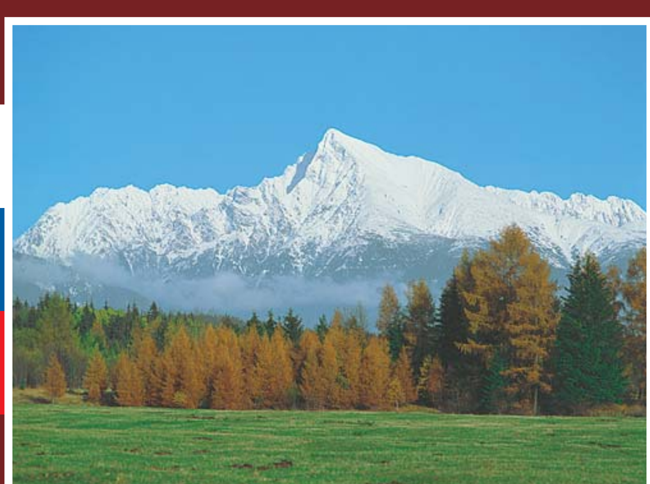
Ministry of the Environment
of the Slovak Republic

STATE OF THE ENVIRONMENT REPORT SLOVAK REPUBLIC 2007



Slovak Environmental
Agency

j. Klinda

*The aim of the **air quality** care is to sustain the air quality in places, where it is adequate, and to improve the air quality in other cases.*

§ 5 par. 1 of Act No. 478/2002 Coll. on Air Production, amending Act No. 401/1998 Coll. on Air Pollution Surcharges as subsequently amended (Air Act)

MAJOR CUMMULATIVE ENVIRONMENTAL PRESSURES

• CLIMATE CHANGES

In Slovakia, over the last 100 years, there has been recorded an increasing **trend in the average annual air temperature** by 1.1 °C, and reduction in annual precipitation balance by 5.6 % (south of the SR showed a reduction by more than 10 %, while the north and some sporadic northeast locations showed an increase up to 3 % over the whole century). Significant reduction in **relative air humidity** (up to 5 %) and **reduction in snowcap** almost in the whole of Slovakia were recorded. Characteristics of the potential and actual evaporation, soil humidity, global radiation and radiation balance also prove that the south of Slovakia is gradually drying up (potential evapo-transpiration rises and soil humidity decreases); however, no substantial changes were detected in solar radiation characteristics (with the exception of temporary reduction in the years 1965-1985).

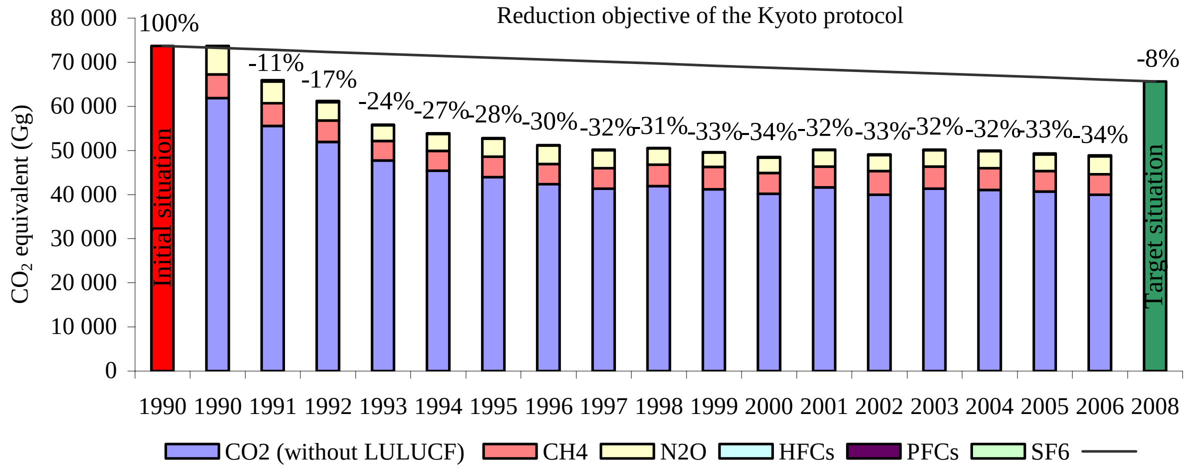
Special attention is given to characteristics of climate variability, especially **precipitation balances.** Over the last 7 years, there was a significant increase in the occurrence of extreme daily precipitation figures, which consequently produced a significant increase in local floods in various regions of Slovakia. On the other hand, mainly in the years 1989-2002, there was a more frequent occurrence of local or overall drought, which was caused mainly by long periods of relatively warm weather patterns. Especially harmful were droughts in the periods of 1990-1994, 2000, and 2002.

International obligations in the area of climate changes

At the UN Conference on Environment and Development (Rio de Janeiro, 1992) was adopted **framework Convention on Climate Change** – basic international legal instrument for protection of global climate. The convention became effective in the Slovak Republic on November 23, 1994. Slovakia accepted all obligations stemming from the Convention, including the obligation to decrease greenhouse gases emissions by the year 2000 to the level of 1990. Aggregated emissions of greenhouse gases in 2000 (47.448 Gg CO_2 equivalent) did not exceed the level of 1990 (73.679 Gg CO_2 equivalent).

