Joint report on air quality in the Tri-border region of the Czech Republic, Poland and Germany in 2004 (former Black Triangle region)

Společná zpráva o kvalitě ovzduší v příhraniční oblasti České republiky, Polska a Německa v roce 2004 (bývalá oblast Černého trojúhelníku)

Gemeinsamer Bericht zur Luftqualität im Dreiländereck der Tschechischen Republik, Polens und Deutschlands 2004 (ehemals Schwarzes Dreieck)

Wspólny raport o jakości powietrza w trójgranicznym regionie Republiki Czeskiej, Polski i Niemiec w roku 2004 (były region Czarnego Trójkąta)

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Czech:	www.env.cz www.chmi.cz
German:	www.umweltbundesamt.de www.umwelt.sachsen.de/lfug
Polish:	www.wroclaw.pios.gov.pl

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.

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.

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 Dessau 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. The 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 European Air Quality Directives. 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 in the decision making process, in accordance with Article 8 (6) of Council Framework Directive 96/62/EC on Air Quality.

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 completion of a QA/QC system for air quality assessment in Poland. The QA/QC system is compliant with the existing requirements of relevant EU Directives. The aim of the QA/QC project was to establish 4 calibrating 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. These laboratories are currently being set up. The existing calibrating laboratory in Jelenia Góra is used, as before, to meet current needs of the Lower Silesian air monitoring network inter alia for the Polish part of JAMS.

In the Czech Republic, activities in 2003 – 2005 dealt with the innovation of the national air monitoring network, monitoring instrumentation, systems of QA/QC and data transport, including accreditation of the whole network under ISO 17025. Laboratory reconstruction and innovation of laboratory instrumentation were also completed. Measurements of PM_{10}, $PM_{2.5}$, heavy metals, benzene, NH3 and PAHs were continued/started. The above activities were carried out 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 seventh 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 2004 for atmospheric pollutants. In addition, it describes ozone and PM_{10} episodes in 2004, emission trends since 1989, changes in ambient air quality since 1996 and wet deposition trends for sulphur and nitrogen. 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) in relation to the future target values set by the fourth Daughter Directive 2004/107/EC, which was adopted in December 2004. These target values will enter into force on 31 December 2012.

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	[km^2]	9 880	14 000	8 500	32 380
Population	[million]	1.38	3.26	1.24	5.88
Population density	[per km^2]	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 sectors, 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 37 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, 2004
Obrázek 1. Společný systém monitoringu ovzduší v příhraniční oblasti, 2004
Abbildung 1. Das gemeinsame Luftüberwachungssystems im Dreiländereck, 2004
Rysunek 1. Wspólny system monitoringu powietrza (JAMS) w trójgranicznym regionie, 2004

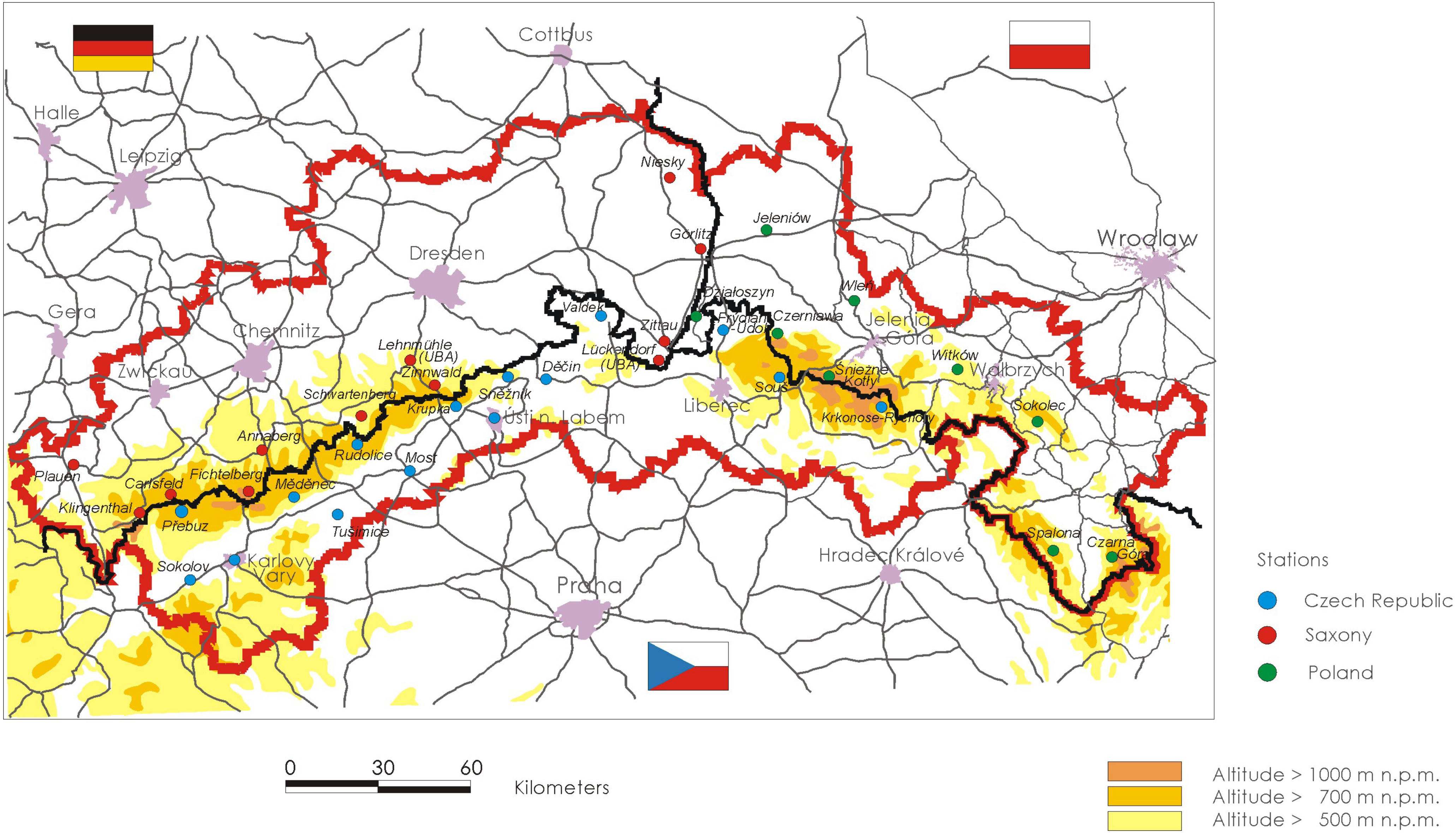


Table 2. Description of the Joint Air Monitoring System in the Tri-border region for the year 2004
Tabulka 2. Popis společného systému sledování kvality ovzduší v příhraniční oblasti v roce 2004
Tabelle 2. Beschreibung des gemeinsamen Luftüberwachungssystems im Dreiländereck 2004
Tabela 2. Opis wspólnego systemu monitoringu powietrza w trójgranicznym regionie w roku 2004

	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					x	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
CZ	Měděnec	827	background	rural	agric., natural	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	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		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	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										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	x
DE	Plauen Süd	343	traffic	urban	res., comm.		x	x		x	x				x				x	x	x	x		
DE	Plauen DWD	385	background	rural	res. agric				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	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			x
DE	Görlitz	210	traffic	urban	res., comm., ind.	x	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	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
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

SPM-L = suspended particulate matter (Low-Volume)
SPM-H = suspended particulate matter (High-Volume)
Sed.D. = sediment dust
TSP = total suspended particulates
W-Di = wind direction
W-Sp = wind speed
Temp = temperature
Hum = humidity
Pres = pressure
SR = solar radiation
UBA - Federal Environmental Agency, national network
UBA - Umwellbundesamt, nationales Mesneck
UBA - Federalna, krajowa stacja pomiarowa
UBA - Spolkový úřad pro životní prostředí, národní síť

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 – 1998-2004**
Tabulka 3. **Meteorologické podmínky v české části příhraniční oblasti – 1998-2004**
Tabelle 3. **Die meteorologischen Bedingungen im tschechischen Teil des Dreiländerecks für die Jahre 1998-2004**
Tabela 3. **Warunki meteorologiczne w czeskiej części trójgranicznego regionu – 1998-2004**

Year	Air temperature ** Deviation from long term mean [K]	Precipitation ** Deviation from long term mean [%]	Sunshine duration ** Deviation from long term mean [%]
2004	too warm (-0,1 to +0,8)	too wet (-1,7 to + 26,5)	about normal (-14,1 to +19,8)
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 – 2004**
Tabulka 4. **Čestnost směru větru a bezvětří v české části příhraniční oblasti – 2004**
Tabelle 4. **Windrichtungsverteilung und Anteil der Calmen im tschechischen Teil des Dreiländerecks für das Jahr 2004**
Tabela 4. **Częstości kierunków wiatru i cisz w czeskiej części trójgranicznego regionu – 2004**

Sector	From [°]	To [°]	Frequency [%]					
			Cheb	Tušimice	Měděnec	Rudolice	Sněžník	Souš
N	337,5	22,5	0,00	10,06	0,09	9,95	8,23	9,95
NE	22,5	67,5	1,97	10,69	1,22	10,44	8,85	9,95
E	67,5	112,5	3,93	12,02	7,79	10,79	11,25	10,59
SE	112,5	157,5	4,92	12,84	25,32	15,62	16,55	16,16
S	157,5	202,5	36,86	11,50	7,29	12,26	15,60	11,77
SW	202,5	247,5	22,36	11,80	10,06	11,25	11,05	10,63
W	247,5	292,5	17,20	12,55	25,68	13,09	15,25	11,70
NW	292,5	337,5	17,78	17,95	22,52	16,43	12,85	15,08
calm < 0,5 m/s			0,00	0,57	0,05	0,16	0,34	4,16

Table 5. Meteorological conditions in the German part of the Tri-border region – 1998-2004
Tabulka 5. Meteorologické podmínky v neměcké části příhraniční oblasti – 1998-2004
Tabelle 5. Die meteorologischen Bedingungen im deutschen Teil des Dreiländerecks für die Jahre 1998-2004
Tabela 5. Warunki meteorologiczne w niemieckiej części trójgranicznego regionu – 1998-2004

Year	Air temperature ** Deviation from long term mean [K]	Precipitation ** Deviation from long term mean [%]	Sunshine duration ** Deviation from long term mean [%]
2004	too warm (+0,4 to +0,6)	non uniform (-7 to + 24)	above the average (+1 to +12)
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)

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

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

Table 6. Frequency of the wind direction and calm in the German part of the Tri-border region – 2004
Tabulka 6. Četnost směru větru a bezvětří v neměcké části v příhraniční oblasti – 2004
Tabelle 6. Windrichtungsverteilung und Anteil der Calmen im deutschen Teil des Dreiländerecks für das Jahr 2004
Tabela 6. Częstości kierunków wiatru i cisz w niemieckiej części trójgranicznego regionu – 2004

Sector	From [°]	To [°]	Frequency [%]				
			Carlsfeld	Fichtelberg	Zinnwald	Lehnmühle	Lückendorf
N	337,5	22,5	9,8	7,2	11,0	5,1	23,6
NE	22,5	67,5	5,8	3,2	5,6	5,0	2,0
E	67,5	112,5	4,9	12,0	2,7	3,5	0,0
SE	112,5	157,5	11,8	6,4	9,2	3,8	0,0
S	157,5	202,5	10,1	5,1	18,6	7,7	37,3
SW	202,5	247,5	26,6	13,6	11,5	20,6	22,2
W	247,5	292,5	16,5	35,9	21,8	22,9	3,1
NW	292,5	337,5	9,9	16,3	19,2	8,9	3,5
calm < 0,5 m/s			4,5	0,4	0,4	23,0	7,8

Table 7. **Meteorological conditions in the Polish part of the Tri-border region – 1998-2004**
Tabulka 7. **Meteorologické podmínky v polské části v příhraniční oblasti – 1998-2004**
Tabelle 7. **Die meteorologischen Bedingungen im polnischen Teil des Dreiländerecks für die Jahre 1998- 2004**
Tabela 7. **Warunki meteorologiczne w polskiej części trójgranicznego regionu –1998- 2004**

Year	Air temperature ** Deviation from long term mean [K]	Precipitation ** Deviation from long term mean [%]	Sunshine duration ** Deviation from long term mean [%]
2004	too warm (+0,3 to +0,6)	too dry (–21,0 to -8,3)	non uniform (–5,0 to +11,5)
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

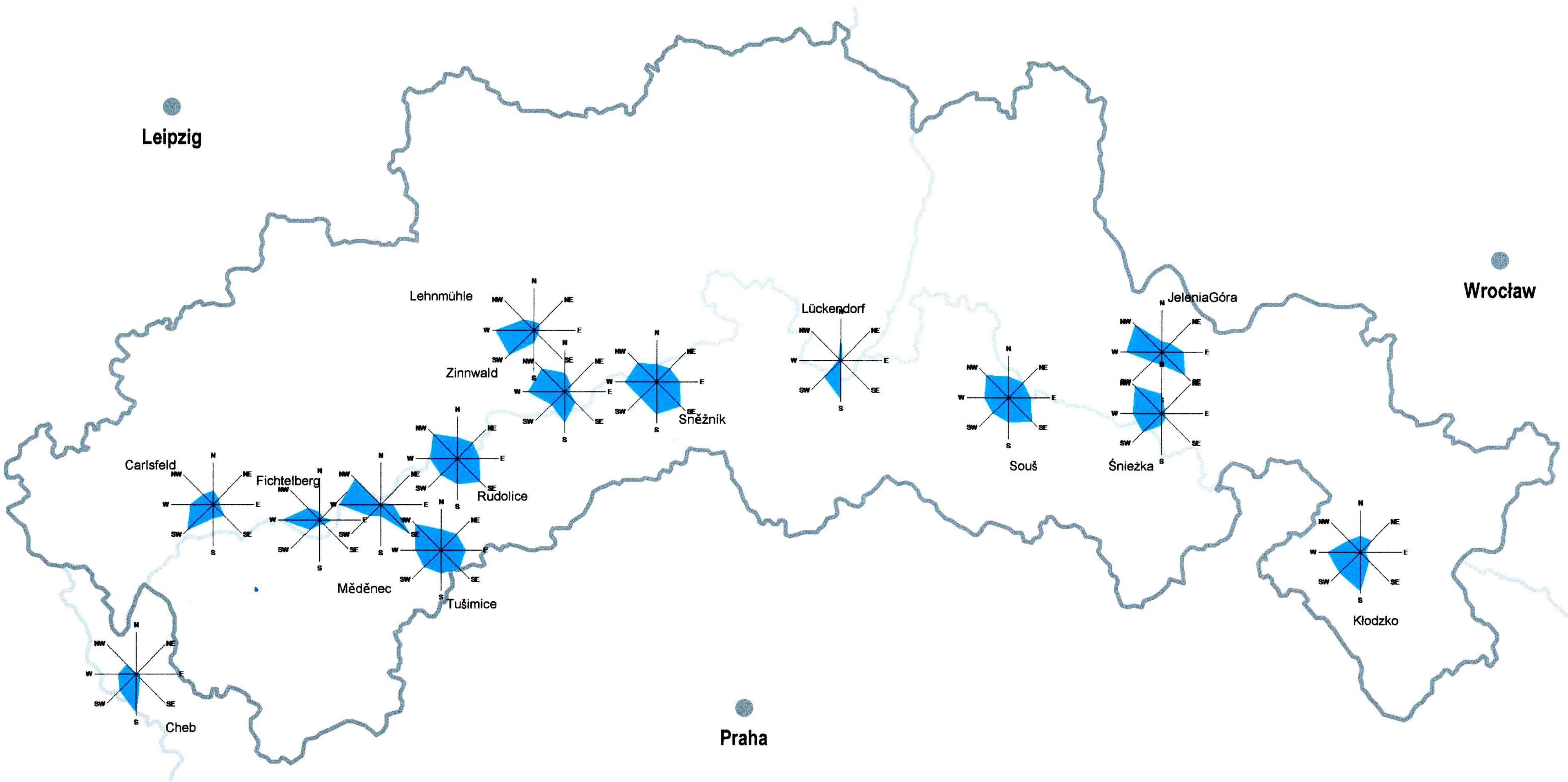
** reference to 30-year mean value (1961-1990)

Table 8. **Frequency of the wind direction and calm in the Polish part of the Tri-border region – 2004**
Tabulka 8. **Čestnost směru větru a bezvětří v polské části v příhraniční oblasti – 2004**
Tabelle 8. **Windrichtungsverteilung und Anteil der Calmen im polnischen Teil des Dreiländereck für das Jahr 2004**
Tabela 8. **Częstości kierunków wiatru i cisz w polskiej części trójgranicznego regionu – 2004**

Sector	from [°]	to [°]	Frequency [%]		
			Jelenia Góra	Kłodzko	Śnieżka
N	337,5	22,5	5,1	7,8	13,6
NE	22,5	67,5	5,8	7,7	3,1
E	67,5	112,5	10,5	2,6	3,2
SE	112,5	157,5	15,7	6,1	3,8
S	157,5	202,5	6,4	18,7	8,6
SW	202,5	247,5	6,9	14,1	19,0
W	247,5	292,5	17,2	15,6	20,7
NW	292,5	337,5	18,5	8,0	27,4
calm < 0,5 m/s			13,8	19,5	0,5

* IMGW stations: Jelenia Góra, Kłodzko, Śnieżka

Figure 2. Frequency of wind directions in the Tri-border region, 2004
Obrázek 2. Četnost směru větru v příhraniční oblasti v roce, 2004
Abbildung 2. Windrichtungsverteilung im Dreiländereck, 2004
Rysunek 2. Częstości kierunków wiatru w trójgranicznym regionie, 2004



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 is in accordance with the EC Air Quality Directives in force (1999/30/EC, 2000/69/EC, 2002/3/EC, 2004/107/EC).

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/limit/imlim.html

http://www.chmi.cz/uoco/isko/tab_roc/2004_enh/cze/pdf/04kom.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 Immission 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.

An amendment to the 22nd BImSchV was finalised to transpose the requirements of the 4th Daughter Directive, which was adopted in December 2004, into national law.

