



MINISTRY OF THE ENVIRONMENT OF THE SLOVAK REPUBLIC



**STATE OF THE ENVIRONMENT REPORT
SLOVAK REPUBLIC 2006**





***Environment** is everything that creates natural conditions for existence of organisms, including the humans, and is a condition of their further development. Environment is created **by its parts**, first of all air, water, rocks, soil and living organisms.*

§2 of Act No 17/1992 Coll. on Natural Environment as amended

COMPONENTS OF THE ENVIRONMENT AND THEIR PROTECTION

• AIR

Emission situation

◆ **Balance of particulate matter emissions**

Pursuant to **Act 478/2002 Coll. on air protection, which amends Act 401/1998 Coll. on fees for air pollution as amended (Air Act)** (Sect. 19, par. 2(d) an operator of a **large and medium-sized source** is required to provide to the pertinent local environment protection authority always before February 15 of the current year, a complete and true information on the source, emissions, and keeping of the emission limits and quota for the previous calendar year. Local environmental protection authority will submit these processed electronic data to the authorized MoE SR organization - the SHMI (Slovak Hydrometeorological Institute), which operates the central **National Emission Inventory System (NEIS)**. SHMI processes these data on the national level. In 2001, the SHMI for the first time collected and processed information through the NEIS module, which replaced the previously used REZZO system. **In 2005, this system processed data from 843 large sources and 12 082 medium sources.**

SHMI assesses the volume of polluting compound emissions from the from **small sources** on a yerly basis, based on the volume and quality of sold solid fuels to retailers and households. This information is available from the submitted data to the local environment protection authority by individual sellers, as well as from natural gas consumption by households.

Mobile sources emissions have been monitored since 1990 and are determined on the year-to-year basis. To calculate road transport emissions, the method of Computer Programme to Calculate Emissions from Road Transport (COPERT) is used. The method builds on the number of individual automobile types, volume of travelled kilometres, and consumption of individual fuel types. Besides road transport, calculated are also emissions from the railway, air, and ship transports, all in compliance with the Intergovernmental Panel Climate Change (IPCC) methodology.

♦ **History of particulate matter emissions and sulphur dioxide emissions**

Emissions of solids and sulphur dioxide (SO₂) have shown a steady reduction since 1990, which, apart from reduction in production and energy consumption, has been caused by a change within the fuel group toward more purified fuels, as well as by using fuels with higher quality labels.

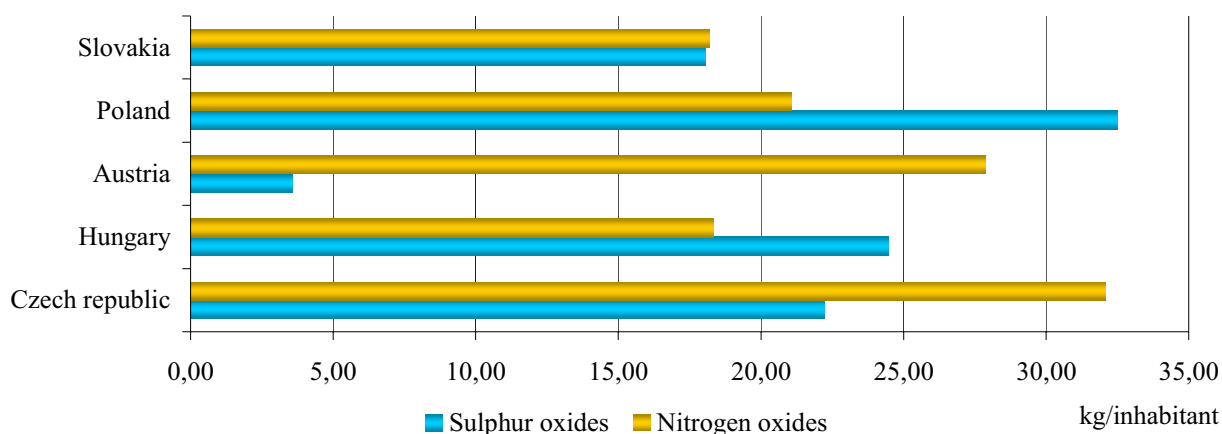
♦ **Trend in emissions of nitrogen oxides**

Nitrogen emissions (NO_x) have shown a slight reduction since 1990. Slight increase in emissions in 1995 was related to an increased consumption of natural gas. Decrease in nitrogen oxides in 1996 was caused by a change to the emission factor that took into consideration the level of equipment and technology of incineration processes. Reduction in solid fuel consumption since 1997 has led to a further decrease in NO_x emissions. In the years 2002 and 2003, de-nitrification played a significant role in emission reduction (electric power plant Vojany). In the years 2004 and 2005, the emissions trend has marked no major changes.