Next internal goal that Slovakia set to achieve was to reach the „Toronto Objective" i.e. 20 % reduction in emissions by 2005, compared to 1988. At the conference of signatories to the UN Framework Convention on Climate Change in Kyoto, Japan, in December 1997, Slovakia bound itself to reduce the production of greenhouse gases by 8 % by 2008, compared to 1990, and to continue keep the same level until 2012. The Protocol became effective after its ratification by the Russian Federation, on February 16, 2005, which is the 90th day after its signing by at least 55 countries, including the countries listed in Annex 1, that contribute by at least 55 % to total CO_2 emissions for the year 1990 as listed in Annex B accompanying the article 25 of the Kyoto Protocol.

Assessment of anthropogenic emission of greenhouse gases under compliance with the Kyoto protocols outcomes



Source: SHMI

Balance of greenhouse gases emissions

On the basis of **greenhouse gases emissions** assessed under the IPCC methodology (Intergovernmental Panel of Climate Change) in 2006, total anthropogenic CO_2 emissions, without deducting detections in the LULUCF sector (Land use, land use change and forestry), reached the value of 39 984.02 Gg. Sink of carbon dioxide in forest ecosystems in 2006 was -3 028.72 Gg (appr. -2 388.50 Gg in 1990). Total CH_4 emissions in 2006 reached the value of 220.36 Gg (256.93 Gg in 1990), while total NO_2 emissions in the same year reached 13.03 Gg (19.91 Gg in 1990). Anthropogenic emissions of greenhouse gases reached their highest level in the late 80-ties, while in 2006 their levels dropped by 34 %, compared to the reference year of 1990.

Aggregated greenhouse gases emissions constitute total emissions of greenhouse gases expressed as the CO_2 equivalent, calculated through the GWP 100 (Global warming potential). In 2006, CO_2 emissions represent more than 83 %, CH_4 emissions are on the level over 9 %, while N_2O emissions contribute 8 %, and the share of the F-gases (HFC, PFC, and SF_6) is less than 1 %.

Share of individual industries on the production of greenhouse gases remains very similar to the year 1990. The area of agriculture shows the most significant difference, with the reduction in emissions by 3.1 %, compared to 1990. This change was caused mainly by a reduced use of industrial fertilizers and reduced numbers of livestock. Industrial processes and waste noticed in 2006 accumulation share of greenhouses gases emissions.

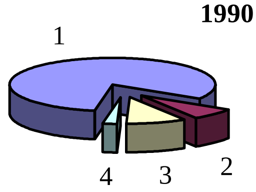
Aggregated emissions of greenhouse gases (Tg) in CO_2 equivalents

Tg (CO_2 equivalent)	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Net CO_2	43.41	42.12	41.22	39.92	39.92	39.98	39.59	37.79	36.42	34.73	36.53	36.81	39.83	36.93
CO_2*	47.69	44.44	43.92	42.37	41.33	41.92	41.23	40.20	41.64	39.97	41.36	41.07	40.70	39.98
CH_4	4.47	4.45	4.64	4.58	4.63	4.86	5.07	4.68	4.73	5.33	4.96	4.93	4.63	4.63
N_2O	3.51	3.85	4.08	4.21	4.10	3.70	3.25	3.52	3.72	3.68	3.72	3.82	3.79	4.04
HFCs, PFCs, SF_6	0.16	0.14	0.15	0.08	0.11	0.08	0.09	0.10	0.11	0.13	0.17	0.19	0.21	0.25
Total (with CO_2)	51.54	50.57	50.10	48.83	48.76	48.64	48.03	46.11	44.99	43.89	45.39	45.77	48.48	45.87
Total*	**55.83**	**53.88**	**52.79**	**51.24**	**50.16**	**50.57**	**49.65**	**48.50**	**50.20**	**49.11**	**50.20**	**50.00**	**49.33**	**48.90**

Emission were assessed by 15.04.2008 Source: SHMI
The table shows calculated years 1990-2005
** Emissions without deducting the sinks in the sector of LULUCF (Land use-Land use change and forestry)*

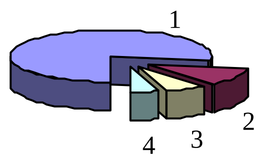
Share of individual sources on greenhouse gases emissions

1990



1990	Source	2006
81.2 %	1. Power Industry	76.2 %
7.1 %	2. Industry Processes	12.2 %
9.6 %	3. Agriculture	6,5 %
2.1 %	4. Waste	5.2 %

2006



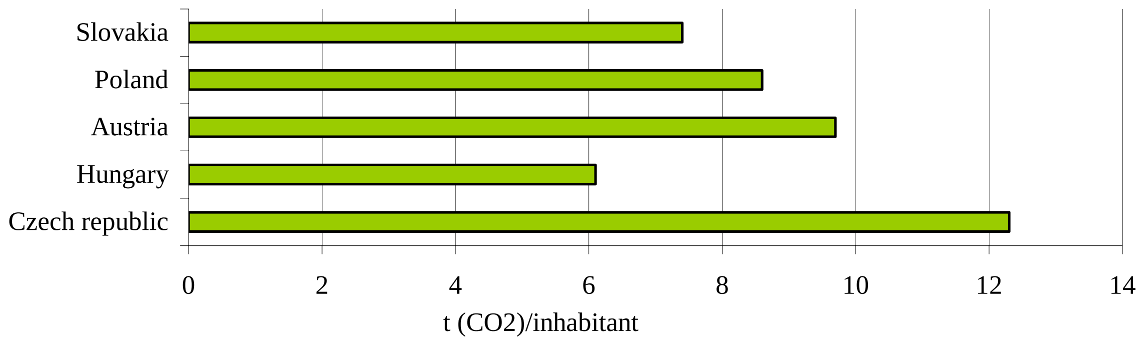
Emission were assessed by 15.04.2008 Source: SHMI