More information is available on the website of the Federal Environmental Agency.

http://www.umweltbundesamt.de/luft/infos/gesetze/index.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://wwm.jgora.pios.gov.pl/bt/kom/2004/normy.htm

http://air.wroclaw.pios.gov.pl/normy_start.php

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

In this reporting period, three Daughter Directives to Council Directive 96/62/EC on Ambient Air Quality Assessment and Management were in force. 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 2004/107/EC, relating to metals and PAHs in ambient air, was adopted in December 2004, and 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/m^3] or *[ng/m^3]										
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/m^3**	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/m^3**	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/m^3**	-	-	20	20	20	20	20	20	20	20	20	20	20
Alarm value* [19.07.2001]	3 consecutive hours	**500 µg/m^3**	-	-	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/m^3**	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/m^3**	-	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/m^3**	-	-	30	30	30	30	30	30	30	30	30	30	30
Alert threshold* [19.07.2001]	3 consecutive hours	**400 µg/m^3**	-	-	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/m^3**	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/m^3**	-	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/m^3**	7	-	-	-	-	-	-	-	-	-	-	-	50
stage 2 - limit value for the protection of human health [01.01.2010]	Calendar year	**20 µg/m^3**	-	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)	(18000 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 characteristics of ambient air quality in the Tri-border Region are based on measurement results obtained in 2004 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.

Wet deposition, which is not yet covered by Council Directives, is given in kequ/ha/y for better component related comparison.

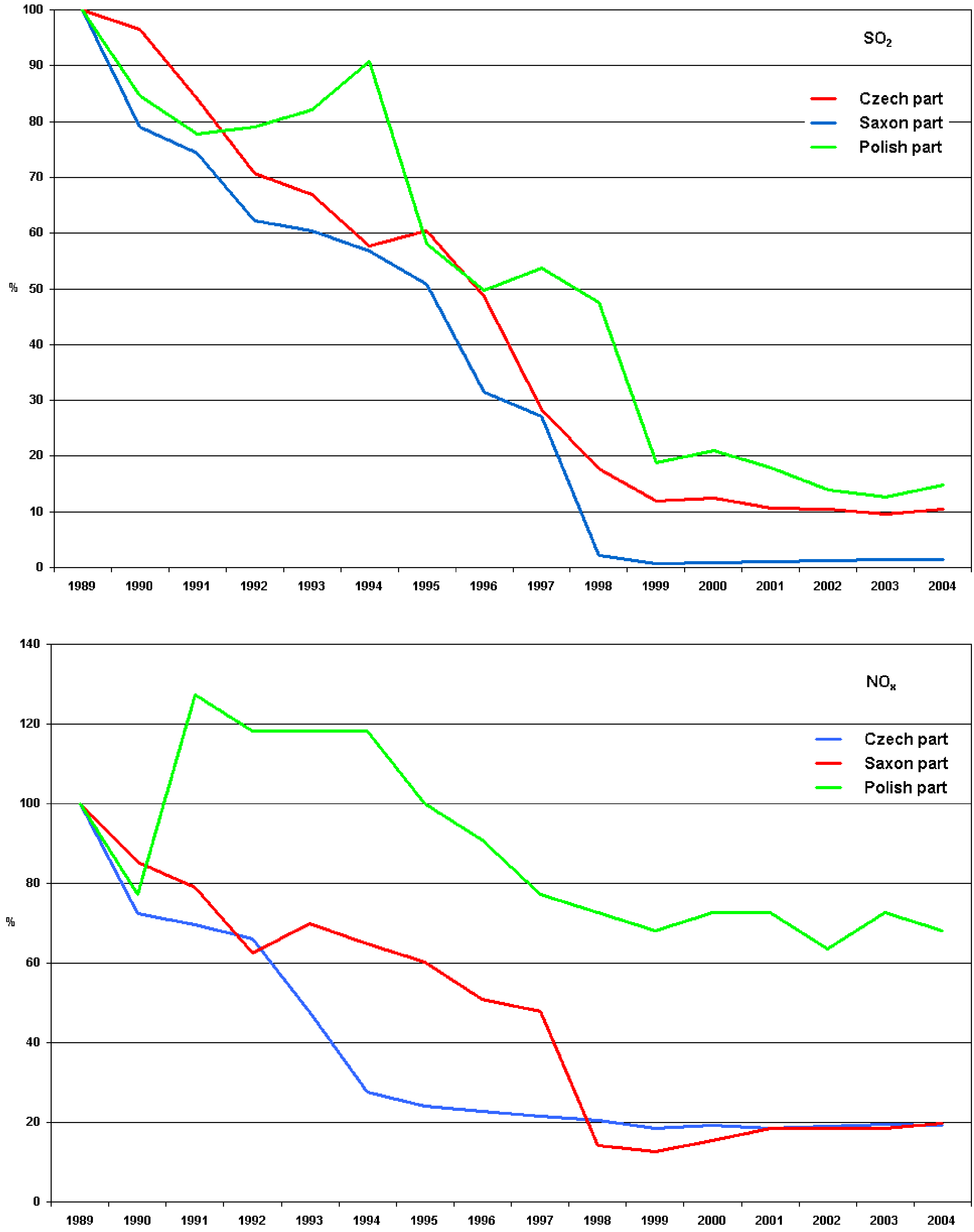
3.1. Emission trends

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 2004, 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 NO_x emissions of these mentioned sources. In Poland and the Czech Republic conditions are almost the same as in Saxony.

During the last 16 years (from 1989 till 2004) a decrease in emissions of sulphur dioxide (93 %), nitrogen oxides (78 %) and solid particles (98 %) 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 and still increasing source category of NO_x emissions. Sulphur dioxide emissions increased about 10 %, emission of nitrogen oxides has the same level, while solid particles emission decreased about 20 % in 2004, in comparison with 2003.

Figure 3.	Relative emission trends in the Tri-border region 1989–2004, base year 1989 = 100% (see text for details)
Obrázek 3.	Trendy poměrných emisní v příhraniční oblasti v období 1989-2004, vztaženo k roku 1989 = 100% (podrobnosti jsou uvedeny v textu)
Abbildung 3.	Relative Emissionsentwicklung im Dreiländereck 1989 – 2004, Basisjahr ist 1989 = 100% (Details siehe Text)
Rysunek 3.	Tendencje emisji względnych w trójgranicznym regionie 1989–2004, rok bazowy 1989 = 100% (patrz szczegóły w tekście)



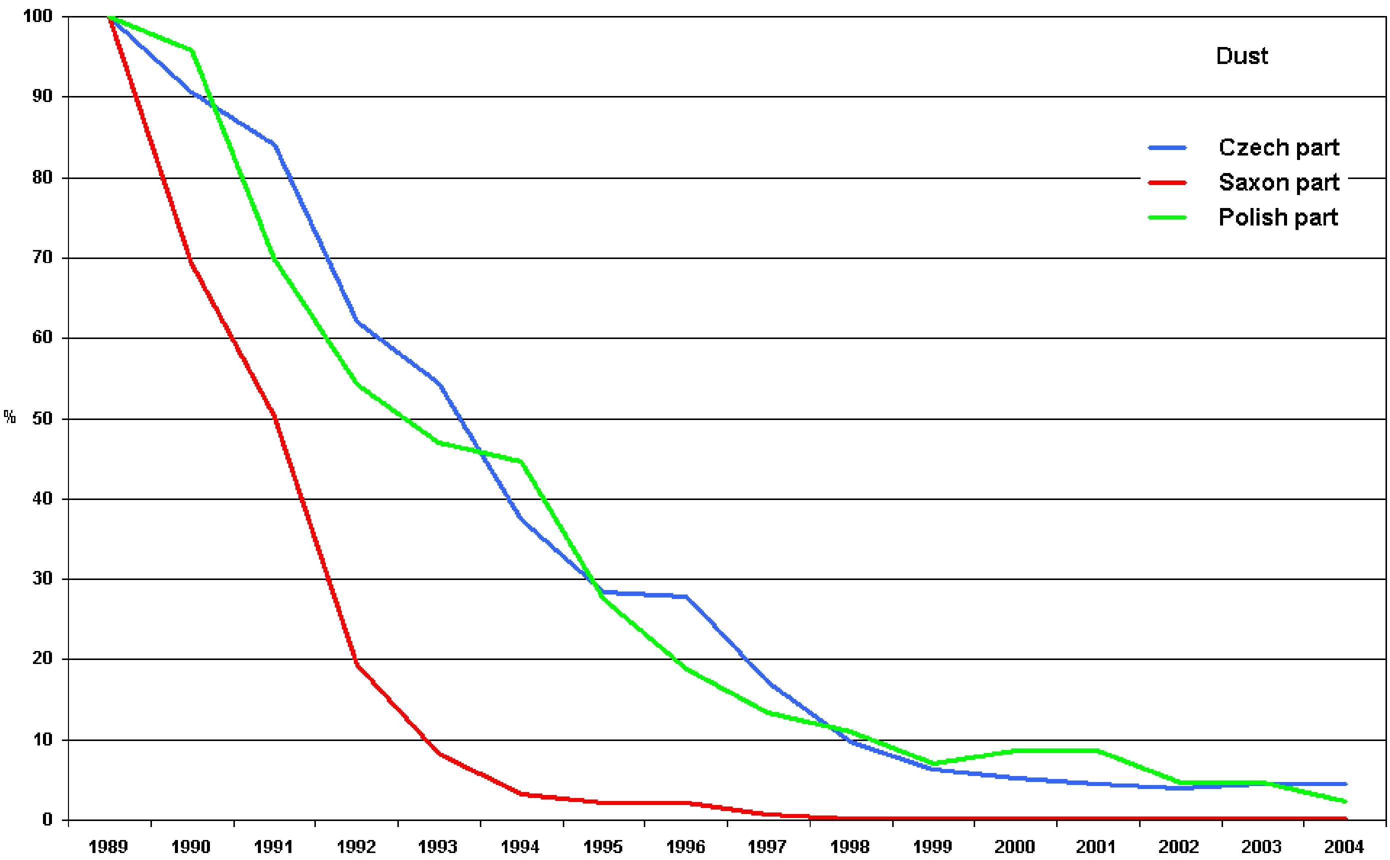


Table 10. Emission trends in the Tri-border region 1989 – 2004 [kilotons/year]
Tabulka 10. Emisní trendy v příhraniční oblasti 1989 – 2004 []
Tabelle 10. Entwicklung der Emissionen im Dreiländereck 1989 – 2004 []
Tabela 10. Tendencje emisji w trójgranicznym regionie 1989 – 2004 [tysięcy ton/rok]

Czech Republic

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
SO_2	882	852	741	624	590	509	533	430	250	157	105	110	94	92	84	92
NO_x	292	211	203	193	139	81	70	66	63	60	54	56	54	55	57	56
Dust	174	157	146	108	94	65	49	48	30	17	11	9	8	7	8	8

Saxony

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
SO_2	805	636	598	501	487	457	409	254	219	18	6	8	9	10	12	12
NO_x	71	60	56	44	50	46	43	36	34	10	9	11	13	13	13	14
Dust	183	126	92	35	15	6	4	4	1	0.4	0.2	0.3	0.4	0.4	0.4	0,4

Large sources (> 50 MW hard fuel and > 100 MW gaseous fuel).

Poland

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
SO_2	229	194	178	181	188	208	133	114	123	109	43	48	41	32	29	34
NO_x	22	17	28	26	26	26	22	20	17	16	15	16	16	14	16	15
Dust	127	122	89	69	60	57	35	24	17	14	9	11	11	6	6	3

3.2. Changes in air pollution 1996–2004

This chapter presents the results of evaluation of air quality data from **long-term measurements** for the time period of 1996 – 2004. Only selected representative stations of the JAMS network were chosen. The results are presented in Table 11 and Figure 4.

Sulphur dioxide SO_2

Annual average sulphur dioxide concentrations show, in general, a downward trend in the years 1996 – 1999, a stable level or an increase in the years 2000 – 2003, and again a decrease slightly in 2004, 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, presented on the basis of the selected rural background stations, first fell slightly in the years 1996 - 1999, increased gradually in the years 2000 – 2002 up to 20 $\mu g/m^3$, then decreased to 15 $\mu g/m^3$ in 2003 and to 12 $\mu g/m^3$ in 2004. At the traffic stations, concentrations in the period of 1996 – 2000 were at 35 $\mu g/m^3$, then slowly fell to 30 $\mu g/m^3$ in the years 2001 – 2002 to rise to 33 $\mu g/m^3$ in 2003 and to decrease again to 29 $\mu g/m^3$ in the year 2004.

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. In the year 2004 it decreased again to 16 $\mu g/m^3$ in the rural zone and to 27 $\mu g/m^3$ at the traffic station.

Lead

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 years 2003-2004 to a level of 12-14 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 and to 14 ng/m^3 in 2004. For the rural background station the lead concentrations have been decreasing slightly since 2000.

Ozone O_3

Annual average concentration values for ozone at rural background stations rose slightly in the years 1996 – 2003 and fell in 2004. At the station 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 were observed at the traffic station in Görlitz in the years 1996 – 1999; in subsequent year CO concentrations were stable at this station and increased in the years 2002 – 2003 up to 800 $\mu g/m^3$. At the Polish and Czech rural background stations, concentrations of carbon monoxide remained, in general, unchanged. In 2004, a decrease of carbon monoxide concentration was observed at all Tri-border Region stations.

Summing up, annual average concentrations of sulphur dioxide, ozone, nitrogen dioxide, carbon monoxide and PM_{10} in 2004 were lower than those in 2003 at all stations, with the exception of lead concentrations at Sokolov station.

Benzene

At present benzene is measured at 6 monitoring sites in the Tri-border Region:

DE – Görlitz, Schwartenberg, Plauen Süd, Klingenthal

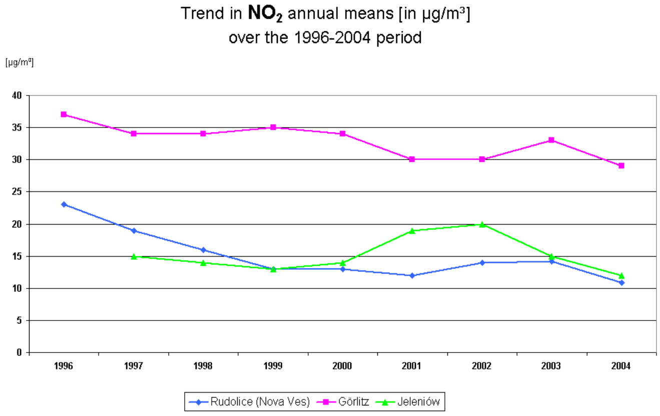
CZ – Most, Rudolice v Horách

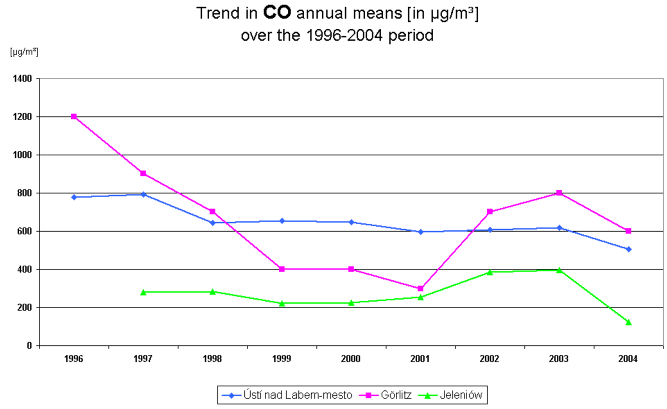
PL – not measured at present

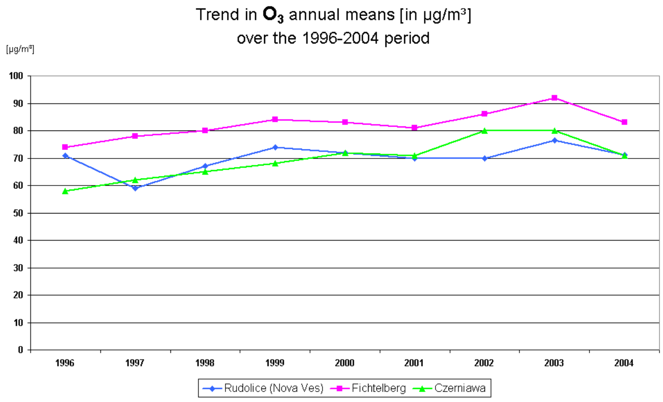
As expected, more traffic related stations show higher concentrations than rural stations. At present none of the stations exceed the current limit value of 10 µg/m³. For the last seven years benzene concentrations have been decreasing steadily, as shown for Görlitz. This is due to the reduction of the benzene content in gasoline, following legal requirements. In the year 2003 an increase in the benzene concentration to 3.8 µg/m³, then a decrease to 3.5 µg/m³ in 2004, was observed at the monitoring site in Most.

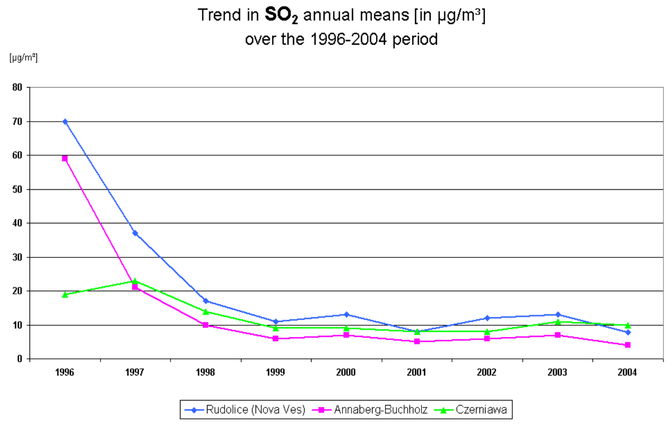
Unfortunately, the hitherto beneficial development of air quality in the Tri-border region may change because of the tendency in the Czech Republic and Poland to use cheaper, inferior fuel; this may affect air quality in the whole Tri-border Region, including Saxony.