♦ **Trend in carbon monoxide emissions**

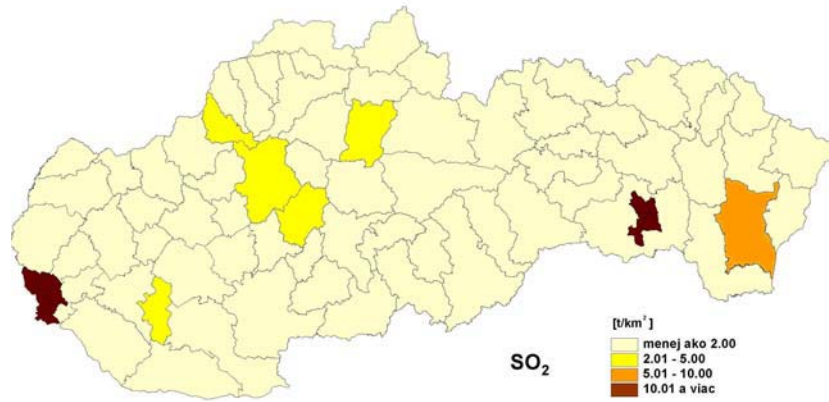
Carbon monoxide emissions (CO) since 1990 have shown a falling tendency, which was caused mainly by reduced consumption and change in fuel composition in the sphere of retail consumers. CO emissions from large sources were decreasing only slightly. The most significant share on CO emissions from large sources comes from iron and steel industries.

Emissions of nitrogen and sulphur oxides (shown as NO₂ and SO₂ equivalents) per capita in Slovakia and neighbouring countries in 2004



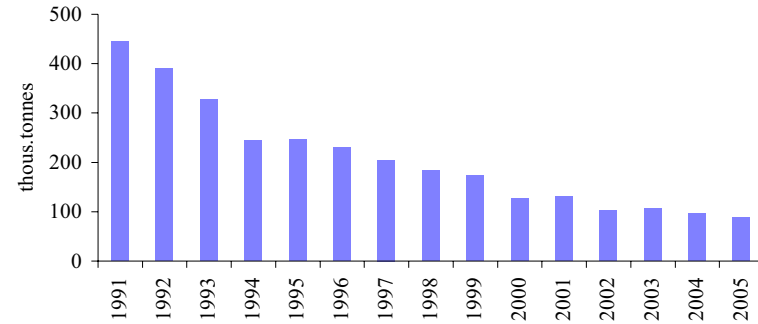
Source: Eurostat

Element regional emission of SO₂ in 2005 (t.km⁻²)