Aggregated emissions of greenhouse gases (Tg) by sectors in CO_2 equivalents

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Power Industry*	46.54	44.02	42.35	40.78	39.65	39.62	38.85	38.33	39.67	37.89	39.54	38.37	37.96	37.19
Industry Processes**	3.43	4.12	4.43	4.57	4.62	5.06	4.87	4.63	4.89	4.82	4.68	5.67	5.62	5.94
Using solvents	0,02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.06	0.06	0.08	0.09	0.08
Agriculture	4,39	4.12	4.39	4.22	4.02	3.71	3.47	3.48	3.53	3.55	3.41	3.23	3.22	3.16
LULUCF	-4.27	-3.31	-2.68	-2.41	-1.39	-1.93	-1.62	-2.39	-5.21	-5.23	-4.81	-4.23	-0.85	-3.03
Waste	1.45	1.52	1.59	1.64	1.85	2.16	2.44	2.03	2.09	2.80	2.52	2.65	2.45	2.53

Emission were assessed by 15.04.2008 Source: SHMI
The table shows calculated years 1990-2005
** Including the traffic*
*** Including the F-gases*

Comparison in CO emissions in selected countries – in 2005



Source: Eurostat

*The limit value of air pollution is **the level of air pollution** defined in order to avert, prevent or diminish harmful impact on human health, which should be reached in particular time, and from that time on it shall not be exceeded.*

§2 letter e/ of the Act No 478/2002 Coll. on Air Protection

• ACIDIFICATION

Air Acidification

Slovakia is a signatory to the **UN Economic Commission Convention on Long-Range Trans-boundary Air Pollution** (which became effective for ČSFR in March 1984 and Slovakia being its successor since May 1993). This Convention became the basis for protocols which also spelled out obligations for the signatories to reduce individual anthropogenic emissions of pollutants contributing to global environmental problems. The following text shows how individual protocol's obligations in the area of acidification are met:

➢ ***Protocol on further reduction of sulfur emissions***

This protocol was signed in Oslo in 1994. Ratified by the Slovak Republic in January 1998 the protocol became effective in August 1998. Obligations of the Slovak Republic to reduce the SO_2 emissions as set forth in the Protocol (compared to the reference year of 1980) include:

Obligation to reduce SO_2 emission pursuant to Protocol on further reduction of sulfur emissions

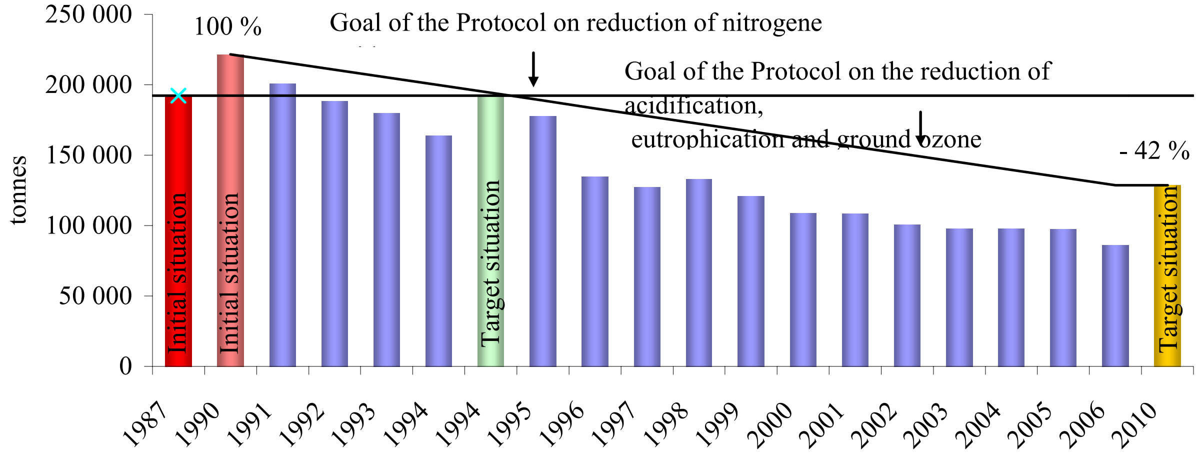
Year	1980 (initial year)	2000	2005	2010
SO_2 emission (thous. t)	843	337	295	240
SO_2 emission reduction (%)	100	60	65	72

Slovakia met one of its Protocol objectives to reduce the SO_2 emissions in 2000 by 60 % compared to the reference year of 1980. In 2000 sulfur dioxide emissions reached the level of 126.952 thousand tons, which is 85 % less than in the years 1980. In 2005 it was 89 thousand tons, which is 89 % less then in the year 1980.

