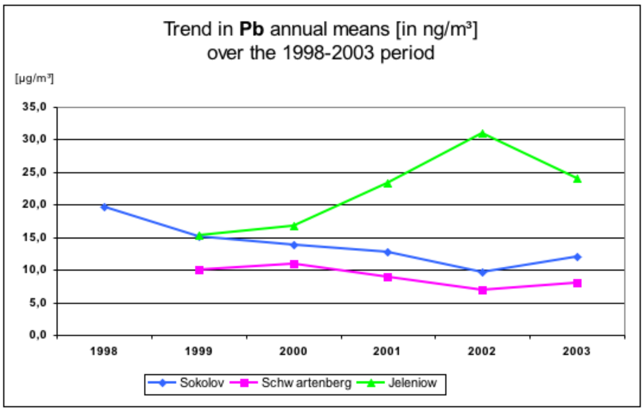












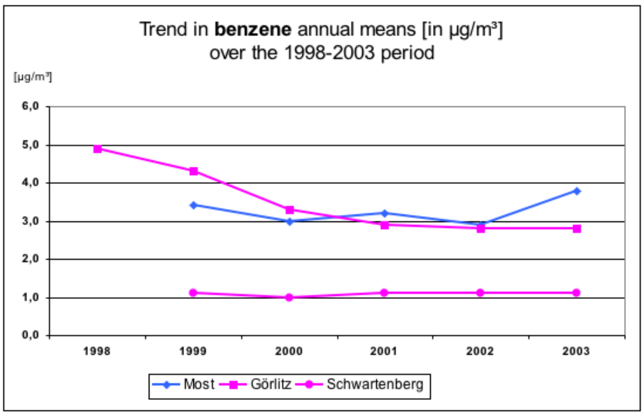


Table 11. Changes in annual mean concentrations (1996–2003)
Tabulka 11. Změny ročních průměrných koncentrací (1996–2003)
Tabelle 11. Die Entwicklung der Jahresmittelwerte (1996–2003)
Tabela 11. Zmiany stężeń średniorocznych (1996-2003)

Czech Republic

Station name	Pollutant	Annual mean concentration [µg/m^3]							
		1996	1997	1998	1999	2000	2001	2002	2003
Rudolice (Nová Ves)	SO_2	70	37	17	11	13	8	12	13
Rudolice (Nová Ves)	NO_2	23	19	16	13	13	12	14	14
Rudolice (Nová Ves)	PM_{10}**	24	21	18	20	16	12	19	22
Ústí nad Labem-město	CO	777	794	643	654	646	598	609	617
Rudolice (Nová Ves)	O_3	71	59	67	74	72	70	70	77
Sokolov	Pb	-	-	0.0196	0.0151	0.0139	0.0128	0.0096	0.012[a]
Most	benzene	-	-	-	3.4	3.0	3.2	2.9	3.8

Saxony

Station name	Pollutant	Annual mean concentration [µg/m^3]							
		1996	1997	1998	1999	2000	2001	2002	2003
Annaberg-Buchholz	SO_2	59	21	10	6	7	5	6	7
Görlitz	NO_2	37	34	34	35	34	30	30	33
Görlitz	TSP	56	46	42	38	43	33	-	-
Görlitz	PM_{10}	-	-	38	34	36	27	29	34
Görlitz	CO	1200	900	700	400	400	300	700	800
Fichtelberg	O_3	74	78	80	84	83	81	86	92
Schwartenberg	Pb	-	-	-	0.0100	0.0110	0.0090	0.0070	0.0080
Görlitz	benzene	-	-	4.9	4.3	3.3	2.9	2.8	2.8
Schwartenberg	benzene	-	-	-	1	1	1	1.1	1.1

Poland

Station name	Pollutant	Annual mean concentration [µg/m^3]							
		1996*	1997	1998	1999	2000	2001	2002	2003
Czerniawa	SO_2	19	23	14	9	9	8	8	11
Jeleniów	NO_2	-	15	14	13	14	19	20	15
Czerniawa	PM_{10}**	19	20	16	15	15	13	14	8
Jeleniów	CO	-	281	284	222	227	253	387	397
Czerniawa	O_3	58	62	65	68	72	71	80	80
Jeleniów	Pb	-	-	-	0.0154	0.0168	0.0234	0.0310	0.024

a data coverage: >50% and <75% (measurements on the every fifth day basis)

* the second half-year

** for PM_{10} concentration measurement the radiometric method is used

3.3. Air pollution in the Tri-border region in 2003 with reference to standards of European Communities

3.3.1. Council Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air

In the following, concentrations of sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air in the tri-border region are assessed on the basis of Directive 1999/30/EC, which has been in force since 19 July 2001.

3.3.1.1. Limit values for sulphur dioxide

Limit values for sulphur dioxide were not exceeded at any station.

Hourly SO_2 limit value for the protection of human health - 350 µg/m^3 (not to be exceeded more than 24 times in a calendar year, limit value to become effective on 1 January 2005)

The allowed number of hourly limit value exceedances was not exceeded at any station. The number of hourly limit value exceedances was as follows: once at Rudolice v Horách station and twice at Annaberg-Buchholz, Schwartenberg and Měděnec stations. These are stations exposed to emissions from large and medium sources located in the North-Bohemian basin.

The 25th highest hourly SO_2 concentration ranged from 29 µg/m^3 (Śnieżne Kotły) to 171 µg/m^3 (Měděnec). Maximum hourly values ranged from 47 µg/m^3 (Klingenthal) to 471 µg/m^3 (Schwartenberg).

In the Ore Mountains some short term peaks of increased SO_2 concentrations related to transport of highly polluted air masses from the North-Bohemian basin, during air pollution episodes, may still occur.

Daily SO_2 limit value for the protection of human health - 125 µg/m^3 (not to be exceeded more than 3 times in a calendar year, to become effective on 1 January 2005)

The set daily limit value was not exceeded more than 3 times at any station. Maximum daily values ranged from 14 µg/m^3 (Klingenthal) to 161 µg/m^3 (Měděnec). The daily limit value was exceeded once at Měděnec station. This mountainous station is situated in the Ore Mountains close to the North-Bohemian basin where a number of emissions sources exist. The 4th highest daily SO_2 concentration reached values from 14 µg/m^3 (Śnieżne Kotły) to 89 µg/m^3 (Schwartenberg).

Calendar year and winter SO_2 limit values for the protection of ecosystems - 20 µg/m^3. The calendar year and winter limit values were not exceeded at any eco-station in 2003 and in winter 2002/2003 respectively. Calendar year values at eco-stations were in the range from 3 µg/m^3 (Carlsfeld) to 14 µg/m^3 (Měděnec - in the Ore Mountains). Winter values at eco-stations ranged from 4 µg/m^3 (Carlsfeld) to 19 µg/m^3 (Krupka).

The alert threshold for sulphur dioxide - 500 µg/m^3 - was not exceeded.

3.3.1.2. Limit values for nitrogen dioxide and oxides of nitrogen

The limit values for nitrogen dioxide and oxides of nitrogen were not exceeded at any station.

Hourly limit value for NO_2 for the protection of human health - 200 µg/m^3 (not to be exceeded more than 18 times in a calendar year, limit value to become effective on 1 January 2010)

Hourly concentrations of NO_2 did not exceed the hourly limit value of 200 µg/m^3 at any station.

Maximum hourly concentrations ranged from 46 µg/m^3 (Sokolec) to 165 µg/m^3 (Most). The 19th highest hourly NO_2 concentration ranged from 30 µg/m^3 (Śnieżne Kotły i Czarna Góra) to 118 µg/m^3 (Ústí nad Labem). This station is located in the industrial area of the North-Bohemian basin. Traffic is the main source of NO_2 in the more polluted areas.

Annual limit value for NO_2 for the protection of human health - 40 µg/m^3 (limit value to become effective on 1 January 2010)

No station reported exceedances of the annual limit value of 40 µg/m^3. Annual average concentrations of NO_2 show substantial variation, related to different exposure of the stations. Rural stations show lower values (5 µg/m^3 Sokolec, 7 µg/m^3 Czarna Gora and 8 µg/m^3 Śnieżne Kotły), while urban (traffic related) sites are more polluted (37 µg/m^3 Plauen Süd, 35 µg/m^3 Ústí n.L.-město, 33 µg/m^3 Görlitz, 29 µg/m^3 Annaberg and Most).

The **annual limit value for NO_x for the protection of vegetation - 30 µg/m^3** was not exceeded at any eco-station in 2003. Annual mean concentrations at eco-stations were in the range from 5 µg/m^3 (Sokolec) to 23 µg/m^3 (Krupka - in the Ore Mountains).

The **alert threshold for nitrogen dioxide - 400 µg/m^3** - was not exceeded.

3.3.1.3. Limit values for particulate matter (PM_{10})

Both the daily and annual limit values for particulate matter (PM_{10}) were exceeded at some stations in the year 2003.

24-hour limit value for PM_{10} for the protection of human health - 50 µg/m^3 (not to be exceeded more than 35 times in a calendar year, relevant margin of tolerance 10 µg/m^3, limit value to become effective on 1 January 2005)

Maximum daily concentrations of PM_{10} were in the range from 30 µg/m^3 (Śnieżne Kotły) to 279 µg/m^3 (Ústí n.L.-město). The number of days with concentrations higher than 50 µg/m^3 was ranged from zero days (Czerniawa, Śnieżne Kotły and Krkonoše-Rýchory) to 130 days (Ústí n.L.-město). The 36th highest daily PM_{10} concentration reached values from 14 µg/m^3 (Śnieżne Kotły) to 96 µg/m^3 (Děčín).

The 24-hour limit value of 50 µg/m^3 PM_{10} was exceeded more than 35 times at the stations Ústí n.L.-město (130 times), Děčín (127 times), Tušimice (118 times), Sokolov (86 times), Most (77 times), Karlovy Vary (52 times), Görlitz (51 times), Zittau (49 times), Plauen (39 times).

The 24-hour limit value for PM_{10} plus the relevant margin of tolerance was exceeded more than 35 times at the stations Ústí n.L.-město (92 times), Děčín (90 times), Tušimice (65 times), Sokolov (64 times), Most (51 times).

Out of the total number of 30 stations at which PM_{10} measurements were carried out, 9 stations reported exceedances of the 24-hour PM_{10} limit value while five stations reported an exceedance of the limit value plus the margin of tolerance.

Annual limit value for PM_{10} for the protection of human health - 40 µg/m^3 (margin of tolerance 3.2 µg/m^3, limit value to become effective on 1 January 2005)

The annual PM_{10} limit value of 40 µg/m^3 was exceeded at the stations Ústí n.L.-město, Děčín – 50 µg/m^3 and Tušimice - 45 µg/m^3. Annual mean concentrations of PM_{10} were in the range from 8 µg/m^3 (Czerniawa) to 50 µg/m^3 (Ústí n.L.-město and Děčín). The stations with the highest levels of particulate matter (PM_{10}) are the urban ones, more exposed to traffic, industrial and other sources.

3.3.1.4. Limit value for lead

Annual limit value for the protection of human health - 0.5 µg/m^3 (limit value to become effective on 1 January 2005)

The annual limit value for lead of 0.5 µg/m^3 was not exceeded at any station. Annual values at the stations ranged from 0.008 µg/m^3 (Rudolice v Horách and Schwartenberg) to 0.024 µg/m^3 (Jeleniów).

Table 12. Hourly and daily mean concentrations 2003
Tabulka 12. Hodinové a denní průměrné koncentrace 2003
Tabelle 12. Stunden- und Tagesmittelwerte 2003
Tabela 12. Godzinne i dobowe wartości stężeń 2003.

Czech Republic

station	SO_2			SO_2			NO_2			PM_{10}		
	max. of hourly mean/year	number of hours hourly mean > 350 µg/m³	25th max.hourly value µg/m³	max. of daily mean /year	number of days daily mean > 125 µg/m³	4th max.daily value µg/m³	max. of hourly mean/year	number of hours hourly mean > 200 µg/m³	19th max.hour value µg/m³	max. of daily mean /year	number of days daily mean > 50 µg/m³	36th max.daily value µg/m³
Děčín *	120	0	73	103	0	73	118	0	83	266	127	96
Frýdlant-Údolí */**	138	0	63	63	0	36	58	0	43	134	25	42
Karlovy Vary *	102a	0a	71a	55a	0a	43a	106a	0a	85a	127a	52a	59a
Krkonoše - Rýchory **/***	76	0	35	34	0	18	53	0	36	42	0	16
Krupka **/***	345	0	162	100	0	75	147	0	94	153	30	46
Měděnec **/***	462	2	171	161	1	67	114	0	84	84	13	35
Most *	253	0	97	54	0	40	165	0	117	181	77	69
Přebuz **/***	126	0	45	43	0	18	67	0	45	66	5	29
Rudolice v Horách **/***	383	1	127	77	0	63	125	0	78	85	15	35
Sněžník **/***	263	0	132	56	0	50	124	0	75	165	20	44
Sokolov *	277	0	117	43	0	38	118	0	68	220	86	76
Souš **/***	109	0	44	27	0	25	87	0	51	95	10	35
Tušimice */**	173	0	85	71	0	48	92	0	61	245	118	77
Ústí n.L.-město *	161	0	88	55	0	44	151	0	118	279	130	92
Valdek */**	146	0	78	64	0	50	80	0	61	132	19	42

a >50% and <75% continous measurements)

Saxony

station	SO_2			SO_2			NO_2			PM_{10}		
	max. of hourly mean/year	number of hours hourly mean > 350 µg/m³	25th max.hourly value µg/m³	max. of daily mean /year	number of days daily mean > 125 µg/m³	4th max.daily value µg/m³	max. of hourly mean/year	number of hours hourly mean > 200 µg/m³	19th max.hour value µg/m³	max. of daily mean /year	number of days daily mean > 50 µg/m³	36th max.daily value µg/m³
Klingenthal	47	0	87	14	0	59	110	0	87	71	22	44
Plauen Süd	-	-	-	-	-	-	136	0	112	99	39	53
Annaberg-Buchholz	425	2	104	86	0	47	128	0	105	-	-	-
Fichtelberg	166	0	83	60	0	37	-	-	-	-	-	-
Carlsfeld	116	0	37	30	0	15	-	-	-	-	-	-
Zittau Ost	250	0	71	53	0	37	96	0	73	175	49	60
Görlitz	120	0	83	53	0	48	145	0	98	176	51	60
Zinnwald	208	0	114	66	0	55	108	0	72	-	-	-
Schwartenberg	471	2	155	131	0	89	103	0	76	111	10	32
Lehnmühle	78	0	52	34	0	29	76	0	53	71	7	32
Lückendorf	312	0	91	87	0	45	72	0	45	96	14	34

Poland

station	SO_2			SO_2			NO_2			PM_{10}		
	max. of hourly mean/year	number of hours hourly mean > 350 µg/m³	25th max.hourly value µg/m³	max. of daily mean /year	number of days daily mean > 125 µg/m³	4th max.daily value µg/m³	max. of hourly mean/year	number of hours hourly mean > 200 µg/m³	19th max.hour value µg/m³	max. of daily mean /year	number of days daily mean > 50 µg/m³	36th max.daily value µg/m³
Działoszyn	217	0	72	60	0	35	-		-	99	8	34
Czerniawa[a]	118	0	76	46	0	40	-		-	43	0	16
Wleń[a]	118	0	59	58	0	34	-		-	158	32	47
Śnieżne Kotły	100	0	29	21	0	14	61	0	30	30	0	14
Jeleniów	142	0	80	67	0	40	90	0	64	56	1	19
Spalona[a]	76	0	51	41	0	31	-		-	-		-
Czarna Góra	84	0	63	43	0	25	56	0	30	82	2	17
Sokolec[b]	-		-	-		-	46	0	31	91	7	20
Witków	133	0	85	72	0	39	66	0	43	128	30	46

[a] Data coverage for NO_2 <50% (continous measurements)

[b] Data coverage for SO_2 <50% (continous measurements)

Table 13. Annual mean concentrations 2003
Tabulka 13. Roční průměrné koncentrace 2003
Tabelle 13. Jahresmittelwerte 2003
Tabela 13. Średnie roczne wartości stężeń 2003

Czech Republic

station	NO_x annual mean 2003	NO_2 annual mean 2003	PM_{10} annual mean 2003	SO_2 annual mean 2003	SO_2 winter mean 2002/2003	Pb annual mean 2003
	limit value = 30 µg/m³	limit value = 40 µg/m³	limit value = 40 µg/m³	limit value = 20 µg/m³	limit value = 20 µg/m³	limit value = 500 ng/m³
Děčín *	-	25	50	11	18	-
Frýdlant-Údolí */**	11	9	30[a]	7	8	-
Karlovy Vary *	-	27[a]	40[a]	11[a]	14	-
Krkonoše - Rýchory **/***	10	9	11[a]	5	6	x
Krupka **/***	23	18	25	14	19	-
Měděnec **/***	20	16	21	14	11	-
Most *	-	29	37	11	15	-
Přebuz **/***	11	10	15	5	5	-
Rudolice v Horách **/***	17	22	22	13	12	8[a]
Sněžník **/***	16	14	24	13	18	-
Sokolov *	-	22	40	12	14	12[a]
Souš **/***	11	10	20	5	6	18[a]
Tušimice */**	23	18	45	9	10	-
Ústí n.L.-město *	-	35	50	12	17	17[a, b]
Valdek */**	17	14	30[a]	8	10	-

Saxony

station	NO_x annual mean 2003	NO_2 annual mean 2003	PM_{10} annual mean 2003	SO_2 annual mean 2003	SO_2 winter mean 2002/2003	Pb annual mean 2003
	limit value = 30 µg/m³	limit value = 40 µg/m³	limit value = 40 µg/m³	limit value = 20 µg/m³	limit value = 20 µg/m³	limit value = 500 ng/m³
Klingenthal *	-	21	27	4	-	-
Plauen Süd *	-	37	31	-	-	-
Annaberg-Buchholz *	-	29	-	7	-	-
Fichtelberg ***	-	-	-	5	7	-
Carlsfeld ***	-	-	16	3	4	-
Zittau Ost *	-	17	32	7	-	-
Görlitz *	-	33	34	7	-	-
Zinnwald *	-	13	-	10	-	-
Schwartenberg **/***	17	14	17	12	15	8
Lehnmühle *	13	11	20	6	8	-
Lückendorf *	11	10	20	7	10	-

Poland

station	NO_x annual mean 2003	NO_2 annual mean 2003	PM_{10} annual mean 2003	SO_2 annual mean 2003	SO_2 winter mean 2002/2003	Pb annual mean 2003
	limit value = 30 µg/m³	limit value = 40 µg/m³	limit value = 40 µg/m³	limit value = 20 µg/m³	limit value = 20 µg/m³	limit value = 500 ng/m³
Działoszyn *	-	x	19	10	13	19
Czerniawa **	x	x	8	11	12[c]	-
Wleń *	-	x	25	9	14	-
Śnieżne Kotły ***/**	10	8	8[c]	5[c]	x	-
Jeleniów **	20	15	9	14	16	24
Spalona ***	x	x	x	7	10	-
Czarna Góra ***/**	9	7	10[c]	8[c]	7	-
Sokolec ***/**	5	5	15[c]	x	x	-
Witków *	-	9	24	9	13	-

* protection of human health

** protection of vegetation/NO_x

*** protection of ecosystems /SO_2

[a] data coverage: >50% and <75% (measurements on the every fifth day basis)

x <50% (continous measurements)

[b] Ústí nad Labem - Kočkov

[c] data coverage: >50% and <75% (continous measurements)

3.3.2. Council Directive 2000/69/EC of 16 November 2000 relating to limit values for benzene and carbon monoxide in ambient air

3.3.2.1. Limit value for carbon monoxide

Maximum daily 8-hour mean for the protection of human health - 10 mg/m³ (limit value to become effective on 1 January 2010; margin of tolerance for 2003: 4 mg/m³)

The maximum daily 8-hour mean was not exceeded at any station; values ranged from 0.9 mg/m³ (Měděnec) to 3.6 mg/m³ (Most).

Table 14. 8-hour and annual mean concentrations, 2003
Tabulka 14. 8-hodinové a roční průměrné koncentrace, 2003
Tabelle 14. 8-Stunden-Mittelwerte und Jahresmittelwerte, 2003
Tabela 14. 8-godzinne i średnie roczne wartości stężeń, 2003

Czech Republic

station	CO		Benzene
	max. of 8-hour mean /year (mg/m³)	number of days 8-hourly mean > 10 mg/m³	annual mean limit value = 5 µg/m³
Děčín	2.9	0	-
Karlovy Vary	1.4	0	-
Krupka	1.2	0	-
Měděnec	0.9	0	-
Most	3.6	0	3.8
Rudolice v Horách	-	-	0.7
Sokolov	3.0	0	-
Ústí n.L.-město	3.1	0	-

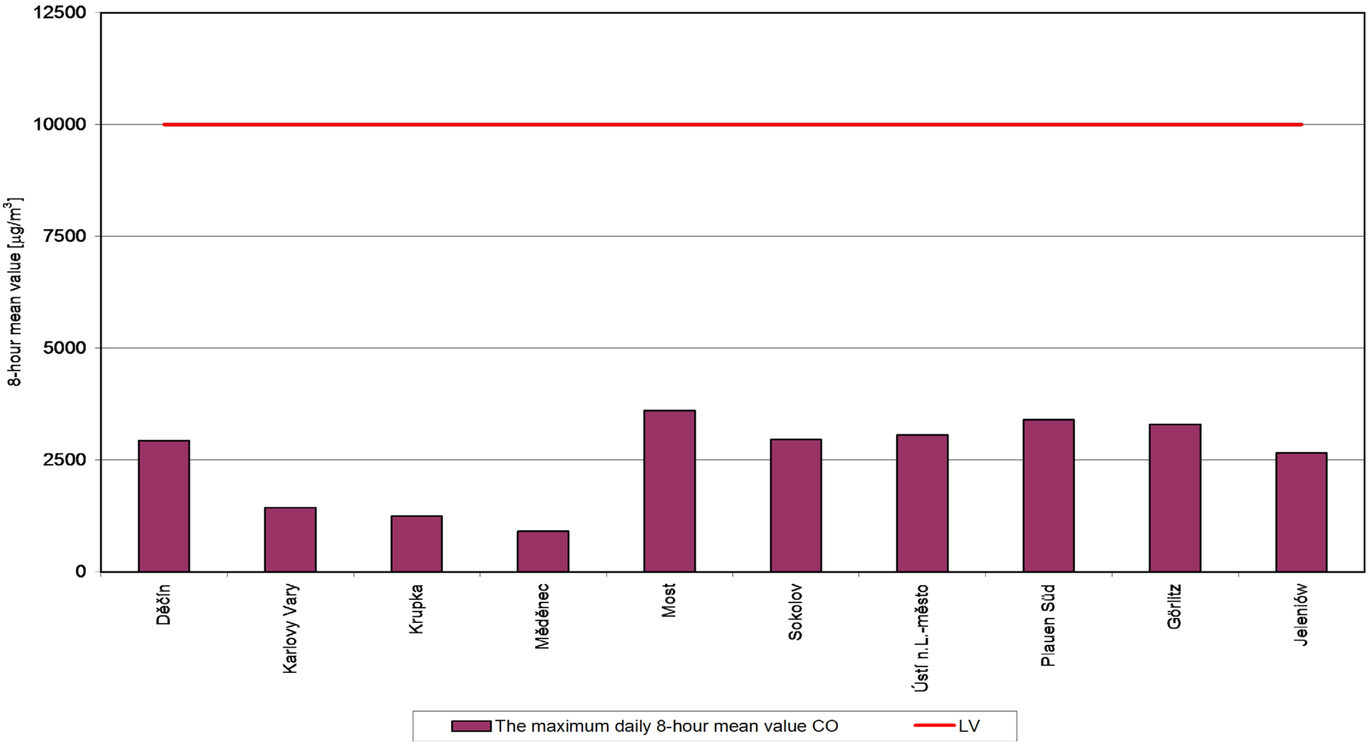
Saxony

station	CO		Benzene
	max. of 8-hour mean /year (mg/m³)	number of days 8-hourly mean > 10 mg/m³	annual mean limit value = 5 µg/m³
Klingenthal	-	-	1.9
Plauen Süd	3.4	0	2.6
Görlitz	3.3	0	3.0
Schwartenberg	-	-	1.1

Poland

station	CO		Benzene
	max. of 8-hour mean /year (mg/m³)	number of days 8-hourly mean > 10 mg/m³	annual mean limit value = 5 µg/m³
Jeleniów	2.7	0	-
Witków	-	-	-

Figure 5. Maximum daily 8-hour means CO [µg/m³], 2003
Obrázek 5. Maximální denní 8-hodinová průměrná hodnota CO [µg/m³], 2003
Abbildung 5. Höchster 8-Stunden-Mittelwert eines Tages für CO [µg/m³], 2003
Rysunek 5. Dobowe maksimum z 8-godzinnych średnich wartości CO [µg/m³], 2003



3.3.2.2. Limit value for benzene

Annual limit value for the protection of human health - 5 µg/m³ (limit value to become effective on 1 January 2010; margin of tolerance for 2003: 5 µg/m³).