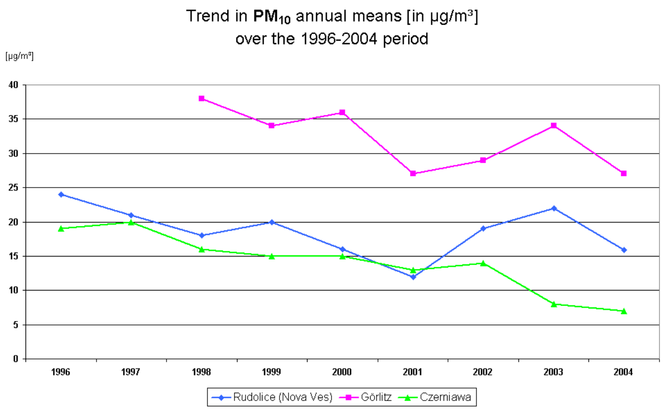
Figure 4. Changes in annual mean concentrations (1996–2004)
Obrázek 4. Změny ročních průměrných koncentrací (období 1996–2004)
Abbildung 4. Die Entwicklung der Jahresmittelwerte (1996 bis 2004)
Rysunek 4. Zmiany stężeń średniorocznych (okres 1996–2004)

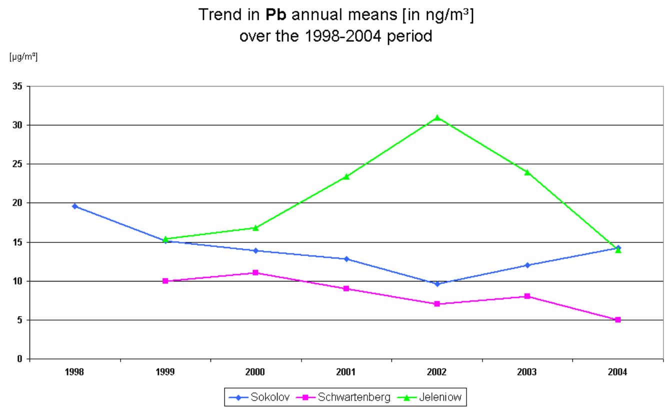












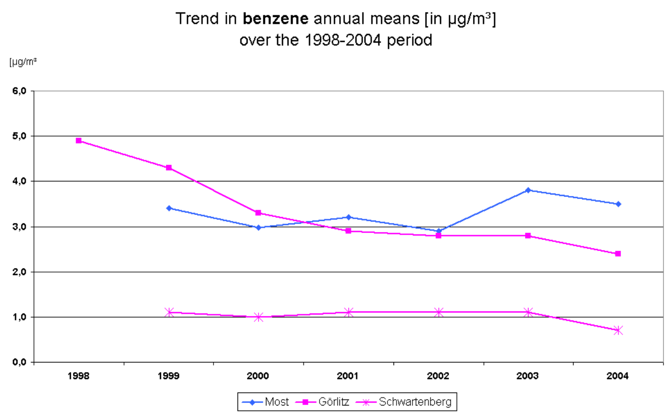


Table 11. Changes in annual mean concentrations (1996–2004)
Tabulka 11. Změny ročních průměrných koncentrací (1996–2004)
Tabelle 11. Die Entwicklung der Jahresmittelwerte (1996–2004)
Tabela 11. Zmiany stężeń średniorocznych (1996-2004)

Czech Republic

Station name	Pollutant	Annual mean concentration [μg/m^3]								
		1996	1997	1998	1999	2000	2001	2002	2003	2004
Rudolice (Nová Ves)	SO_2	70	37	17	11	13	8	12	13	8
Rudolice (Nová Ves)	NO_2	23	19	16	13	13	12	14	14	11
Rudolice (Nová Ves)	PM_{10}**	24	21	18	20	16	12	19	22	16
Ústí nad Labem-město	CO	777	794	643	654	646	598	609	617	507
Rudolice (Nová Ves)	O_3	71	59	67	74	72	70	70	77	71
Sokolov	Pb	-	-	0.0196	0.0151	0.0139	0.0128	0.0096	0.012[a]	0,014[a]
Most	benzene	-	-	-	3.4	3.0	3.2	2.9	3.8	3,5

Saxony

Station name	Pollutant	Annual mean concentration [μg/m^3]								
		1996	1997	1998	1999	2000	2001	2002	2003	2004
Annaberg-Buchholz	SO_2	59	21	10	6	7	5	6	7	4
Görlitz	NO_2	37	34	34	35	34	30	30	33	29
Görlitz	TSP	56	46	42	38	43	33	-	-	-
Görlitz	PM_{10}	-	-	38	34	36	27	29	34	27
Görlitz	CO	1200	900	700	400	400	300	700	800	600
Fichtelberg	O_3	74	78	80	84	83	81	86	92	83
Schwartenberg	Pb	-	-	-	0.0100	0.0110	0.0090	0.0070	0.0080	0,0050
Görlitz	benzene	-	-	4.9	4.3	3.3	2.9	2.8	2.8	2,4
Schwartenberg	benzene	-	-	-	1	1	1	1.1	1.1	0,7

Poland

Station name	Pollutant	Annual mean concentration [μg/m^3]								
		1996*	1997	1998	1999	2000	2001	2002	2003	2004
Czerniawa	SO_2	19	23	14	9	9	8	8	11	10
Jeleniów	NO_2	-	15	14	13	14	19	20	15	12
Czerniawa	PM_{10}**	19	20	16	15	15	13	14	8	7
Jeleniów	CO	-	281	284	222	227	253	387	397	125
Czerniawa	O_3	58	62	65	68	72	71	80	80	71
Jeleniów	Pb	-	-	-	0.0154	0.0168	0.0234	0.0310	0.024	0,014

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 2004 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/m³ (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: 3 times at Schwartenberg station and once at Sněžník station. 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 25 μg/m³ (Krkonoše Rýchory) to 164 μg/m³ (Sněžník). Maximum hourly values ranged from 38 μg/m³ (Krkonoše Rýchory) to 446 μg/m³ (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/m³ (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 17 μg/m³ (Krkonoše Rýchory) to 150 μg/m³ (Sněžník). The daily limit value was exceeded once at Krupka, Sněžník and Děčín stations. Krupka and Sněžník are mountainous stations situated in the Ore Mountains close to the North-Bohemian basin where a number of emissions sources exist. Station Děčín is a lowland town station situated in the valley of the river Labe. The 4th highest daily SO_2 concentration reached values from 12 μg/m³ (Carlsfeld) to 87 μg/m³ (Sněžník), 86 μg/m³ (Krupka).

Calendar year and winter SO_2 limit values for the protection of ecosystems - 20 μg/m³.

The calendar year and winter limit values were not exceeded at any eco-station in 2004 or in winter 2003/2004. Calendar year values at eco-stations were in the range from 2 μg/m³ (Carlsfeld) to 14 μg/m³ (Krupka - in the Ore Mountains). Winter values at eco-stations ranged from 3 μg/m³ (Carlsfeld) to 17 μg/m³ (Krupka).

The alert threshold for sulphur dioxide - 500 μg/m³ - 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/m³ (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/m³ at any station.

Maximum hourly concentrations ranged from 38 μg/m³ (Czarna Góra) to 196 μg/m³ (Annaberg). The 19th highest hourly

NO_2 concentration ranged from 31 µg/m³ (Krkonoše Rýchory) to 102 µg/m³ (Karlovy Vary). 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/m³ (limit value to become effective on 1 January 2010)

No station reported exceedances of the annual limit value of 40 µg/m³. Annual average concentrations of NO_2 show substantial variation, related to different exposure of the stations. Rural stations show lower values (6 µg/m³ Wlen, 7 µg/m³ Czerniawa and 8 µg/m³ Lehnmühle, Lückendorf, Přebuz, Krkonoše Rýchory), while urban (traffic related) sites are more polluted (38 µg/m³ Karlovy Vary, 31 µg/m³ Plauen Süd, 30 µg/m³ Ústí n.L.-město, 29 µg/m³ Görlitz, 26 µg/m³ Annaberg).

The annual limit value for NO_x for the protection of vegetation - 30 µg/m³ was not exceeded at any eco-station in 2004. Annual mean concentrations at eco-stations were in the range from 8 µg/m³ (Czerniawa) to 21 µg/m³ (Krupka - in the Ore Mountains).

The alert threshold for nitrogen dioxide - 400 µg/m³ - 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 2004.

24-hour limit value for PM_{10} for the protection of human health - 50 µg/m³ (not to be exceeded more than 35 times in a calendar year, relevant margin of tolerance 5 µg/m³, limit value to become effective on 1 January 2005)

Maximum daily concentrations of PM_{10} were in the range from 22 µg/m³ (Śnieżne Kotły) to 244 µg/m³ (Tušimice). The number of days with concentrations higher than 50 µg/m³ ranged from zero days (Czerniawa, Śnieżne Kotły, Czarna Gora and Krkonoše-Rýchory) to 97 days (Ústí n.L.-město). The 36th highest daily PM_{10} concentration reached values from 12 µg/m³ (Śnieżne Kotły), 13 µg/m³ (Krkonoše-Rýchory) to 81 µg/m³ (Ústí n.L.-město).

The 24-hour limit value of 50 µg /m³ for PM_{10} was exceeded more than 35 times at the stations Ústí n.L.-město (97 times), Děčín (88 times), Most (72 times), Karlovy Vary (61 times), Tušimice (54 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 (79 times), Děčín (77 times), Most (61 times), Karlovy Vary (46 times), Tušimice (42 times).

Out of the total number of 28 stations at which PM_{10} measurements are carried out, five stations reported exceedances of the 24-hour PM_{10} limit value and the same 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/m³ (margin of tolerance 1.6 µg/m³, limit value to become effective on 1 January 2005)

The annual PM_{10} limit value of 40 µg/m³ was exceeded at the stations Ústí n.L.-město (44 µg/m³) and Děčín (42 µg/m³). Annual mean concentrations of PM_{10} were in the range from 6 µg/m³ (Śnieżne Kotły), 7 µg/m³ (Czerniawa) to 44 µg/m³ (Ústí n.L.-město). 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/m³ (limit value to become effective on 1 January 2005)

The annual limit value for lead of 0.5 µg/m³ was not exceeded at any station. Annual values at the stations ranged from 0.005 µg/m³ (Schwartenberg) to 0.016 µg/m³ (Souš).

Table 12. **Hourly and daily mean concentrations 2004**
Tabulka 12. **Hodinové a denní průměrné koncentrace 2004**
Tabelle 12. **Stunden- und Tagesmittelwerte 2004**
Tabela 12. **Godzinne i dobowe wartości stężeń 2004.**

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 *	153	0	110	127	1	63	108	0	85	200	88	74
Frýdlant-Údolí */**	126	0	49	31	0	26	104	0	35	52	4	35
Karlovy Vary *	80	0	47	33	0	29	128	0	102	145	61	61
Krkonoše - Rýchory **/***	38	0	25	17	0	15	55	0	31	23	0	13
Krupka **/***	309	0	163	133	1	86	98	0	78	160	8	36
Měděnec **/***	301	0	115	74	0	43	89	0	67	69	2	30
Most *	264	0	90	79	0	53	110	0	86	223	72	70
Přebuz **/***	78	0	36	25	0	14	70	0	41	52	3	25
Rudolice v Horách **/***	183	0	91	61	0	37	109	0	56	73	5	29
Sněžník **/***	401	1	164	150	1	87	68	0	60	72	9	37
Sokolov *	271	0	112	55	0	38	95	0	70	151	16	36
Souš **/***	68	0	35	24	0	16	61	0	47	93	3	27
Tušimice */**	138	0	78	49	0	44	106	0	84	224	54	57
Ústí n.L.-město *	204	0	88	69	0	55	108	0	89	210	97	81
Valdek */**	103	0	54	62	0	31	88	0	60	63	7	35

a >50% and <75% (continuous 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	90	0	30	30	0	14	75	0	60	70	7	38
Plauen Süd	-	-	-	-	-	-	114	0	89	75	14	42
Annaberg-Buchholz	115	0	54	34	0	25	196	0	99	-	-	-
Fichtelberg	158	0	55	38	0	26	-	-	-	-	-	-
Carlsfeld	159	0	29	18	0	12	-	-	-	-	-	-
Zittau Ost	74	0	40	39	0	21	70	0	56	77	17	43
Görlitz	151	0	65	39	0	30	11	0	79	137	26	46
Zinnwald	226	0	103	89	0	52	86	0	61	-	-	-
Schwartenberg	446	3	116	124	0	61	85	0	63	153	2	33
Lehnmühle	115	0	47	59	0	23	61	0	49	70	4	27
Lückendorf	73	0	41	41	0	22	51	0	43	59	3	25

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	162	0	80	39	0	26	78	0	58	61	6	34
Czerniawa	132	0	87	80	0	43	47	0	36	28	0	14
Wleń	188[a]	0	85[a]	79[a]	0	54[a]	56	0	41	65	12	31
Śnieżne Kotły	69	0	33	25	0	18	59	0	51	22	0	12
Jeleniów	169	0	31	62	0	41	73	0	60	58	5	31
Spalona[b]	-	-	-	-	-	-	-	-	-	-	-	-
Czarna Góra	129[a]	0	61[a]	101	0	27	38	0	34	36	0	16
Sokolec[b]	-	-	-	-	-	-	-	-	-	-	-	-
Witków[b]	-	-	-	-	-	-	-	-	-	-	-	-

[a] >50% and <75% (continuous measurements)

[b] <50% (continuous measurements)

Table 13. **Annual mean concentrations 2004**
Tabulka 13. **Roční průměrné koncentrace 2004**
Tabelle 13. **Jahresmittelwerte 2004**
Tabela 13. **Średnie roczne wartości stężeń 2004**

Czech Republic

station	NO_x annual mean 2004	NO_2 annual mean 2004	PM_{10} annual mean 2004	SO_2 annual mean 2004	SO_2 winter mean 2003/2004	Pb annual mean 2004
	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 *	45	25	42	9	14	
Frýdlant-Údolí */**	11	9	22	7	8	
Karlovy Vary *	80	38	36	7	8	6.37[c]
Krkonoše - Rýchory **/***	9	8	8	5	6	
Krupka **/***	21	16	20	14	17	
Měděnec **/***	14	11	17	10	10	
Most *	43	23	39	10	12	
Přebuz **/***	10	8	14	3	5	
Rudolice v Horách **/***	13	11	16	8	13	5.84
Sněžník **/***	16	12	19	12	16	
Sokolov *	25	18	22	9	9	14.27[a]
Souš **/***	11	10	15	5	6	16.49
Tušimice */**	19	15	33	8	9	
Ústí n.L.-město *	50	30	44	12	12	12.45[b]
Valdek */**	15	13	20	7	9	

Saxony

station	NO_x annual mean 2004	NO_2 annual mean 2004	PM_{10} annual mean 2004	SO_2 annual mean 2004	SO_2 winter mean 2003/2004	Pb annual mean 2004
	limit value = 30 µg/m^3	limit value = 40 µg/m^3	limit value = 40 µg/m^3	limit value = 20 µg/m^3	limit value = 20 µg/m^3	limit value = 500 ng/m^3
Klingenthal *	-	17	21	3	-	-
Plauen Süd *	-	31	26	-	-	-
Annaberg-Buchholz *	-	26	-	4	-	-
Fichtelberg ***	-	-	-	4	4	-
Carlsfeld ***	-	-	13	2	3	-
Zittau Ost *	-	14	23	5	-	-
Görlitz *	-	29	27	5	-	-
Zinnwald *	-	12	-	8	-	-
Schwartenberg **/***	14	11	13	8	13	-5
Lehnmühle *	10	8	16	4	7	-
Lückendorf *	10	8	14	5	6	-

Poland

station	NO_x annual mean 2004	NO_2 annual mean 2004	PM_{10} annual mean 2004	SO_2 annual mean 2004	SO_2 winter mean 2003/2004	Pb annual mean 2004
	limit value = 30 µg/m^3	limit value = 40 µg/m^3	limit value = 40 µg/m^3	limit value = 20 µg/m^3	limit value = 20 µg/m^3	limit value = 500 ng/m^3
Działoszyn *	-	15[c]	20	9	9	11
Czerniawa **	8	7	7	10[c]	12	8
Wleń *	-	6	18	13[c]	10	
Śnieżne Kotły ***/**	16	13	6	5	6	
Jeleniów **	19	15	16	12	13	14
Spalona ***	-	x	x	x	8[c]	
Czarna Góra ***/**	13	10	9	7[c]	8[c]	
Sokolec ***/**	x	x	x	x	14[c]	
Witków *	-	x	x	x	12	

* 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% (continuous measurements)

[b] Ústí nad Labem - Kočkov

[c] data coverage: >50% and <75% (continuous 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 2004: 2 mg/m³)

The maximum daily 8-hour mean was not exceeded at any station; values ranged from 0.6 mg/m³ (Jeleniów) to 3.6 mg/m³ (Most).

Table 14. 8-hour and annual mean concentrations, 2004
Tabulka 14. 8-hodinové a roční průměrné koncentrace, 2004
Tabelle 14. 8-Stunden-Mittelwerte und Jahresmittelwerte, 2004
Tabela 14. 8-godzinne i średnie roczne wartości stężeń, 2004

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	2.7	0	
Karlovy Vary	2.5	0	
Most	3.6	0	3.5
Rudolice v Horách			0.9
Sokolov	1.5	0	
Ústí n.L.-město	2.3	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	-	-	1.4
Plauen Süd	2.1	0	2.2
Görlitz	-	0	2.4
Schwartenberg	-	-	0.7

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	0.6	0	-

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 2004: 5 µg/m³).

The annual limit value for benzene was not exceeded at any station; values ranged from 0.7 µg/m³ (Schwartenberg) to 3.5 µg/m³ (Most).

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

The applicable directive for assessment of ozone concentrations is Directive 2002/3/EC, which entered into force on 9 September 2003.

It sets a target value of 120 µg/m³ (maximum daily 8-hour mean) for the **protection of human health**. 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 2002 to 2004, 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 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*h averaged over five years. In the period from 2000 to 2004, 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 in Krkonoše-Rýchory at 28454 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 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.