➢ ***Protocol on the Reduction of Acidification, Eutrofication and Ground Ozone***

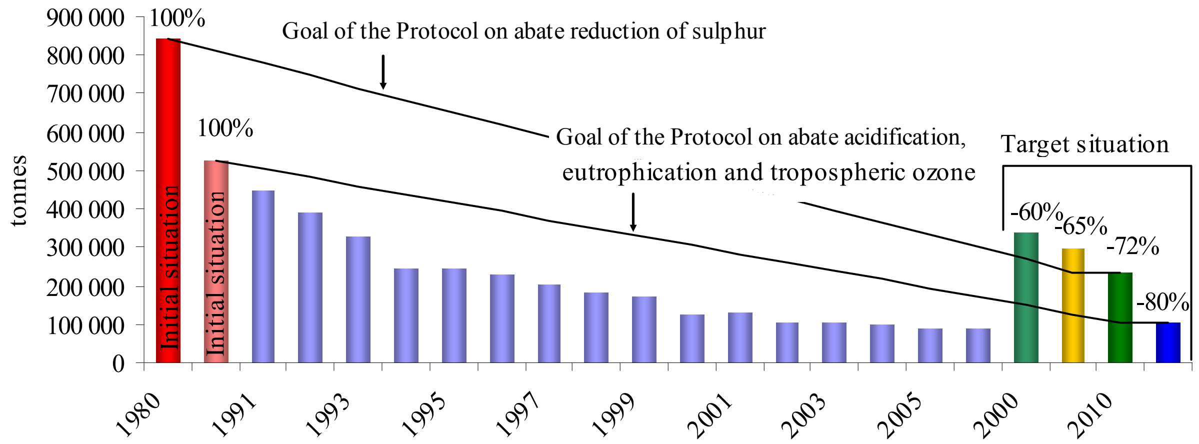
The protocol was signed in Göteborg in 1999. Slovakia signed the protocol in 1999 and ratified in 2005. Slovakia obliged itself to reduce the SO_2 emissions by 2010 by 80 %, the NO_2 emissions by 2010 by 42 %, the NH_3 emissions by 2010 by 37 % and the VOC emissions by 2010 by 6 % in comparison to the year 1990. Slovakia has the potential to fulfill this obligation.

Trend in NO_x emission with regard to following the outcomes of international agreements



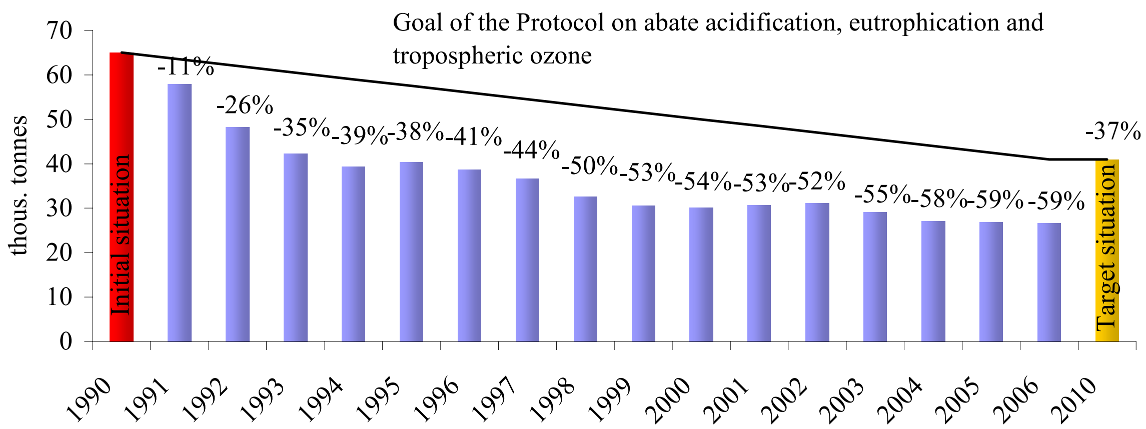
Source: SHMI

Trend in SO_2 emission with regards to following the outcomes of international agreements



Source: SHMI

Trend in NH_3 emission with regard to following the outcomes of international agreements



Source: SHMI

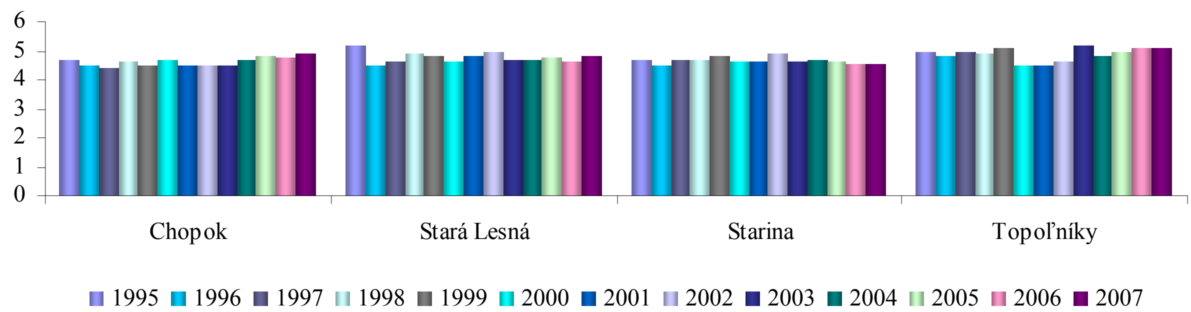
During the period of the years 1990-2006 in case of SO_2 and HN_3 the recorded reduction in emissions was obvious (with slight deviations in some years). Nitrogen oxides emissions showed a slight decrease only in 1995 and 1998 their increase was caused by increased natural gas consumption by retail consumers.