The annual limit value for benzene was not exceeded at any station; values ranged from 0.7 µg/m³ (Rudolice v Horách) to 3.8 µg/m³ (Most).

Table 15. Monthly and annual mean concentrations of benzene in 2003 [µg/m³]
Tabulka 15: Měsíční a roční průměrné koncentrace benzenu v roce 2003 [µg/m³]
Tabelle 15. Monats- und Jahresmittelwerte der Benzolkonzentration in 2003 [µg/m³]
Tabela 15. Średniomiesięczne i średnioroczne stężenia benzenu w roku 2003 [µg/m³]

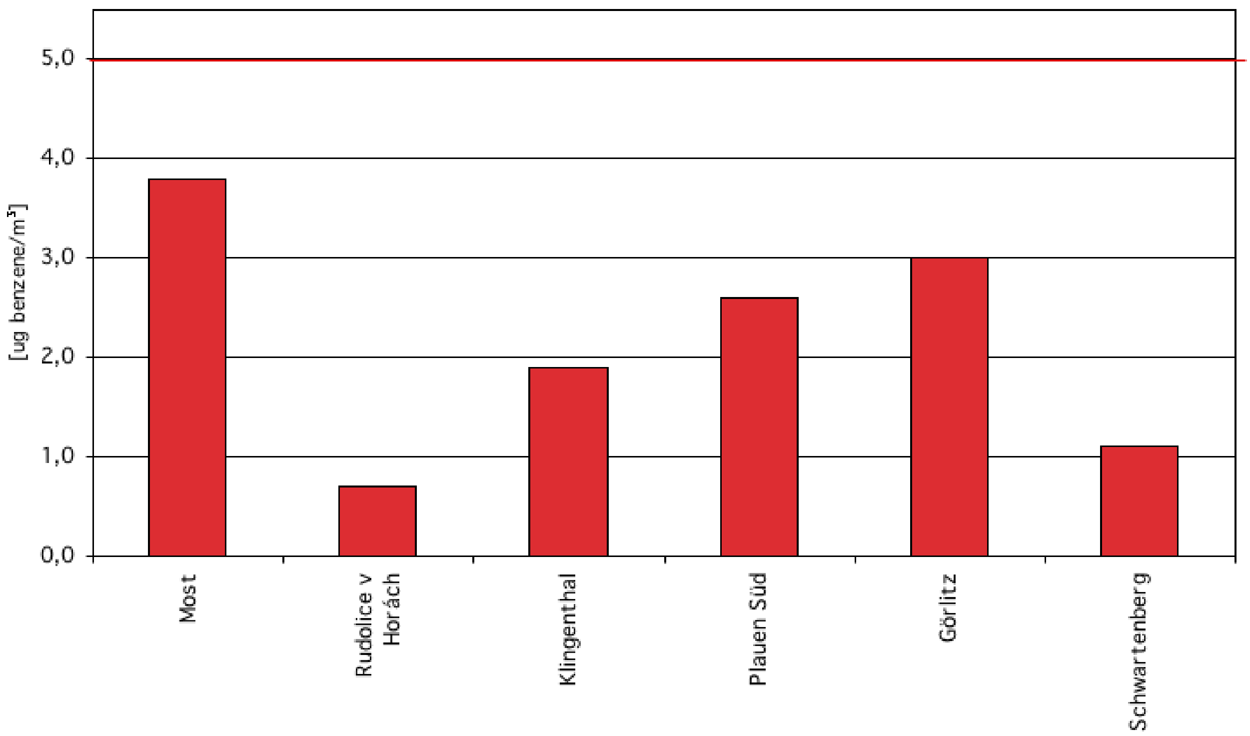
Czech Republic

Station name	month												year
	1	2	3	4	5	6	7	8	9	10	11	12	2003
Most	3.8	5.3	3.8	2.0	1.7	1.7	1.7	3.1	2.5	2.8	4.1	13.0	3.8
Rudolice v Horách	0.2	1.0	1.1	0.8	0.5	0.4	0.3	0.4	0.5	0.7	1.3	2.1	0.7

Saxony

Station name	month												year
	1	2	3	4	5	6	7	8	9	10	11	12	2003
Görlitz	4.1	4.6	3.9	2.4	1.9	1.8	2.0	2.0	2.4	2.8	3.6	3.8	3.0
Schwartenberg	1.7	2.3	1.4	0.9	0.7	0.5	0.4	0.5	0.6	1.0	2.2	1.2	1.1
Plauen Süd	3.2	4.4	3.1	2.2	1.7	1.6	1.6	1.8	2.3	2.8	3.2	3.0	2.6

Figure 6. **Annual mean values of benzene 2003**
Obrázek 6. **Roční průměrné hodnoty benzenu 2003**
Abbildung 6. **Jahresmittelwerte für Benzol 2003**
Rysunek 6. **Średnioroczne wartości benzenu 2003**



3.3.3. Directive 2002/3/EC of 12 February 2002 relating to ozone in ambient air

The applicable directives for assessment of ozone concentrations are Directive 92/72/EEC (up until 8 September 2003) and Directive 2002/3/EC (from 9 September 2003). In this report, ozone concentrations in the tri-border region are assessed on the basis of both Directives.

The threshold value for **protection of vegetation** (daily mean > 65 µg/m³) of Directive 92/72/EEC was most frequently exceeded at the measuring sites of Přebuz (86 % in a year) and Krkonoše - Rýchory (85 %). The ozone threshold value was more frequently exceeded in the upper locations of the Ore Mountains and the Sudeten/Sudety Mountains as well as in the rural districts of the tri-border region than in towns and cities.

As from 9 September 2003, the target value of 120 µg/m³ (maximum daily 8-hour mean) for the **protection of human health** is binding. This value is not to be exceeded more often than 25 days per calendar year (averaged over a period of 3 years). The target value is to be met as from 2010. In the period from 2001 to 2003, the target value was exceeded at all measuring sites located in the tri-border region, with the exception of the stations in Annaberg-Buchholz, Lehnmühle, Most and Ústí nad Labem-mesto.

As target value for the protection of vegetation, Directive 2002/3/EC provides for an AOT40 value of 18000 µg/m³ averaged over five years. In the period from 1999 to 2003, this target value was exceeded mainly on the German and Czech sides of the Ore Mountains and on the Czech side of the Izera/Jizerske Mountains. The highest exceedance was detected on Fichtelberg at 28448 µg/m³*h. There was also one exceedance of the target value at the Polish station Czarna Góra.

Generally it can be said that the acute ozone pollution (levels exceeding the information and alert thresholds) in 2003 was higher than in the preceding years. It can, however, be classified as normal. Chronic ozone pollution measured on the basis of exceedances of the target values for the protection of human health and vegetation is to be classified as very high also.

The reduction of chronic ozone pollution will remain a priority goal. This goal can, however, only be achieved in the long run, through extensive reduction of the emissions of precursor substances on a long-term basis. The main source is road traffic.

Table 16. Number of days in 2003 with ozone daily mean exceeding the threshold value of 65 μg/m³ for the protection of vegetation
Tabulka 16. Počet dní v roce 2003 s denními průměry ozonu překračujícími mezní hodnotu 65 μg/m³ pro ochranu vegetace
Tabelle 16. Anzahl der Tage mit Tagesmittelwertüberschreitungen des Schwellenwertes zum Schutz der Vegetation 65 μg/m³ in 2003
Tabela 16. Liczba dni w 2003 roku z wartościami średniodobowymi ozonu przekraczającymi wartość progową 65 μg/m³ dla ochrony roślin

Czech Republic

Station name	ozone daily means > 65 μg/m³	
	number of days with the exceedances	relation to number of valid daily means [%]
Krkonoše - Rýchory	257/302	85
Most	83/346	24
Rudolice v Horách	213/263	81
Přebuz	234/271	86
Sněžník	205/364	56
Sokolov	192/361	53
Souš	209/348	60
Tušimice	151/360	42
Ústí nad Labem-město	85/359	24
Valdek	151/182	83

Saxony

Station name	ozone daily means > 65 μg/m³	
	number of days with the exceedances	relation to number of valid daily means [%]
Klingenthal	105/365	29
Annaberg-Buchholz	105/365	29
Fichtelberg	297/365	81
Carlsfeld	239/364	66
Zittau Ost	144/365	40
Zinnwald	238/365	65
Schwartenberg	230/364	63
Lehnmühle	135/349	39
Lückendorf	207/363	57

Poland

Station name	ozone daily means > 65 μg/m³	
	number of days with the exceedances	relation to number of valid daily means [%]
Czerniawa	213/334	64
Śnieżne Kotły	192/251	76
Jeleniów	131/331	40
Czarna Góra	266/349	76
Sokolec	218/342	64

Table 17. Number of days with 8- hour mean exceeding 120 µg/m³ (mean over 3 years 2000-2002, 2001-2003)
Tabulka 17. Počet dní s 8-hodinovým průměrem > 120 ug/m³ (průměr za 3 roky 2000-2002, 2001-2003)
Tabelle 17. Anzahl der Tage mit 8-Stunden-Mittelwerten >120 µg/m³ (Mittelwert über 3 Jahre 2000-2002, 2001-2003)
Tabela 17. Liczba dni z wartościami 8-godzinnymi ozonu > 120 µg/m³ (średnia z 3 lat 2000-2002, 2001-2003)

Czech Republic

station	Number of days 8-hourly mean>120 µg/m³								Number of days 8-hourly mean>120 µg/m³ (mean over 3 years: 2000-2002	number of days 8-hourly mean> 120 µg/m³ (mean over 3 years: 2001 - 2003)	max 8-hourly
	2000	number of days *	2001	number of days *	2002	number of days *	2003	number of days *	2000-2002	2001 - 2003	(in year 2003)
Krkonoše - Rýchory	52	351	18	352	87	365	126	305	52	77	208
Most	25	366	13	365	21	365	35	357	20	23	175
Přebuz	30	360	26	363	41	362	105	274	32	57	213
Rudolice v Horách	48	366	36	365	51	365	84	272	45	57	195
Sněžník	48	366	28	364	45	364	83	365	40	52	205
Sokolov	3	365	10	363	21	361	87	365	11	39	204
Souš	34	363	21	365	39	365	75	361	31	45	197
Tušimice	17	366	32	363	25	365	57	362	25	38	183
Ústí nad Labem-město	23	366	13	362	14	365	31	362	17	19	180
Valdek		0		0		0	58	184		58 a	210

number of days * - Number of days(in the year) with maximum daily 8 hours mean in database
the present times criteria in CZ database for:
8 hours mean - min. 5 "one hours values" and max two hours continuous lack of data
Maximum daily 8 hours mean from hourly running 8 hours averages - min. one 8 hours mean in the day

Saxony

station	Number of days 8-hourly mean>120 µg/m³								Number of days 8-hourly mean>120 µg/m³ (mean over 3 years: 2000-2002	number of days 8-hourly mean> 120 µg/m³ (mean over 3 years: 2001 - 2003)	max 8-hourly
	2000	number of days *	2001	number of days *	2002	number of days *	2003	number of days *	2000-2002	2001 - 2003	(in year 2003)
Klingenthal	28	360	15	359	28	358	59	359	24	34	192
Annaberg-Buchholz	5	345	8	357	6	362	33	357	6	16	175
Fichtelberg	51	361	51	353	87	341	116	358	63	85	204
Carlsfeld	42	362	25	352	51	360	99	353	39	58	203
Zittau Ost	24	358	15	353	37	355	66	356	25	39	203
Zinnwald	41	339	29	355	67	360	93	363	46	63	211
Schwartenberg	39	341	31	350	62	360	104	359	44	66	211
Lehnmühle	31	343	14	344	2	347	36	341	16	17	186
Lückendorf	35	337	4	347	10	328	87	353	16	34	207

Poland

station	Number of days 8-hourly mean>120 µg/m³								Number of days 8-hourly mean>120 µg/m³ (mean over 3 years: 2000-2002	number of days 8-hourly mean> 120 µg/m³ (mean over 3 years: 2001 - 2003)	max 8-hourly
	2000	number of days *	2001	number of days *	2002	number of days *	2003	number of days *	2000-2002	2001 - 2003	(in year 2003)
Sokolec	30	363	18	275	63	335	55	346	37	45	181
Czarna Góra	36	355	31	265	32	355	71	351	33	45	178
Jeleniów	16	351	14	295	37	359	43	327	22	31	208
Czerniawa	34	333	26	281	42	301	72	322	34	47	185
Śnieżne Kotły	23	244	30	270	82	269	48	262	45	53	200

Table 18. AOT40 mean value over 5 years (1998-2002, 1999-2003)
Tabulka 18. AOT40 pětileté průměry (1998-2002, 1999-2003)
Tabelle 18. AOT-Mittelwert für 5 Jahre (1998-2002, 1999-2003)
Tabela 18. AOT40 średnia wartość z 5 lat (1998-2002, 1999-2003)

Czech Republic

station	AOT40 [µg/m³h]						AOT40 mean over 5 years [µg/m³h]	
	1998	1999	2000	2001	2002	2003	1998-2002	1999 - 2003
Krkonoše - Rýchory	-	-	-	-	31 575	42 829	-	-
Most	19 404	21 079	20 623	13 152	15 562	15 107	17 964	17 105
Přebuz	11 784	22 447	22 771	20 010	23 282	39 859	20 059	25 674
Rudolice v Horách	19 729	-	29 366	24 336	25 399	34 994	19.766[b]	22.819[b]
Sněžník	-	7 698	27 280	-	21 194	33 390	18.724[a]	22.391[b]
Sokolov	17 165	9 673	5 350	-	18 382	33 234	12.643[b]	16.660[b]
Souš	27 774	22 071	21 799	17 279	22 766	-	22 338	20.979[b]
Tušimice	11 867	14 757	13 315	20 591	17 843	28 069	15 675	18 915
Ústí nad Labem-město	11 282	11 037	-	-	14 571	15 546	12.297[a]	13.718[a]
Valdek	-	-	-	-	-	24 857	-	-

Saxony

station	AOT40 [µg/m³h]						AOT40 mean over 5 years [µg/m³h]	
	1998	1999	2000	2001	2002	2003	1998-2002	1999 - 2003
Klingenthal	12 478	17 481	18 126	13 485	16 851	24 755	15 684	18 140
Annaberg-Buchholz	6 212	6 589	-	8 588	11 310	15 816	8175[b]	10.576[b]
Fichtelberg	24 544	26 007	26 772	24 495	28 740	36 224	26 112	28 448
Carlsfeld	20 048	22 073	21 340	19 263	22 330	34 672	21 011	23 936
Zittau Ost	11 790	14 635	15 363	12 809	19 743	26 449	14 868	17 800
Zinnwald	16 058	23 165	25 953	17 653	24 580	34 161	21 482	25 103
Schwartenberg	14 828	19 196	22 057	17 759	23 495	37 555	19 467	24 012
Lehnmühle								
Lückendorf								

Poland

station	AOT40 [µg/m³h]						AOT40 mean over 5 years [µg/m³h]	
	1998	1999	2000	2001	2002	2003	1998 -2002	1999 - 2003
Sokolec	13 114	11 498	18 628	13 861	18 722	-	15 164	15677[b]
Czarna Góra	15 207	16 023	20 635	17 450	24 586	25 523	18 780	20 843
Jeleniów	12 531	14 397	17 075	14 142	17 545	-	15 138	15790[b]
Czerniawa	13 816	-	-	16 329	20 150	-	16765[a]	-
Śnieżne Kotły	20 136	16 408	-	20 243	-	-	18929[a]	-

a - three year data only

b - four year data only

Remark on AOT40:

Required proportion of valid data is 90 % of the 1 hour values over the time period defined for calculating the AOT40 value:

In cases where all possible measured data are not available, the following factor shall be used to calculated AOT40 values:

$$AOT40\ [\text{estimate}] = AOT40_{\text{measured}} \times \frac{\text{total possible number of hours}\ ^*}{\text{number of measured hourly values}}$$

* being the number of hours within the time period of AOT40 definition (i.e. 08:00 to 20:00 h CET from 1 May to 31 July each year, for vegetation protection and from 1 April to 30 September each year for the forest protection).

- resp AOT40 (estimate) for 100% of defined period = [AOT40 (measured) / proportion of valid data [%]] * 100

If the five year averages AOT 40 cannot be determined on the basis of a full and consecutive set of annual data, the minimum annual data required for checking compliance with the target values will be valid data for three years.

Figure 7. Number of days in 2003 with ozone daily mean exceeding the threshold value of 65 µg/m³ for the protection of vegetation
Obrázek 7. Počet dní v roce 2003 s denními průměry ozonu překračujícími mezní hodnotu 65 µg/m³ pro ochranu vegetace
Abbildung 7. Anzahl der Tage mit Tagesmittelwertüberschreitungen des Schwellenwertes zum Schutz der Vegetation 65 µg/m³ in 2003
Rysunek 7. Liczba dni w 2003 roku z wartościami średniodobowymi ozonu przekraczającymi wartość progową dla ochrony roślin 65 µg/m³

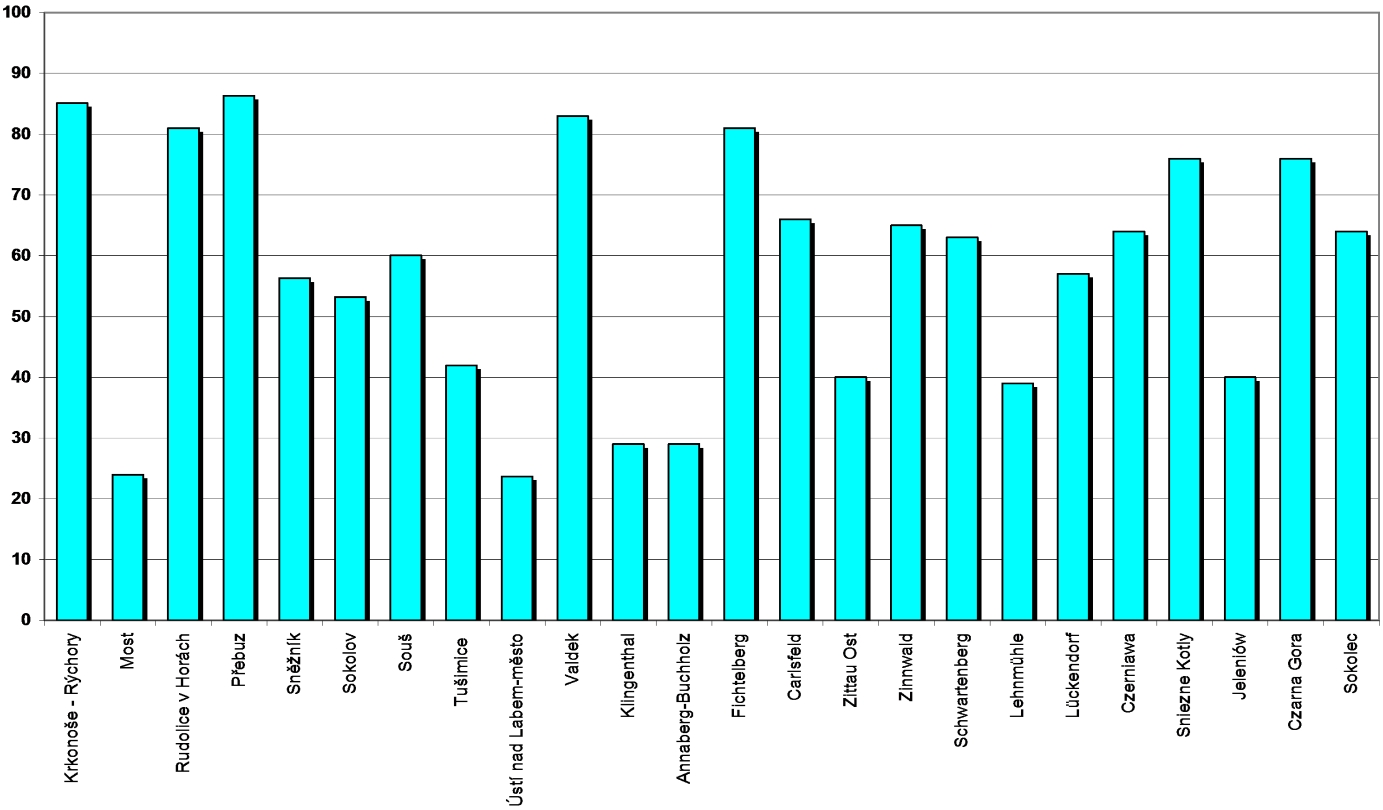


Figure 8. Number of days with 8-hour mean exceeding 120 µg/m³ (mean over 3 years 2001-2003)
Obrázek 8. Počet dní s 8-hodinovým průměrem > 120 ug/m³ (průměr za 3 roky 2001-2003)
Abbildung 8. Anzahl der Tage mit 8-Stunden-Mittelwerten >120 µg/m³ (Mittelwert über 3 Jahre 2001-2003)
Rysunek 8. Liczba dni z wartościami 8-godzinnymi ozonu > 120 µg/m³ (średnia z 3 lat 2001-2003)