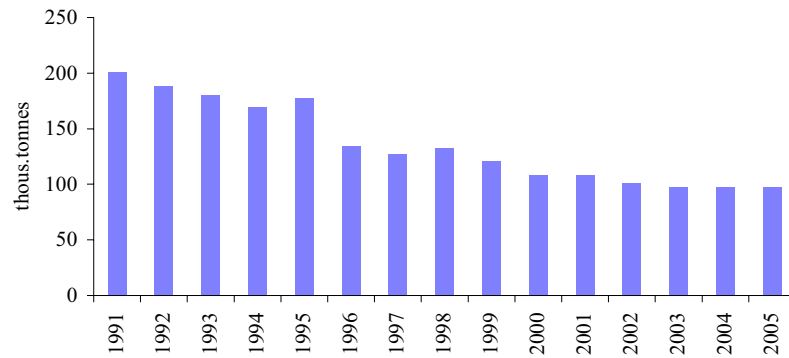
Source: SHMI

Trend in emission of SO₂



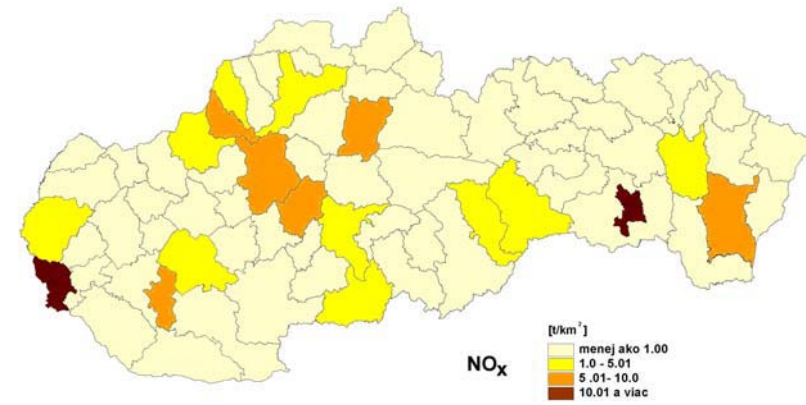
Source: SHMI

Trend in emission of NO_x



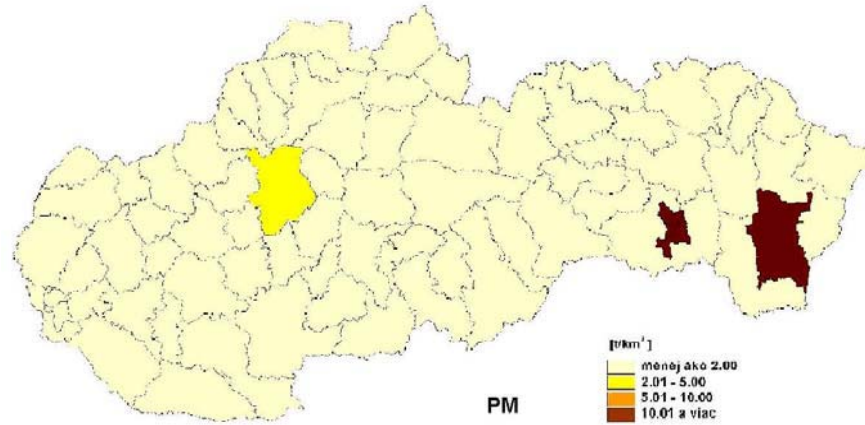
Source: SHMI

Element regional emission of NO_x in 2005 (t.km⁻²)



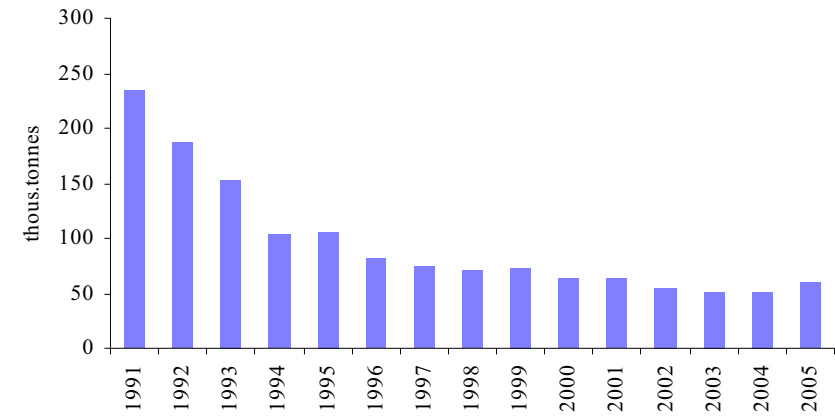
Source: SHMI

Element regional emission of PM in 2005 (t.km⁻²)



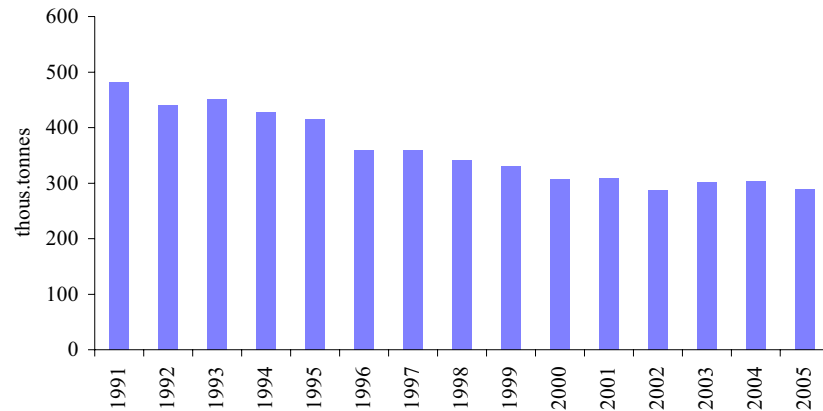
Source: SHMI

Trend in emission of PM



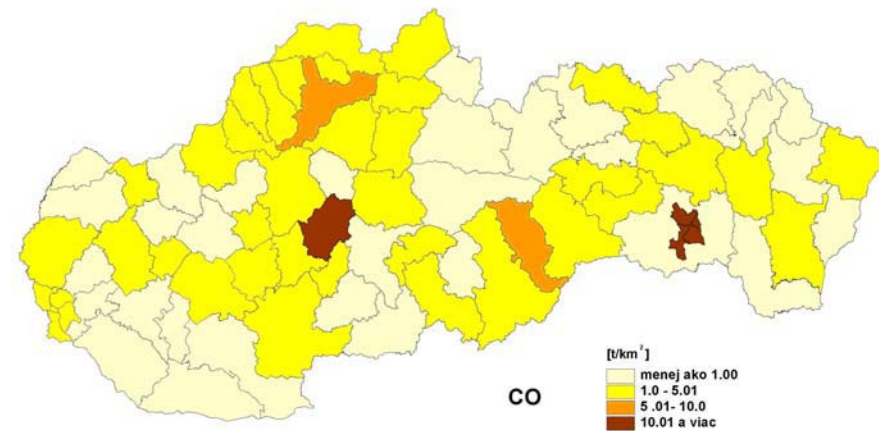
Source: SHMI

Trend in emission of CO



Source: SHMI

Element regional emission of CO in 2005 (t.km⁻²)



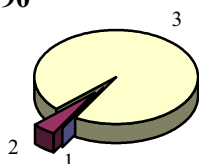
Source: SHMI

◆ **Balance of ammonia emissions (NH₃)**

NH₃ emissions in 2005 reached 26 926.5 tons. In 1990-2005 ammonia emissions were reduced by 58.5 %. This reduction was caused mainly by changes in agriculture.