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 15. **Number of days with 8- hour mean exceeding 120 µg/m³ (mean over 3 years 2001-2003, 2002-2004)**
Tabulka 15. **Počet dní s 8-hodinovým průměrem > 120 ug/m³ (průměr za 3 roky 2001-2003, 2002-2004)**
Tabelle 15. **Anzahl der Tage mit 8-Stunden-Mittelwerten >120 µg/m³ (Mittelwert über 3 Jahre 2001-2003, 2002-2004)**
Tabela 15. **Liczba dni z wartościami 8-godzinnymi ozonu > 120 µg/m³ (średnia z 3 lat 2001-2003, 2002-2004)**

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: 2001-2003	number of days 8-hourly mean> 120 µg/m³ (mean over 3 years: 2002- 2004	max 8-hourly
	2001	number of days *	2002	number of days *	2003	number of days *	2004	number of days *	2001-2003	2002 - 2004	(in year 2004)
Krkonoše - Rýchory	18	352	87	365	126	305	24	357	77	79	145
Most	13	365	21	365	35	357	22	362	23	26	151
Přebuz	26	363	41	362	105	274	19	360	57	55	150
Rudolice v Horách	36	365	51	365	84	272	34	343	57	56	169
Sněžník	28	364	45	364	83	365	33	356	52	54	168
Sokolov	10	363	21	361	87	365	15	362	39	41	141
Souš	21	365	39	365	75	361	21	146	45	45	146
Tušimice	32	363	25	365	57	362	30	364	38	37	170
Ústí nad Labem-město	13	362	14	365	31	362	10	358	19	18	146
Valdek		0		0	58	184	7	320	58[a]	33[b]	142

number of days * - number of days (in the year) with maximum daily 8 hours mean in database

[a] - one year data only

[b] - two years data only

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: 2001-2003	number of days 8-hourly mean> 120 µg/m³ (mean over 3 years: 2002- 2004	max 8-hourly
	2001	number of days *	2002	number of days *	2003	number of days *	2004	number of days *	2001-2003	2002 - 2004	(in year 2004)
Klingenthal	15	359	28	358	59	359	20	359	34	36	154
Annaberg-Buchholz	8	357	6	362	33	357	9	358	16	16	139
Fichtelberg	51	353	87	341	116	358	51	343	85	78	165
Carlsfeld	25	352	51	360	99	353	35	345	58	58	156
Zittau Ost	15	353	37	355	66	356	12	362	39	37	150
Zinnwald	29	355	67	360	93	363	30	364	63	61	169
Schwartenberg	31	350	62	360	104	359	39	357	66	66	188
Lehnmühle	14	344	2	347	36	341	8	348	17	15	159
Lückendorf	4	347	10	328	87	353	22	361	34	40	154

Poland

station	Number of days 8-hourly mean>120 μg/m³								number of days 8-hourly mean>120 μg/m³ (mean over 3 years: 2001-2003	number of days 8-hourly mean> 120 μg/m³ (mean over 3 years: 2002- 2004	max 8-hourly
	2001	number of days *	2002	number of days *	2003	number of days *	2004	number of days *	2001-2003	2002 - 2004	(in year 2004)
Sokolec	18	275	63	335	55	346	2	128	45	40	128
Czarna Góra	31	265	32	355	71	351	31	342	45	45	148
Jeleniów	14	295	37	359	43	327	18	346	31	33	165
Czerniawa	26	281	42	301	72	322	13	351	47	42	144
Śnieżne Kotły	30	270	82	269	48	262	32	249	53	54	150

Table 16. AOT40 mean value over 5 years (1999-2003, 2000-2004)
Tabulka 16. AOT40 pětileté průměry (1999-2003, 2000-2004)
Tabelle 16. AOT-Mittelwert für 5 Jahre (1999-2003, 2000-2004)
Tabela 16. AOT40 średnia wartość z 5 lat (1999-2003, 2000-2004)

Czech Republic

station	AOT40 [μg/m³h]						AOT40 mean over 5 years [μg/m³h]	
	1999	2000	2001	2002	2003	2004	1999-2003	2000 - 2004
Krkonoše - Rýchory	-	-	-	31 575	42 829	10 958	-	28 454[a]
Most	21 079	20 623	13 152	15 562	15 107	13 124	17 105	15 514
Přebuz	22 447	22 771	20 010	23 282	39 859	12 378	25 674	23 660
Rudolice v Horách	-	29 366	24 336	25 399	34 994	17 013	22 819[b]	26 222
Sněžník	7 698	27 280	-	21 194	33 390	15 972	22 391[b]	24 459[b]
Sokolov	9 673	5 350	-	18 382	33 234	11 434	16 660[b]	17 100[b]
Souš	22 071	21 799	17 279	22 766	-	14 727	20 979[b]	19 143[b]
Tušimice	14 757	13 315	20 591	17 843	28 069	13 816	18 915	18 727
Ústí nad Labem-město	11 037	-	-	14 571	15 546	9 992	13 718[a]	13 370[a]
Valdek	-	-	-	-	24 857	-	-	-

Saxony

station	AOT40 [µg/m³h]						AOT40 mean over 5 years [µg/m³h]	
	1999	2000	2001	2002	2003	2004	1999-2003	2000 - 2004
Klingenthal	17 481	18 126	13 485	16 851	24 755	9 013	18 140	16 446
Annaberg-Buchholz	6 589	-	8 588	11 310	15 816	7 908	10.576[b]	10 905[b]
Fichtelberg	26 007	26 772	24 495	28 740	36 224	21 149	28 448	27 476
Carlsfeld	22 073	21 340	19 263	22 330	34 672	16 416	23 936	22 804
Zittau Ost	14 635	15 363	12 809	19 743	26 449	11 306	17 800	17 134
Zinnwald	23 165	25 953	17 653	24 580	34 161	16 795	25 103	23 828
Schwartenberg	19 196	22 057	17 759	23 495	37 555	19 037	24 012	23 981
Lehnmühle	13 286	17 230	12 960	5 413	18 628	6 635	13 503	12 173
Lückendorf	15 561	19 652	6 529	13 782	32 335	11 889	17 572	16 837

Poland

station	AOT40 [µg/m³h]						AOT40 mean over 5 years [µg/m³h]	
	1999	2000	2001	2002	2003	2004	1999-2003	2000 - 2004
Sokolec	11 498	18 628	13 861	18 722	-		15677[b]	17 070[a]
Czarna Góra	16 023	20 635	17 450	24 586	25 523	16 308	20 843	20 900
Jeleniów	14 397	17 075	14 142	17 545	-		15790[b]	16 254[a]
Czerniawa	-	-	16 329	20 150	-	12 193	-	16 224[a]
Śnieżne Kotły	16 408	-	20 243	-	-	19 031	-	-

a - three years data only

b - four years 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:

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

* 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 5. Number of days with 8-hour mean exceeding 120 µg/m^3 (mean over 3 years 2002-2004)
Obrázek 5. Počet dní s 8-hodinovým průměrem > 120 ug/m^3 (průměr za 3 roky 2002-2004)
Abbildung 5. Anzahl der Tage mit 8-Stunden-Mittelwerten >120 µg/m^3 (Mittelwert über 3 Jahre 2002-2004)
Rysunek 5. Liczba dni z wartościami 8-godzinnymi ozonu > 120 µg/m^3 (średnia z 3 lat 2002-2004)

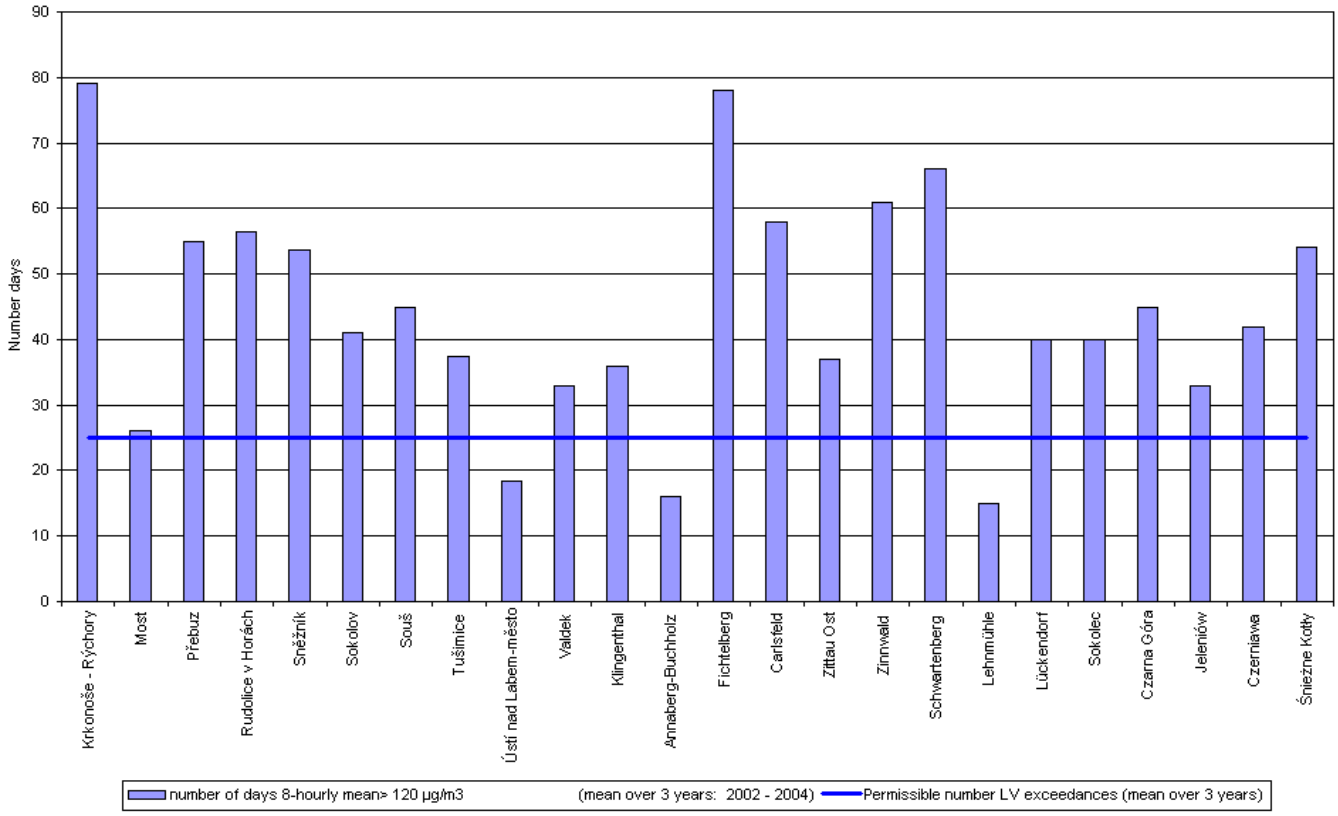
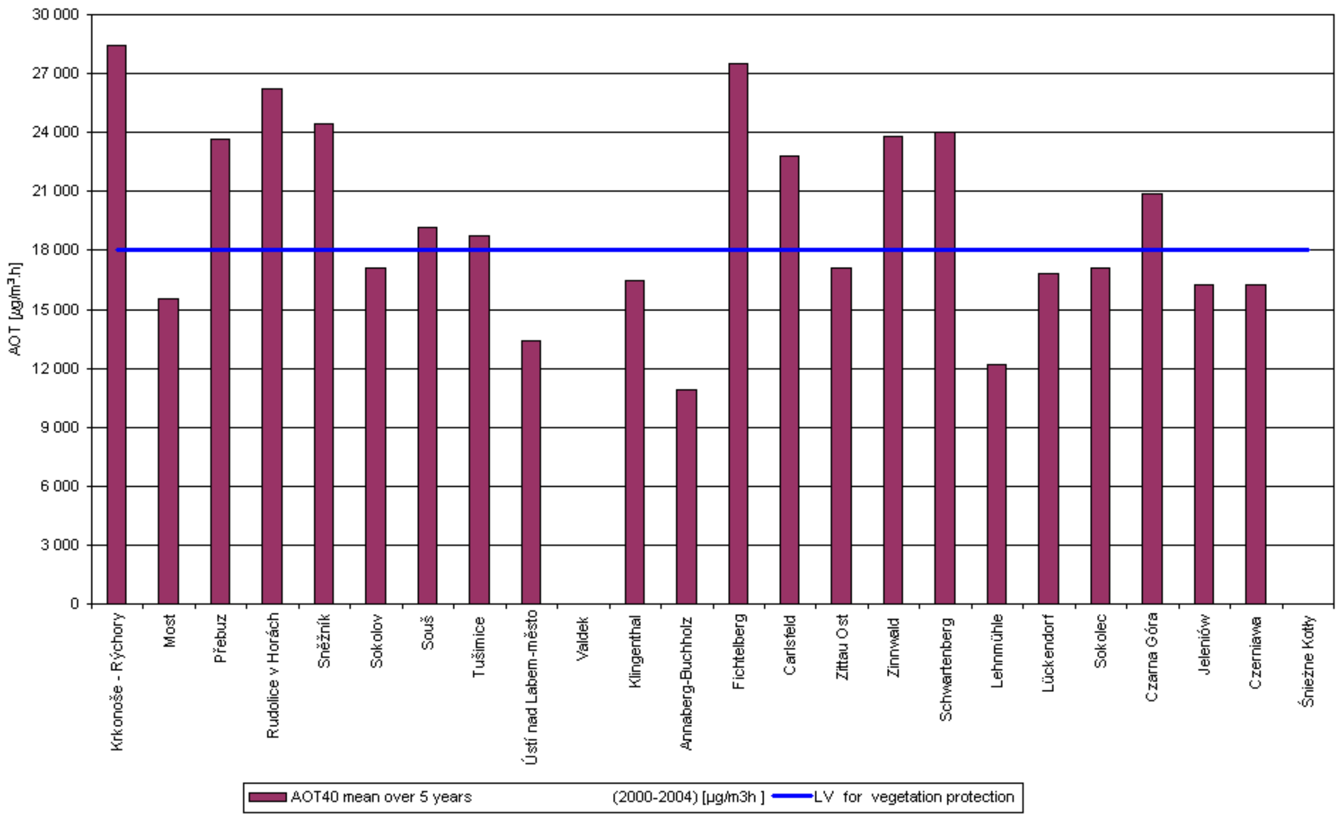


Figure 6. AOT40 mean over 5 years (2000-2004)
Obrázek 6. AOT40 průměr za 5 let (2000-2004)
Abbildung 6. AOT40, Mittelwert über 5 Jahre (2000-2004)
Rysunek 6. AOT40 - średnia z 5 lat (2000-2004)



3.3.4. Directive 2004/107/EC of December 2004 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 4th 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.

Therefore the Directive only defines target values for the concentration of the above mentioned heavy metals in ambient air. The target values refer to an annual average in the PM_{10} fraction.

Measurements of the heavy metals - cadmium, arsenic and nickel - were carried out in keeping with the Directive at 10 stations. In 2004 the target values for nickel and arsenic, which will apply as from 31 December 2012, were not exceeded at any of the stations. The target value for cadmium was exceeded only at Souš, with an annual mean of 5.8 ng Cd/m^3, but this is 0.8 ng/m^3 less than last year's average. The annual averages for the heavy metals measured ranged from 0.1 ng/m^3 (Schwartenberg) to 5.8 ng/m^3 (Souš) for cadmium, 0.61 ng/m^3 (Krkonoše) to 3.3 ng/m^3 (Działoszyn) for arsenic and 0.3 ng/m^3 (Souš) to 2.0 ng/m^3 (Działoszyn) for nickel.

Table 17. Annual mean concentrations of As, Cd, Ni and BaP in the PM_{10} in 2004
Tabulka 17. Roční průměrné koncentrace As, Cd, Ni a BaP v PM_{10} v roce 2004
Tabelle 17. Jahresmittelwerte für As, Cd, Ni und BaP in PM_{10} für das Jahr 2004
Tabela 17. Średnie roczne wartości stężeń As, Cd, Ni i BaP w PM_{10} w roku 2004

Czech Republic

station	BaP	Cd	Ni	As
	annual mean ng/m^3	annual mean ng/m^3	annual mean ng/m^3	annual mean ng/m^3
	long term objective = 1 ng/m^3	*long term objective = 5 ng/m^3*	*long term objective = 20 ng/m^3*	*long term objective = 6 ng/m^3*
Krkonoše - Rýchory		0.31[a]	0.47[a]	0.61[a]
Rudolice	0,2	0,2	0,4	1,7
Sokolov	0,8	0,41[a]	1,09[a]	2,83[a]
Souš		**5,8**	0,3	3,1
Teplice	**1,1**			
Ústí n.L.- Kočkov		0,3	0,6	3,1

Saxony

station	BaP	Cd	Ni	As
	annual mean ng/m^3	annual mean ng/m^3	annual mean ng/m^3	annual mean ng/m^3
Görlitz	1,0	0,6	1,8	2,7
Schwartenberg	0,2	0,1	0,6	1,4

Poland

station	BaP	Cd	Ni	As
	annual mean ng/m^3	annual mean ng/m^3	annual mean ng/m^3	annual mean ng/m^3
Jeleniów	**1,5**	0,7	1,7	3,1
Działoszyn	**1,2**	1,5	2,0	3,3
Czerniawa	0,8	0,7	1,4	2,4

a >50% and <75%

3.3.4.2. Target value for the carcinogenic risk-marker substance BaP - 1 ng/m^3

The 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 (BaP).

In 2004 PAHs were measured at 8 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), Rudolice, Sokolov; and Poland – Czerniawa, Jeleniów, Działoszyn. More details on the measurements and the measurement methods used were provided in the "Common Report on Air Quality in the Black Triangle Region – 2001".

The annual mean concentrations of BaP in the PM_{10} fraction for 2004 are lower than those for 2003, excluding Czerniawa, but there is no clear indication of a trend for the observed time period 1998 – 2004 (see Figure 7).