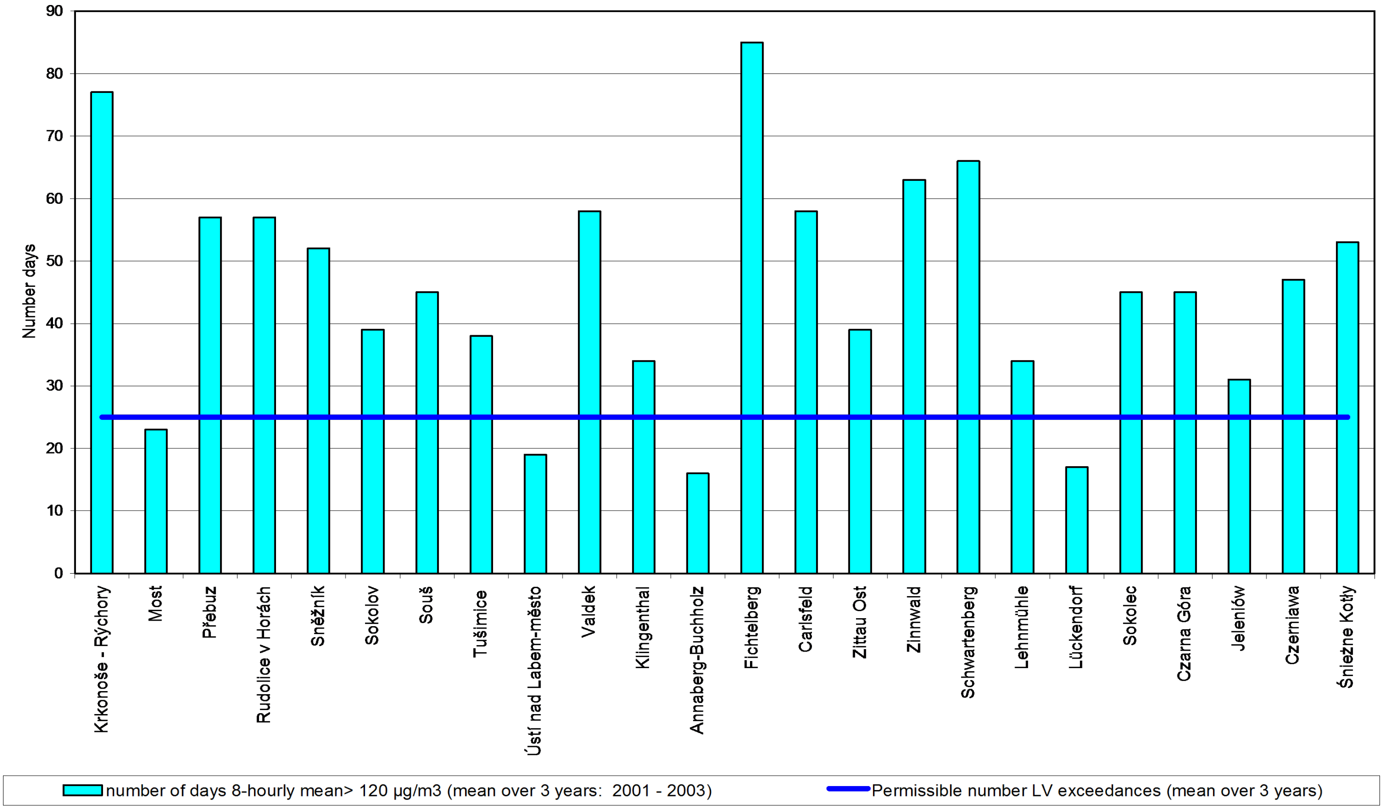
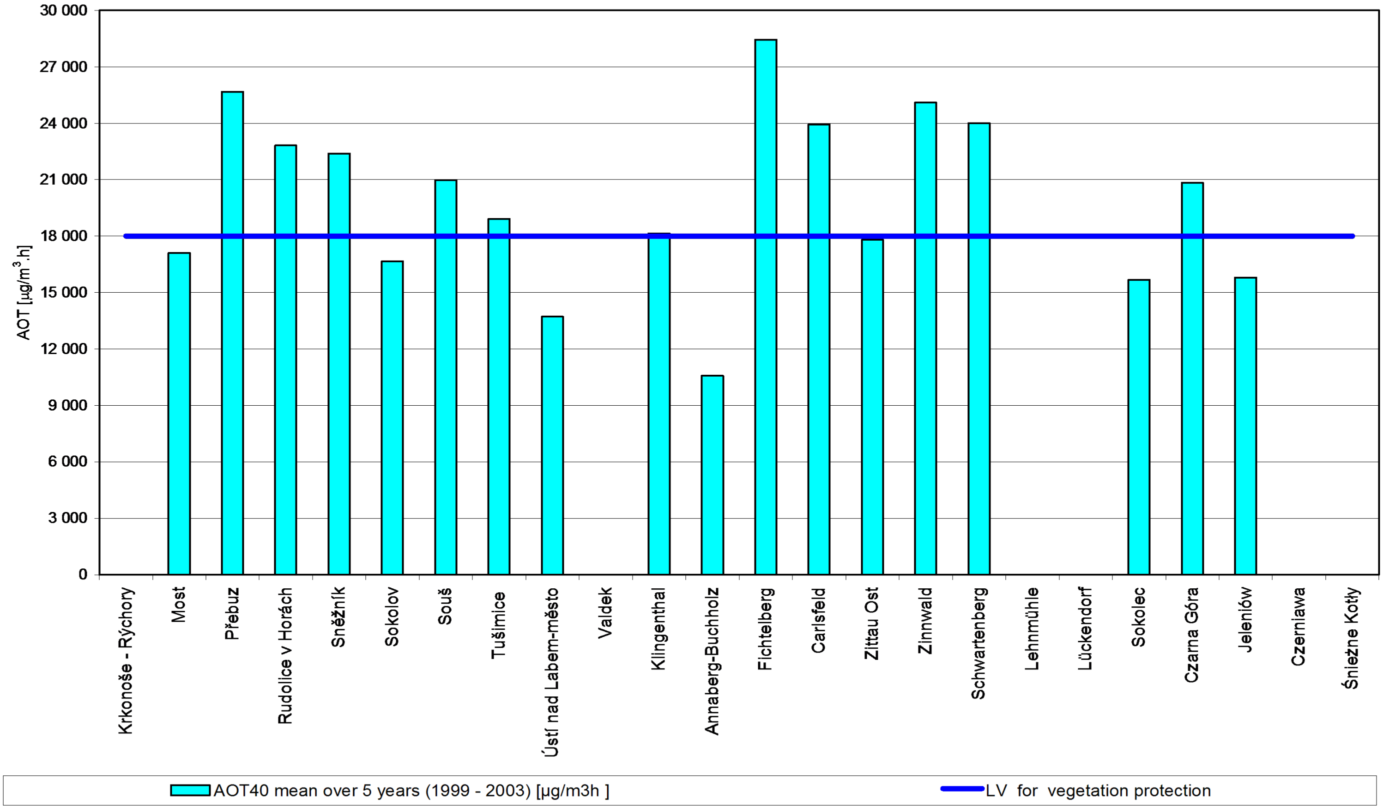


Figure 9. AOT40 mean over 5 years (1999-2003)
Obrázek 9. AOT40 průměr za 5 let (1999-2003)
Abbildung 9. AOT40, Mittelwert über 5 Jahre (1999-2003)
Rysunek 9. AOT40 - średnia z 5 lat (1999-2003)



3.3.4. Directive 2004/107/EC of 15 December 2004 of the European Parliament and of the Council relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons (PAHs) in ambient air

3.3.4.1. Target values for heavy metals: As - 6 ng/m^3; Cd - 5 ng/m^3, Ni - 20 ng/m^3

The fourth Daughter Directive aims to meet the obligation of applying the precautionary principle for the protection of human health and the environment and the principle that exposure to pollutants for which no adverse-effect threshold can be identified should be as low as reasonably achievable.

This Directive, which was adopted in December 2004, but has not yet entered into force, only establishes target values for the concentrations of the above heavy metals in ambient air. The target values refer to an annual average of PM_{10} particle fraction.

Measurement of the heavy metals - cadmium, arsenic and nickel - was carried out in keeping with the proposed Directive. The target value for nickel was not exceeded at any of the stations. The target value for cadmium was exceeded only at Souš, with an annual mean of 6.6 ng Cd/m^3. The target value for arsenic was exceeded in Görlitz (6.4 ng As/m^3) and Działoszyn (6.2 ng As/m^3).

Annual averages ranged from 0.3 ng/m^3 (Schwartenberg, Rudolice) to 6.6 ng/m^3 (Souš) for cadmium, 1.9 ng/m^3 (Rudolice) to 6.4 ng/m^3 (Görlitz) for arsenic and 1.0 ng/m^3 (Schwartenberg) to 3.1 ng/m^3 (Sokolov) for nickel.

Table 19. Annual mean concentrations of As, Cd, Ni and BaP in the PM_{10} in 2003
Tabulka 19. Roční průměrné koncentrace As, Cd, Ni a BaP v PM^{10} v roce 2003
Tabelle 19. Jahresmittelwerte für As, Cd, Ni und BaP in PM_{10} für das Jahr 2003
Tabela 19. Średnie roczne wartości stężeń As, Cd, Ni i BaP w PM_{10} w roku 2003

Czech Republic

station	BaP	Cd	Ni	As
	annual mean ng/m³	annual mean ng/m³	annual mean ng/m³	annual mean ng/m³
	long term objective = 1 ng/m³	*long term objective = 5 ng/m³*	*long term objective = 20 ng/m³*	*long term objective = 6 ng/m³*
Rudolice	-	0.3a	2.0a	1.9a
Sokolov	-	0.4a	3.1a	2.3a
Souš	-	6.6a	1.7a	3.8a
Teplice	1,1	-	-	-
Ústí n.L.- Kočkov	-	0.5a	2.8a	4.8a

Saxony

station	BaP	Cd	Ni	As
	annual mean ng/m³	annual mean ng/m³	annual mean ng/m³	annual mean ng/m³
Görlitz	2,0	0,9	2,2	6,4
Schwartenberg	0,4	0,3	1,0	2,5

Poland

station	BaP	Cd	Ni	As
	annual mean ng/m³	annual mean ng/m³	annual mean ng/m³	annual mean ng/m³
Jeleniów	1,7	1,0	2,6	4,4
Działoszyn	1,4	2,0	2,6	6,2
Czerniawa	0,7	-	-	-

a >50% and <75% x <50%

3.3.4.2. Target value for the carcinogenic risk-marker substance BaP - 1 ng/m³

The above Directive (4th daughter directive) provides for EU Member States to monitor other relevant PAHs like BaA, BbF, BkF, INP, DBahA, FLU[1] at a limited number of stations in order to observe the relationship with the indicator substance benzo(a)pyrene (BaP).

In 2003 PAHs were measured at 6 monitoring sites in the tri-border region of our three countries: Germany - Görlitz, Schwartenberg[2]; in the Czech Republic – Teplice* (station does not belong to the JAMS network) and Poland – Czerniawa, Jeleniów, Działoszyn. More details on the measurements are described in the "Common Report on Air Quality in the Black Triangle Region – 2001".

The annual mean concentrations of BaP in the PM_{10}-fraction do not indicate a significant trend for the years 1998 – 2003 (see Figure 10).

1 BaA - benzo(a)antracene, BbF - benzo(b)fluoranthene, BkF - benzo(k)fluoranthene, INP - Indeno(1,2,3 –cd)pyrene, DBahA - dibenzo(a,h)anthracene, FLU - fluoranthene

2 PAHs are no longer measured at the Zinnwald station. These data series are being continued with data from the station in Schwartenberg

Figure 10. **Annual mean concentrations of BaP in the PM_{10} fraction for the years 1998 - 2003**
Obrázek 10. **Roční průměrné koncentrace BaP ve frakci PM_{10} pro roky 1998 - 2003**
Abbildung 10. **Jahresmittelwerte der BaP-Konzentration in der PM_{10}-Fraktion für die Jahre 1998 - 2003**
Rysunek 10. **Średnie roczne wartości stężeń BaP we frakcji PM_{10} w latach 1998 - 2003**

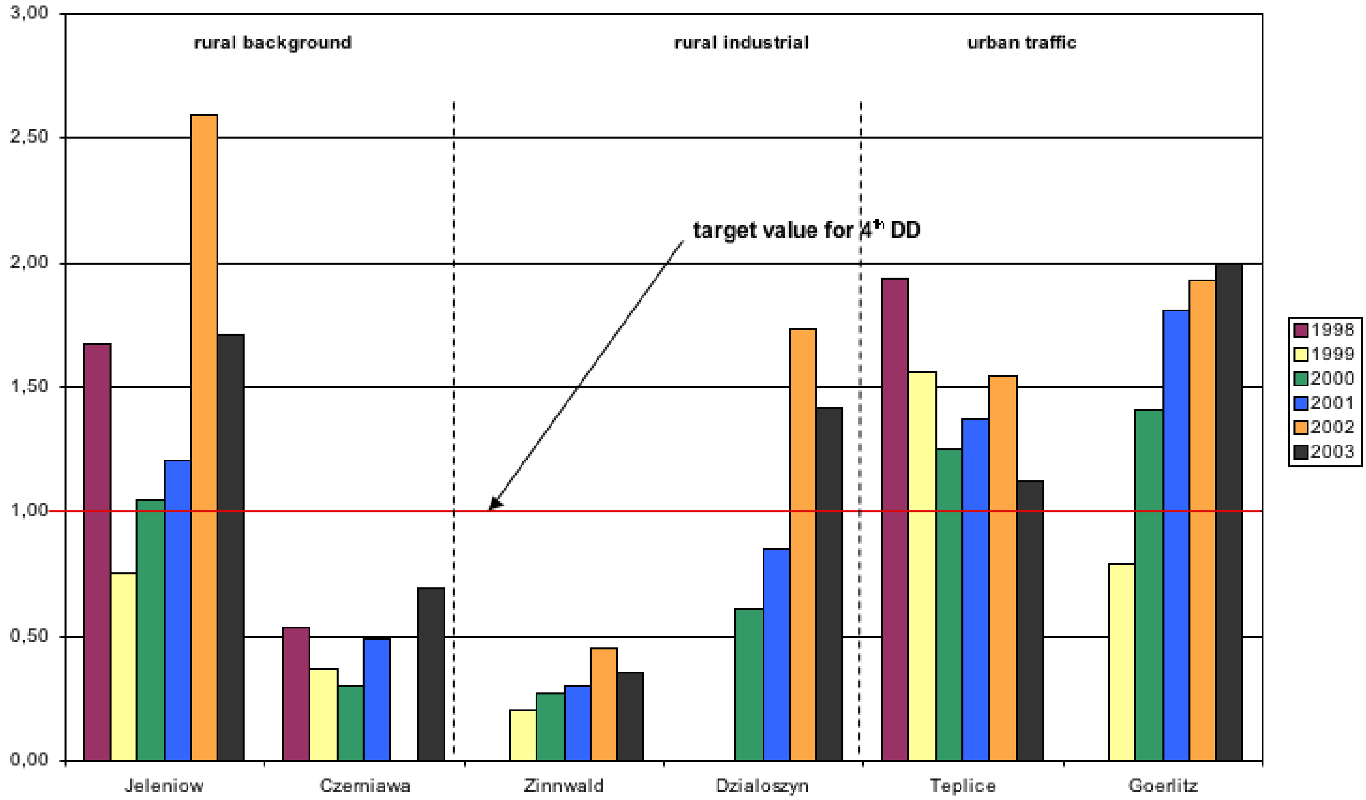


Table 20. **Annual mean concentrations of BaP in the PM_{10} in 1998 - 2003**
Tabulka 20. **Roční průměrné koncentrace BaP v PM_{10} v letech 1998 - 2003**
Tabelle 20. **Jahresmittelwerte für BaP in PM_{10} für die Jahre 1998 - 2003**
Tabela 20. **Średnie roczne wartości stężeń BaP w PM_{10} w latach 1998- 2003**

	Jeleniow	Czerniawa	Zinnwald	Dzialoszyn	Teplice	Goerlitz
1998	1,68	0,54	0,00	0,00	1,94	0,00
1999	0,75	0,37	0,20	0,00	1,56	0,79
2000	1,05	0,30	0,27	0,61	1,25	1,41
2001	1,21	0,49	0,30	0,85	1,37	1,81
2002	2,59	0,00	0,45	1,73	1,55	1,93
2003	1,71	0,69	0,35	1,42	1,12	2,00

The basis for qualified assessment is the classification of stations according to Council Decision 97/101/EC. This classification of types of station (traffic, industrial, background) and location (urban, suburban, rural) is used in the presentation below.

Stations included in the rural-industrial and urban-traffic categories generally exceed the set target value of 1 ng BaP/m^3. At the urban-traffic station in Teplice PAHs are measured in gas phase and aerosols, which could explain higher PAH values. Rural background stations like Czerniawa and Zinnwald/Schwartenberg remained below the target value while at Jeleniów the target value was exceeded with the exception of 1999.

The urban-traffic stations present a varied picture. Whilst annual mean concentrations increased steadily at Görlitz, they decreased slightly at Teplice during the same period.

Figure 11. Annual mean values for PAHs (BaP, BbF, BkF, INP, DbahA, FLU) over the period 1998-2003, in ng/m³
Obrázek 11. Roční průměrné hodnoty PAHs (BaA, BbF, BkF, INP, DBahA, FLU) za období 1998-2003 v ng/m³
Abbildung 11. Jahresmittelwerte der PAK´s (BaA, BbF, BkF, INP, DBahA, FLU) für den Zeitraum 1998-2003 in ng/m³
Rysunek 11. Średnie roczne wartości stężeń WWA (BaA, BbF, BkF, INP, DBahA, FLU) w latach 1998-2003 w ng/m³

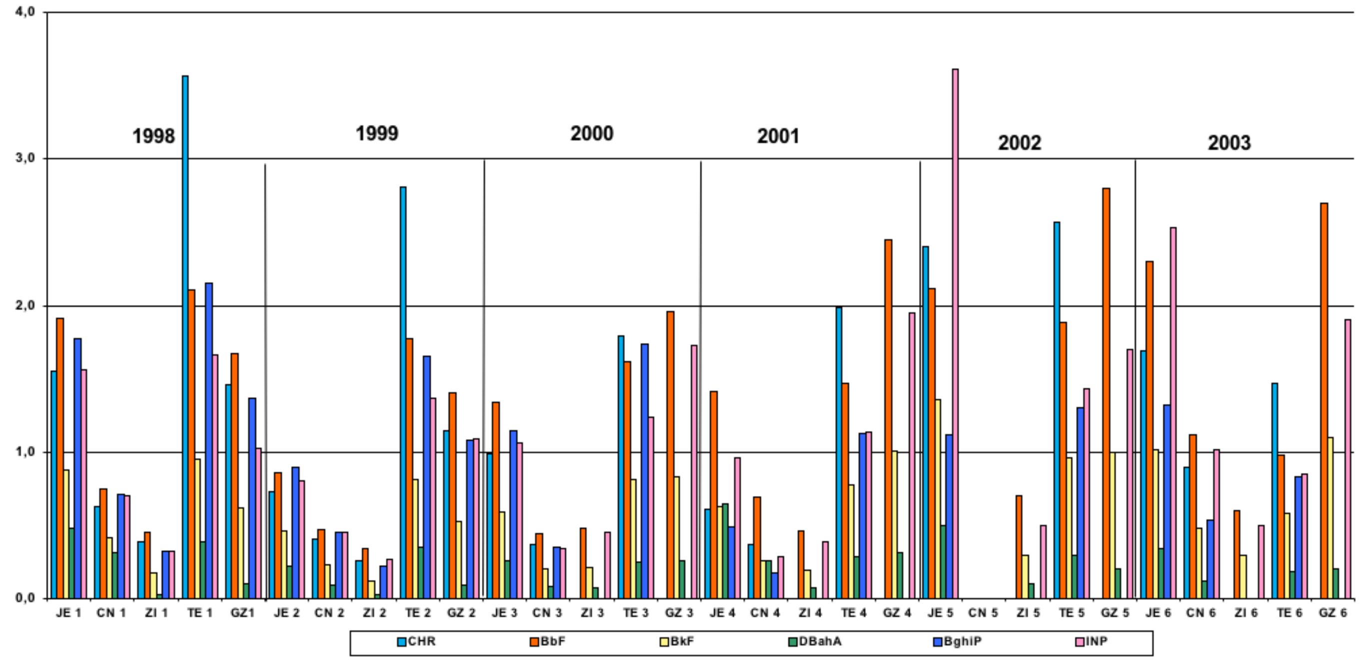


Table 21. Annual mean concentrations of different PAHs measured in 1998-2003, [ng/m³]
Tabulka 21. Roční průměrné koncentrace různých PAH naměřené v letech 1998 - 2003, [ng/m³]
Tabelle 21. PAK-Jahresmittelwerte für die Jahre 1998-2003, [ng/m³]
Tabela 21. Średnie roczne wartości stężeń WWA w latach 1998-2003, [ng/m³]

Station	Station Figure 11	year	CHR	BbF	BkF	DBahA	BghiP	INP
Jeleniow	JE 1	1998	1,55	1,91	0,88	0,48	1,77	1,56
Czerniawa	CN 1	1998	0,63	0,75	0,42	0,31	0,71	0,70
Działoszyn								
Teplice	TE 1	1998	3,57	2,11	0,95	0,39	2,15	1,66
Aue								
Görlitz	GZ 1	1998	1,46	1,67	0,62	0,1	1,37	1,03
Zinnwald	ZI 1	1998	0,39	0,45	0,18	0,03	0,32	0,32
Jeleniow	JE 2	1999	0,73	0,86	0,46	0,22	0,90	0,80
Czerniawa	CN 2	1999	0,41	0,47	0,23	0,09	0,45	0,45
Działoszyn								
Teplice	TE 2	1999	2,81	1,77	0,81	0,35	1,65	1,37
Görlitz	GZ 2	1999	1,15	1,40	0,53	0,09	1,08	1,09
Aue		1999	0,64	0,82	0,32	0,07	0,74	0,68
Zinnwald	ZI 2	1999	0,26	0,34	0,12	0,03	0,22	0,27
Jeleniow	JE 3	2000	0,99	1,34	0,59	0,26	1,15	1,06
Czerniawa	CN 3	2000	0,37	0,44	0,20	0,08	0,35	0,34
Działoszyn		2000	0,77	0,94	0,41	0,15	0,64	0,68
Teplice	TE 3	2000	1,79	1,62	0,81	0,25	1,74	1,24
Görlitz	GZ 3	2000	-	1,96	0,83	0,26	-	1,73

Zinnwald	ZI 3	2000	-	0,48	0,21	0,07	-	0,45
Jeleniow	JE 4	2001	0,61	1,41	0,63	0,65	0,49	0,96
Czerniawa	CN 4	2001	0,37	0,69	0,26	0,26	0,18	0,29
Działoszyn		2001	0,61	1,18	0,44	0,56	0,44	0,6
Teplice	TE 4	2001	1,99	1,47	0,78	0,29	1,13	1,14
Görlitz	GZ 4	2001	-	2,45	1,01	0,31	-	1,95
Zinnwald	ZI 4	2001	-	0,46	0,19	0,07	-	0,39
Jeleniow	JE 5	2002	2,40	2,12	1,36	0,50	1,12	3,61
Czerniawa	CN 5	2002	-	-	-	-	-	-
Działoszyn		2002	1,96	1,70	0,83	0,47	0,87	2,43
Teplice	TE 5	2002	2,57	1,88	0,96	0,30	1,30	1,43
Görlitz	GZ 5	2002	-	2,8	1	0,2	-	1,7
Zinnwald	ZI 5	2002	-	0,7	0,3	0,1	-	0,5
Jeleniow	JE 6	2003	1,69	2,30	1,01	0,34	1,32	2,54
Czerniawa	CN 6	2003	0,90	1,12	0,48	0,12	0,54	1,02
Działoszyn		2003	1,64	1,88	0,87	0,20	0,86	2,19
Teplice	TE 6	2003	1,47	0,98	0,58	0,18	0,83	0,85
Görlitz	GZ 6	2003	-	2,7	1,1	0,2	-	1,9
Zinnwald	ZI 6	2003	-	0,6	0,3	0,0	-	0,5

Monthly mean values of BaP for different stations show substantial seasonal variations. Depending on the type of station, differences between winter and summer time are larger, such as for Teplice and Görlitz, or smaller, such as for Czerniawa and Zinnwald. However, as shown in Figure 12, weather conditions in 2003 were obviously incomparable to those in other years.