Acidity of atmospheric precipitations

Natural acidity of precipitation water in equilibrium with carbon dioxide has the pH of 5.65. Atmospheric precipitations are considered acidic if the bulk charge of the acidic anions is greater than the charge of cations and the pH value is below 5.65. Sulfates by approximately 60-70 % and nitrates by approximately 25-30 % contribute to the acidity of precipitation water.

In 2007, total **atmopheric precipitations** at regional stations were between 551 and 1 087 mm. Upper limit of the interval was occupied by the highest located station of Chopok, while the bottom limit was occupied by Topoľníky, with the lowest altitude. Acidity of atmospheric precipitations was dominant at Starina, copying the lower limit of the pH interval of 4.54 - 5.07. Time sequence and pH trend over a longer time period show a reduced acidity. pH values well correspond with the pH values by the EMEP maps.

Trend of pH precipitation



Source: SHMI

Concentrations of dominant sulfates in precipitation water showed the interval of 0.49 - 0.54 $mg.l^{-1}$. Interestingly, sulphate concentrations at three highest located stations are equal in annual average, they are only slightly lower at Topoľníky. The overall reduction in sulfate concentrations over a long period corresponds to the reduction of SO_2 emissions since 1980. Values for wet deposition of sulphates were ranging between 0.27 to 0.59 $g.S.m^{-2}.r^{-1}$. So far, no critical loads have been set in Slovakia for wet deposition. In USA and Canada, wet deposition value of 0.7 g $S.m^{-2}$ per year for sulphates is considered the critical load for forests.

Nitrates that show less influence on the acidity of precipitations than sulfates showed the concentration interval of 0.28 - 0.38 mg $N.l^{-1}$. Ammonia ions also belong to the major ions, with their concentration interval representing 0.32 - 0.58 $mg.l^{-1}$.

Wet deposition of sulphates ($g.S.m^{-2}.r^{-1}$) - 2007

Station	Wet deposition of sulphates $g.S.m^{-2}.r^{-1}$
Chopok	0.59
Stará Lesná	0.43
Starina	0.40
Topoľníky	0.27

Source: SHMI

Lead concentrations in atmospheric precipitations were between 0.92 µg/l (Topoľníky) and 1.99 µg/l (Starina). All stations showed lower Pb values, compared to 2006. The greatest difference was recorded at Chopok.

Cadmium concentrations were ranging between 0.04 µg/l (Topoľníky) and 0.09 µg/l (Stará Lesná). Compared to 2006, Cadmium values were lower at all stations.

With the exception of Chopok and Statá Lesná, **Zinc** values at the other stations were higher, when compared to 2006.

Arsenic showed greatest reduction at Chopok, compared to the other stations. With the exception of Starina, **nickel** and **chromium** values at the other stations were lower, compared to 2006.

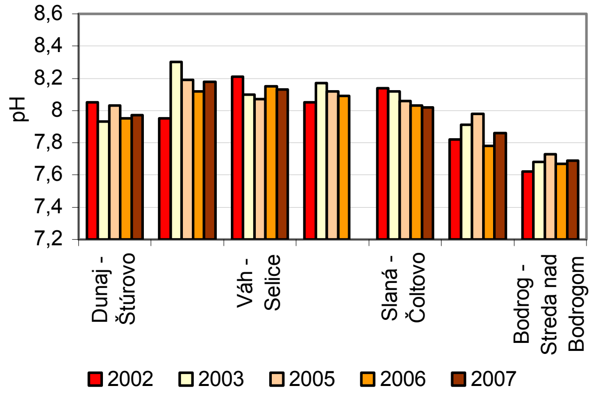
Copper content decreaseed most at Chopok, less in the other station, and at Starina there was higher concentration than in the previous year.

Lead and **cadmium** in precipitations represent metals of the highest quality. It has not been possible to assess them in a more complex way due to the short time span, just like the other mentioned metals monitored since 2002.

Acidification of surface water

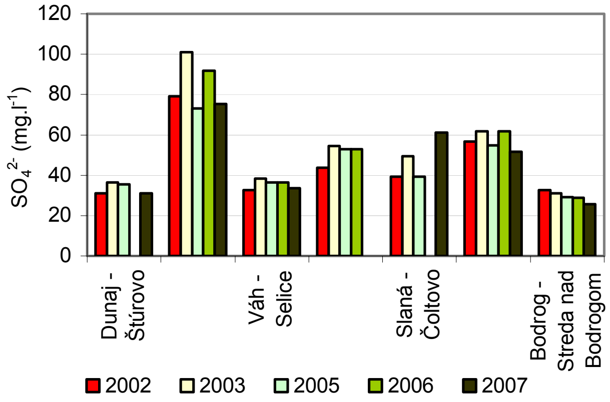
In general, considering the diversity of the rock aquifer, soil types, hydrological and climate conditions, general assessment of acidification renders itself difficult. Surface water acidification fluctuates depending on the season, especially in running water. Surface stream and lake water is most acidic in spring. In total we can say that the trend in the pH values sulfate concentrations and alkalinity of surface water show variable and fluctuating characteristics. Currently thanks to valid legal standards for releasing acidification mixtures the content of atmospheric and precipitation sulfates and nitrates dropped, meanwhile reducing the risk of acidification of surface and groundwater.