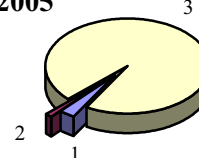
The contribution of the particular sectors in NH₃ emission

1990



0.05 %	1. Transport	2.94 %
4.79 %	2. Industry	1.42 %
95.17 %	3. Agriculture	95.64 %

2005



Source: SHMI

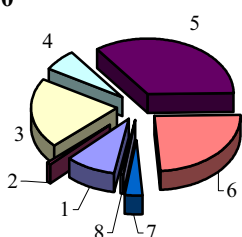
Emissions were stated to the date 15.02.2007

◆ **Emissions of non-methane volatile organic compounds**

NM VOC emissions show a lasting decreasing trend since 1990. In 2005, volume of NM VOC emissions reached the value of 78 940 tons, which is a reduction by 42.8 %, compared to 1990.

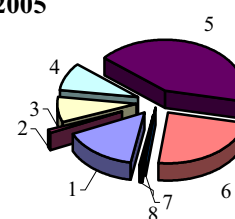
The contribution of the NM VOC emission according to sector of their origin

1990



9.4 %	1. Combustion processes	15.3 %
0.8 %	2. Combustion processes in the industry	1.0 %
20.5 %	3. Industrial technologies	8.2 %
6.4 %	4. Mining and distribution of raw materials	9.0 %
34.8 %	5. Using the solvents and other products	42.0 %
24.3 %	6. Transport	23.7 %
3.3 %	7. Waste disposal	0.3 %
0.5 %	8. Agriculture	0.6 %

2005



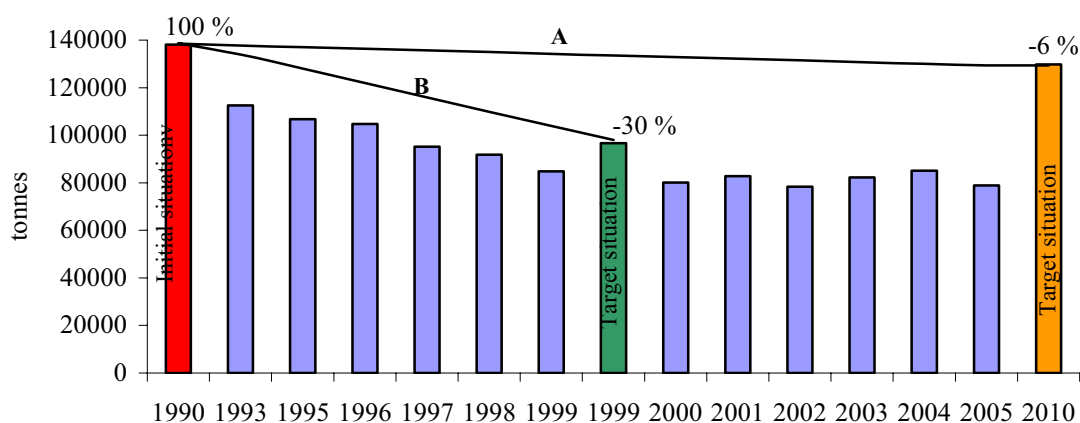
Source: SHMI

Emissions were stated to the date 15.02.2007

In 1999, the Slovak Republic signed the Protocol on the Reduction of Acidification, Eutrophication and Ground Ozone, and bound itself to reduce the volume of NM VOC by 6 % by 2010, compared to emissions from 1990. This plan has been followed so far.



Trend in NM VOC emissions with regard to fulfilling of the international agreements (tons)



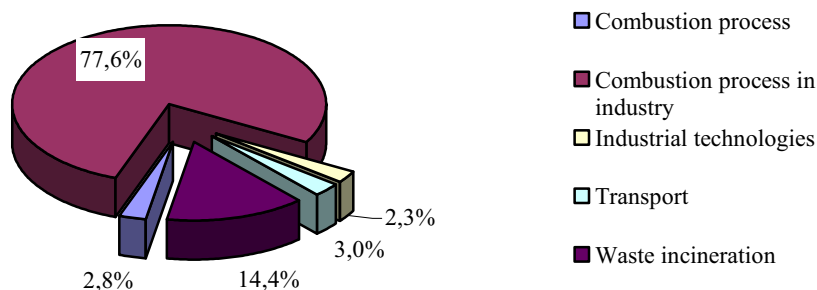
Source: SHMI

A – Reduction aim of the Protocol to abate acidification, eutrophication and tropospheric ozone
 B – Reduction aim of the Protocol on limitation of VOC emissions or their Cross-Border Transfers

◆ Balance of heavy metals emissions

Heavy metal emissions (Pb, As, Cd, Cr, Cu, Hg, Ni, Se, Zn) have been decreasing since 1990. In that year, heavy metal emissions were at the volume of 675.44 tons, while in 2005 it was 242.95 tons, which is a 64 % reduction in comparison to 1990.