Figure 12. **Monthly mean values for BaP over the period 1998-2003, in ng/m^3**
Obrázek 12: **Měsíční průměrné hodnoty BaP v období 1998-2003 v ng/m^3**
Abbildung 12. **BaP-Monatsmittelwerte für die Jahre 1998-2003 in ng/m^3**
Rysunek 12. **Średnie miesięczne wartości BaP w okresie 1998-2003 w ng/m^3**

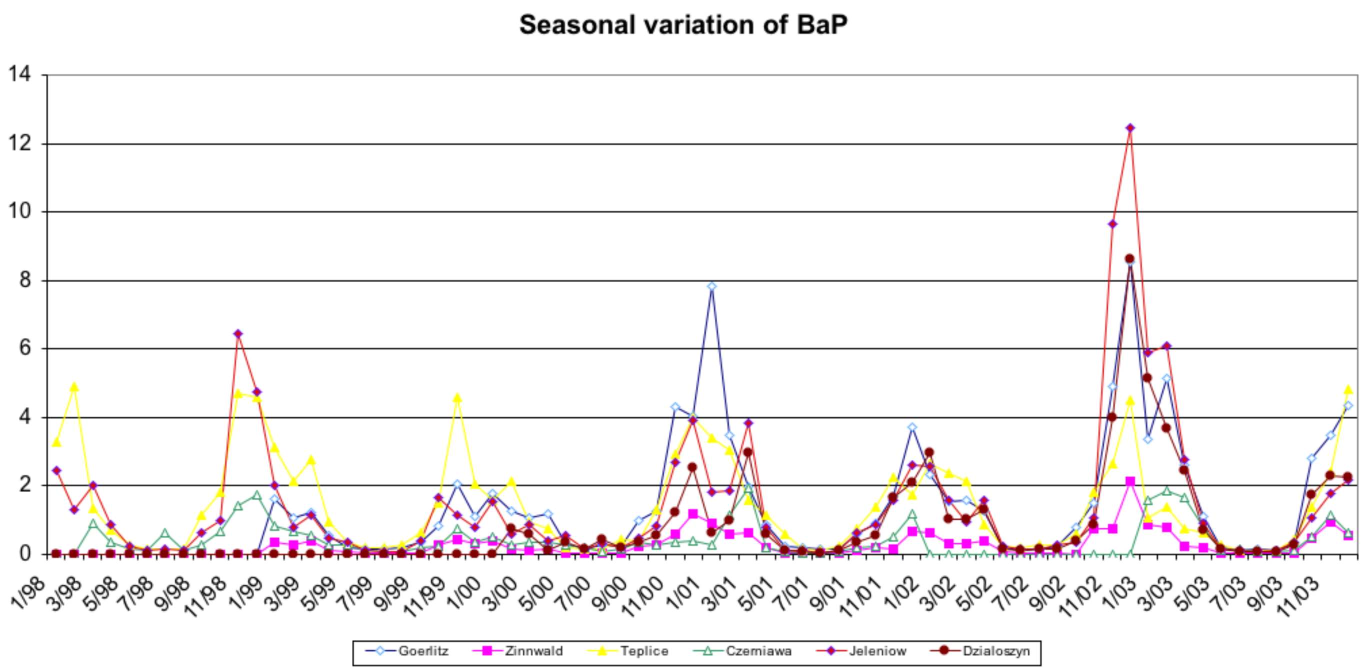


Table 22. Monthly mean values for BaP over the period 1998-2003, [ng/m³]
Tabulka 22. Měsíční průměrné hodnoty BaP v období 1998-2003, [ng/m³]
Tabelle 22. BaP-Monatsmittelwerte für die Jahre 1998-2003, [ng/m³]
Tabela 22. Średnie miesięczne wartości stężeń BaP w latach 1998-2003, [ng/m³]

	Goerlitz	Zinnwald	Teplice	Czerniawa	Jeleniow	Dzialoszyn	Schwartenberg
1/98	-	-	3,27	-	2,45	-	-
2/98	-	-	4,91	-	1,30	-	-
3/98	-	-	1,36	0,92	2,03	-	-
4/98	-	-	0,73	0,35	0,86	-	-
5/98	-	-	0,29	0,15	0,24	-	-
6/98	-	-	0,16	0,13	0,11	-	-
7/98	-	-	0,15	0,64	0,16	-	-
8/98	-	-	0,16	0,10	0,12	-	-
9/98	-	-	1,14	0,29	0,65	-	-
10/98	-	-	1,81	0,66	1,00	-	-
11/98	-	-	4,70	1,43	6,46	-	-
12/98	-	-	4,58	1,75	4,75	-	-
1/99	1,60	0,34	3,12	0,84	2,01	-	-
2/99	1,07	0,28	2,14	0,66	0,80	-	-
3/99	1,21	0,39	2,77	0,56	1,17	-	-
4/99	0,54	0,13	0,96	0,28	0,47	-	-
5/99	0,21	0,07	0,34	0,28	0,36	-	-
6/99	0,14	0,05	0,20	0,12	0,14	-	-
7/99	0,14	0,03	0,18	0,07	0,08	-	-
8/99	0,21	0,04	0,28	0,06	0,08	-	-
9/99	0,34	0,06	0,64	0,22	0,38	-	-
10/99	0,84	0,28	1,50	0,23	1,65	-	-
11/99	2,06	0,43	4,58	0,76	1,15	-	-
12/99	1,11	0,31	2,04	0,36	0,78	-	-
1/00	1,79	0,38	1,59	0,51	1,54	-	-
2/00	1,26	0,15	2,12	0,26	0,59	0,73	-
3/00	1,08	0,13	0,97	0,37	0,88	0,60	-
4/00	1,17	0,17	0,77	0,35	0,41	0,13	-
5/00	0,31	0,05	0,20	0,29	0,55	0,35	-
6/00	0,14	0,03	0,17	0,20	0,16	0,16	-
7/00	0,27	0,05	0,15	0,08	0,32	0,45	-
8/00	0,22	0,04	0,42	0,16	0,19	0,20	-
9/00	1,00	0,24	0,38	0,37	0,46	0,34	-
10/00	1,28	0,29	1,31	0,28	0,84	0,57	-
11/00	4,33	0,58	2,92	0,38	2,69	1,21	-
12/00	4,04	1,18	4,01	0,38	3,90	2,54	-
1/01	7,83	0,92	3,40	0,27	1,83	0,65	-
2/01	3,46	0,58	3,06	1,15	1,86	0,98	-
3/01	1,99	0,62	1,59	1,93	3,85	2,98	-
4/01	0,87	0,18	1,16	0,21	0,81	0,59	-
5/01	0,23	0,04	0,58	0,08	0,11	0,13	-
6/01	0,19	0,04	0,17	0,05	0,13	0,08	-
7/01	0,16	0,03	0,12	0,04	0,05	0,05	-
8/01	0,15	0,03	0,23	0,07	0,13	0,10	-
9/01	0,58	0,11	0,76	0,19	0,62	0,36	-
10/01	0,89	0,18	1,37	0,23	0,89	0,53	-
11/01	1,69	0,15	2,27	0,52	1,59	1,66	-
12/01	3,70	0,69	1,75	1,17	2,62	2,09	-
1/02	2,32	0,64	2,64	-	2,58	2,95	-

2/02	1,56	0,31	2,38	-	1,59	1,03	-
3/02	1,59	0,30	2,15	-	0,96	1,02	-
4/02	1,25	0,41	0,86	-	1,58	1,29	-
5/02	0,18	0,07	0,22	-	0,23	0,17	-
6/02	0,13	0,02	0,21	-	0,15	0,14	-
7/02	0,15	0,03	0,30	-	0,14	0,17	-
8/02	0,24	0,04	0,27	-	0,28	0,14	-
9/02	0,79	-	0,59	-	0,35	0,41	-
10/02	1,51	0,75	1,81	-	1,08	0,88	-
11/02	4,92	0,74	2,66	-	9,65	3,98	-
12/02	8,55	2,13	4,50	-	12,48	8,62	-
1/03	3,38	0,87	1,07	1,60	5,88	5,15	0,87
2/03	5,12	0,79	1,39	1,85	6,09	3,69	0,79
3/03	2,61	0,25	0,73	1,66	2,76	2,47	0,25
4/03	1,12	0,22	0,62	0,78	0,92	0,69	0,22
5/03	0,21	0,04	0,28	0,12	0,15	0,18	0,04
6/03	0,12	0,03	0,13	0,14	0,13	0,08	0,03
7/03	0,15	0,03	0,13	0,06	0,10	0,08	0,03
8/03	0,13	0,03	0,10	0,07	0,12	0,09	0,03
9/03	0,30	0,05	0,44	0,12	0,34	0,26	0,05
10/03	2,80	0,46	1,37	0,52	1,07	1,73	0,46
11/03	3,48	0,94	2,40	1,17	1,76	2,31	0,94
12/03	4,37	0,54	4,82	0,62	2,18	2,26	0,54

No clear trend can be seen so far for annual mean values of PAHs (BaP, BaA, BbF, BkF, INP, DBahA, FLU).

It should be mentioned that concentrations of heavy metals and PAHs at the Polish stations are estimates. This means, the quantities of these substance in PM_{10} have been measured but volume of air was assessed, due to the equipment used.

3.3.5. Wet deposition

Wet deposition standards have not been defined to date. The proposal for the fourth Daughter Directive considers deposition rates for cadmium (Cd) and mercury (Hg) only.

The analysis of nitrogen deposition (Total-N) in atmospheric precipitation at the rural background stations showed levels from 0.54 g/m^2 in Wleń (at a precipitation level of 385 mm) to 1.03 g/m^2 in Czerniawa (at a precipitation level of 702 mm) and 0.97 g/m^2 in Souš (at a precipitation level of 984 mm).

Sulphur deposition (SO_4^{-2} - S) levels ranged from 0.28 g/m^2 in Wleń to 0.67 g/m^2 in Souš and 0.64 g/m^2 in Czerniawa. The highest level of precipitation was observed in Souš, at 984 mm.

Sulphur deposition to nitrogen deposition ratios at particular stations were: 0.4 in Carlsfeld; 0.5 in Lehnmühle, Mittelndorf, Wleń and Jelenia Gora; 0.6 in Rudolice, Zinnwald, Czerniawa and Witków; 0.7 in Souš and 0.8 in Spalona.

At the urban zone communication stations in Görlitz and Plauen and the urban background station in Ústí n.L., nitrogen wet deposition levels were 0.52–0.65 g/m^2, at a precipitation of 400 mm.

The lowest sulphur deposition values were measured in Plauen (0.3 g/m^2), in Ústí n.L. (0.38 g/m^2) and the highest one in Goerlitz (0.5 g/m^2).

Sulphur deposition to nitrogen deposition ratios were: 0.5 in Plauen, 0.6 in Ústí n.L. and 1.0 in Görlitz. At all monitoring stations nitrogen concentrations in precipitation were higher than the sulphur concentrations, with the exception of Goerlitz station, where they were at the same level.

Wet deposition results differ from country to country. Ranges of nitrogen deposition were as follows:

in Poland 0.54 – 1.03 g $N/m^2/year$,

in the Czech Republic 0.61 – 0.97 g $N/m^2/year$,

in Germany 0.52 – 0.94 g $N/m^2/year$.

Sulphur deposition levels were in the following ranges:

0.28 – 0.64 g $S/m^2/year$ at the Polish stations,

0.30 – 0.54 g $S/m^2/year$ at the Saxon stations and

0.38 – 0.67 g $S/m^2/year$ at the Czech stations.

Precipitation levels ranged from 378 mm in Ústí n.L. to 984 mm in Souš.

Table 23: Annual wet deposition - 2003
Tabulka 23. Roční mokrá depozice - 2003
Tabelle 23. Jährliche nasse Depositionen - 2003
Tabela 23. Roczna mokra depozycja - 2003

Czech Republic

Station	Annual wet deposition		
	rain [mm]	SO_4^{2-}-S [g/m²]	Total-N [g/m²]
Ústí-Kočkov*	378	0,38	0,61
Rudolice	481	0,45	0,81
Souš	984	0,67	0,97

* whole name of station: Ústí nad Labem - Kockov

Saxony

Station	Annual wet deposition		
	rain [mm]	SO_4^{2-}-S [g/m²]	Total-N [g/m²]
Carlsfeld	918	0,41	0,94
Görlitz	381	0,50	0,52
Mittelndorf	414	0,38	0,74
Lehnmühle	506	0,32	0,67
Plauen	445	0,30	0,65
Zinnwald	619	0,54	0,87

Poland

Station	Annual wet deposition		
	rain [mm]	SO_4^{2-}-S [g/m²]	Total-N [g/m²]
Czerniawa	702	0,64	1,03
Spalona	651	0,58	0,76
Witków	508	0,37	0,57
Wleń	385	0,28	0,54
Jelenia Góra	418	0,30	0,56

Figure 13. Wet deposition - 2003
Obrázek 13. Mokrá depozice - 2003
Abbildung 13. Nasse Deposition - 2003
Rysunek 13. Wartości mokrej depozycji - 2003

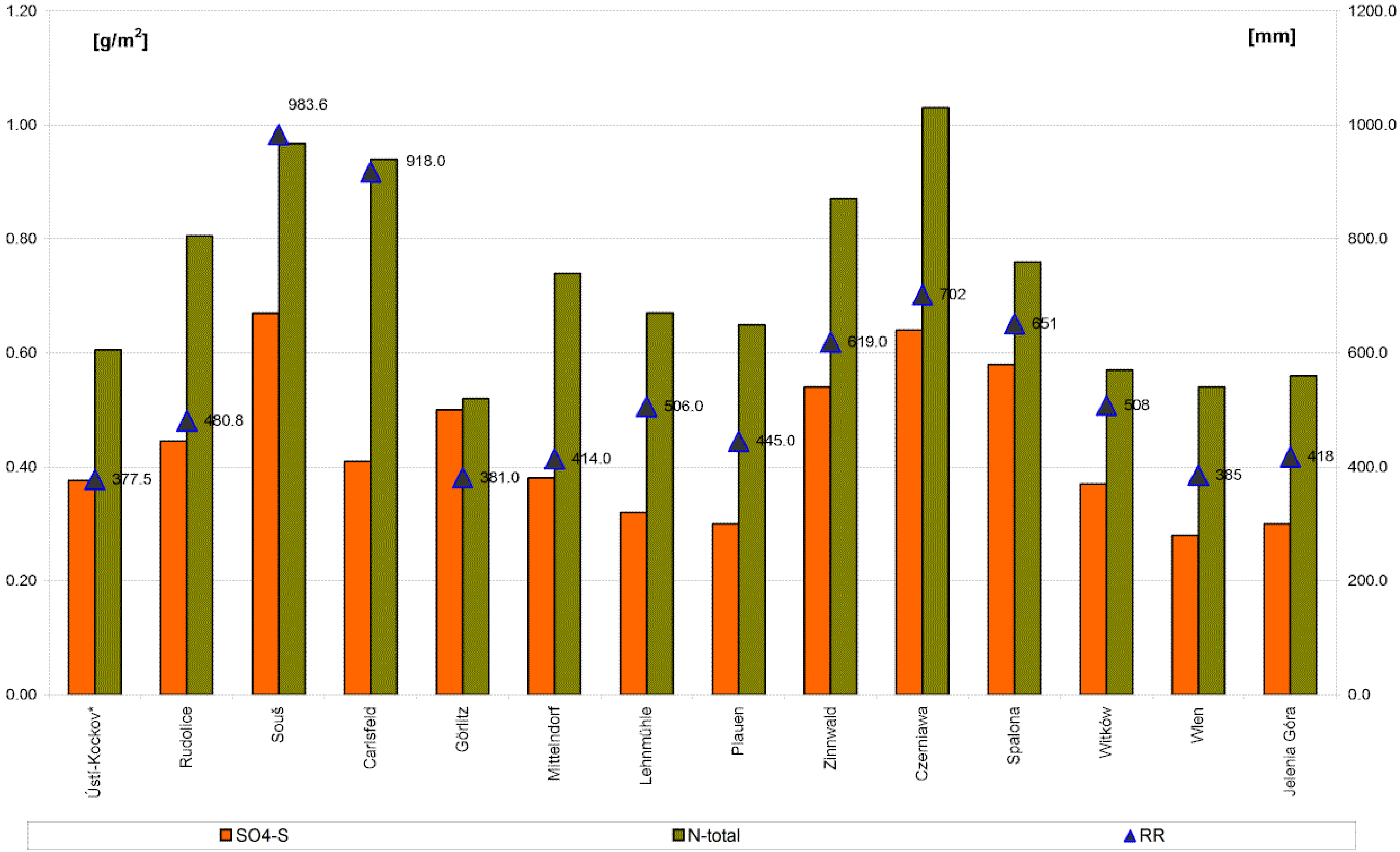


Figure 14. Annual mean values of sulphur dioxide in the tri-border region (1998 - 2003)
Obrázek 14 Roční průměrné hodnoty oxidu siřičitého v příhraniční oblasti (1998 - 2003)
Abbildung 14. Schwefeldioxid-Jahresmittelwerte im Dreiländereck (1998 - 2003)
Rysunek 14. Średnioroczne wartości stężeń dwutlenku siarki w trójgranicznym regionie (1998 - 2003)

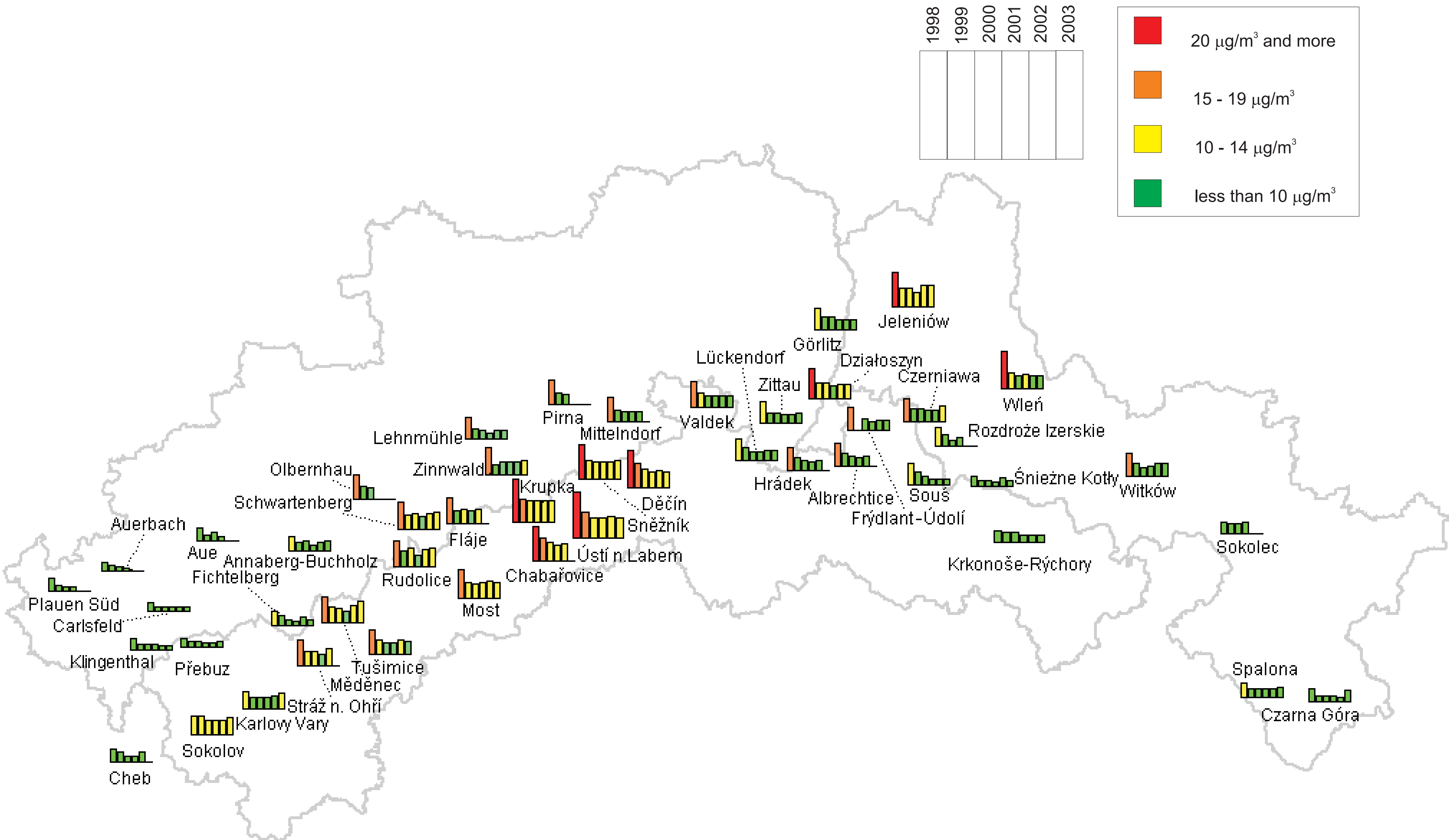


Figure 15. Annual mean values of nitrogen dioxide in the tri-border region (1998 - 2003)
Obrázek 15 Roční průměrné hodnoty oxidu dusičitého v příhraniční oblasti (1998 - 2003)
Abbildung 15. Stickstoffdioxid-Jahresmittelwerte im Dreiländereck (1998 - 2003)
Rysunek 15. Średnioroczne wartości stężeń dwutlenku azotu w trójgranicznym regionie (1998 - 2003)