Trend in pH in selected Slovak watercourses (annual average values)



Source: SHMI

Trend in sulphates in selected Slovak watercourses (annual average values)



Source: SHMI

Acidification of soils

Acidification as a process of raising the soil's acidity represents one of the important processes of chemical degradation. Ability of the agro-ecosystem to cope with natural and anthropogenic acidification is defined by the capacity and potential of the buffering function of the soil. This reflects a degree of soil resistance to acidification.

Partial Monitoring System - Soil, provides information on the state and development of acidification of agricultural soil. Monitoring of acidification of forestland is part of the whole-European forest monitoring programme.

Outcomes from the Partial Monitoring System - Soil (PMS-S) showed that during 1993 through 1997 there were statistically negligible changes and stabilisation processes in soil acidification. On the contrary, outcomes from the third monitoring cycle with the extraction year of 2002 showed significantly greater acidification tendencies, especially in case of mollic fluvisols, cambisols, podsols, rankers, and lithomorphic soils.

Content of active aluminium was in negative correlation with soil reaction values. The chart shows its content growing significantly with reduction in soil reaction.

Shown pH values dependent on active aluminium in selected SR soils for the A horizon within the basic partial monitoring system (PMS-P) in third monitoring cycle (active Al determined in soils with pH in KCl of < 6.0)

Soil representative	pH in KCl	Al in $mg.kg^{-1}$	Al^{3+}/Ca^{2+}
		x	
Cambisols on vulcanite - PG	4.86	45.79	5.40
Cambisols on acidic substrates and AL shale	5.50	4.38	0.50
Cambisols on acidic substrates and PG shale	4.40	80.64	1.87
Cambisols and planosols on AL flysch	5.53	42.24	0.63
Cambisols and planosols on PG flysch	4.67	107.51	1.41
Mollic fluvisols on non-carb. fluvial AL sediments	4.85	4.22	0.12
Fluvisols on non-carb. fluvial AL sediments	5.66	85.83	2.46
Pseudogley on polyg. AL loess soils	5.78	8.16	1.22
Pseudogley on polyg. PG loess soils	5.52	11.78	0.15
Luvisols on AL loess	6.12	5.14	0.44
Podsols, rankers, and litosols var. silicate PG	3.16	661.35	58.81

AL – arable land, PG – permanent grassland, x – arithmetic average

Source: SSCRI

*The mass media regularly and free of charge inform the public about the **situation of the ozone layer of the Earth** and about the values of the ultra-violet radiation falling on the area of Slovak Republic.*

§ 13 par.1 of the Act No. 76/1998 Coll. on Protection of the Ozone Layer of the Earth ... as amended by the Act No. 408/2000 Coll. and the Act No. 553/2001 Coll.

• OZONE LAYER DEPLETION

International liabilities concerning ozone layer protection

Due to the urgency of this global problem, the international community adopted at its UN platform a number of steps to eliminate the ozone layer depletion. First international forum with the first-ever mentioning of the ozone layer took place in Vienna in 1985, with the **Vienna Convention on the Ozone Layer Protection** signed there. In 1987, this document was closely followed by adopting the first enforcing protocol to the **Montreal Protocol on Ozone-depleting Substances**. Since that year, signatories to the Montreal Protocol met five times (in London (1990), in Copenhagen (1992), in Vienna (1995), in Montreal (1997) and in Beijing (1999)), to limit or, if necessary, totally eliminate the production and consumption of substances that deplete the ozone layer.

Slovakia made effective the **Montreal Annex** to the Montreal Protocol on February 1, 2000. This document prohibits Slovakia to import and export all controlled substances, including methyl bromide, from and to non-signatory countries, as well as sets forth the obligation to introduce a licensing system for import and export of controlled substances. In 2002, Act 408/2000 Coll. was adopted, which amends Act 76/1998 Coll. on the Earth's ozone layer protection and on amendment to Act 455/1991 Coll. on small business (Small Business Act) as amended, which transposed the decisive majority of responsibilities stipulated under the European Parliament and Commission Directive 2 037/2000 EC and banned the production of brom-chloro-methane, creating conditions for ratification of the **Beijing Annex** of the Montreal Protocol. (for Slovakia effective as from August 20, 2002).

Consumption of controlled substances

Slovakia does not produce any ozone-depleting substances. All such consumed substances come from the export. These imported substances are used mainly in cooling agents and detection gases, solvents, and cleaning chemicals.