Figure 7. Annual mean concentrations of BaP in the PM_{10} fraction for the years 1998 - 2004
Obrázek 7. Roční průměrné koncentrace BaP ve frakci PM_{10} pro roky 1998 - 2004
Abbildung 7. Jahresmittelwerte der BaP-Konzentration in der PM_{10}-Fraktion für die Jahre 1998 - 2004
Rysunek 7. Średnie roczne wartości stężeń BaP we frakcji PM_{10} w latach 1998 - 2004

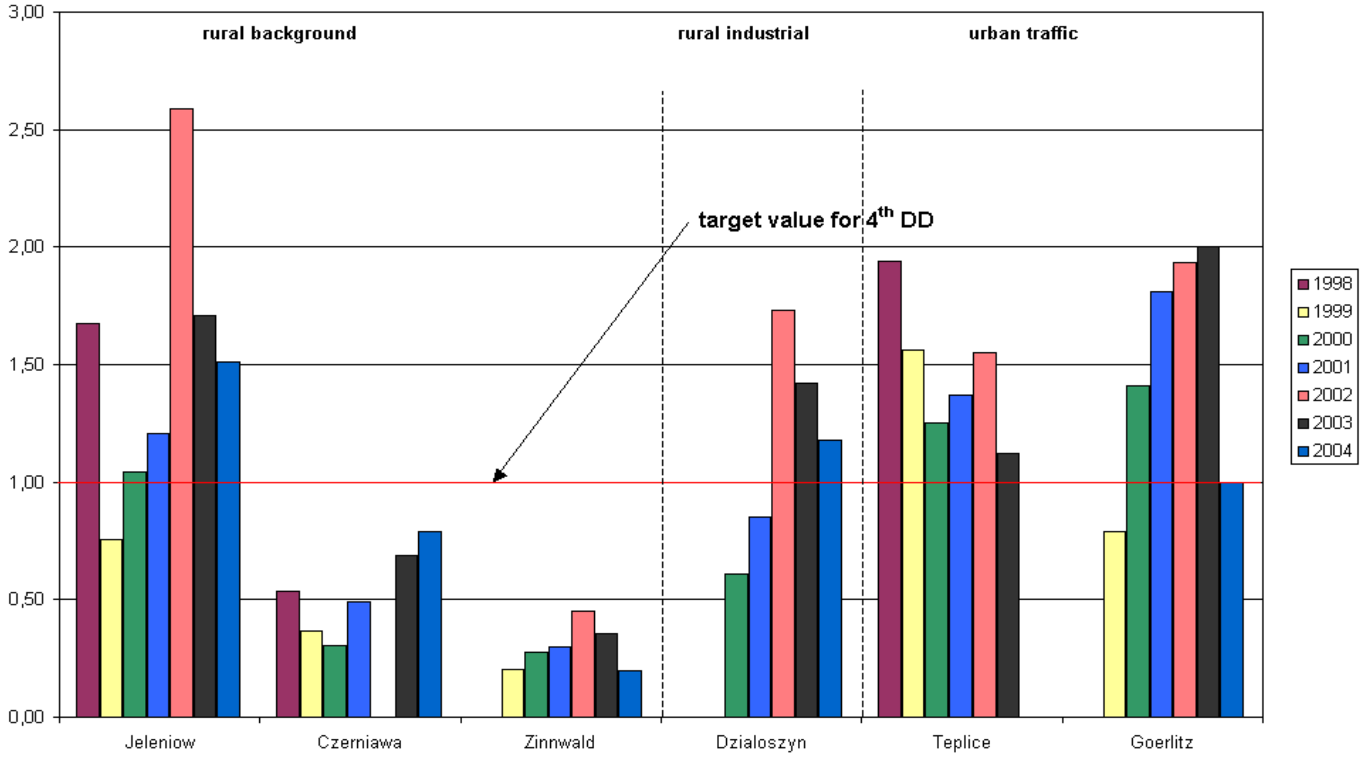


Table 18. Annual mean concentrations of BaP in the PM_{10} in 1998 - 2004
Tabulka 18. Roční průměrné koncentrace BaP v PM_{10} v letech 1998 - 2004
Tabelle 18. Jahresmittelwerte für BaP in PM_{10} für die Jahre 1998 - 2004
Tabela 18. Średnie roczne wartości stężeń BaP w PM_{10} w latach 1998- 2004

	Jeleniow	Czerniawa	Zinnwald	Dzialoszyn	Teplice	Goerlitz	Sokolov	Rudolice v Horách
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**		
2004	**1,51**	0,79	0,2	**1,18**		1,0	0,8	0,2

[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

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 belonging to the categories rural-industrial and urban-traffic mostly exceed the set target value of 1 ng BaP/m³. Rural background stations like Czerniawa and Zinnwald/Schwartenberg remained below the target value whilst at Jeleniów the target value was exceeded in all years considered with the exception of 1999. It seems that this station is influenced by considerable industrial sources, i.e. the power plants at the Polish and German sides of the borderline.

The urban-traffic stations present a varied picture. At Görlitz, annual mean concentrations increased steadily till 2003 and the limit value was reached but not exceeded in 2004. The situation looks different for Teplice. The BaP concentration decreased steadily from 1999 to 2000, then increased till 2003 and decreased again in 2004.

Table 19. **Annual mean concentrations of different PAHs measured in 1998-2004, [ng/m³]**
Tabulka 19. **Roční průměrné koncentrace různých PAH naměřené v letech 1998 - 2004, [ng/m³]**
Tabelle 19. **PAK-Jahresmittelwerte für die Jahre 1998-2004, [ng/m³]**
Tabela 19. **Średnie roczne wartości stężeń WWA w latach 1998-2004, [ng/m³]**

Station	year	CHR	BbF	BkF	DBahA	BghiP	INP
Jeleniow	1999	1.55	1.91	0.88	0.48	1.77	1.56
	2000	0.73	0.86	0.46	0.22	0.90	0.80
	2001	0.99	1.34	0.59	0.26	1.15	1.06
	2002	0.61	1.41	0.63	0.65	0.49	0.96
	2003	2.40	2.12	1.36	0.50	1.12	3.61
	2004	1.29	1.91	0.82	0.43	0.89	1.62
Czerniawa	1999	0.63	0.75	0.42	0.31	0.71	0.70
	2000	0.41	0.47	0.23	0.09	0.45	0.45
	2001	0.37	0.44	0.20	0.08	0.35	0.34
	2002	0.37	0.69	0.26	0.26	0.18	0.29
	2003	-	-	-	-	-	-
	2004	0.67	0.90	0.41	0.28	0.51	0.88
Zinnwald	1999	0.39	0.45	0.18	0.03	0.32	0.32
	2000	0.41	0.47	0.23	0.09	0.45	0.45
	2001	-	0.48	0.21	0.07	-	0.45
	2002	-	0.46	0.19	0.07	-	0.39
	2003	-	0.70	0.30	0.10	-	0.50
	2004	-	0.40	0.10	0.00	-	0.30
Teplice	1999	3.57	2.11	0.95	0.39	2.15	1.66
	2000	2.81	1.77	0.81	0.35	1.65	1.37
	2001	1.79	1.62	0.81	0.25	1.74	1.24
	2002	1.99	1.47	0.48	0.29	1.13	1.14
	2003	2.57	1.88	0.96	0.30	1.30	1.43
	2004	1.57	1.36	0.61	0.18	1.07	0.98
Görlitz	1999	1.46	1.67	0.62	0.10	1.37	1.03
	2000	1.15	1.40	0.53	0.09	1.08	1.09
	2001	-	1.96	0.83	0.26	-	1.73
	2002	-	2.45	1.01	0.31	-	1.95
	2003	-	2.80	1.00	0.20	-	1.70
	2004	-	1.50	0.50	0.10	-	0.90

No clear trend can be observed for the annual mean values of different PAHs (CHR, BbF, BkF, DBahA, BghiP, INP) in the period 1998 - 2004.

3.3.5. Wet deposition

Wet deposition standards have not been defined to date. The fourth Daughter Directive considers only total deposition rates for heavy metals and PAHs.

The analysis of nitrogen deposition (Total-N) in atmospheric precipitation at the **rural background stations** showed levels from 0.61 g/m² in Jelenia Góra (at a precipitation level of 533 mm) to 1.63 g/m² in Rudolice (at a precipitation level of 887 mm) and 1.54 g/m² in Souš (at a precipitation level of 1397 mm).

Sulphur deposition (SO4-2 - S) levels ranged from 0.34 g/m² in Jelenia Góra and 0.36 g/m² in Wleń to 0.99 g/m² in Souš and 0.80 g/m² in Rudolice. The highest level of precipitation was observed in Souš, at 1397 mm.

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

At the **urban zone traffic stations** in Görlitz and Plauen and the **urban background station** in Ústí n.L., nitrogen wet deposition levels were 0.65–0.77 g/m², at a precipitation of about 600 mm.

The lowest sulphur deposition values were measured in Plauen (0.31 g/m²), in Görlitz (0.39 g/m²) and the highest in Ústí n.L. (0.51 g/m²)

Sulphur deposition to nitrogen deposition **ratios** were: 0.5 in Plauen and Görlitz and 0.7 in Ústí n.L. At all monitoring stations nitrogen concentrations in precipitation were higher than the sulphur concentrations.

Wet deposition results differ from country to country. Ranges of nitrogen deposition were as follows:
in Poland 0.55 – 1.03 g N/m²/year – the same level as in 2003; in the Czech Republic 0.77 – 1.63 g N/m²/year, and in Germany 0.65 – 1.26 g N/m²/year – which means that 2004 had higher levels than 2003 in these two parts of JAMS network.

Sulphur deposition levels were in the following ranges: 0.34 – 0.58 g S/m²/year at the Polish stations, 0.31 – 0.68 g S/m²/year at the Saxon stations and 0.51 – 0.99 g S/m²/year at the Czech stations. In all three countries sulphur deposition levels in 2004 were higher than in 2003. Precipitation levels ranged from 533 mm in Jelenia Góra to 1397 mm in Souš.

Table 20: Annual wet deposition - 2004
Tabulka 20. Roční mokrá depozice - 2004
Tabelle 20. Jährliche nasse Depositionen - 2004
Tabela 20. Roczna mokra depozycja - 2004

Czech Republic

Station	Annual wet deposition		
	rain [mm]	SO_4^{2-}-S [g/m²]	Total-N [g/m²]
Ústí-Kočkov*	646	0.51	0.77
Rudolice	887	0.80	1.63
Souš	1397	0.99	1.54

* 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	1326	0.53	1.26
Görlitz	629	0.39	0.77
Mittelndorf	-	-	-
Lehnmühle	802	0.43	0.93
Plauen	642	0.31	0.65
Zinnwald	1134	0.68	1.22

Poland

Station	Annual wet deposition		
	rain [mm]	SO_4^{2-}-S [g/m²]	Total-N [g/m²]
Czerniawa	830	0.58	1.03
Spalona	-	-	-
Witków	-	-	-
Wleń	546	0.36	0.70
Jelenia Góra	533	0.34	0.61
Jeleniów	634	0.57	0.94
Działoszyn	451	0.36	0.55

3.3.6. Long term trends in wet deposition in the Tri-border Region

The figures below show the long term trend in sulphur and nitrogen deposition at the permanent measuring stations in the framework of the JAMS. The depositions are given in kilo-equivalents per hectare for better comparability. If the so called dry years 1999 and 2003 (low annual precipitation amount) are ignored, then the following trends were observed:

1. The sulphur depositions decreased at most stations. However at Rudolice and, to a lesser extent, at Souš they increased slightly from 2000 onwards. The sulphur depositions for Zinnwald remained more or less unchanged.
2. Total nitrogen depositions show a downward trend for the German station Carlsfeld and less for Görlitz and Plauen. The values for Zinnwald remained again at the same level. Deposition increased at the stations Rudolice and Ústí-Kočkov and shows a slight upward trend at Czerniawa and Souš.

The assessment of the deposition data shows that there has been no significant improvement in deposition loads in the common region of interest since 1998. This holds especially for nitrogen. Further activities are needed to reduce the emissions for protection of human health as well as of ecosystems.

Figure 8. Annual precipitation amount for the years 1998 – 2004 at permanent JAMS measuring stations
Obrázek 8. Roční úhrny srážek za roky 1998-2004 na nepřetržitě měřících stanicích společné monitorovací sítě
Abbildung 8: Jährliche Niederschlagsmengen für die Jahre 1998-2004 für die Dauermessstellen des gemeinsamen Programms
Rysunek 8. Roczna ilość opadu w latach 1998 – 2004 z pomiarów ciągłych stacji Wspólnego systemu monitoringu powietrza

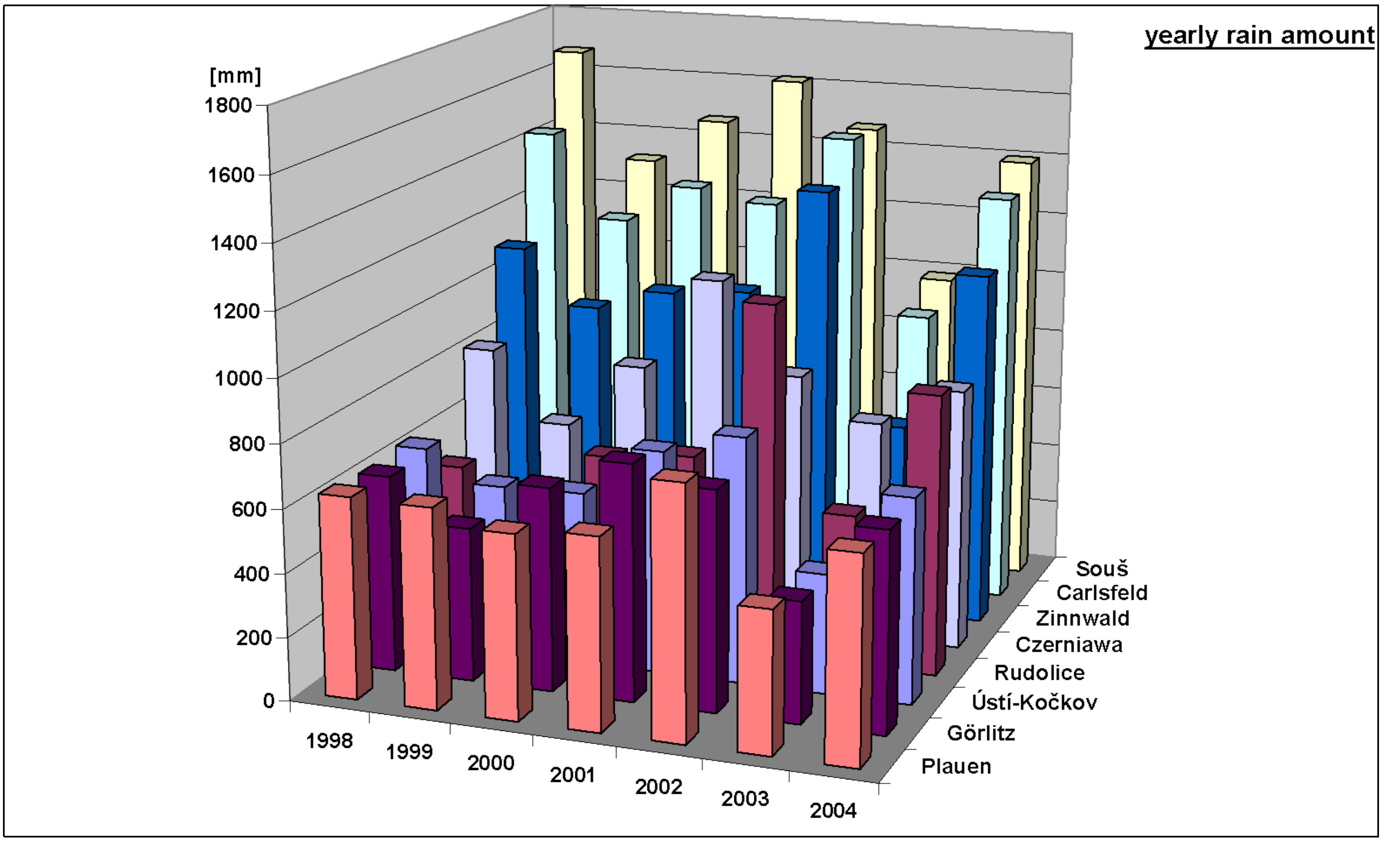


Figure 9. Sulphur deposition for the years 1998 – 2004 at permanent JAMS measuring stations
Obrázek 9. Depozice síry za roky 1998-2004 na nepřetržitě měřících stanicích společné monitorovací sítě
Abbildung 9: Schwefeldepositionen für die Jahre 1998-2004 für die Dauermessstellen des gemeinsamen Programms
Rysunek 9. Depozycja siarki w latach 1998 – 2004 z pomiarów ciągłych stacji Wspólnego systemu monitoringu powietrza

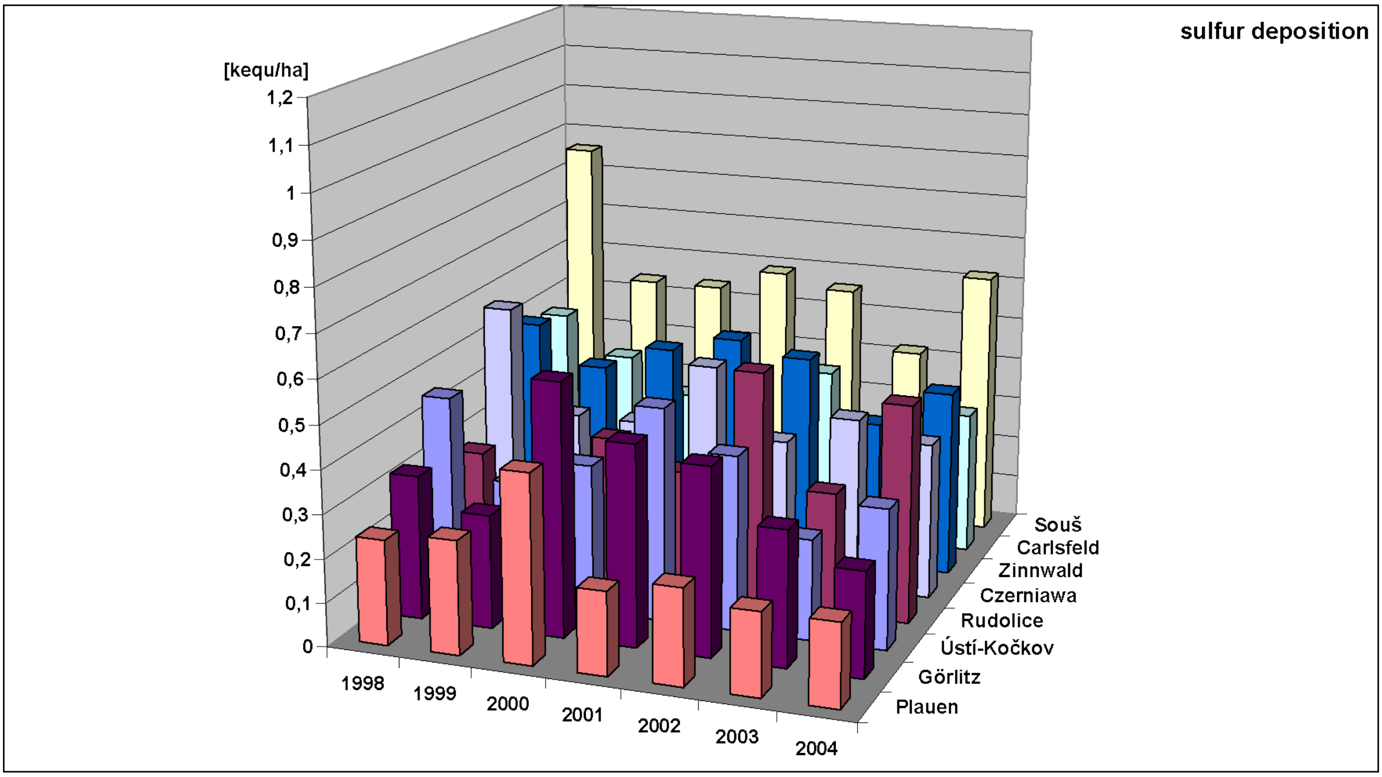


Figure 10. Nitrogen deposition for the years 1998 – 2004 at permanent JAMS measuring stations
Obrázek 10. Depozice dusíku za roky 1998-2004 na nepřetržitě měřících stanicích společné monitorovací sítě
Abbildung 10: Stickstoffdepositionen für die Jahre 1998-2004 für die Dauermessstellen des gemeinsamen Programms
Rysunek 10. Depozycja azotu w latach 1998 – 2004 z pomiarów ciągłych stacji Wspólnego systemu monitoringu powietrza