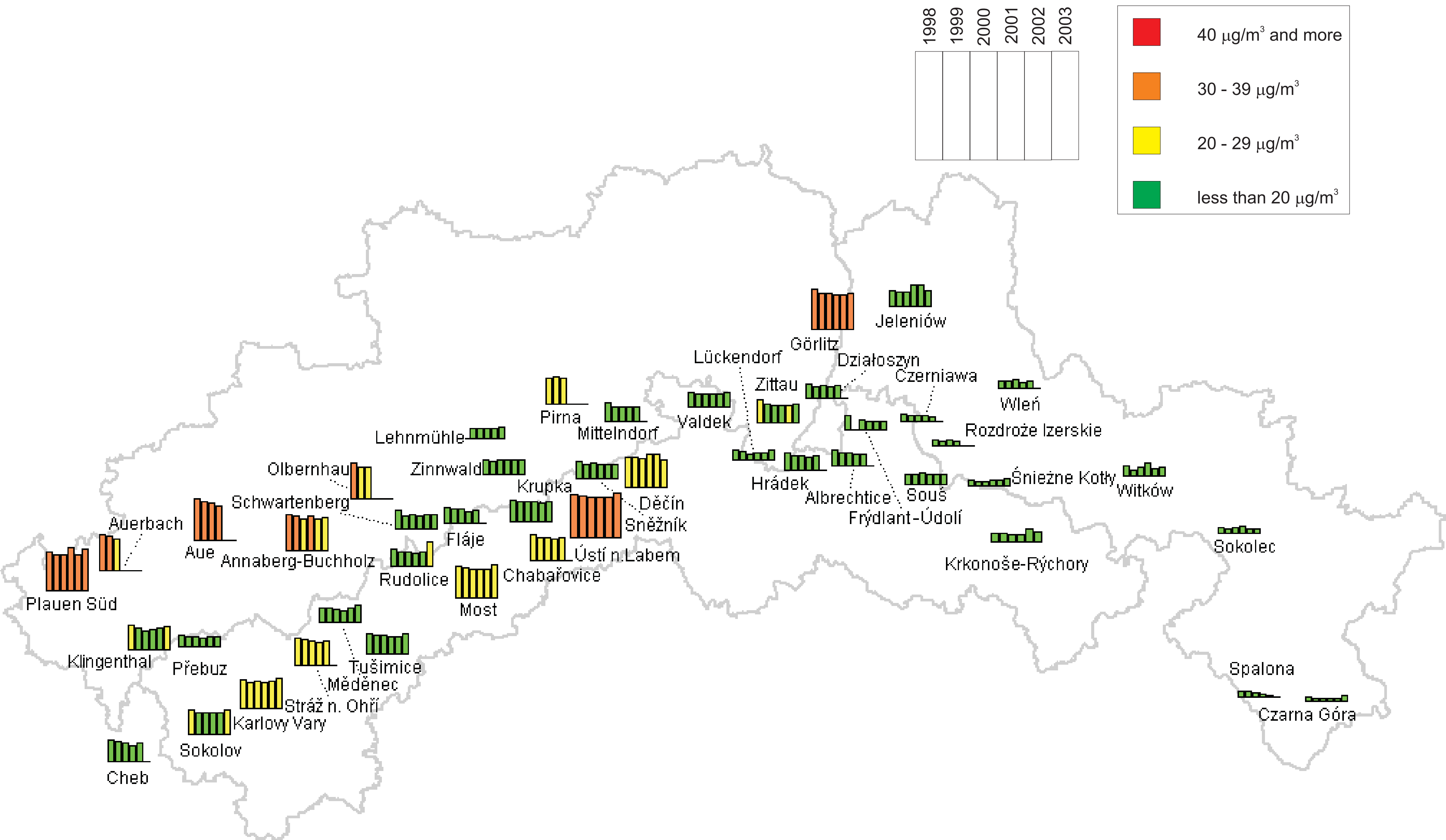


Figure 16. Annual mean values of suspended particulate matter PM10 in the tri-border region (1998 - 2003)
Obrázek 16 Roční průměrné hodnoty prašného aerosolu PM10 v příhraniční oblasti (1998 - 2003)
Abbildung 16. PM10-Schwebstaub-Jahresmittelwerte im Dreiländereck (1998 - 2003)
Rysunek 16. Średnioroczne wartości stężeń pyłu zawieszonego PM10 w trójgranicznym regionie (1998 - 2003)

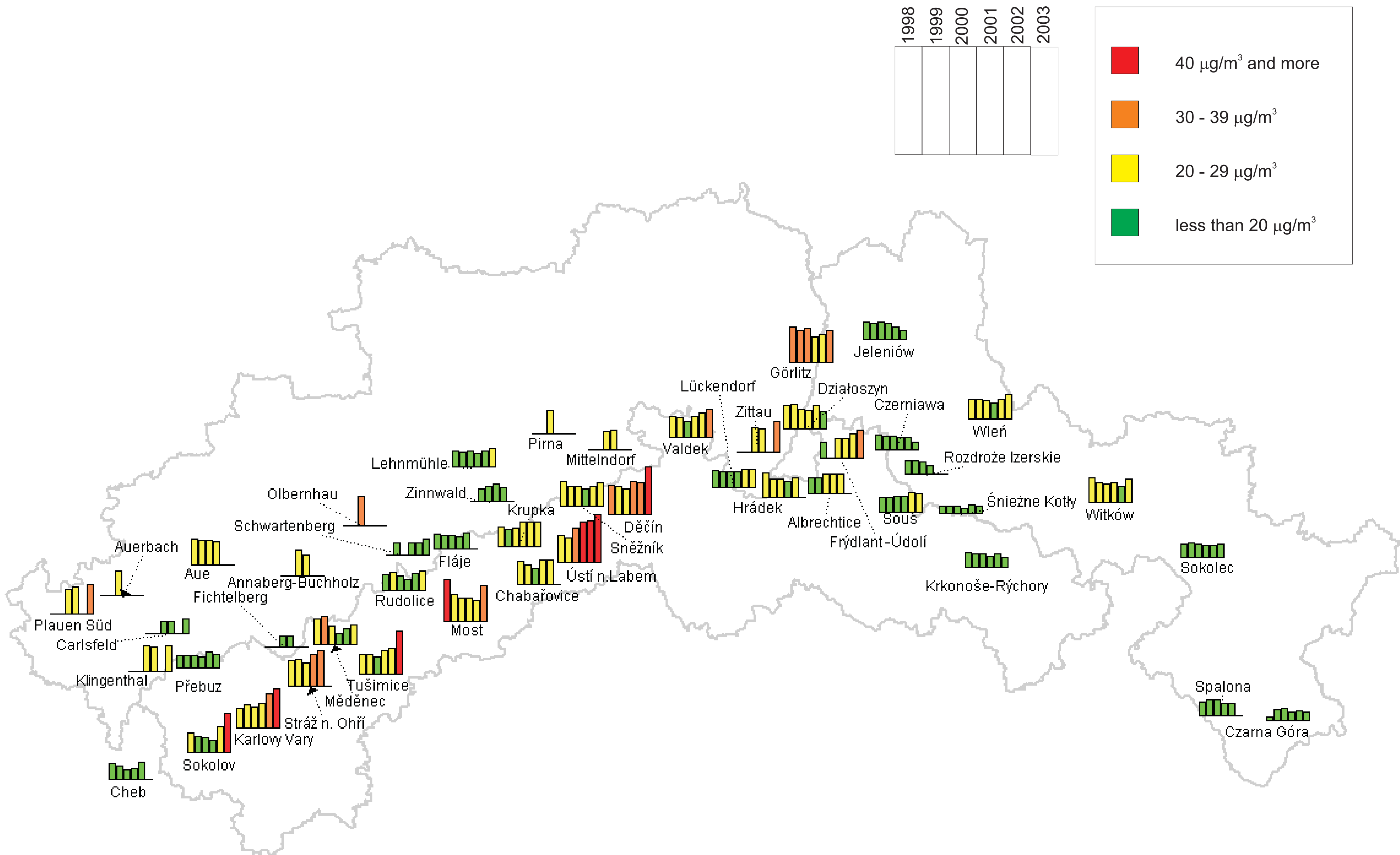


Figure 17. Annual mean values of carbon monoxide in the tri-border region (1998 - 2003)
Obrázek 17 Roční průměrné hodnoty oxidu uhelnatého v příhraniční oblasti (1998 - 2003)
Abbildung 17. Kohlenmonoxid-Jahresmittelwerte im Dreiländereck (1998 - 2003)
Rysunek 17. Średnioroczne wartości stężeń tlenku węgla w trójgranicznym regionie (1998 - 2003)

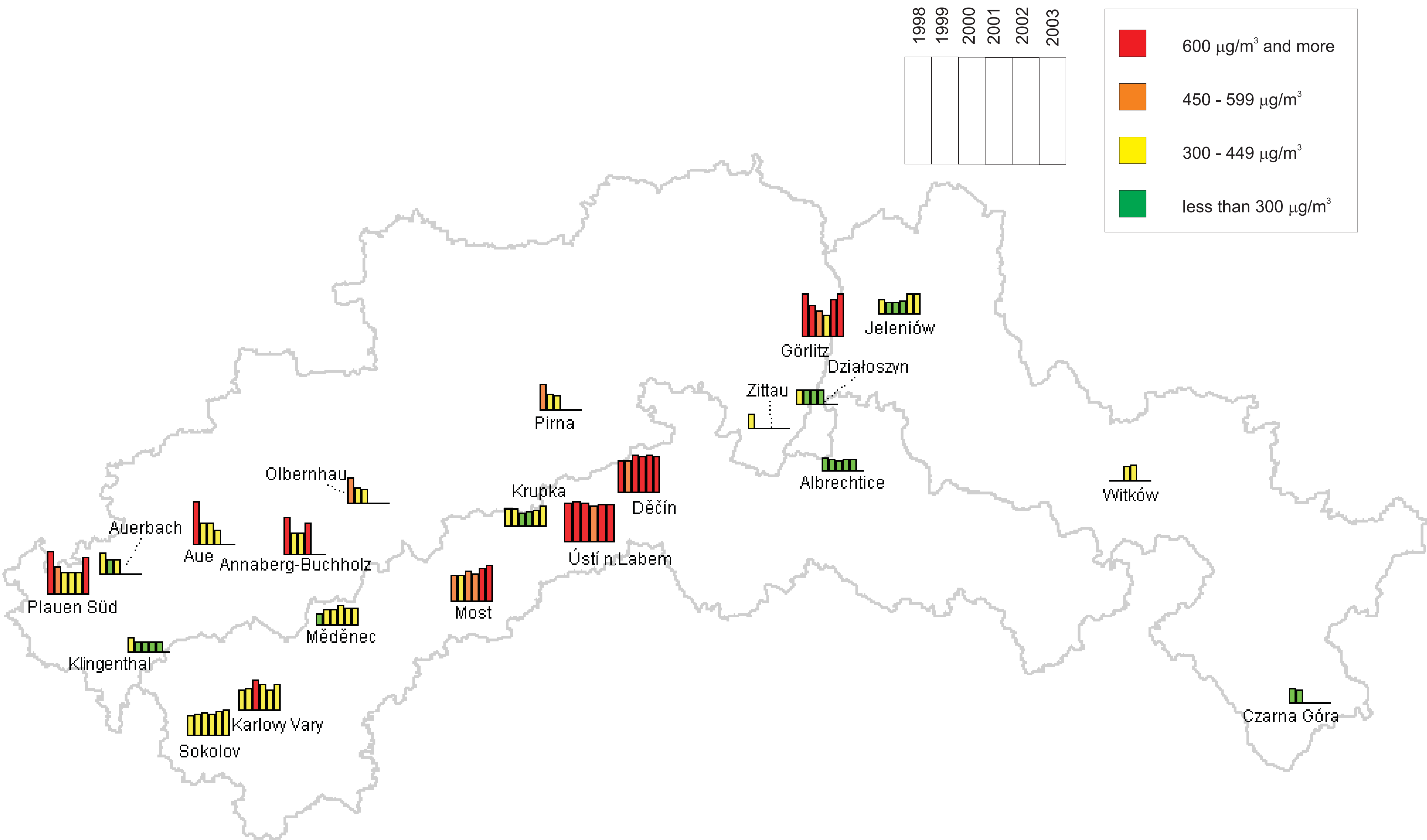


Figure 18. Annual mean values of ozone in the tri-border region (1998 - 2003)
Obrázek 18 Roční průměrné hodnoty ozonu v příhraniční oblasti (1998 - 2003)
Abbildung 18 Ozon-Jahresmittelwerte im Dreiländereck (1998 - 2003)
Rysunek 18. Średnioroczne wartości stężeń ozonu w trójgranicznym regionie (1998 - 2003)

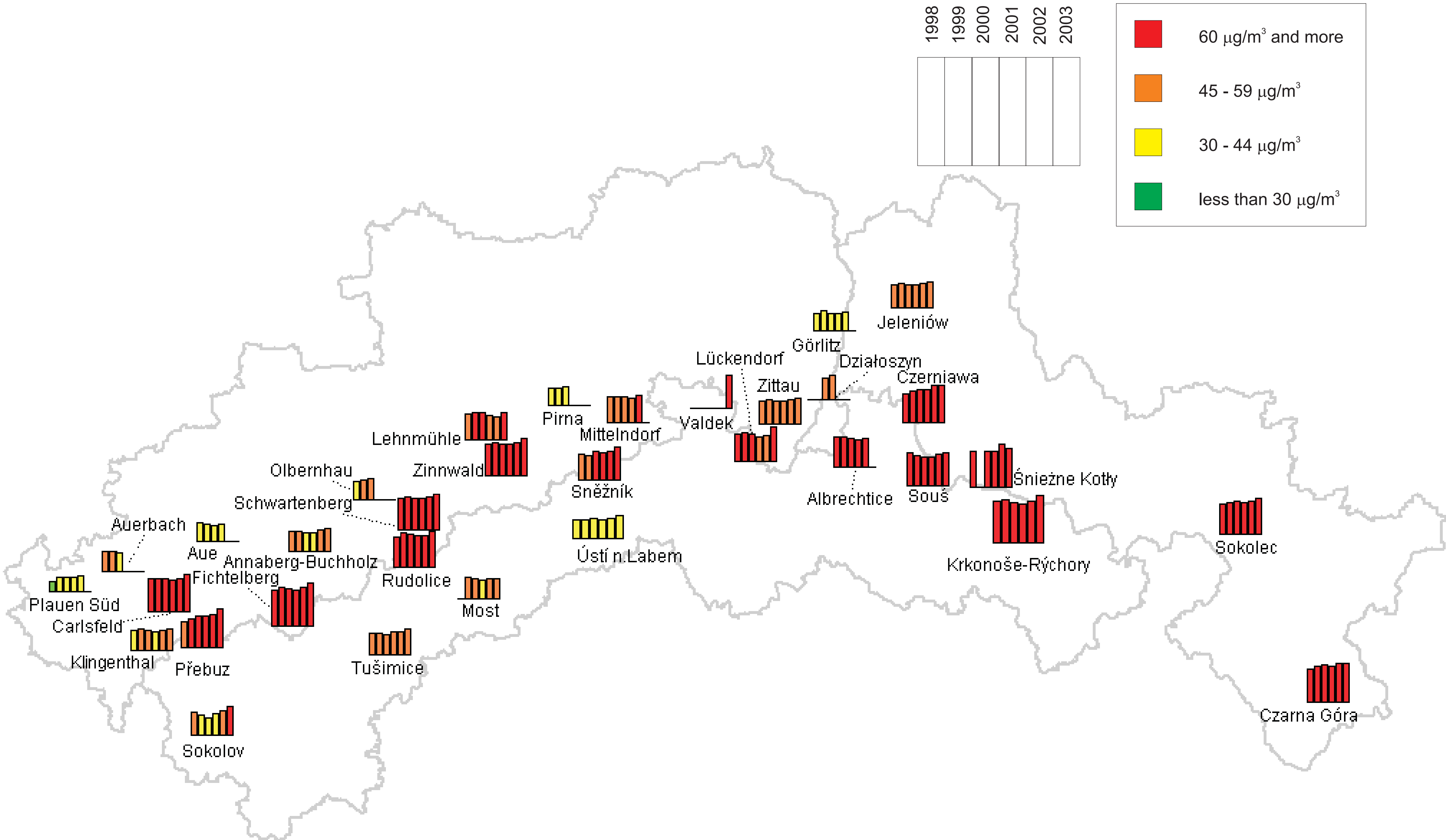


Figure 19. Annual wet deposition in the tri-border region - 2003
Obrázek 19 Roční mokrá depozice v příhraniční oblasti - 2003
Abbildung 19 Jahreswerte der nassen Deposition im Dreiländereck - 2003
Rysunek 19 Roczna mokra depozycja w trójgranicznym regionie - 2003

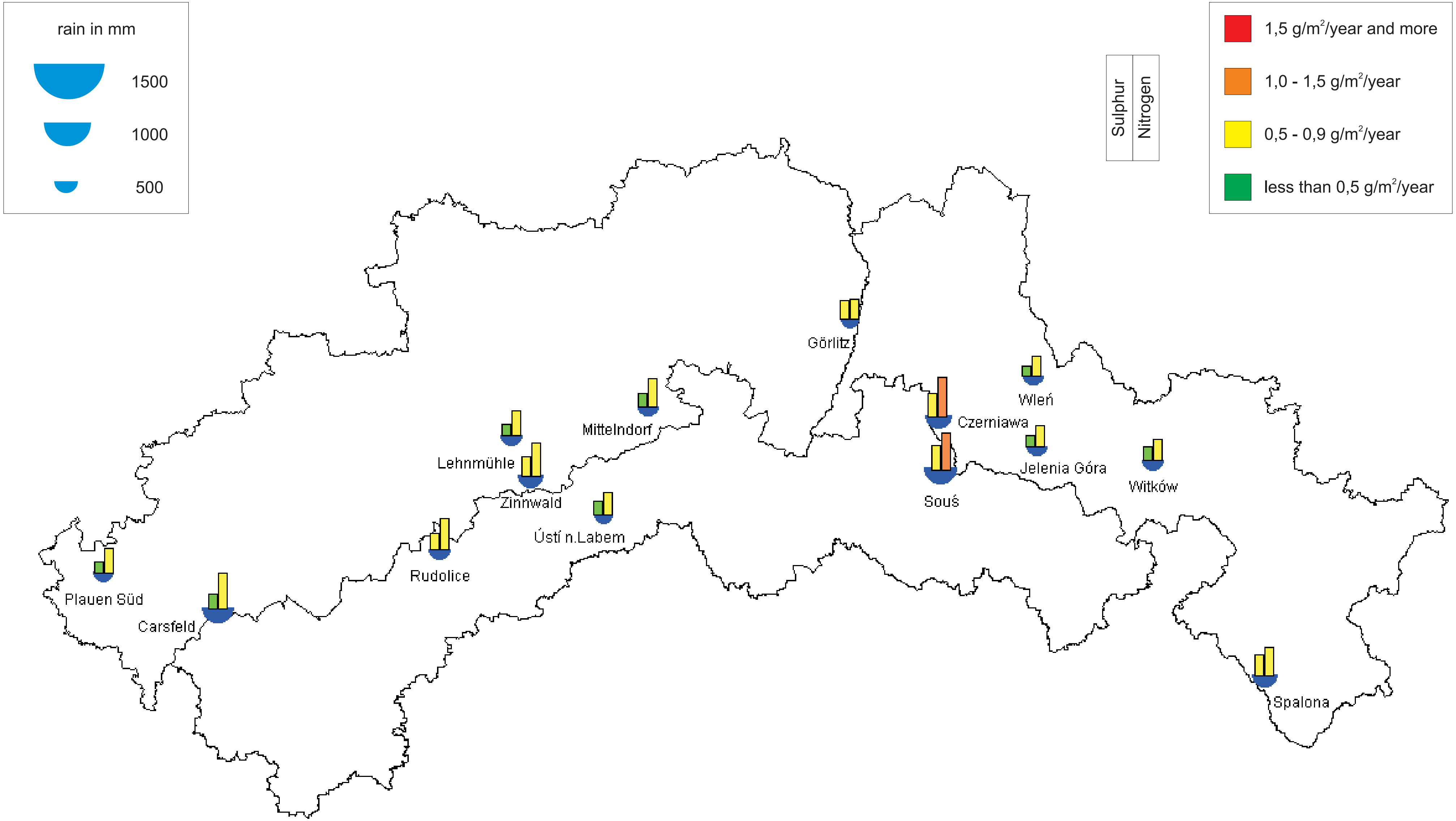
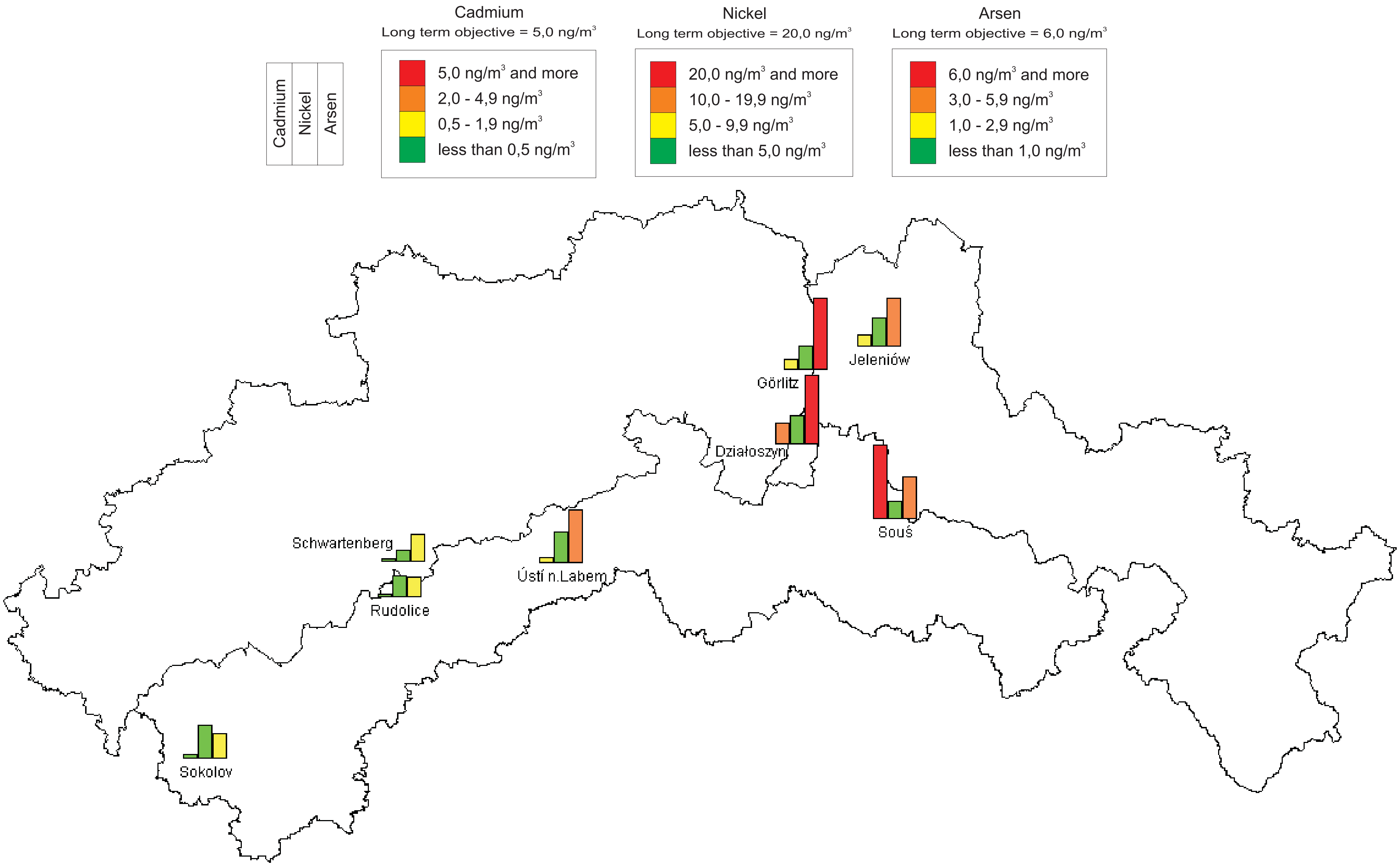


Figure 20. Annual mean values for heavy metals in PM_{10} in the tri-border region - 2003
Obrázek 20 Roční průměrné hodnoty těžkých kovů v PM_{10} v příhraniční oblasti - 2003
Abbildung 20. Jahresmittelwerte der Schwermetallgehalte in PM_{10} im Dreiländereck - 2003
Rysunek 20. Średnioroczne zawartości metali ciężkich w PM_{10} w trójgranicznym regionie - 2003



3.4. Air pollution episodes in the Tri-border region in 2003

3.4.1. Ozone episode

The most significant episode of high ground-level ozone concentrations occurred between 12 and 14 August 2003. During the monitored period the anticyclone of 1020 hPa with the centre above southern Hungary moved across northern Italy to southern Spain and enabled the shift of the frontal zone from northern to central Europe. On the rear side of this anticyclone very warm air from south came at first to western, later also to central Europe. Air temperature reached 30°C even in the mountain regions. At the end of the period two subsequent cold fronts came from northwest to the Tri-border territory and the air masses exchanged.