Consumption of substances under control in SR during 1995-2007 (tons)

Group of substances	1986/89	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
AI - freons	1 710.5	379.2	1.21[1)]	2.05[1)]	1.71[1)]	1.69[1)]	2.07	4.1	0.996	0.81	0.533	0.758	0.29	0.43
A II - halons	8.1	0	0	0	0	0	0	0	-	-	-	-	-	-
BI* - freons	0.1	0	0	0	0	0	0	0	-	-	-	-	-	-
B II* - CCl4	91	0.6	0	0.16[1)]	0.07	0.08	0.022	0.03	0.01	0.009	0.047	0.258	0.045	0
BIII* - 1,1,1 trichloroethane	200.1	69.4	0	0.11[1)]	0	0	0	0	-	-	-	-	-	-
C I*	49.7	37.2	61.00	59.90	90.48	44.92	64.73	66.8	71.5	52.91	38.64	48.76	43.94	41.32
C II - HBFC22B1	-	-	14.30	0	0	0	0	0	-	-	-	-	-	-
E - CH_3Br**	10.0	-	9.60	5.60	10.20	0	0	0.48	0.48	0.48	0.48	0	-	0
Total	2 019.5	449.2	86.10	61.81	102.50	46.69	66.82	71.4	72.986	54.21	39.7	49.78	44.28	41.75

[#] Initial usage * Initial year 1989 ** Initial year 1991 Source: MoE SR

[1)] Usage of substances in groups A I, B II a B III between 1996-2001 represents import of these substances for their analytical and laboratory use in accordance with the general exception from the Montreal Protocol

Note 1: Besides the indicated substances, another 250 tons of recycled tetrachloromethane and 20 tons of regenerated freon CFC 12 *were imported in 1996, which (with reference to applicable methodology) are not counted in the consumption figures. The data from previous years on usage of substances in groups C I, C II and E are not available.*

Note 2: *Besides the indicated substances, another 40 tons of used Freon CFC 12 were imported in 1997, which (with reference to applicable methodology) are not counted in the consumption figures, and 2.16 tons of methyl bromide for Slovakofarma, which was used as base material for pharmaceutical production and with reference to applicable methodology also are not counted in the consumption figures.*

Note 3: *Besides the indicated substances, 8.975 tons of used coolant R 12 were imported in 1998, which belongs to group A1. With reference to applicable methodology of the Montreal Protocol it is not are not counted in the consumption figures.*

Note 4: *Besides the indicated substances, another 1.8 tons of used Freon CFC 12 were imported in 1999, which (with reference to applicable methodology) are not counted in the consumption figures, and 1.04 tons of methyl bromide for Slovakofarma, which were used as base material for pharmaceutical production and with reference to applicable methodology also are not counted in the consumption figures.*

Note 5*: In 2001, 0.48 tons of methyl bromide were imported for Slovakofarma, which were used as base material for pharmaceutical production and with reference to applicable methodology are not counted in the consumption figures.*

Note 6*: In 2002, 0.48 tonnes CH_3Br were imported for Slovakofarma, which were used as base material for pharmaceutical product (Septonex) and with reference to applicable methodology are not counted in the consumption figures.*

Usage of substances under control in 2006 (tons)

Usage	Group of substances							
	AI	A II	BI	B II	BIII	C I	C II	E
Coolant	-	-	-	-	-	41.32	-	-
Fire extinguishers	-	-	-	-	-	-	-	-
Isolating gases	-	-	-	-	-	-	-	-
Detection gases, diluents, detergents	0.43	-	-	0.00	-	-	-	-
Aerosols	-	-	-	-	-	-	-	-
Swelling agents	-	-	-	-	-	-	-	-
Sterilizers, sterile mixtures	-	-	-	-	-	-	-	-

Source: MoE SR

Total atmospheric ozone and ultraviolet radiation

The average annual value of total atmospheric ozone in 2007 was 357.7 Dobson units (D.U.), which is 3.7 % below the long-term average from measurements in Hradec Králové in 1962-1990. Values from these measurements have been used also for our territory as the long-term normal value.

Average monthly deviations within 2007

Month	1	2	3	4	5	6	7	8	9	10	11	12	Year
Average (DU)	329	353	377	358	350	335	316	307	308	291	296	311	325.7
Deviation (%)	-4	-5	-1	-7	-6	-6	-7	-5	2	1	2	0	-3.7

Source: SHMI

*With respect to the recent scientific knowledge, the long-range goal concerning the ozone is to achieve **the level of ozone concentration in air,** at which the direct harmful effects on human health or on the environment will be unlikely; this goal should be achieved, if possible, with the long range prospective, so that effective protection of human health and environment is provided for.*

§ 5 par.4 of the Act No. 478/2002 Coll. on Air Protection

• TROPOSPHERIC OZONE

Average concentrations of tropospheric ozone in the Slovak territory were growing during the years 1973-1990 by app. 1 $\mu g.m^{-3}$ per year. After 1990, in line with all Central European monitoring outcomes, no significant trend in average concentrations was recorded. Maximal concentrations were decreasing over the last decade. However, ground ozone values are more than two-times higher than they were in the beginning of this century. The exceptional year of 2003 showed extraordinary hot patterns with increased concentrations recorded at all stations. Ground ozone concentrations in the Slovak territory in 2006 were only slightly below the record-breaking values in 2003. Average annual concentrations of ground ozone in Slovakia in contaminated urban and industrial locations in 2007 were within the interval of 44-91 $\mu g.m^{-3}$. Greatest average annual ground ozone concentrations in 2007 were recorded at the Chopok station (91 $\mu g.m^{-3}$).