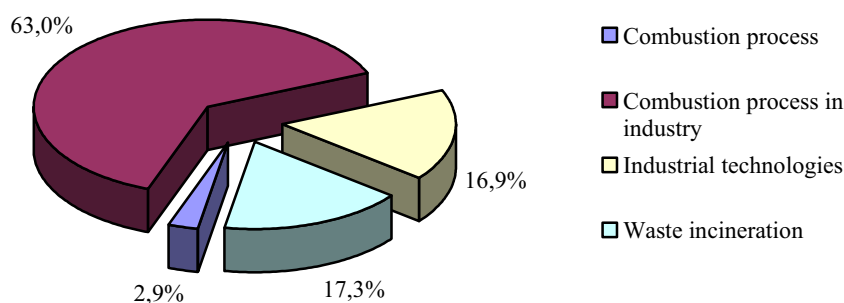
The contribution of the particular sectors in the Pb emission production for year 2005



Emissions were stated to the date 15.02.2007

Source: SHMI

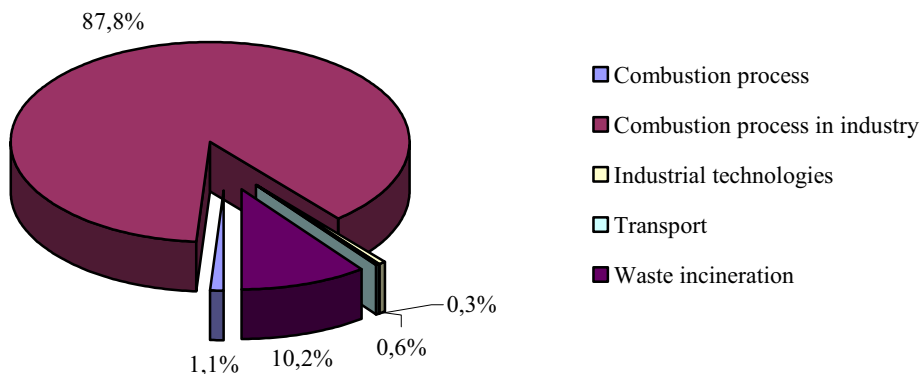
The contribution of the particular sectors in the Hg emission production for year 2005



Emissions were stated to the date 15.02.2007

Source: SHMI

The contribution of the particular sectors in the Cd emission production for year 2005

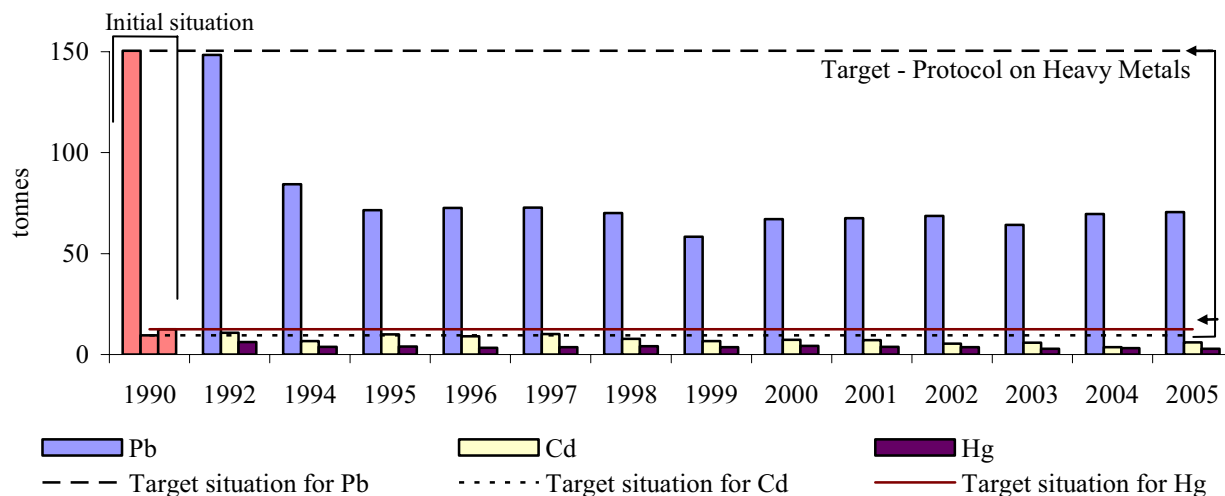


Emissions were stated to the date 15.02.2007

Source: SHMI

Heavy metals in the air do not represent an environmental issue of only one country. In 1998, the **Protocol on heavy metals** was drafted in Aarhus. This document **followed the UN EEC Convention on Long - Range Trans-boundary Air Pollution**, whose only objective is the decrease heavy metal emissions (Pb, Cd, Hg) to the level of 1990. SR signed this Protocol in that same year. This goal is still being followed.