On 12 August within the very warm air mass moving over the Tri-border territory the maximum values of ground-level ozone exceeded 180 μg/m³ first at the mountain stations Rudolice v Horách and Schwartenberg. Next day on 13 August 2003 the ground level ozone episode culminated and concentrations approached or exceeded 200 μg/m³ at all measuring stations presented. On 14 August 2003, after the passage of two cold fronts the ozone concentrations declined to 130–160 μg/m³ within the Tri-border region and the value 180 μg/m³ was already not exceeded.

Figure 21. Summer episode: Tušimice - lowland station (CZ)
Obrázek 21 Letní epizoda: Tušimice, nízko položená stanice (CZ)
Abbildung 21. Sommerepisode für die tiefgelegene Station Tušimice (CZ)
Rysunek 21. Epizod letni: Tušimice - stacja nizinna (CZ)

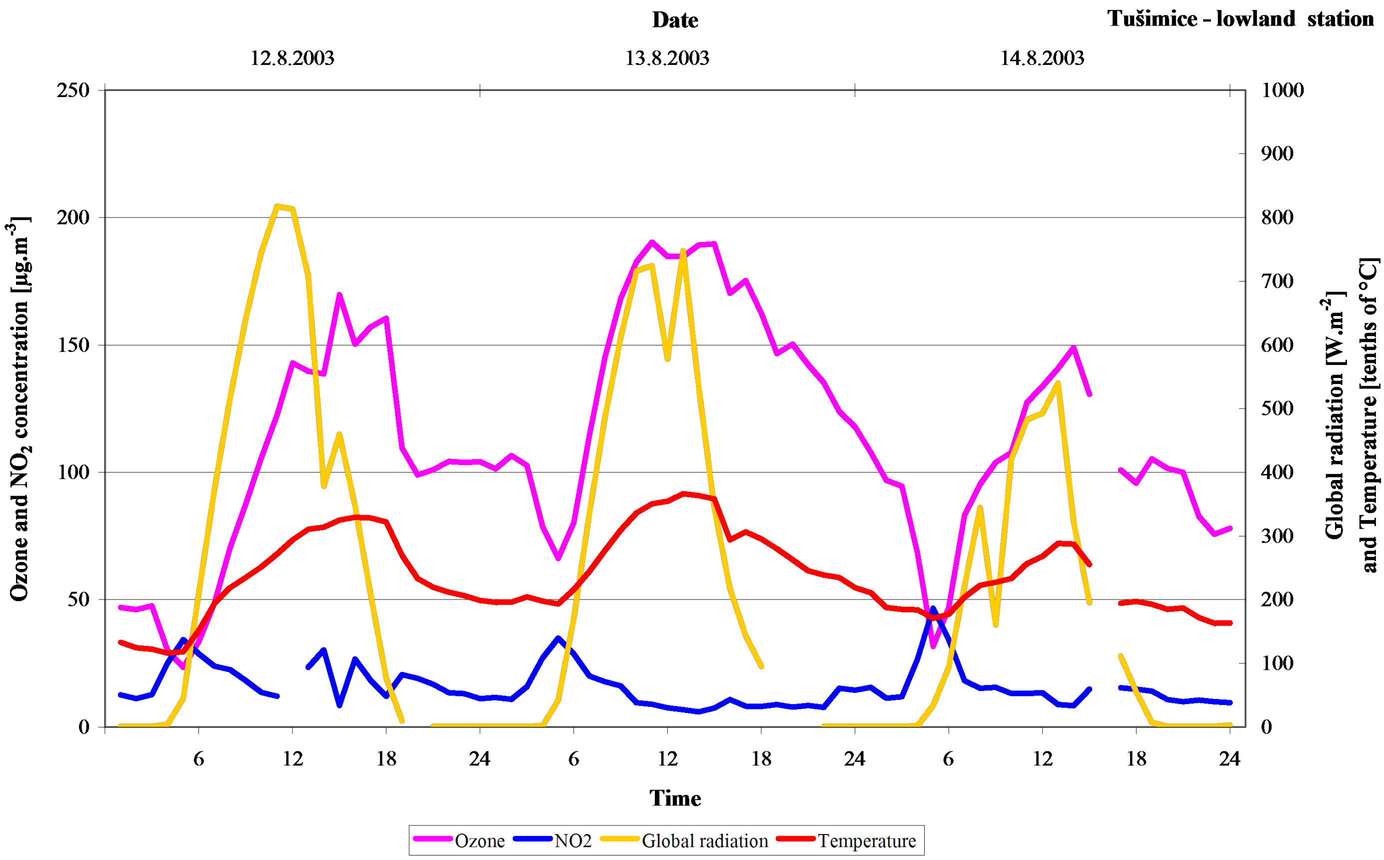


Figure 22. Summer episode: Rudolice-mountain station (CZ)
Obrázek 22 Letní epizoda: Rudolice, horská stanice (CZ)
Abbildung 22. Sommerepisode für die Bergstation Rudolice (CZ)
Rysunek 22. Epizod letni: Rudolice - stacja górska (CZ)

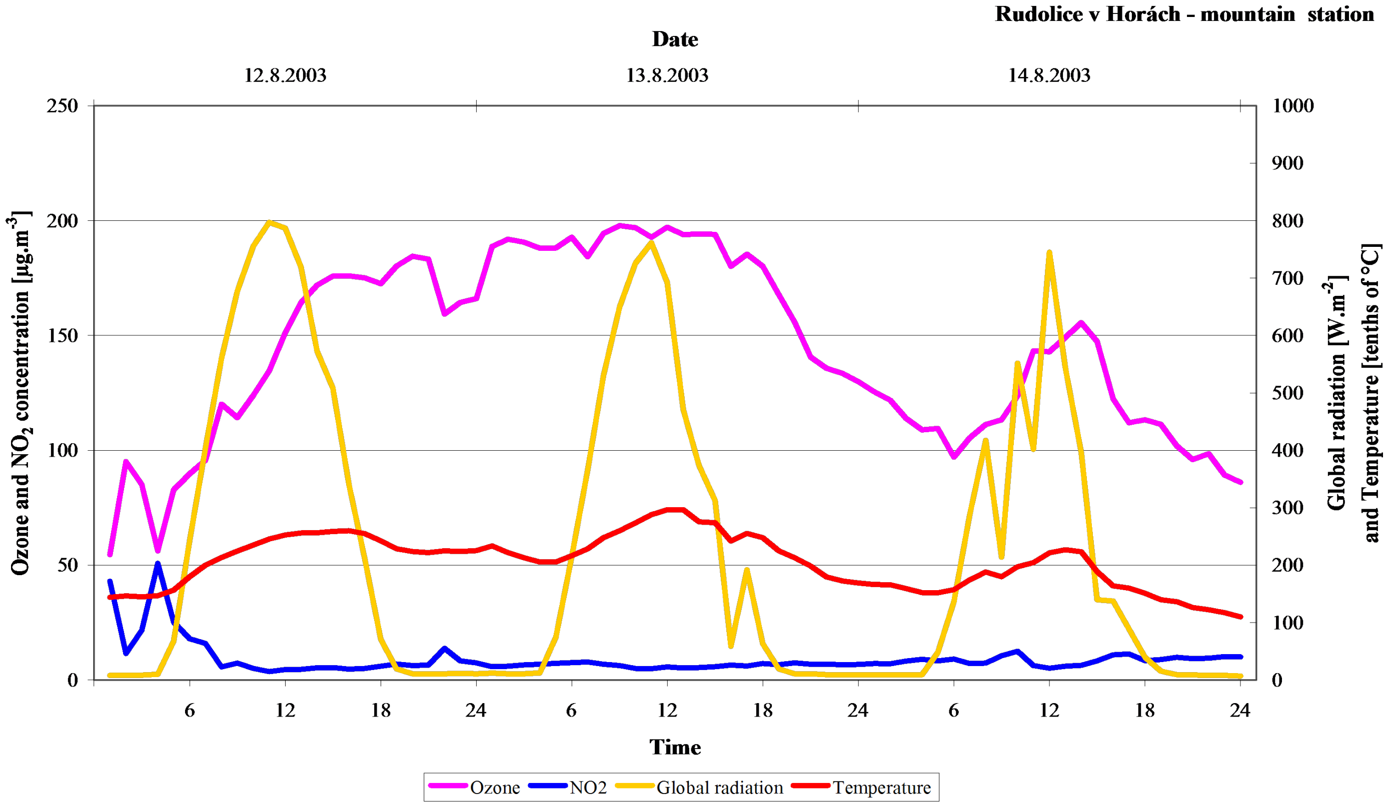


Figure 23. Summer episode: Niesky - lowland station (DE)
Obrázek 23 Letní epizoda: Niesky, nízko položená stanice (DE)
Abbildung 23. Sommerepisode für die tiefgelegene Station Niesky (DE)
Rysunek 23. Epizod letni: Niesky - stacja nizinna (DE)

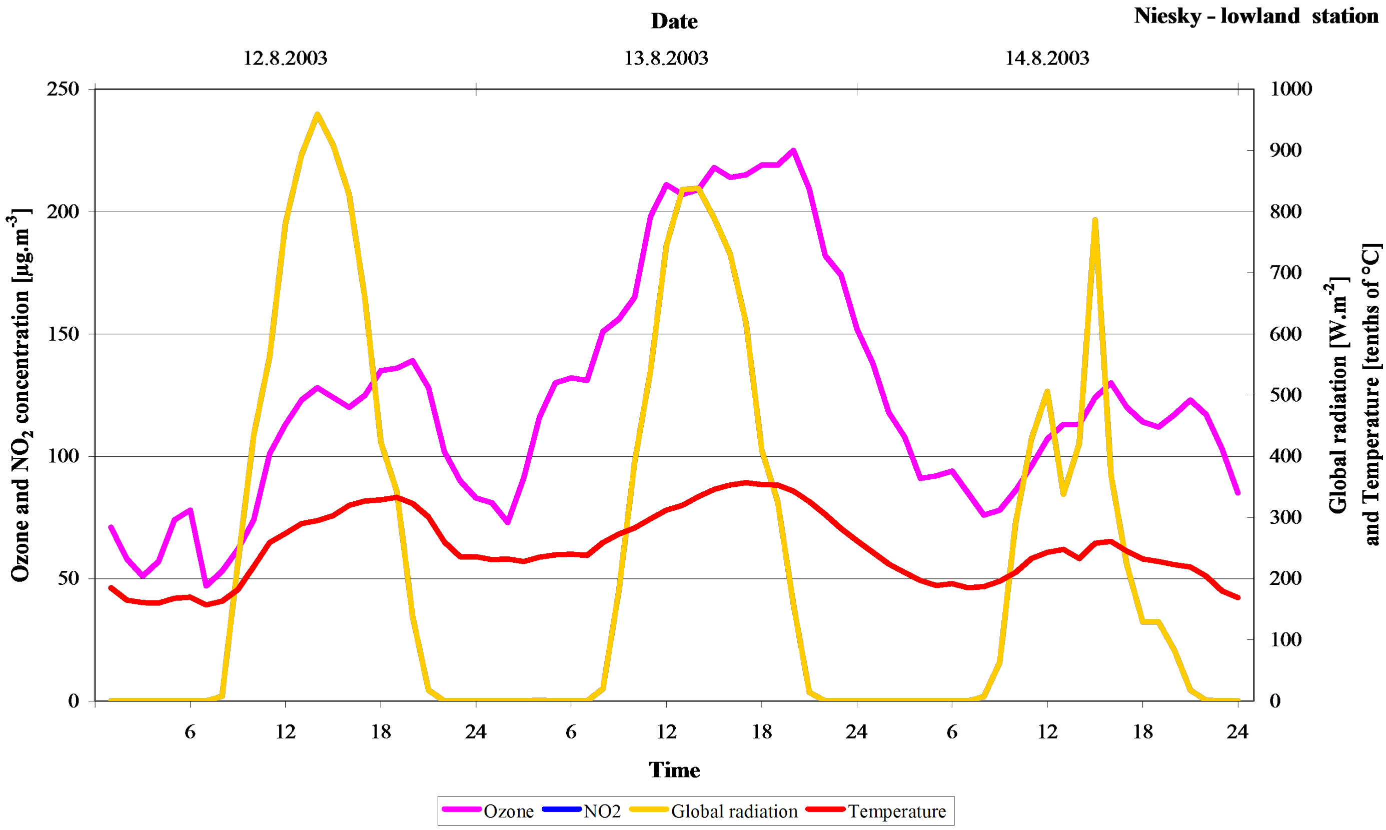


Figure 24. Summer episode: Schwartenberg - mountain station (DE)
Obrázek 24 Letní epizoda: Schwartenberg, horská stanice (DE)
Abbildung 24. Sommerepisode für die Bergstation Shwartenberg (DE)
Rysunek 24. Epizod letni: Schwartenberg - stacja górska (DE)

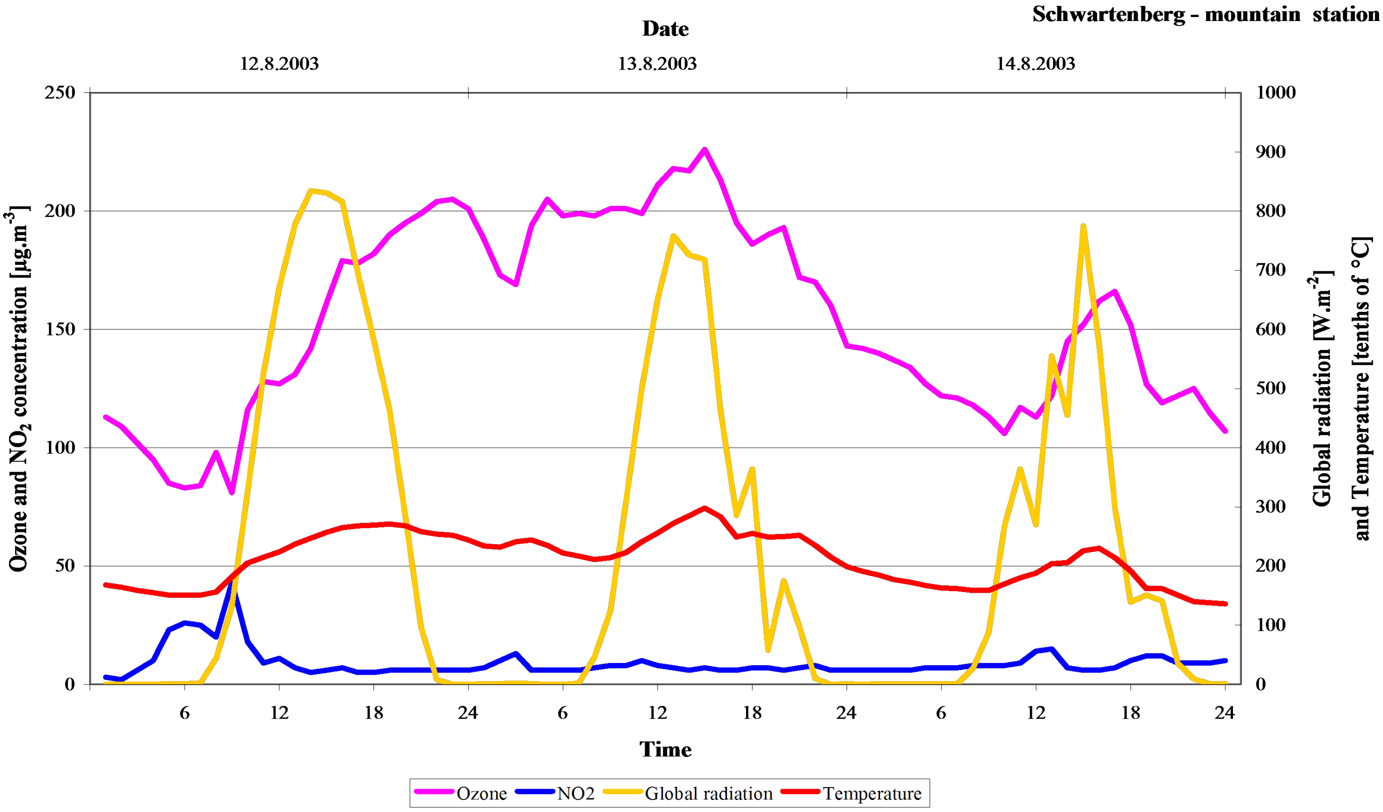


Figure 25. Summer episode: Jeleniów - lowland station (PL)
Obrázek 25 Letní epizoda: Jeleniów, nízko položená stanice (PL)
Abbildung 25. Sommerepisode für die tiefgelegene Station Jeleniów (PL)
Rysunek 25. Epizod letni: Jeleniów - stacja nizinna (PL)

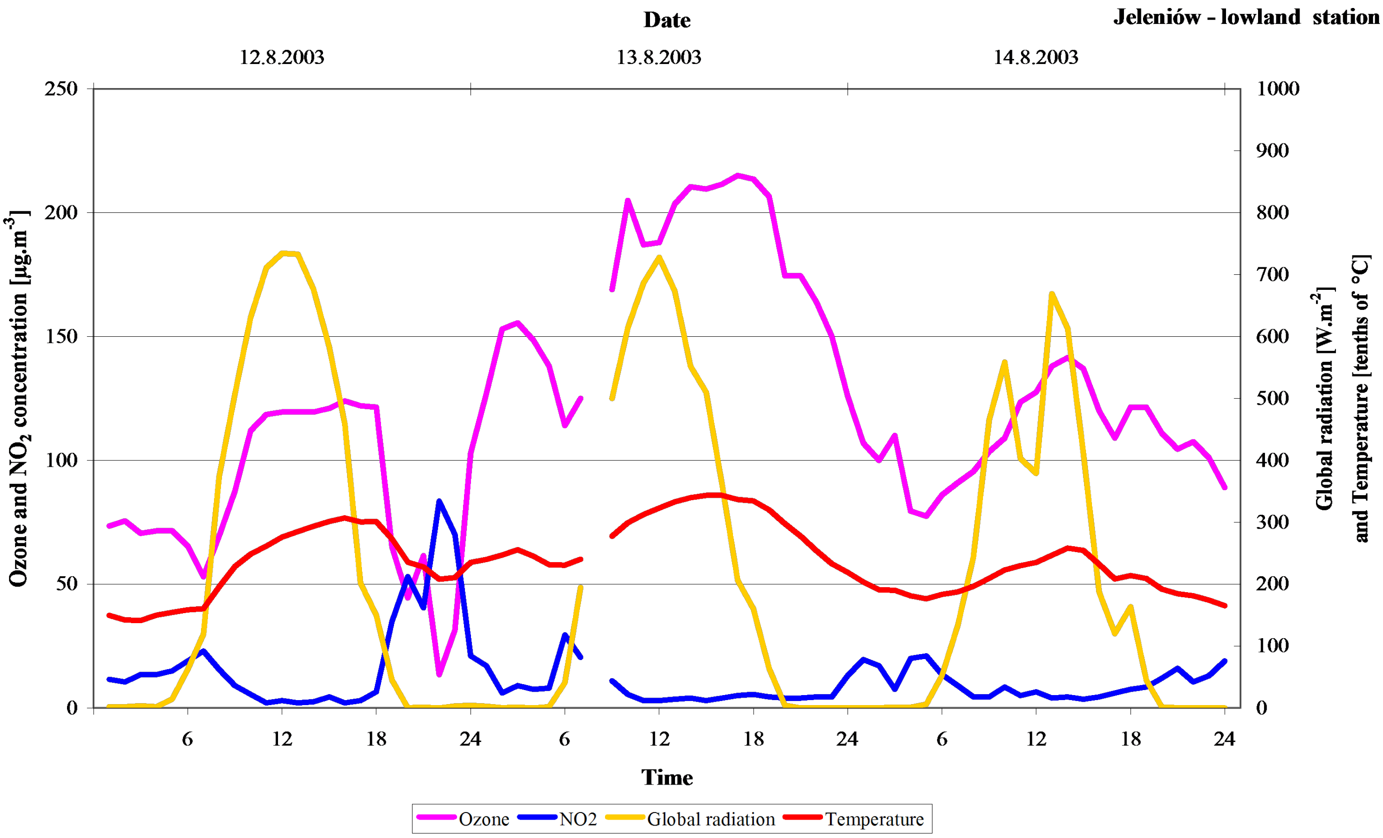
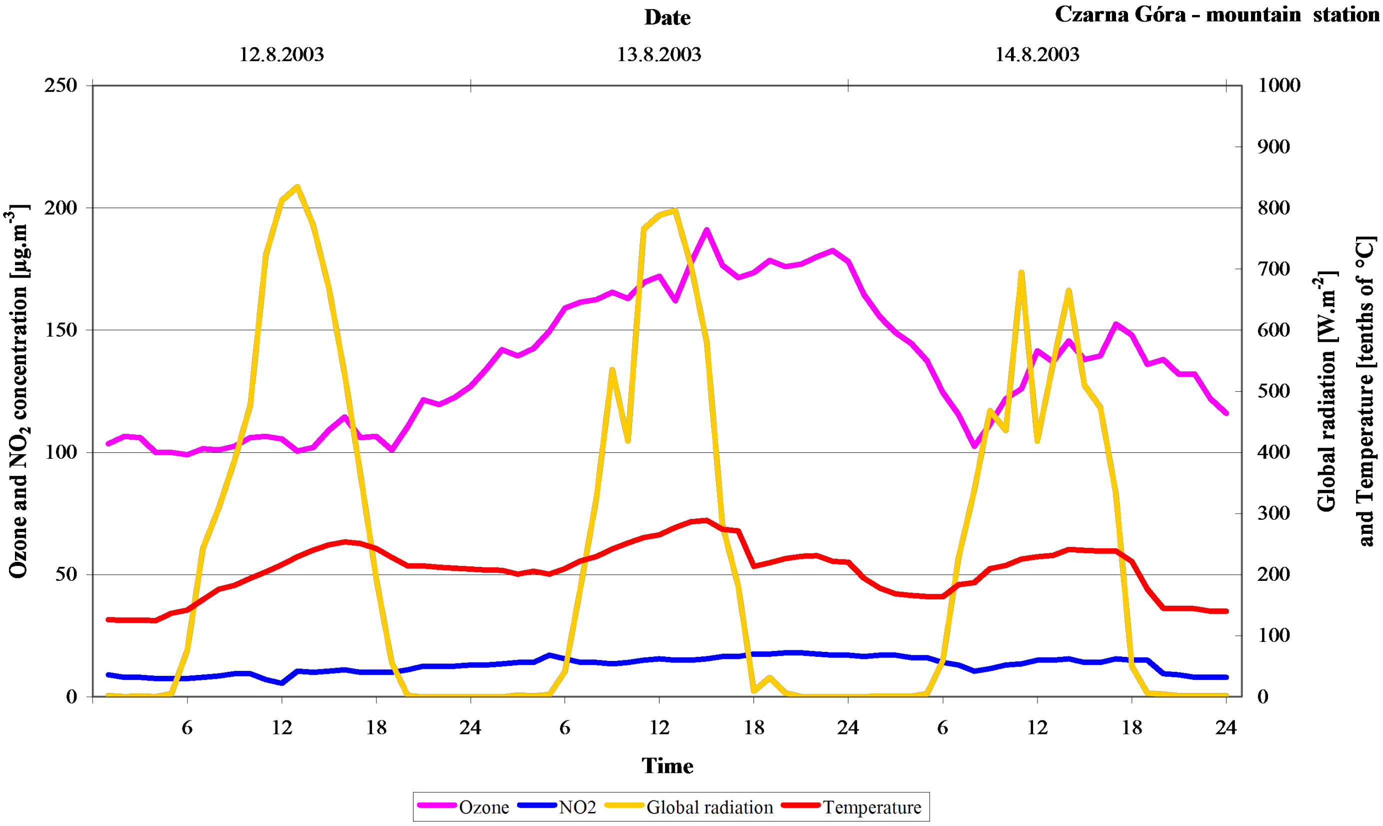


Figure 26. Summer episode: Czarna Góra - mountain station (PL)
Obrázek 26 Letní epizoda: Czarna Góra, horská stanice (PL)
Abbildung 26. Sommerepisode für die Bergstation Czarna Góra (PL)
Rysunek 26. Epizod letni: Czarna Góra - stacja górska (PL)



3.4.2. PM_{10} episode

The PM_{10} episode example presented in this report shows that the particle burden is not only a locally specific problem. From time to time long-lasting episodes can occur, such as that in February and March 2003. During such episodes daily exceedances might be observed in different countries at the same time. So, recommended measures at the country level cannot always cut down particle concentrations and guarantee maintaining of the daily concentrations below the limit values for health protection. Measures applied at inter-country level are required in case of such episodes.