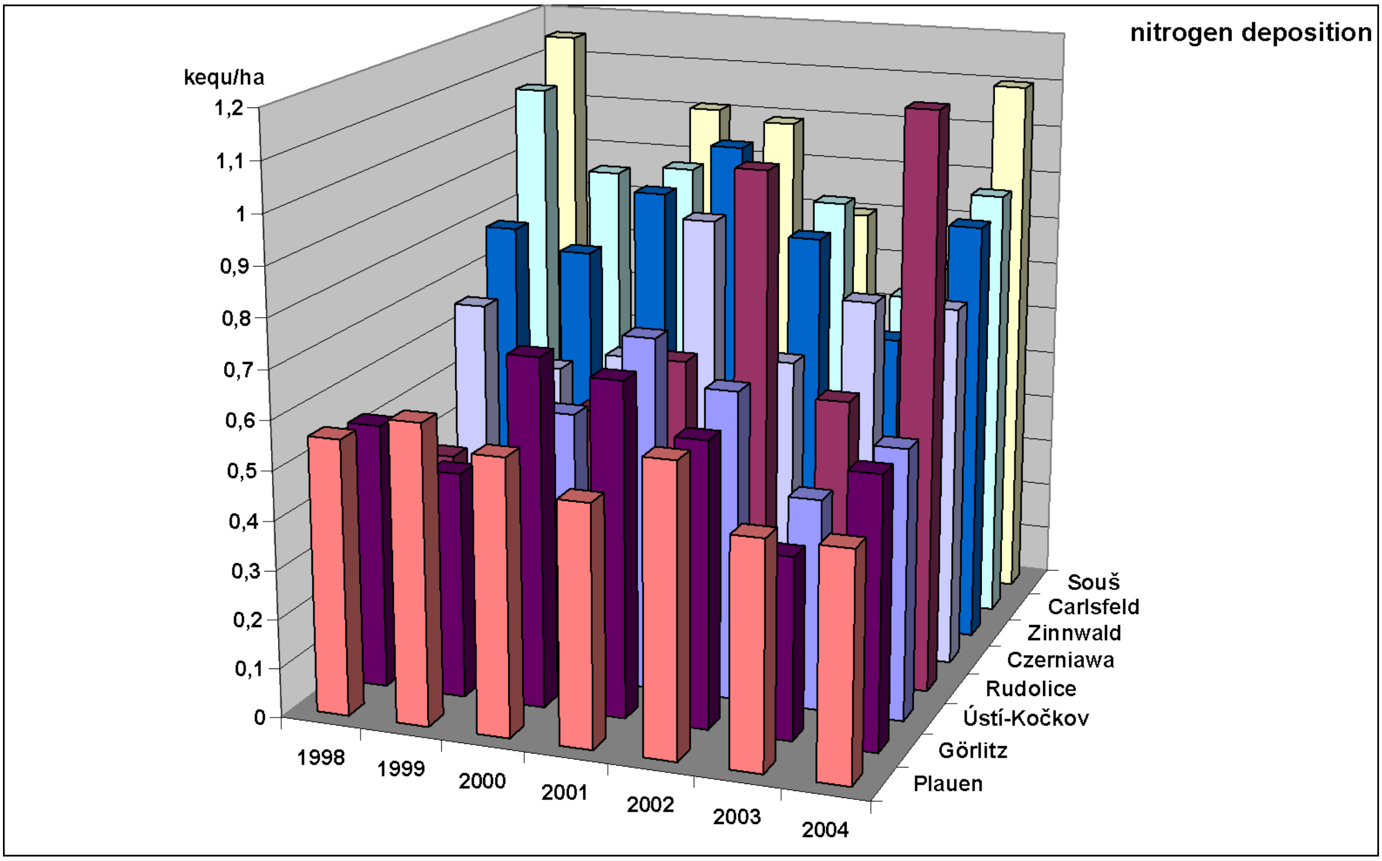


Table 21: Annual precipitation amount, sulphur and nitrogen deposition values for the years 1998 – 2004 at permanent measuring JAMS stations
Tabulka 21. Roční úhrny srážek, depozice síry a dusíku za roky 1998-2004 na nepřetržitě měřících stanicích společné monitorovací sítě
Tabelle 21: Jährliche Niederschlagsmengen, Schwefeldepositionen und Stickstoffdepositionen für die Jahre 1998-2004 für die Dauermessstellen des gemeinsamen Programms
Tabela 21. Roczna ilość opadu, depozycja siarki i depozycja azotu w latach 1998 – 2004 z pomiarów ciągłych stacji Wspólnego systemu monitoringu powietrza

Station	Rain [mm]						
	1998	1999	2000	2001	2002	2003	2004
Ústí-Kočkov*	635	539	546	706	777	378	646
Rudolice	500	441	587	615	1122	481	887
Souš	1673	1316	1466	1617	1473	984	1397
Carlsfeld	1437	1163	1291	1255	1487	912	1326
Görlitz	620	485	641	743	692	381	629
Plauen	634	630	579	601	790	445	642
Zinnwald	1101	923	994	1018	1365	619	1134
Czerniawa	821	596	811	1115	829	702	830

Station	SO_4^{2-}-S [kequ/ha]						
	1998	1999	2000	2001	2002	2003	2004
Ústí-Kočkov*	0.46	0.28	0.34	0.49	0.40	0.23	0.32
Rudolice	0.28	0.23	0.35	0.29	0.54	0.28	0.50
Souš	0.86	0.54	0.54	0.59	0.56	0.42	0.62
Carlsfeld	0.48	0.39	0.31	0.36	0.40	0.26	0.33
Görlitz	0.33	0.26	0.58	0.46	0.43	0.31	0.24
Plauen	0.24	0.26	0.43	0.19	0.22	0.19	0.19
Zinnwald	0.50	0.41	0.47	0.51	0.48	0.34	0.43
Czerniawa	0.58	0.34	0.34	0.49	0.33	0.40	0.36

Station	NO_3^- N+ NH_4^+ [kequ/ha]						
	1998	1999	2000	2001	2002	2003	2004
Ústí-Kočkov*	0.01	0.41	0.55	0.72	0.63	0.43	0.55
Rudolice	0.38	0.35	0.51	0.63	1.03	0.58	1.17
Souš	1.15	0.09	1.01	0.99	0.80	0.69	1.10
Carlsfeld	1.06	0.89	0.91	0.92	0.86	0.67	0.90
Görlitz	0.54	0.46	0.71	0.68	0.58	0.37	0.55
Plauen	0.56	0.61	0.56	0.49	0.59	0.46	0.46
Zinnwald	0.79	0.75	0.89	1.00	0.82	0.62	0.87
Czerniawa	0.66	0.54	0.58	0.88	0.60	0.74	0.74

* whole name of station: Ústí nad Labem - Kočkov

Figure 11. Annual mean values of sulphur dioxide in the Tri-border Region (1998 - 2004)
Obrázek 11. Roční průměrné hodnoty oxidu siřičitého v příhraniční oblasti (1998 - 2004)
Abbildung 11. Schwefeldioxid-Jahresmittelwerte im Dreiländereck (1998 - 2004)
Rysunek 11. Średnioroczne wartości stężeń dwutlenku siarki w trójgranicznym regionie (1998 - 2004)

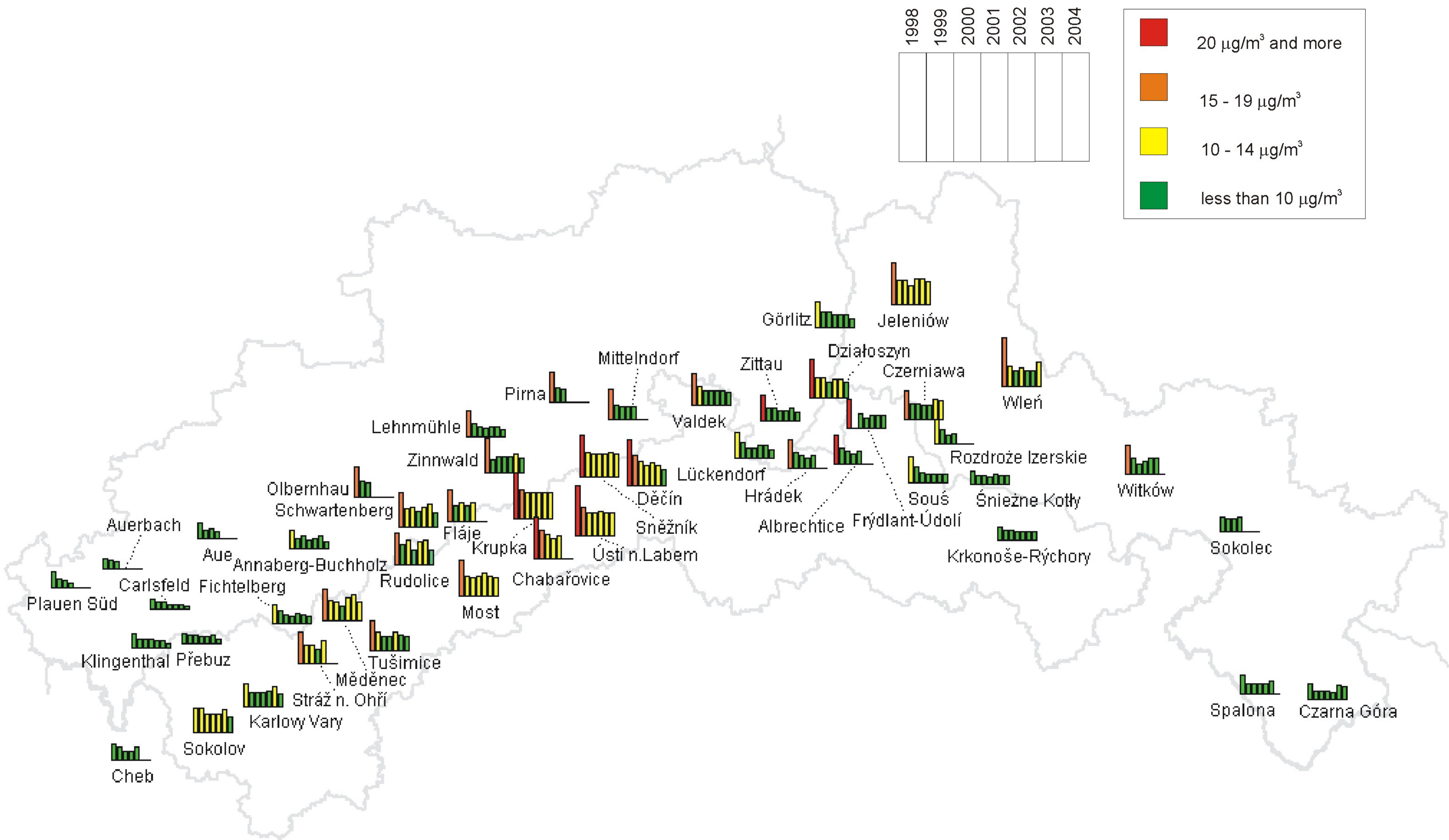


Figure 12. Annual mean values of nitrogen dioxide in the Tri-border Region (1998 - 2004)
Obrázek 12. Roční průměrné hodnoty oxidu dusičitého v příhraniční oblasti (1998 - 2004)
Abbildung 12. Stickstoffdioxid-Jahresmittelwerte im Dreiländereck (1998 - 2004)
Rysunek 12. Średnioroczne wartości stężeń dwutlenku azotu w trójgranicznym regionie (1998 - 2004)

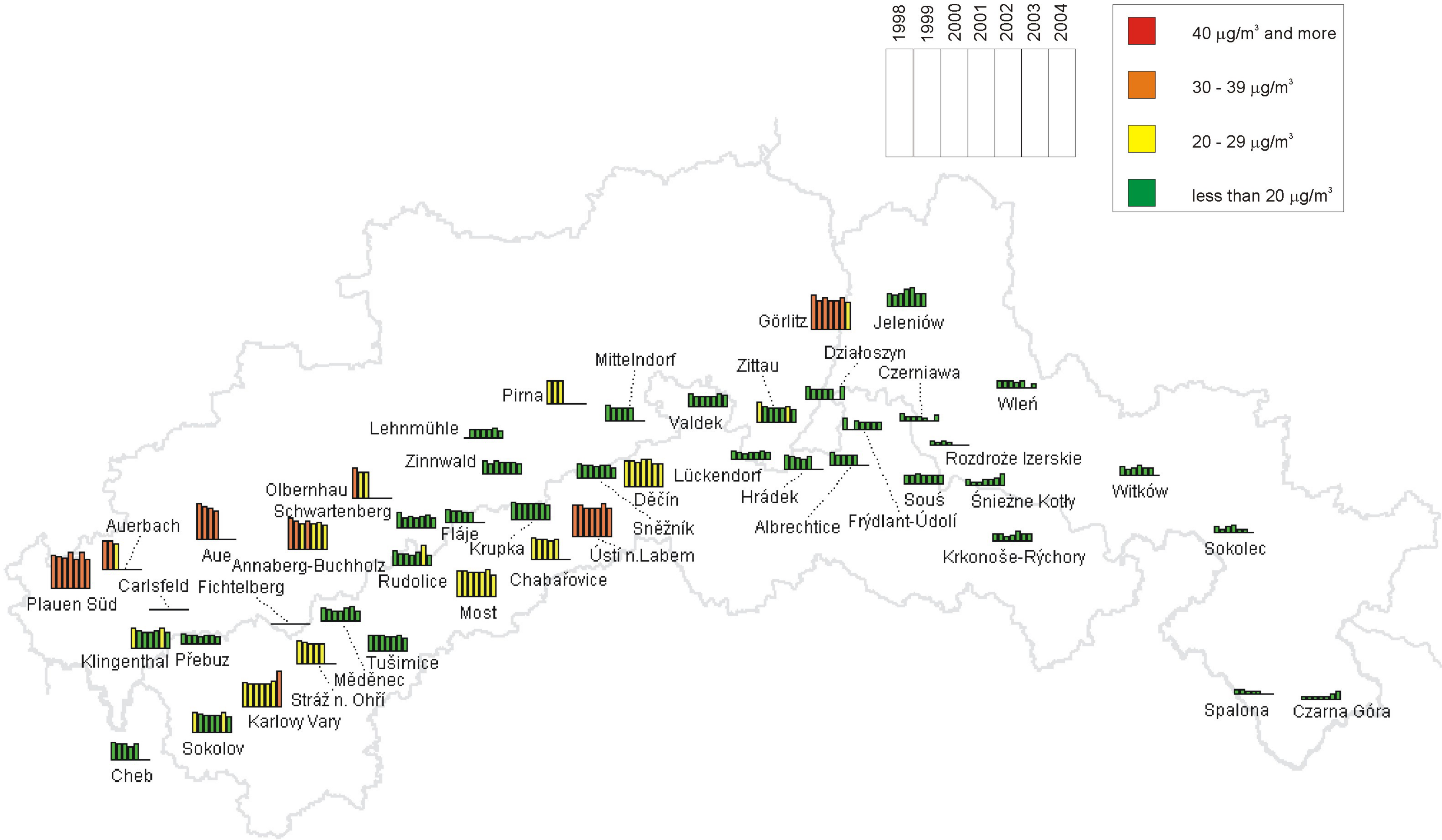


Figure 13. Annual mean values of suspended particulate matter PM_{10} in the Tri-border Region (1998 - 2004)
Obrázek 13. Roční průměrné hodnoty prašného aerosolu PM_{10} v příhraniční oblasti (1998 - 2004)
Abbildung 13. PM_{10}-Schwebstaub-Jahresmittelwerte im Dreiländereck (1998 - 2004)
Rysunek 13. Średnioroczne wartości stężeń pyłu zawieszonego PM_{10} w trójgranicznym regionie (1998 - 2004)

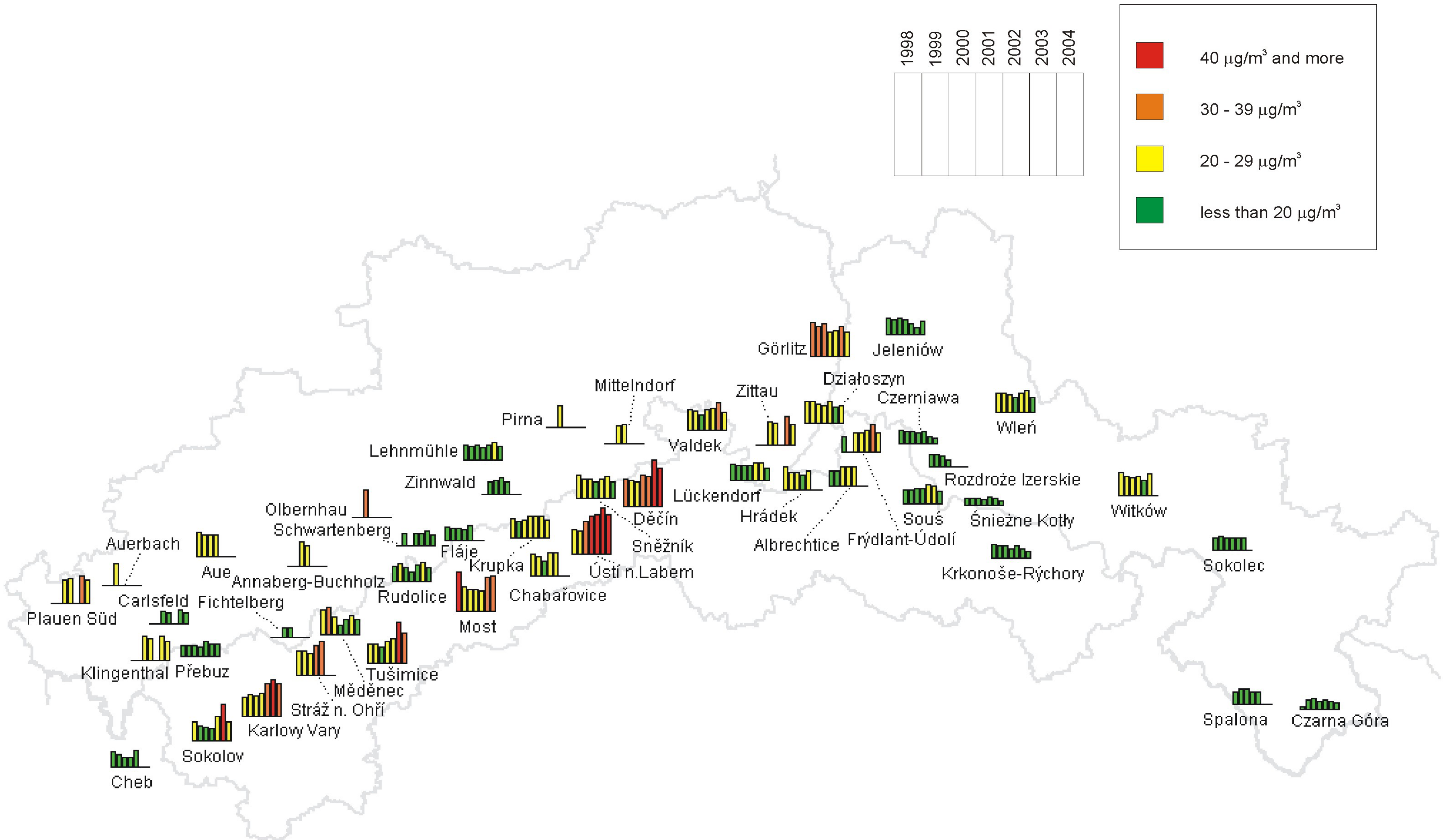


Figure 14. Heavy metal contains (cadmium, nickel and arsen) in PM_{10} as annual means in the Tri-border Region – 2004
Obrázek 14. Roční průměrné obsahu kadmia, niklu a arsenu těžkých kovů v PM_{10} v příhraniční oblasti - 2004
Abbildung 14. Jahresmittelwerte der Schwermetallgehalte (Cadmium, Nickel und Arsen) in PM_{10}-Staub im Dreiländereck - 2004
Rysunek 14. Średnioroczne zawartości metali ciężkich (kadmu, niklu i arsenu) w PM_{10} w trójgranicznym regionie - 2004