Trend in emissions of heavy metals regarding the fulfilment of the international conventions

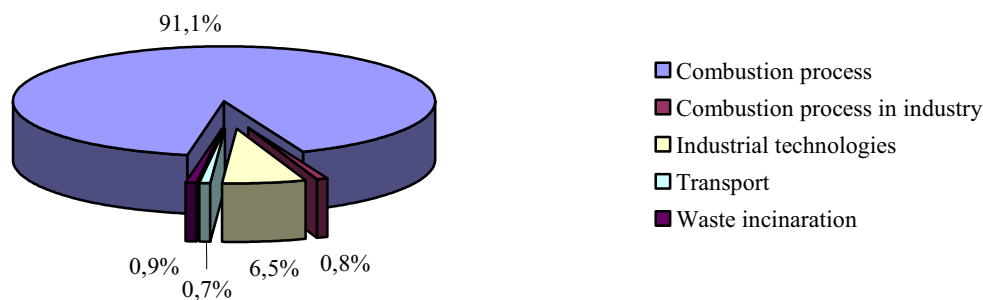


Source: SHMI

◆ Balance of Persistent organic pollutants (POPs)

In 1990-2005 **emissions of persistent organic particles** (PCDD/PCDF, PCB, and PAH {B(a)P, B(k)F, B(b)F, I(1,2,3-cd)P}) had a decreasing trend with fluctuating characteristics over the last years. They were most apparent in the emissions of poly-aromatic carbohydrates (PAH).

The contribution of the particular sectors in the PAH emission production for year 2004



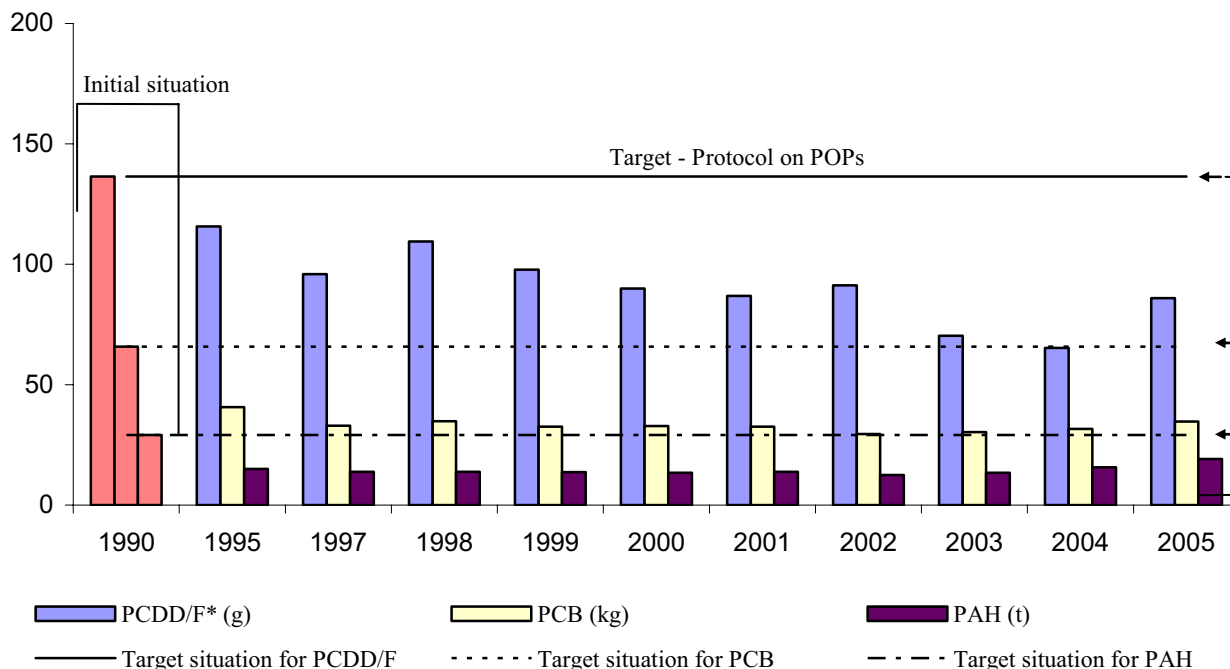
Emissions were stated to the date 15.02.2007

Source: SHMI

In 1998, the Slovak Republic also accessed to **Protocol on Limitation of Persistent Organic Compounds Emissions under the mentioned Convention**, whose objective was to reduce POP emissions to the emission level of the year 1990, compared to the reference year of 1990. The Slovak Republic signed the Protocol in the same year. This goal is still being followed.