During the last decade of February 2003 and the first decade of March an episode of significantly high PM_{10} concentrations was registered in the Tri-border region. An extensive anticyclone of about 1040 hPa, whose center was located over the western Russia, governed the weather and dispersion conditions during the above-mentioned period. On the rear side of this anticyclone, an inflow of warm air prevailed above this region at higher atmospheric levels. Consequently, strong temperature inversion formed near the ground, which blocked vertical mixing and led to cessation of air flow, which caused pollutants accumulation particularly in lowland regions. Examples of correlations of calms or low wind speeds with high PM_{10} concentrations can be seen on graphs for stations Tušimice, Görlitz and Wleń. Increased particle concentrations exceeding 60 µg/m^3 occurred also in mountainous parts of the Tri-border region. An interesting phenomenon is pictured by the relatively high PM_{10} concentration at the mountain stations Rudolice v Horách (Czech Republic) and Schwartenberg (Germany) correlated with the wind blowing from the south-eastern sector with speed over 10 m/s on 6 March. This might by caused by the elution of pollutants from the basin beneath the Ore Mountains on the Czech side, where low winds amounting 3 m/s were observed at the same time, and their transport over the common border.

After the 3. March the anticyclone moved further to the east and atmospheric fronts moving from the Atlantic started to influence the weather in the region. The episode finished on the 8 March when the frontal zone stretched up to eastern Europe.

Figure 27. Maximum concentration in wintertime: CZ - mountain station Rudolice
Obrázek 27 Maximální koncentrace v zimním období:: Rudolice, horská stanice (CZ)
Abbildung 27. Winterepisode für die Bergstation Rudolice (CZ)
Rysunek 27. Maksymalne stężenia w okresie zimowym: stacja górska Rudolice (CZ)

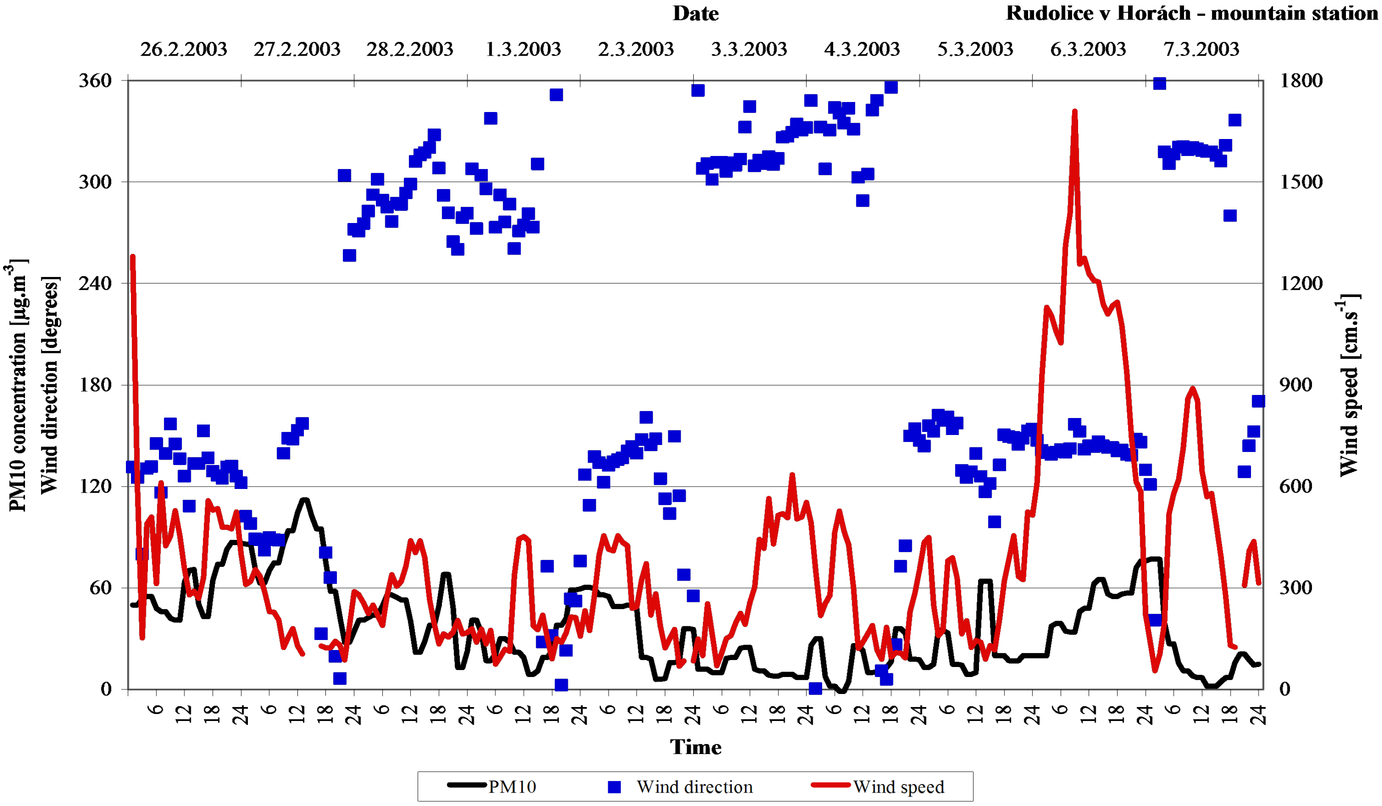


Figure 28. Maximum concentration in wintertime: CZ - lowland station Tušimice
Obrázek 28 Maximální koncentrace v zimním období: Tušimice, nízko položená stanice (CZ)
Abbildung 28. Winterepisode für die tiefgelegene Station Tušimice (CZ)
Rysunek 28. Maksymalne stężenia w okresie zimowym: stacja nizinna Tušimice (CZ)

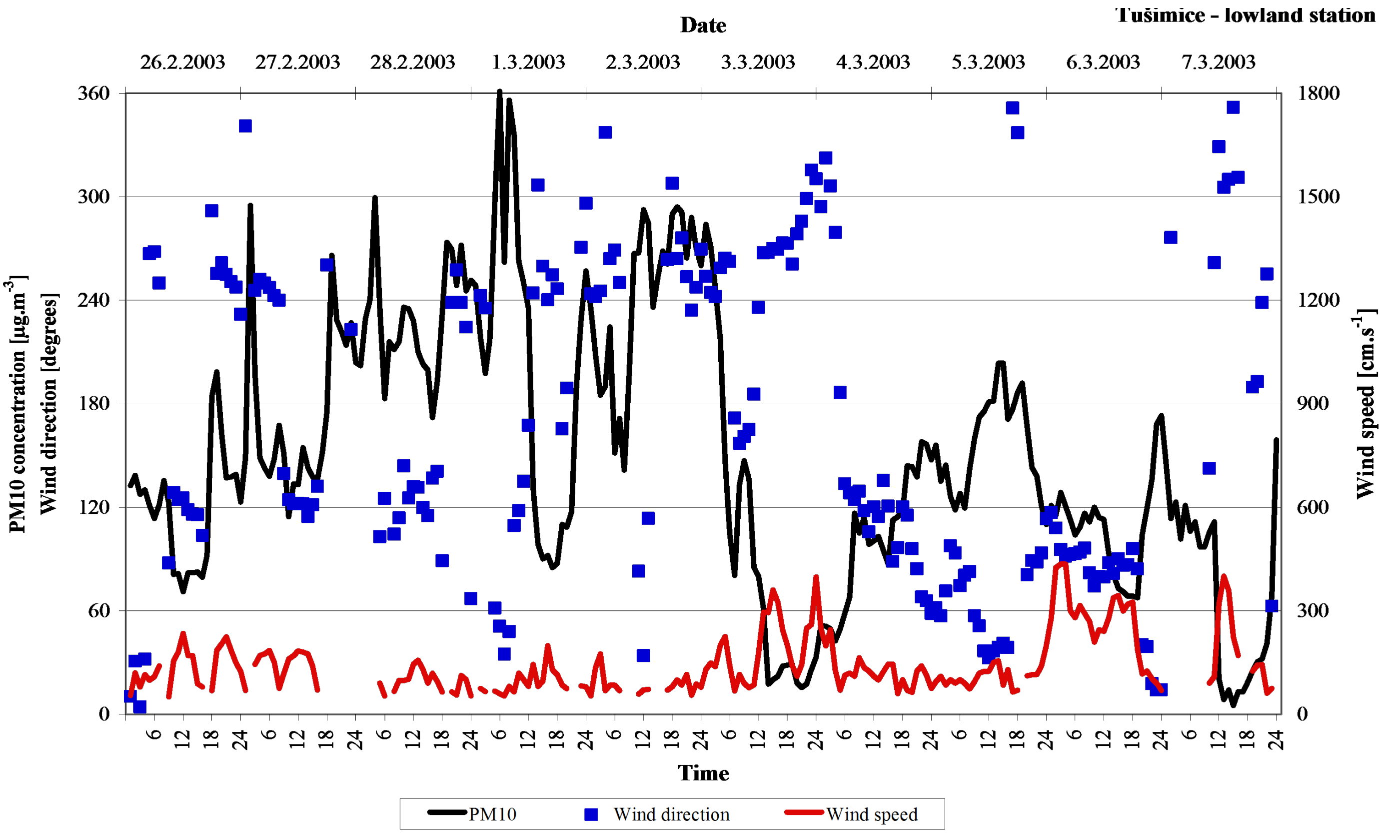


Figure 29. Maximum concentration in wintertime: DE- city station Görlitz
Figure 29. Maximální koncentrace v zimním období: DE – městská stanice Görlitz
Abbildung 29. Winterepisode für die Stadt-Station Görlitz (DE)
Rysunek 29. Maksymalne stężenia w okresie zimowym: stacja miejska Görlitz (DE)

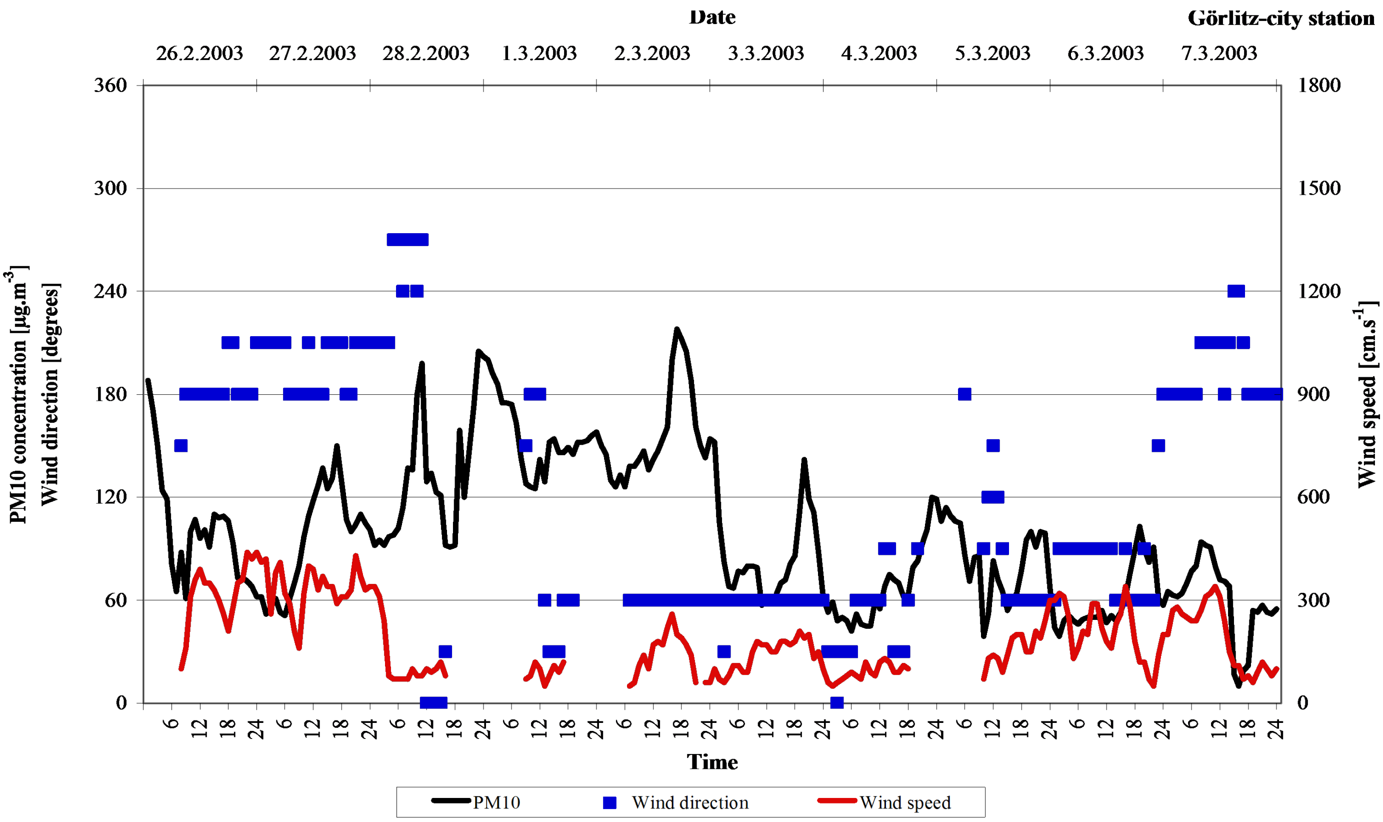


Figure 30. Maximum concentration in wintertime: DE- lowland station Schwartenberg.
Obrázek 30. Maximální koncentrace v zimním období: Schwartenberg, nízko položená stanice (DE)
Abbildung 30. Winterepisode für die tiefgelegene Station Schwartenberg (DE)
Rysunek 30. Maksymalne stężenia w okresie zimowym: stacja nizinna Schwartenberg (DE)

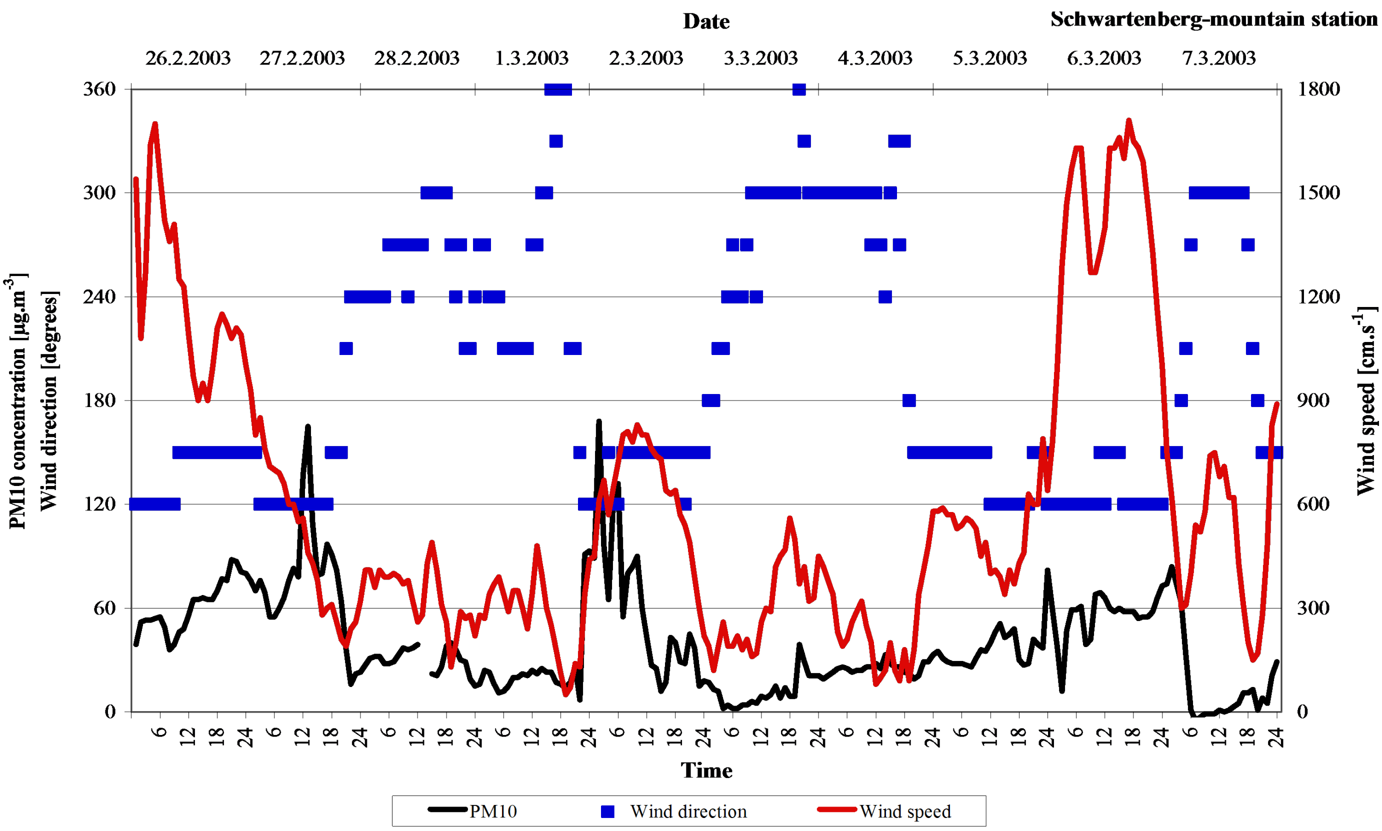


Figure 31. Maximum concentration in wintertime: PL- lowland station Wleń
Obrázek 31 Maximální koncentrace v zimním období: Wleń, nízko položená stanice (PL)
Abbildung 31. Winterepisode für die tiefgelegene Station Wleń (PL)
Rysunek 31. Maksymalne stężenia w okresie zimowym: stacja nizinna Wleń (PL)

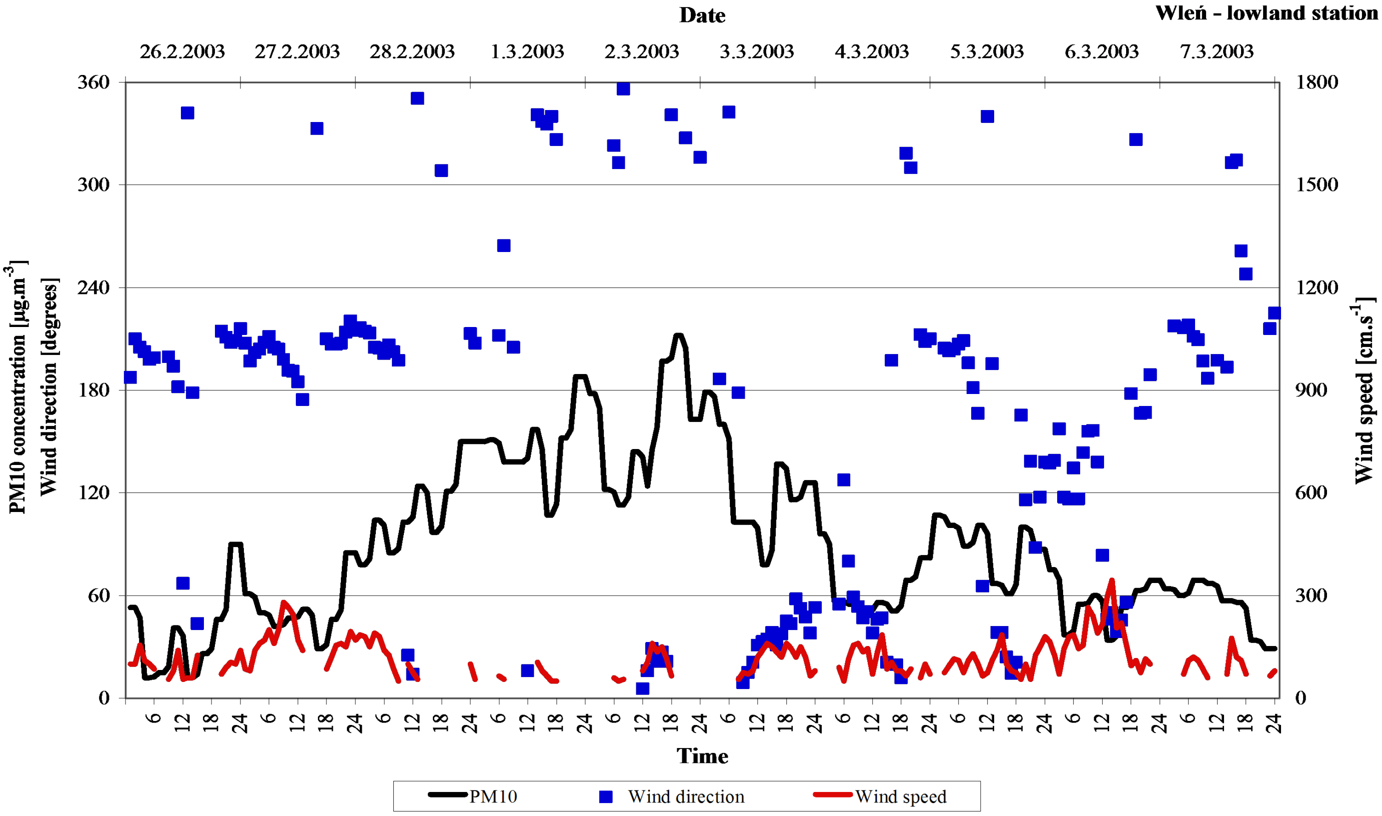
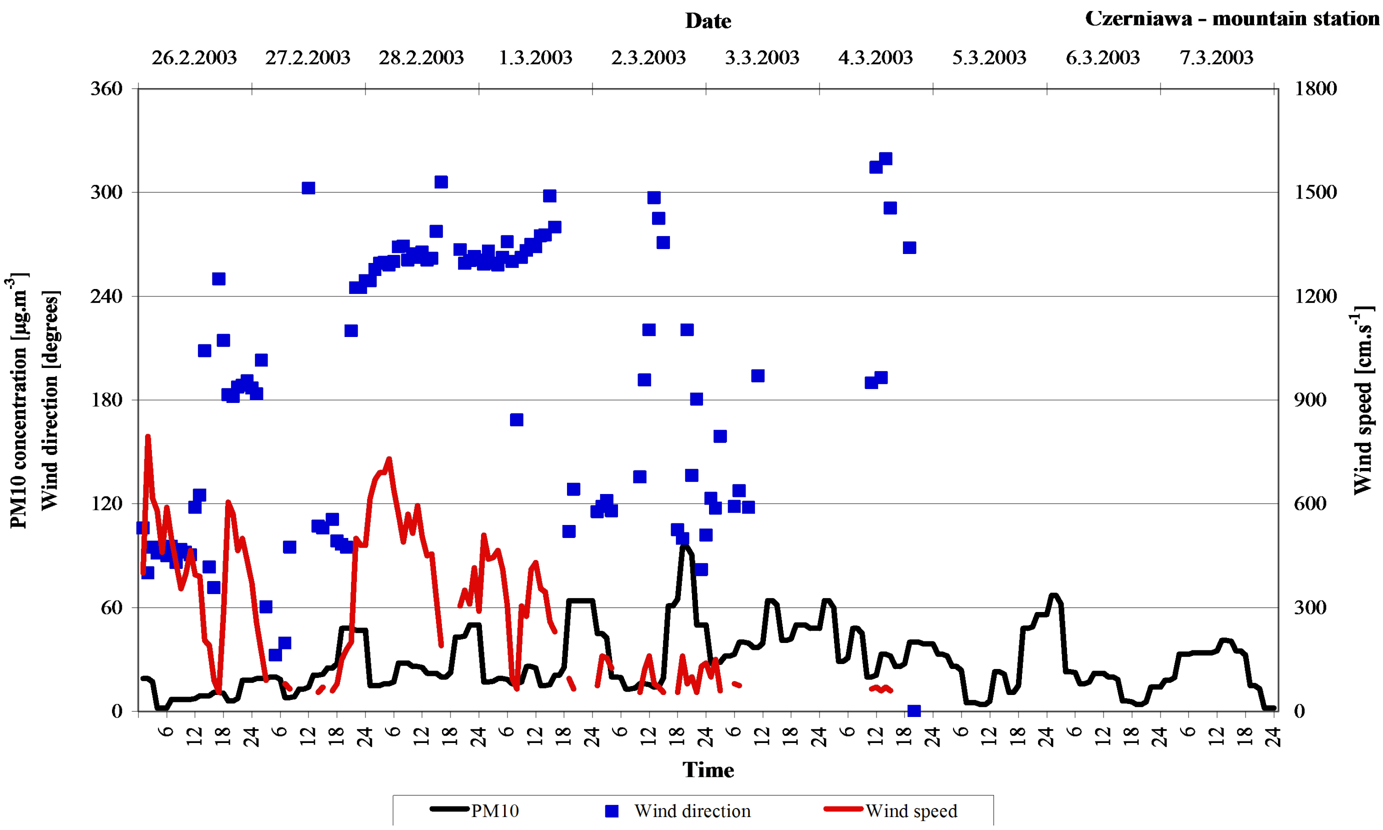