Target value of ground ozone concentration in terms of public health protection is set by the MoE SR Resolution No. 705/2002 Coll. on air quality quoting Resolution 351/2007 Coll. at 120 $\mu g.m^{-3}$ (max. daily 8-hour average). This value must not be exceeded on more than 25 days in of the year, for three consecutive years. For the period of 2005-2007, this target value has been exceeded at all stations, with the exception of Prievidza. Concentrations exceeding the public alarm threshold (240 $\mu g.m^{-3}$) were in 2007 were recorded at Bratislava (Mamateyova) station. Six stations recorded figures that exceeded the information threshold (180 $\mu g.m^{-3}$) - most (17 times) at Bratislava (Mamateyova).

Number of days with exceeded target value for protection of public health – 2005, 2006, 2007, average for 2005-2007

Station	2005	2006	2007	Averaged in 2005-2007
Bratislava, Jeséniova	52	[a] 50	31	44
Bratislava, Mamateyova	42	34	37	38
Gánovce, Meteo. st.	[a] 29	39	25	31
Humenné, Nám. slobody	41	[a] 35	31	36
Chopok, EMEP	77	[b] 53	66	65
Jelšava, Jesenského	13	31	50	31
Kojšovská hoľa	59	63	74	66
Košice, Ďumbierska	33	[b] 0*	20	26
Prievidza, J. Hollého	[a] 12	18	21	17
Stará Lesná, AÚ SAV, EMEP	30	[a] 44	36	37
Starina, water basin, EMEP	39	[b] 27	18	28
Topoľníky, Aszód, EMEP	47	41	46	45
Žilina, Obežná	19	30*	40	30

[a] *75-90%,* [b] *50-75%,* [c] *less than 50% of valid measurements* Source: SHMI

Target value for the **AOT 40 vegetation protection exposition index** is 18 000 µg.m^{-3}.h (MoE SR Resolution No. 705/2002 Coll. on air quality quoting Resolution 351/2007 Coll.). Average values for the years 2003-2007 were exceeded at all reference urban and rural stations, with the exception of Prešov, Prievidza, Ružomberok, Stará Lesná, and Veľká Ida.

Values for the AOT 40 for vegetation protection - the year 2007 and for the averaged period of 2003-2007 (target AOT value for the year 2010 is 18 000 µg.m^{-3}.h for 5 years on average)

Station	Averaged in 2003-2007	2007
Bratislava, Jeséniova	25 322	20 654
Bratislava, Mamateyova	20 775	22 900
Humenné, Nám. slobody	22 150	21 608
Jelšava, Jesenského	21 440	25 987
Košice, Ďumbierska	*19 963	18 397
Prievidza, J. Hollého	15 580	17 466
Žilina, Obežná	19 252	21 891
Gánovce, Meteo.st.	22 360	19 028
Chopok, EMEP	30 777	26 477
Kojšovská hoľa	26 506	29 146
Stará Lesná, AÚ SAV, EMEP	18 880	20 505
Starina, water basin, EMEP	19 531	19 320
Topoľníky, Aszód, EMEP	25 863	26 102

** data from the year 2006 or 2007 were not incuded in calculating the average, since the station did not measure in the summer - did not measure during the monitored period*

Source: SHMI

The reference AOT 40 value for the protection of forests for annual reporting to EC is 20 000 µg.m^{-3}.h, and is valid for urban, rural and rural reference stations. These stations show values that are exceeded every year, at some stations during the photochemical active years, the values are exceeded more than two times as much.

***Eutrophication** is enrichment of water by nutrients, especially compounds of nitrogen and phosphorus, causing an increase in growing cyanobacteria, algae and higher herbal species, which can result in undesirable deterioration of ecological stability and quality of this water.*

§ 2 letters ac/ of the Act on Water No. 364/2004 Coll., amending the Act No. 372/1990 Coll. on Offences as subsequently amended (Water Act)

• EUTROPHICATION

Eutrophication means enriching the water with nutrients, mainly nitrogen and phosphorus compounds, which causes an increased growth of algae and higher plant forms. This may bring about an undesirable deterioration in the biological equilibrium and quality of such water. Indicators for the surface water eutrophication include $N\text{-}NH_4$, $N\text{-}NO_3$, $N\text{-}NO_2$, $N_{org.}$, $N_{tot.}$, $P_{tot.}$, with phosphorus as the limiting element being most critical in Slovakian watercourses.

General requirements for the surface water quality are set forth in the Government Ordinance SR No. 296/2005 Coll. which introduces requirements on the quality and qualitative goals of surface water, as well as the limit indicator values for wastewater and special water contamination. Annex 1 of this Ordinance defines the recommended values for total nitrogen (9.0 $mg.l^{-1}$), total phosphorus (0.4 $mg.l^{-1}$), and chlorophyl „a" (50.0 $\mu g.l^{-1}$). In 2007 total nitrogen and phosphorus concentrations in surface water in selected water courses did not exceed the limit values defined by the Government Ordinance.

In this sense, the most problematic watercourses include Morava, Nitra, and Ipeľ. Nutrient concentrations are generally higher toward the mouth of the river. Assessing the whole **C - nutrients** group and comparing it with previous time period, there have not been major changes and surface water quality that meets group II. and III. criteria.