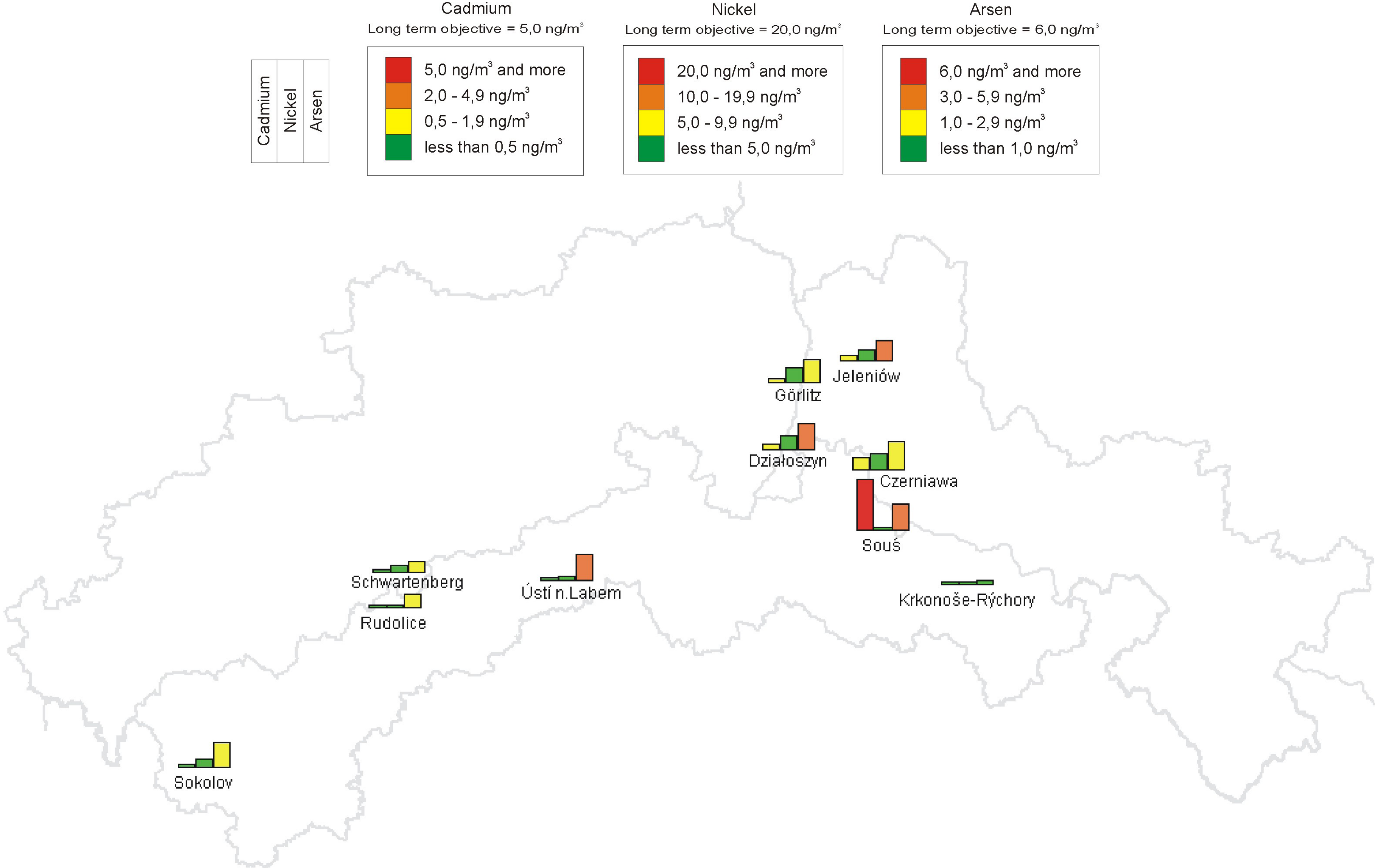
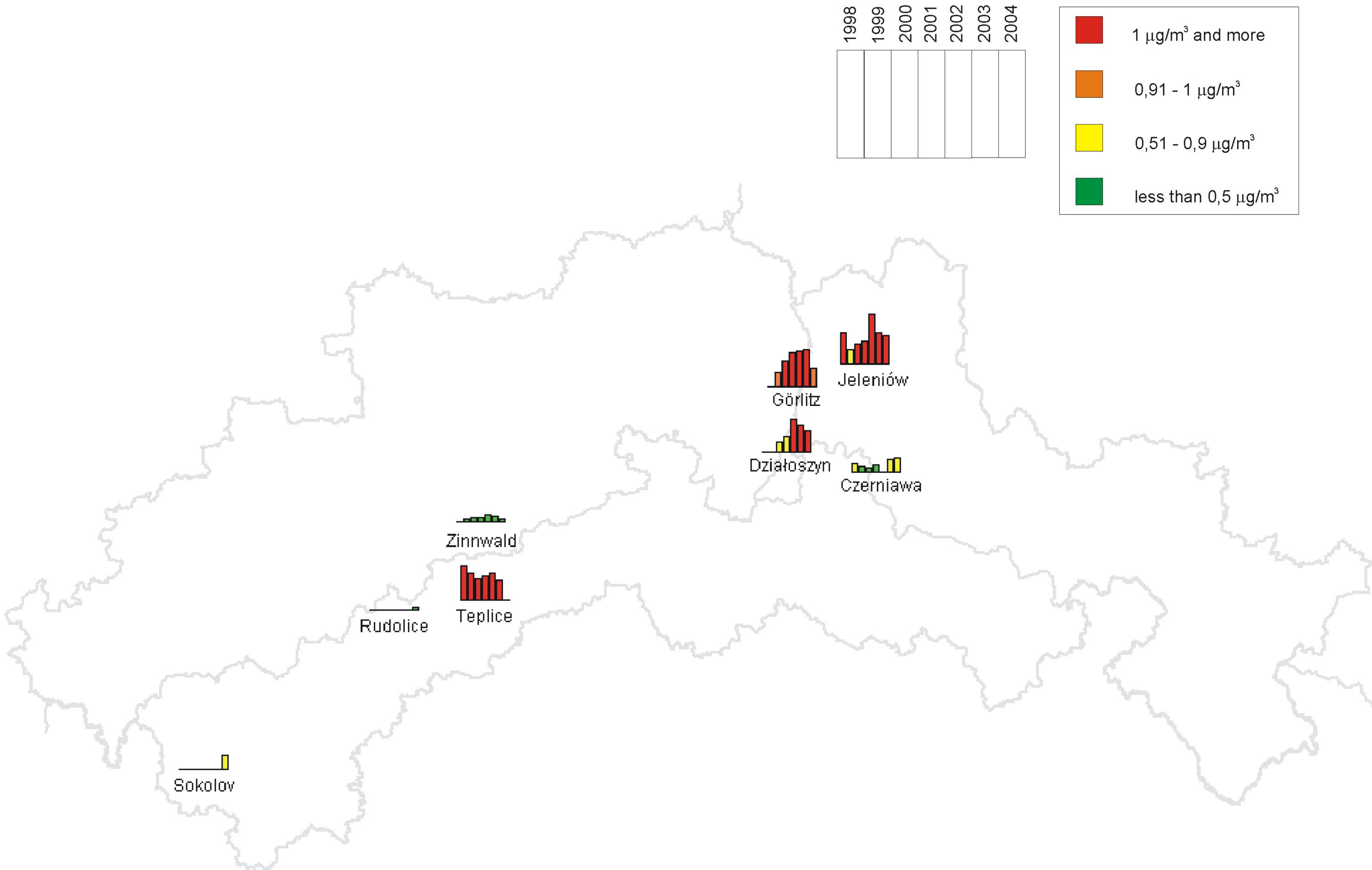


Figure 15. Annual mean values of BaP i in the PM_{10} n the Tri-border Region (1998 - 2004)
Obrázek 15. Roční průměrné koncentrace BaP v Pm_{10} v příhraniční oblasti (1998 - 2004)
Abbildung 15. Jahresmittelwerte fur BaP in PM_{10} im Dreiländereck (1998 - 2004)
Rysunek 15. Średnioroczne wartości stężeń BaP w Pm_{10} w trójgranicznym regionie (1998 - 2004)



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

3.4.1. Ozone episode

In the warm period from 1 April to 30 September 2004 cyclonic situations predominated (69 % of cases). The majority of anticyclonic situations occurred in September (they covered 43 % of the period), in April (40 %), in June (37 %) and in August (32%); only 13 % cases with anticyclonic character of the weather occurred in July. The most frequent situations were anticyclonic situations lasting for 1–3 days. There were three situations lasting for 7–10 days, namely in June, August and September. The analysis of meteorological situations shows that in the period between 1 April and 30 September 2004 conditions were not sufficiently favourable for the formation of ground-level ozone.

The period of elevated ground-level ozone concentrations in the Tri-border region occurred on 12 August 2004. Within the indistinctive higher pressure area a weak occluded front was decaying over central Europe. In the front side of the cyclone of 1000 hPa with the centre above the Bay of Biscay the inflow of warm air from southwest to central Europe culminated. The cold front above western Europe moved to the east and during the night hours crossed over the territory of the Czech Republic.

In the morning of 12 August 2004 the weather was almost clear, the afternoon was somewhat cloudy, the night was cloudy to overcast with storms and showers. The afternoon maximum temperatures exceeded 32°C in the Tri-border Region. The velocity of the wind, blowing from the south in the morning and in the afternoon from the east, did not exceed 3 m/s. During the night the wind got up to 4–7 m/s and veered to the west.

Beginning from 7 August the measuring stations in the Tri-border Region recorded the gradual increase in daily maximum ozone concentrations to 212 µg/m³ at Schwartenberg on 12 August 2004. The concentrations measured on this day reached about 180 µg/m³ at lowland stations in the Region and ranged between 150 and 212 µg/m³ at mountain stations. On the following day, after the cold front had passed, the ground-level ozone concentrations markedly decreased to values between 70 and 90 µg/m³ and the short ozone episode ceased.

Figure 16. Summer episode: Tušimice - lowland station (CZ)
Obrázek 16. Letní epizoda: Tušimice, nízko položená stanice (CZ)
Abbildung 16. Sommerepisode für die tiefgelegene Station Tušimice (CZ)
Rysunek 16. Epizod letni: Tušimice - stacja nizinna (CZ)

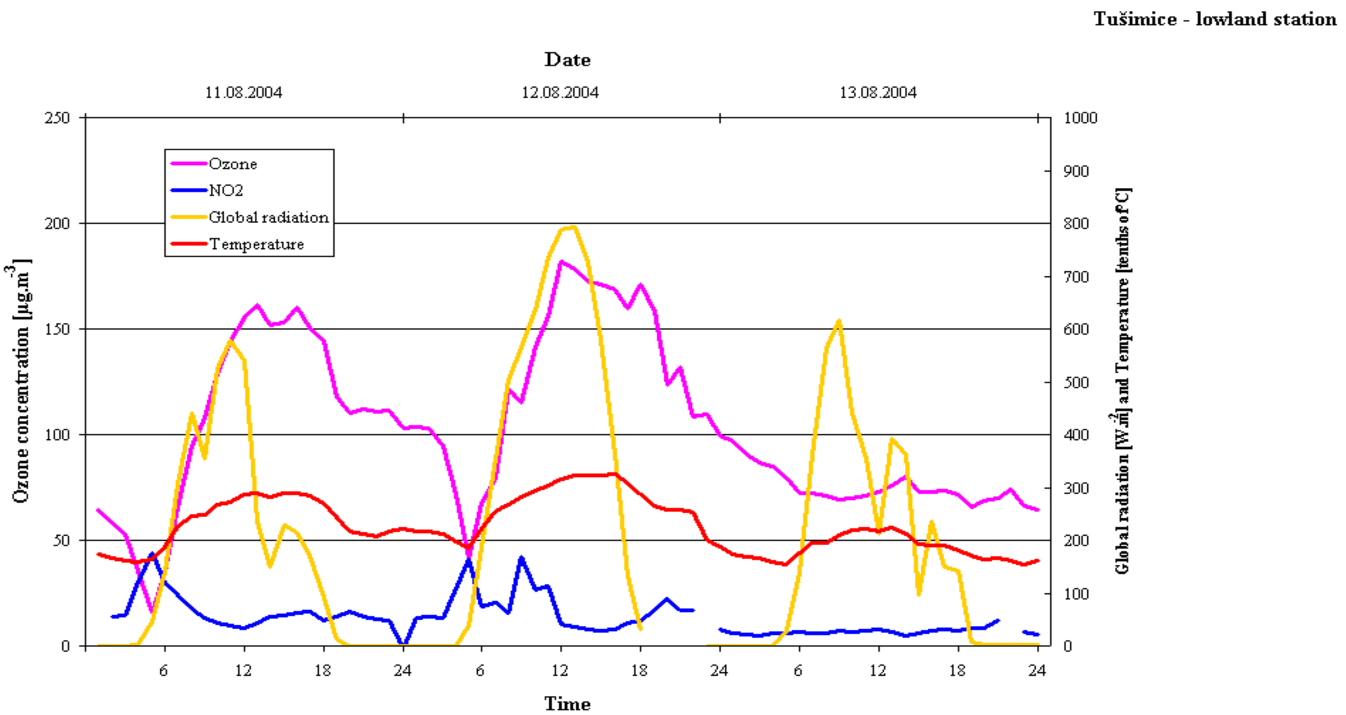


Figure 17. Summer episode: Rudolice-mountain station (CZ)
Obrázek 17. Letní epizoda: Rudolice, horská stanice (CZ)
Abbildung 17. Sommerepisode für die Bergstation Rudolice (CZ)
Rysunek 17. Epizod letni: Rudolice - stacja górska (CZ)

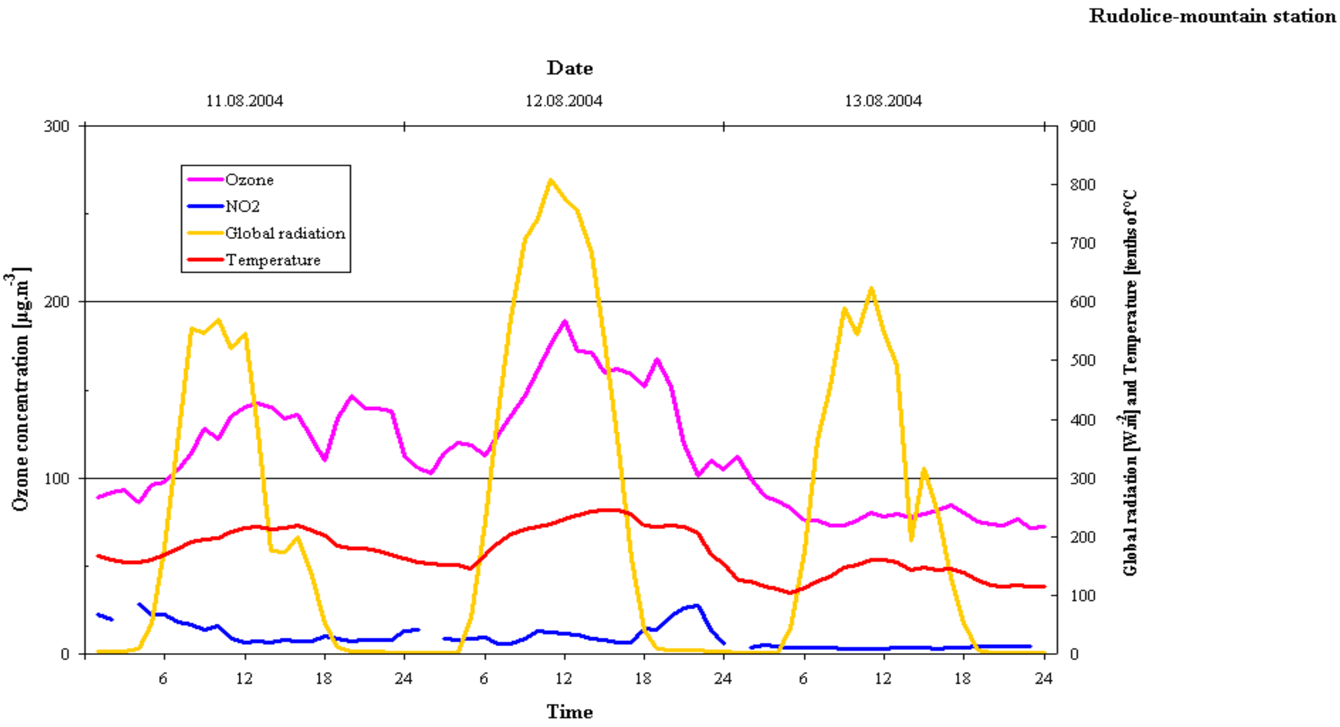


Figure 18. Summer episode: Niesky - lowland station (DE)
Obrázek 18 Letní epizoda: Niesky, nízko položená stanice (DE)
Abbildung 18. Sommerepisode für die tiefgelegene Station Niesky (DE)
Rysunek 18. Epizod letni: Niesky - stacja nizinna (DE)