Figure 32. Maximum concentration in wintertime: PL- mountain station Czerniawa
Obrázek 32 Maximální koncentrace v zimním ob: Czerniawa, horská stanice (PL)
Abbildung 32. Winterepisode für die Bergstation Czerniawa (PL)
Rysunek 32. Maksymalne stężenia w okresie zimowym: stacja górska Czerniawa (PL)



4. Interlaboratory comparison

The exchange of measurement data between Poland, the Czech Republic and Germany within the Joint Air Monitoring System (JAMS) in the tri-border region is dependent on high-quality data, since the measurements are used for the following:

- Comparing air quality in the tri-border region;
- Determining air quality trends for the tri-border region and for the regions in which the measuring centres are located;
- Assessment of the effect on the population, on ecosystems and on vegetation and materials.

Although the measuring principles used in the Joint Air Monitoring System for the tri-border region are identical in most respects, the individual air monitoring and quality assurance systems in each country are different and are not directly comparable. The aim is, however, to harmonise the air monitoring and quality assurance systems of the different countries in line with the requirements of current EU Directives and to achieve comparable standards. Until this aim is achieved, participation in measurement comparisons, ring tests and joint controls of primary standards for air quality measurements will remain very important to all the partners for assessing the quality of measurement systems.

Therefore, the trilateral working group has agreed to carry out quality assurance measures in the form of ring tests for the measurement of gaseous air pollutants (SO_2, NO, NO_2, CO, benzene and ozone) as part of the joint air monitoring system.

A ring test was performed at the CHMI calibrating laboratory for air pollutants in Prague in November 2001, and the next was performed at the accredited calibrating laboratory of the Staatliche Umweltbetriebsgesellschaft Sachsen in Radebeul-Wahnsdorf from 20 to 22 October 2003.

The following institutions took part in the ring test:

1. Staatliche Umweltbetriebsgesellschaft (UBG) Sachsen, Germany;

2. Czech Hydrometeorological Institute (CHMI), Usti nad Labem branch, Czech Republic;

3. Voivodship Inspectorate of Environment Protection in Wrocław (WIOŚ), Department of International Co-operation, Jelenia Góra, Poland.

The measurements were conducted as follows: The UBG produced test gases using a test gas unit manufactured by the MCZ company and fed these into the ring circuits. These test gases were analysed using the participants' analysers. The components measured were carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen monoxide (NO), ozone (O_3) and BTX.

The test gases produced by the test gas unit were certificated in the UBG calibrating laboratory beforehand. These values are defined as set values for self-certification and are presented in Table 24.

Table 24. **Set values for test gases (UBG self-certification)**
Tabulka 24. **Nastavené hodnoty zkušebních plynů (vlastní certifikace UBG)**
Tabelle 24. **Prüfgasdaten (Zertifikate der UBG)**
Tabela 24. **Wartości wzorcowe dla badanych gazów (certyfikaty własne UBG)**

Test gas producing equipment	Components	Set value (ppb)
MCZ Test gas unit, Test gas 1, Line 1	NO	400
MCZ Test gas unit, Test gas 2, Line 1	NO	180
MCZ Test gas unit, Test gas 1, Line 2	CO	6500
MCZ Test gas unit, Test gas 2, Line 2	CO	4000
MCZ Test gas unit, Test gas 1, Line 3	SO_2	180
MCZ Test gas unit, Test gas 2, Line 3	SO_2	100
MCZ Test gas unit, Test gas 1, Line 4	O_3	198
MCZ Test gas unit, Test gas 2, Line 4	O_3	100

Measurement of BTX was carried out in the BTX reference laboratory at UBG, using the reference unit GC CP 7001. The test gas was provided from a CHMI test gas cylinder (cylinder no. 8424 A - Messer). The measurement results for these components are presented in Table 26.

The measurements were taken according to a schedule arranged with the participants. During the calibration phase the CHMI analysers were tested with the zero gas provided by UBG and span gas (standards provided by CHMI as cylinder test gases for CO, NO and SO_2).

The WIOS analysers (for NO, SO_2 and O_3) were tested using the zero or span standard integrated into the equipment. After the start of measurements, this equipment was adjusted to the UBG test gas set values.

Table 25. **Types of analysers used for the comparison**
Tabulka 25. **Typy analyzátorů použitých pro srovnávací měření**
Tabelle 25. **Analysatoren, die für den Vergleich verwendet wurden**
Tabela 25. **Typy analizatorów użytych w porównaniu**

Measured component	Type of analyser		
	UBG	CHMI	WIOŚ
NO	CLD 700 L	TE Model 42	Environment s.a. AC 31 M
CO	ML 9830	TE Model 48	Not applicable
SO_2	TE 43C TL	TE Model 43A	Environment s.a. AF 21M
O_3	TE 49C	TE 49C	Environment s.a. O_3 41M

The results of the measurements are shown in Table 26. In each case the result values are the values recorded as soon as a plateau was reached over two hours exposure with test gas.

Table 26. **Results of comparative measurements in Radebeul-Wahnsdorf in October 2003**
Tabulka 26. **Výsledky srovnávacího měření provedeného v Radebeulu-Wahnsdorfu v říjnu 2003**
Tabelle 26. **Ergebnisse des Messvergleichs in Radebeul-Wahnsdorf im Oktober 2003**
Tabela 26. **Wyniki pomiarów porównawczych w Radebeul-Wahnsdorf w październiku 2003**

Measured component	Unit of measurement	UBG set value	UBG measured value	Result CHMI ref. equipment	Deviation from set value, CHMI (1)	Result WIOŚ ref. equipment	Deviation from set value, WIOŚ
NO	ppb	400	398	411	1.027	398	0.995
NO	ppb	180	180	182	1.011	164 (3)	0.911
CO	ppb	6500	6500	6460	0.994		
CO	ppb	4000	4040	4040	1.010		
SO_2	ppb	180	178 (2)	176	0.978	178	0.989
SO_2	ppb	100	99 (2)	98	0.980	99	0.990
Ozone	ppb	198	198	196	0.990	200	1.010
Ozone	ppb	100	100	99	0.990	101	1.010
Benzene	µg/m³		91.1	98.8 (4)	1.084		
Toluene	µg/m³		104.4	115.7 (4)	1.108		
p-xylene	µg/m³		125.8	270.8 (4)	1.086		
m-xylene	µg/m³		123.6				
o-xylene	µg/m³		124.2	134.9 (4)	1.086		

Deviation from set value means CHMI or WIOS measured value divided by UBG set value.

The UBG measured values for SO_2 are to be multiplied by a correction factor (1.0107) for the analyser.

The WIOS NO_x analyser did not produce plausible measured values for NO. During subsequent night measurement it was found that the NO channel was defective.

It was agreed that the test gas cylinder for BTX provided by CHMI should be analysed subsequently at the CHMI in Prague and that this value is then to be used as the CHMI-BTX set value.

The measured values are given in ppb and µg/m³, related to 20°C and 101.325 kPa.

It can be stated that there is good agreement between the results of the comparative measurements and the UBG set values for the components NO, CO, SO_2 and ozone, with a deviation of less than 3%. For BTX, on the other hand, there was a deviation of around 10% from the CHMI set value.

5. Summary and conclusions

The description of ambient air quality is based on measurement results obtained in 2003 at all stations of the Tri-border Region Joint Air Monitoring System and at two Federal Environmental Agency stations situated at the tri-border region.

Air quality is described by means of various statistical characteristics for the following compounds: sulphur dioxide, nitrogen dioxide, PM_{10}, carbon monoxide, ozone, benzene and PAHs. The report also covers nitrogen and sulphur annual wet deposition and heavy metals contained in PM_{10}.

Emission trends

The main sources of air pollution in the tri-border region are: power plants, industrial facilities, residences (domestic heating units) and transport.

During the last 15 years (from 1989 till 2003) a decrease in emissions of sulphur dioxide (93 %), nitrogen oxides (78 %) and solid particles (97 %) could be observed in the whole tri-border region, as far as major stationary sources are concerned. On the other hand road traffic represents a major, additional source of NO_x emissions. Nitrogen oxides emissions increased slightly in 2003 in comparison with 2002.

Summary of the results of air quality monitoring in the Tri-border region

For **sulphur dioxide** in ambient air, the following limit values have been defined (Directive 1999/30/EC):

- for human health protection:
- – 1-hour – 350 µg/m^3, not to be exceeded more than 24 times a year,
- – 24-hour – 125 µg/m^3, not to be exceeded more than 3 times a year,
- for the protection of ecosystems: annual average and winter average – 20 µg/m^3 each,
- alert threshold – 500 µg/m^3.

The above limit values or alert threshold for sulphur dioxide have not been exceeded at any station.

For **nitrogen dioxide** and **nitrogen oxides** in ambient air, the following limit values have been set (Directive 1999/30/EC):

- for human health protection:
- – 1-hour NO_2 value – 200 µg/m^3, not to be exceeded more than 18 times a year,
- – annual - 40 µg/m^3,
- for the protection of vegetation: annual average value for NOx – 30 µg/m^3,
- alert threshold for NO_2 – 400 µg/m^3.

The above **limit values** for **nitrogen dioxide** and **nitrogen oxides,** as well as the **alert threshold have not been exceeded** at any station.

For **PM_{10} particulate matter** the limit values are as follows (Directive 1999/30/EC):

- for human health protection:
- – 24-hour – 50 µg/m^3, not to be exceeded more than 35 times a year, relevant margin of tolerance – 10 µg/m^3,
- – annual - 40 µg/m^3, relevant margin of tolerance – 3.2 µg/m^3.

The **24-hour PM_{10} limit value** was **exceeded more frequently than 35 times** at the following **9 stations**: Ústí n.L.-město, Děčín, Tušimice, Sokolov, Most, Karlovy Vary, Görlitz, Zittau, Plauen. The 24-hour PM_{10} limit value plus the margin of tolerance was exceeded over 35 times at 5 stations: Ústí n.L.-město, Děčín, Tušimice, Sokolov, Most.

The **annual PM_{10} limit value** was **exceeded** at **3 stations:** Ústí n.L.-město, Děčín, Tušimice.

For **lead** the annual limit value for the protection of human health was defined at 0.5 µg/m^3 (Directive 1999/30/EC).

This value was not exceeded at any station.

For **carbon monoxide** the limit value for the protection of human health was set at 10 mg/m^3 (Directive 2000/69/EC). This limit value, increased by the margin of tolerance **was not exceeded** at any station.

For **benzene** the annual limit value for the protection of human health was defined at 5 μg/m^3 (Directive 2000/69/EC).

The **limit value for benzene**, increased by the margin of tolerance **was not exceeded** at any station.

As regards **ozone** in ambient air, Directive 92/72/EEC was in force until 8 September 2003 and Directive 2002/3/EC entered into force on 9 September 2003.

The ozone threshold value for the **protection of vegetation** (Directive 92/72/EEC) was most frequently exceeded at the stations Přebuz and Krkonoše - Rýchory. The ozone threshold value was much more frequently exceeded at upland and rural areas of the tri-border region than in urban areas in this region.

Since 9 September 2002 the ozone target value for the **protection of human health** of 120 μg/m^3 has been in force (maximum daily 8-hour mean). It must not be exceeded more often than 25 days a year (averaged over 3 years). Over the 3-year period from 2001 till 2003 th**e target value was exceeded at all** measuring sites situated in the tri-border region, with the exception of the stations in Annaberg-Buchholz, Lehnmühle, Most and Ústí n.L.-město.

An AOT40 value, averaged over 5 years, was adopted as the target value for the **protection of vegetation**. The AOT40 value must not exceed 18000 μg/m^3*h.

In the 5-year period 1999 – 2003 the **AOT40 target value was exceeded** at the German and Czech sides of the Ore Mountains and at the Czech side of the Izera Mountains. The highest AOT40 value was registered at Fichtelberg. There was **one exceedance** of the AOT40 target value at the Czarna Góra station in the Polish part of the tri-border region.

Generally it can be concluded that the acute ozone pollution (levels exceeding the information and alert thresholds in 2003 was higher than in the preceding years, due to the specific meteorological conditions in that year. The chronic ozone load is still very high.

The reduction of chronic ozone pollution will remain a priority aim. This aim can, however, only be achieved in the long run, through extensive reduction of the emissions of precursor substances on a long-term basis. The main source is road traffic.

The **target values** for **heavy metals** are as follows: arsenic – 6 ng/m^3; cadmium - 5 ng/m^3; nickel – 20 ng/m^3 (Directive 2004/107/EC, 15.12.2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air).

The target values for **cadmium and nickel were not exceeded** at any station, while the target value **for arsenic was exceeded** in Görlitz and Działoszyn.

For the **carcinogenic risk indicator benzo-a-pyrene** (BaP) the above Directive sets a target value of 1 ng/m^3.

Stations included in the rural-industrial and urban-traffic categories exceed the set target value of 1 ng/m^3. Rural background stations like Czerniawa and Zinnwald/Schwartenberg remained below the target value, while at Jeleniów the target value was exceeded with the exception of 1999.

No clear trend can be seen for annual mean values of PAHs (BaP, BaA, BbF, BkF, INP, DBahA, FLU).

So far **wet deposition** standards have not been defined.

Wet deposition results differ from country to country. Ranges of nitrogen deposition were as follows:

in Poland 0.54 – 1.03 g N/m^2/year,

in the Czech Republic 0.61 – 0.97 g N/m^2/year,

in Germany 0.52 – 0.94 g N/m^2/year.

Sulphur deposition levels showed the following ranges:

0.28 – 0.64 g S/m^2/year at the Polish stations,

0.30 – 0.54 g S/m^2/year at the Saxon stations and

0.38 – 0.67 g S/m^2/year at the Czech stations.

Precipitation levels ranged from 378 mm in Ústí n.Labem to 984 mm in Souš.

Having analysed the measurement results for air pollution in the border region of the three countries, the following two groups of substances can be distinguished:

- sulphur dioxide, carbon monoxide, benzene – concentrations of these substances are below the relevant limit values and do not pose a problem at the moment,
- ozone, PM_{10} particulate matter, heavy metals and BaP – a noticeable stagnation or an increase in concentrations of these pollutants is apparent, except for lead, which exhibits very low levels.

As far as the PAH concentrations are concerned, seasonal variations were observed for these pollutants – significantly higher levels of PAHs were registered in winter.

As regards ozone it has to be emphasized that the concentrations determined, which remained stable or increased, are influenced by weather conditions (air temperature, solar radiation intensity) as well as by traffic. However, on the basis of the available research it is not possible to evaluate definitely to what extent meteorological conditions on one hand and traffic on the other one have contributed to observed increases in ozone levels.

6. Recommendations for further work

- Further areas to focus on will be identified as the result of new and future European Directives affecting air quality monitoring.
- Monitoring systems should be adapted to the requirements of existing and future EU Directives.
- It is necessary to develop and continue the joint quality assurance/quality control system for the Tri-border Region Joint Air Monitoring System. Participating countries agreed to conduct ring tests at two year intervals in the future. Until a reference laboratory for quality assurance of air measurements is established in Poland, these ring tests will be carried out in Radebeul/Wahnsdorf and in Prague. The next ring test will take place in Prague in 2005. The Polish partner was offered the possibility to adjust their instruments in Radebeul-Wahnsdorf or Prague to the standard of the Umweltbetriebsgesellschaft and Czech Hydrometerological Institute, respectively, on a short-term basis, if required.
- Periodical (annual) publication of reports on air quality in the tri-border region, according to terms of the agreement signed by the three ministers.
- Existing technical problems regarding data transmission should be solved by closer and more efficient cooperation between the participating countries.
  In Poland the PHARE 2001 project PL0105.06.02 'Air Quality Assessment Systems – Phase II' has been in progress to perform the tasks resulting from the Framework Directive 96/62/EC and the new Polish environmental legislation.

  This PHARE project consists of 2 parts. The first part concerns modernisation, reconstruction and innovation of the air quality monitoring network in 8 provinces in the western, south-western and southern regions of Poland, among others in Lower Silesian province. The second part includes designing and implementing a QA/QC system for air quality assessment in Poland.

  In the framework of this PHARE project the new communication system based on GPRS, as well as a new central acquisition system (CAS) and data acquisition systems (DAS) at all stations (hardware and software) will be introduced in the Lower Silesian province, including the Polish part of the tri-border region's Joint Air Monitoring System.

  After completion of the PHARE 2001 project the existing technical problems regarding data transmission should be eliminated.

The present report was compiled on the basis of the agreement between the national Ministries of Environment of the Czech Republic, the Federal Republic of Germany and the Republic of Poland on the "Exchange of Air Monitoring Data in the Black Triangle", dated 17 September 1996.

The trilateral working group convened under the auspices of the agreement is made up of representatives of the following institutions:

- Czech representatives: the Czech Hydrometeorological Institute, Prague and Ústí nad Labem,
- German representatives: the Saxon State Authority for the Environment and Geology, Dresden, Federal Environmental Agency, Berlin,
- Polish representatives: the Voivodship Inspectorate for Environment Protection, Wrocław and Jelenia Góra.

This publication is the sixth Joint Trilateral Report to describe and evaluate air quality in the tri-border region.

The report focuses on measured values for atmospheric pollutants in 2003. In addition it covers emission trends since 1989 and ambient air quality development since 1996.

This report is to be compiled and published on an annual basis.

7. Websites and links to information on air pollution

7.1. Actual air pollution data

Czech Republic:

http://www.chmi.cz/uoco/act/aim/aregion/aim_region.html

http://www.chmi.cz/uoco/isko/graphic_data/ozone/gdb.html (ozone prediction)

http://www.chmi.cz/uoco/isko/graphic_data/ozone/gdb.html

Germany:

http://www.env-it.de/luftdaten

http://www.umwelt.sachsen.de/de/wu/umwelt/lfug/lfug-internet/luft-laerm-klima_1468.html (click: aktuelle Meßwerte);

http://www.umwelt.sachsen.de/de/wu/umwelt/lfug/lfug-internet/documents/Grenzwertueberschreitungen_PM10-HVS_Internet.xls

(LfUG - actual Saxon PM10 exceedances)

Poland:

http://www.jgora.pios.gov.pl/wwm/bt/kom/index.htm (the site includes link to the site with actual air quality data)

7.2. Air pollution limit values

Czech Republic:

http://www.chmi.cz/uoco/isko/tab_roc/2003_enh/eng/pdf/03kom.pdf (chapter 1.2.2 Air pollution assessment)

http://www.chmi.cz/uoco/limit/imlim.html

http://www.chmi.cz/uoco/act/aim/aim_limity.html (information and alert tresholds)

http://www.chmi.cz/UL/akt/oocostr/imisni_limity/imis_limit_cr.htm.

Germany:

http://www.umweltbundesamt.de/luft/vorschriften/eu/immiss-eg-d.htm

Poland:

http://www.jgora.pios.gov.pl/wwm/bt/kom/2005/normy.htm

http://www.jgora.pios.gov.pl/wwm/bt/kom/2005/english_version.htm

7.3. Further information on the air quality

Czech Republic:

http://www.env.cz/ (Ministry of the Environment of the Czech Republic)

http://www.chmi.cz/ (Czech Hydrometeorological Institute)

http://www.cizp.cz (Czech Environmental Inspectorate)

http://www.szu.cz (National Institute of Public Health)

http://www.szu.cz/chzp/ovzdusi/ (National Institute of Public Health - Centre of Environmental health)

Germany:

http://www.umweltbundesamt.de/luft/index.htm

http://www.umweltbundesamt.de/luft/immissionen/immissionen.htm (actual and historical data)

http://www.env-it.de/stationen (air quality network with stations used for information to the public)

http://www.umwelt.sachsen.de/de/wu/umwelt/lfug/lfug-internet/documents/Jahresbericht2004.pdf (LfUG - Saxony air quality data's 2004)

Poland:

http://www.mos.gov.pl (Ministry of Environment)

http://www.mos.gov.pl/1materialy_informacyjne/index.shtml

http://www.mos.gov.pl/1materialy_informacyjne/raporty_opracowania/index.shtml

http://www.gios.gov.pl (the Chief Inspectorate of Environment Protection)

http://www.gios.gov.pl/index7.php?temat=7

http://www.gios.gov.pl/index7.php?temat=8

http://www.ios.edu.pl (Institute of Environment Protection)

http://www.ios.edu.pl/pol/zaklady/siec/index.html

http://www.wroclaw.pios.gov.pl/ (Publikacje; Raporty o stanie środowiska)

http://www.jgora.pios.gov.pl/komunikaty/trendy.htm (historical data)

http://www.jgora.pios.gov.pl/wwm

http://www.jgora.pios.gov.pl/wwm/publikacje/index.htm