Trend of POPs emissions regarding the fulfillment of the international conventions



Source: SHMI

Remote transport of air pollutants

In 2005, approximately 38 500 tons of sulphur were imported and 39 000 tons were exported. This meant a continuing trend in significant reduction to total volumes of imported and exported sulphur.

Slovakia has still remained an exporter of oxidized nitrogen. In 2005, 43 400 tons of nitrogen were received; however, 47 600 tons left the country. This also shows a long-term reduction in total volumes.

Volumes of emitted substances from the Slovak territory (t, %)

	Volumes of emitted sulphur		Volumes of emitted nitrogen	
	(t)	(%)	(t)	(%)
1998	74 600	83	53 900	82
2002	42 300	83	46 214	84
2003	45 621	86	47 761	87
2004	41 900	87	46 000	86
2005	39 000	88	47 600	89

Source: SHMI

Volumes of deposited substances on the Slovak territory (t, %)

	Volumes of deposited sulphur		Volumes of deposited nitrogen	
	(t)	(%)	(t)	(%)
1998	75 700	84	48 700	77
2002	53 320	86	46 282	84
2003	52 800	88	45 326	87
2004	45 600	88	49 600	87
2005	38 500	88	43 400	88

Source: SHMI

Volumes of emitted and deposited sulphur and nitrogen as compared in SR and other European countries

Volumes of emitted sulphur from areas Slovakia in 2005 (t, %)

Target country	Volumes of emitted sulphur	
	(t)	(%)
Slovakia	5 500	12
Ukraine	2 800	6
Poland	3 900	9
Hungary	2 800	6
Russia	3 500	8
Romania	2 000	4
Czech republic	3 200	7
Other	20 800	48
Together	44 500	100

Source: SHMI

Volumes of deposited sulphur from areas Slovakia in 2005 (t, %)

Target country	Volumes of deposited sulphur	
	(t)	(%)
Slovakia	5 500	13
Ukraine	3 900	9
Poland	10 500	24
Hungary	4 900	11
Russia	300	1
Romania	3 600	8
Czech republic	2 000	5
Other	13 300	29
Together	44 000	100

Source: SHMI

Volumes of emitted nitrogen from areas Slovakia in 2005 (t, %)

Target country	Volumes of emitted nitrogen	
	(t)	(%)
Ukraine	3 100	6
Russia	4 600	9
Poland	4 200	8
Hungary	3 300	6
Romania	2 200	4
Slovakia	5 900	11
Czech republic	3 300	6
Other	26 900	50
Together	53 500	100

Source: SHMI

Volumes of deposited nitrogen from areas Slovakia in 2005 (t, %)

Target country	Volumes of deposited nitrogen	
	(t)	(%)
Ukraine	4 400	9
Russia	600	1
Poland	7 800	16
Hungary	7 000	14
Romania	3 100	6
Slovakia	5 900	12
Czech republic	2 200	4
Other	18 300	38
Together	49 300	100