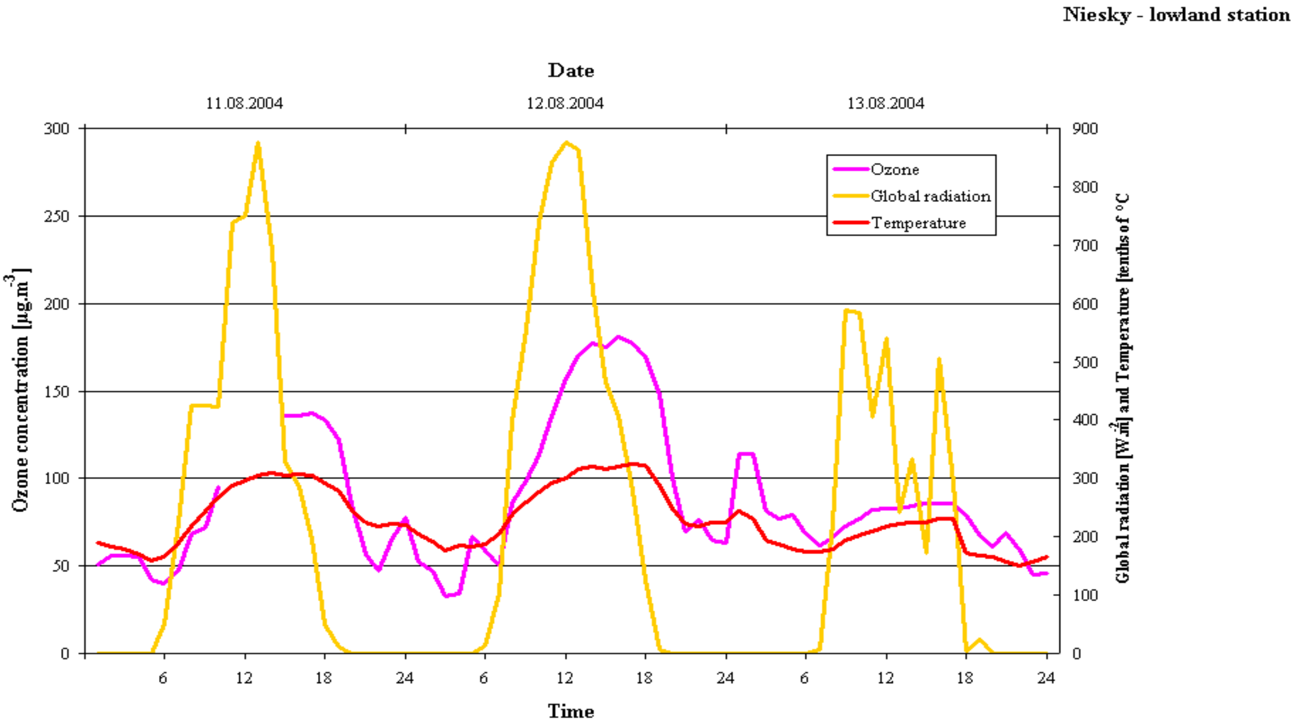


Figure 19. Summer episode: Schwartenberg - mountain station (DE)
Obrázek 19. Letní epizoda: Schwartenberg, horská stanice (DE)
Abbildung 19. Sommerepisode für die Bergstation Shwartenberg (DE)
Rysunek 19. Epizod letni: Schwartenberg - stacja górska (DE)

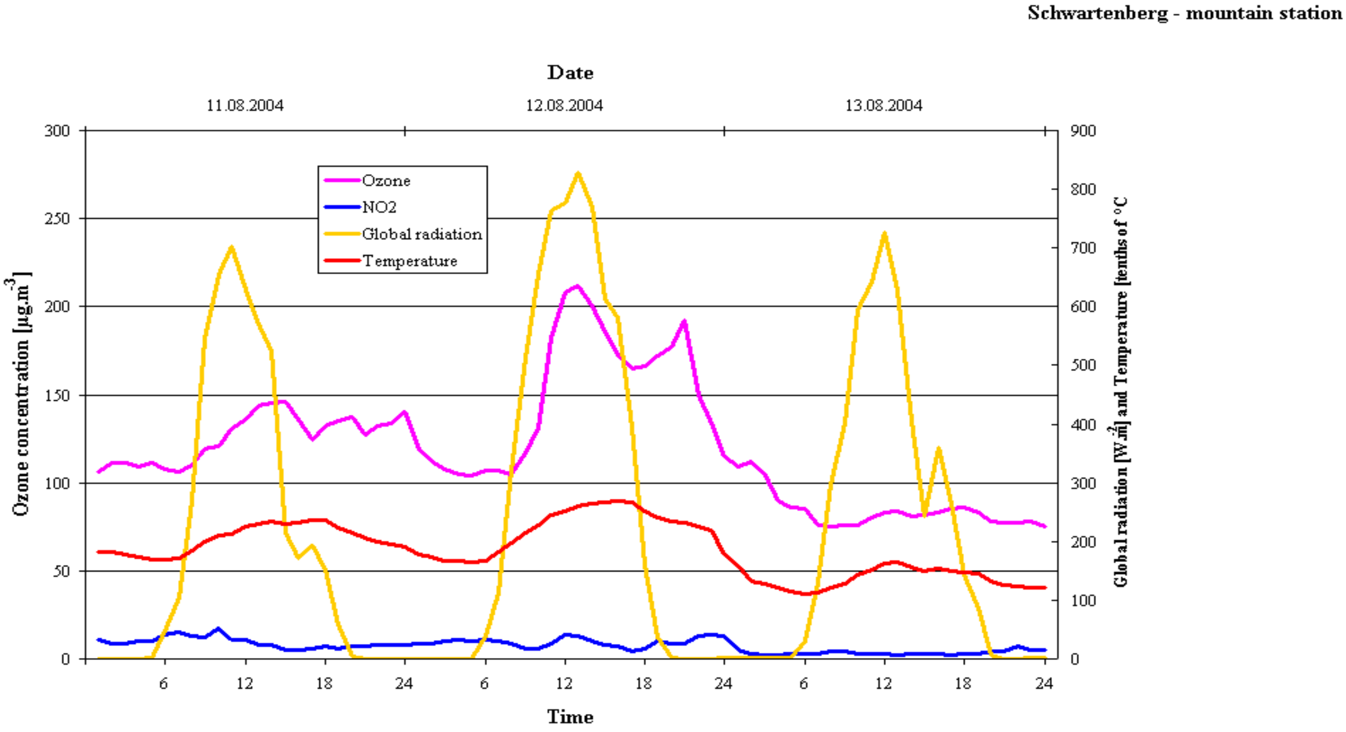


Figure 20. Summer episode: Jeleniów - lowland station (PL)
Obrázek 20. Letní epizoda: Jeleniów, nízko položená stanice (PL)
Abbildung 20. Sommerepisode für die tiefgelegene Station Jeleniów (PL)
Rysunek 20. Epizod letni: Jeleniów - stacja nizinna (PL)

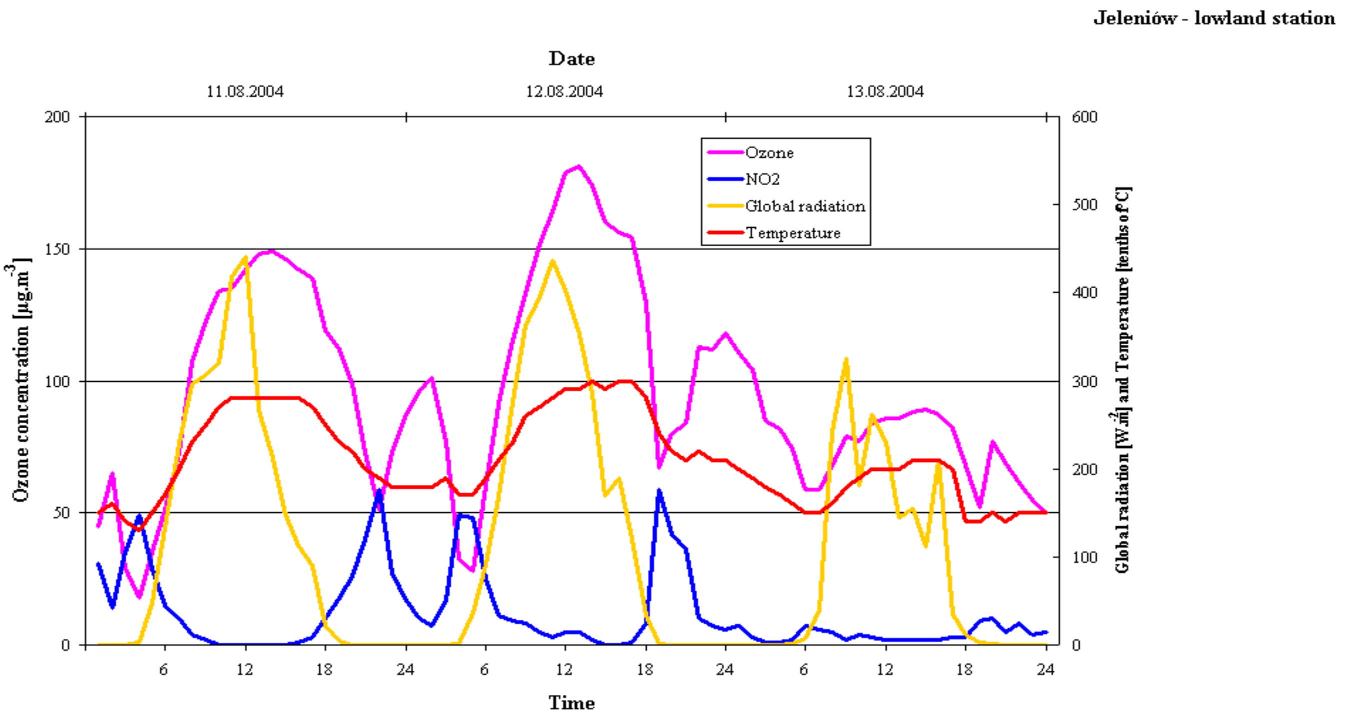
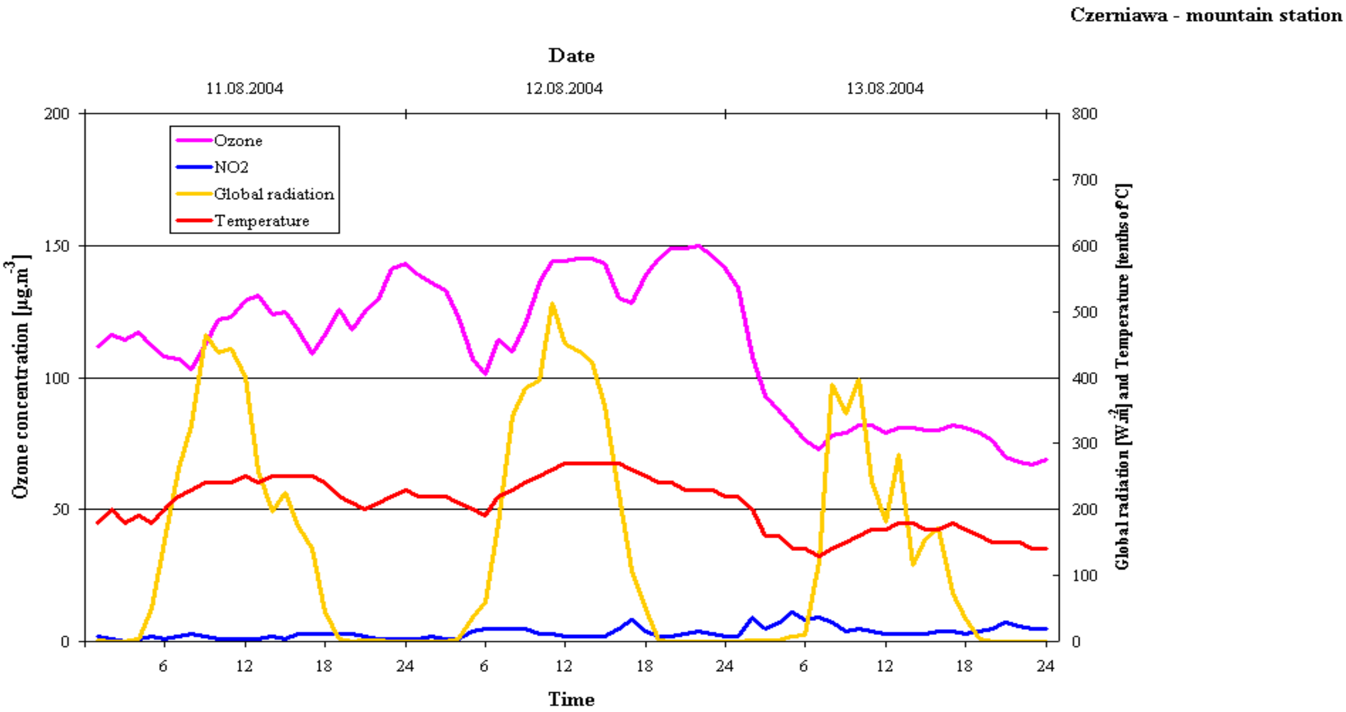


Figure 21. Summer episode: Czerniawa - mountain station (PL)
Obrázek 21. Letní epizoda: Czerniawa, horská stanice (PL)
Abbildung 21. Sommerepisode für die Bergstation Czerniawa (PL)
Rysunek 21. Epizod letni: Czerniawa - stacja górska (PL)



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 main 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 data. Participation in measurement comparisons, ring tests and joint controls of primary standards for air quality measurements remain very important to all the partners for assessing the quality of measurement systems.

Therefore, the institutions participating in the trilateral working group agreed to carry out a quality assurance programme for the measurement of gaseous air pollutants (SO_2, NO, NO_2, CO, benzene and ozone) as a part of the joint air monitoring system.

The last ring test was performed at the accredited calibrating laboratory of the Staatliche Umweltbetriebsgesellschaft Sachsen in Radebeul-Wahnsdorf in October 2003 and the next one is scheduled to take place at the CHMI accredited calibrating laboratory for air pollutants in Prague in October 2005.

5. Summary and conclusions

The description of ambient air quality is based on measurement results obtained in 2004 at all stations of the Tri-border Region Joint Air Monitoring System and at two Federal Environmental Agency stations situated in 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 16 years (from 1989 till 2004) 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 and still increasing source category of NOx emissions. Nitrogen oxides emissions increased slightly in 2004 in comparison with 2003.

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

For **sulphur dioxide** in ambient air, the limit values and alert threshold stated in Directive 1999/30/EC **were not exceeded** at any station in 2004.

Similarly, the limit values for **nitrogen dioxide** and **nitrogen oxides**, as well as the alert threshold **were not exceeded** at any station in 2004.

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

The **annual PM_{10}** limit value **was exceeded at 2 stations**: Ústí n.L.-město and Děčín.

For lead the annual limit value for human health protection was defined at 0.5 µg/m³ (Directive 1999/30/EC). The annual limit value for lead was not exceeded at any station.

For **carbon monoxide** the limit value for the protection of human health plus the corresponding margin of tolerance **was not exceeded** at any station.

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

Over the 3-year period from 2002 till 2004 the **ozone target value** (maximum daily 8-hour mean) **was exceeded at all measuring sites** situated in the Tri-border Region, mainly in rural areas, with the exception of the stations in Annaberg-Buchholz, Lehnmühle and Ústí n.L.-město.

In the 5-year period 2000 – 2004 the **AOT40 target value for ozone 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 Krkonoše-Rýchory and at the Polish station Czarna Góra.

Generally it can be concluded that acute ozone pollution (levels exceeding the information threshold) in 2004 occurred as rarely as in the preceding years. However the chronic ozone load, assessed with respect to the target values for the protection of human health and vegetation, is very high.

As regards ozone it has to be emphasized that the concentrations, in general, 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 the meteorological conditions on one hand and traffic on the other one have contributed to observed ozone level increases.

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

Annual mean concentrations of BaP in the PM_{10}-fraction for 2004 are lower than those for 2003, excluding Czerniawa, but there is no clear indication of a trend for the observed time period 1998 – 2004.

The BaP concentrations exceeded the set target value at rural-industrial and urban-traffic stations Görlitz and Plauen.

Rural background stations like Czerniawa and Zinnwald/Schwartenberg remained below the target value.

No clear trend has been detected for BaP and the other requested PAHs.

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

in Poland 0.55 – 1.03 g N/m^2/year
in the Czech Republic 0.77 – 1.63 g N/m^2/year
in Germany 0.65 – 1.26 g N/m^2/year.

Sulphur deposition levels showed the following ranges:

0.34 – 0.58 g S/m^2/year at the Polish stations,
0.31 – 0.68 g S/m^2/year at the Saxon stations
0.51 – 0.99 g S/m^2/year at the Czech stations.

Precipitation levels ranged from 533 mm in Jelenia Góra to 1397 mm in Souš in 2004.

Having analysed the measurement results for air pollution in the border region of the three countries, the following conclusions were drawn:

- **sulphur dioxide, carbon monoxide, benzene and lead concentrations are below the relevant limit values and do not pose a problem at the moment,**
- **ozone, PM_{10} particulate matter, heavy metals (except lead) and BaP showed a noticeable stagnation or an increase in concentrations.**

6. Recommendations for further work

1. The air quality data generated by the JAMS network will no longer be presented in the form of a detailed "Joint report on air quality in the Tri-border Region" in the future. Future information on air quality in the Tri-border area will be issued in accordance with Article 8(6) of the Framework Directive on Air Quality 96/62/EC and in a short web-based form.
2. The Working Group is responsible for the maintenance, development and usage of the JAMS including the common database. The Working Group is of the opinion that the data gathered represent valuable outcomes and is offering them to modellers and other exerts for further use..
3. The experience gained by the Working Group members through long-term cooperation underlines the need for continued contact and active cooperation between them. Currently they are preparing the project proposal – "Potential contribution of selected (big) sources to transboundary air pollution in the Tri-border-Region of the Czech Republic, Germany and Poland".
4. The Working group asks the CHMI to prepare and operate the envisaged web-based discussion and information exchange platform. The specification of the content of this platform is under discussion and should incorporate the annual information on the air quality status in the Tri-border Region.

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, Dessau,
- Polish representatives: the Voivodship Inspectorate for Environment Protection, Wrocław and Jelenia Góra.

This publication is the seventh Joint Trilateral Report.

The report focuses on measured values for atmospheric pollutants in 2004. In addition it covers emission trends since 1989 and ambient air quality development since 1996.

7. Websites and links to information on air pollution

Further information on the air quality in the Tri-border Region of the Czech Republic, Germany and Poland is given on the following websites:Czech Republic:

Czech Republic:

www.env.cz
www.chmi.cz
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.

Germany:

www.umweltbundesamt.de
www.umwelt.sachsen.de/lfug
http://www.umweltbundesamt.de/luft/infos/gesetze/index.htm

Poland:

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