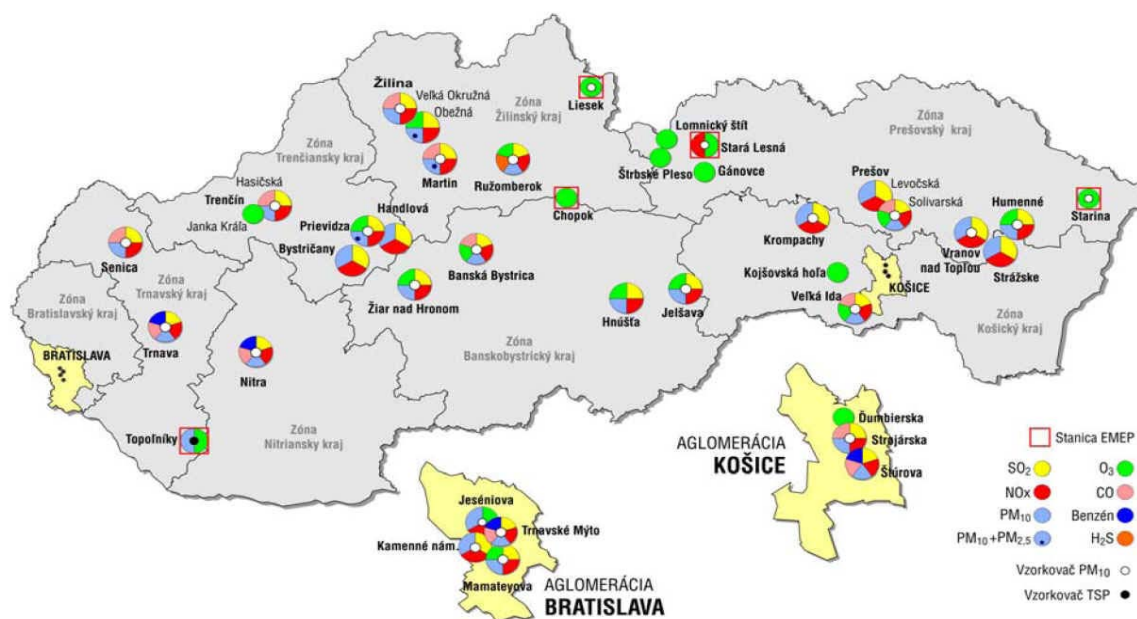
Source: SHMI

Air pollution

♦ **National monitoring air quality network**

In 2006, the **national air assessment quality monitoring network consisted of 38 automated monitoring stations including 5 stations to monitor regional air pollution and precipitation water chemical composition**. Stations that monitor regional air pollution are part of the EMEP – Co-operative Program for the Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe.

National monitoring air quality network - owned by SHMI



Source: SHMI

◆ **Local air pollution**

Assessment of local air pollution focuses on air quality in residential areas, and belongs to critical indicators of the quality of environment.

Sulfur dioxide

In 2006, no agglomeration showed exceeded levels of pollution in hourly or daily values beyond the public health limit.

Nitrogen dioxide

Annual limit value for human health protection was exceeded at the following stations: Bratislava – Trnavské mýto, Nitra - Štefánikova, and Trnava - Kollárova. However, no station showed the exceeded limit value increased by tolerance threshold.

PM₁₀

In 2006, PM₁₀ particles were monitored at 27 stations. At the same time, the PM_{2,5} measurements were carried out at 3 stations, with no limits set for this fraction up to this day. The biggest challenge in the area of air protection in Slovakia and most European countries is currently air pollution by particulate matter (PM₁₀). With the exception of the stations of Bratislava – Jeseniouva, Strážske-Mierova, and Humenné-Nám.slobody, the daily limit value was exceeded at all stations, while 8 AMS stations showed also an exceeded annual limit value.

Carbon monoxide

Carbon monoxide pollution level is relatively low and limit value was not exceeded at any monitoring station.

Lead

At present, air pollution by lead does not pose a major risk in Slovakia. Its concentrations do not exceed the upper threshold evaluation limit.

Benzene

One site (in the Nitra region's zone) shows the pollution level slightly above the limit value of 5 µg.m⁻³ (in Nitra it was 5.2 µg.m⁻³), to be reached by Slovakia in 2010.

◆ **Regional air pollution**

Average annual concentrations of air-borne hazardous compounds - 2006

Station	Prach µg/m ³	SO ₂ -S µg/m ³	NO ₂ -N µg/m ³	HNO ₃ -N µg/m ³	SO ₄ ²⁻ -S µg/m ³	NO ₃ ⁻ -N µg/m ³	O ₃ µg/m ³	Pb µg/m ³	Mn µg/m ³	Cu µg/m ³	Cd ng/m ³	Ni ng/m ³	Cr ng/m ³	Zn ng/m ³	As ng/m ³
Chopok	7.0	0.27	0.59	0.02	0.33	0.09	96	2.67	2.66	1.24	0.08	0.60	0.97	6.40	0.22
Topoľníky	24.5	1.34	2.80	0.04	1.37	0.97	60	13.10	6.92	3.59	0.31	2.83	2.94	20.84	1.26
Starina	19.2	1.36	1.24	0.05	1.23	0.38	62	11.18	5.83	1.99	0.31	0.69	0.72	16.32	0.76
St. Lesná	14.9	0.77	1.52	0.05	1.01	0.34	73	9.36	4.76	2.21	0.23	0.51	0.64	16.32	0.67
Liesek	23.4	2.00	1.94	0.06	1.21	0.57	66	14.41	23.08	2.71	0.41	0.85	0.84	26.65	1.71

Source: SHMI

Sulfur dioxide, sulfates

In 2006, regional level of **sulfur dioxide concentrations** varied within the interval of $0.27 \mu\text{g S.m}^{-3}$ (Chopok) and $2.00 \mu\text{g S.m}^{-3}$ (Liesek). Stations in lower altitude that include Topoľníky, Starina, and Liesek, showed increased concentration values for sulphur dioxide. The values exceeded $1 \mu\text{g S.m}^{-3}$. On the other hand, stations situated in higher altitudes, including Stará Lesná, and Chopok, showed values 2-7 times lower.

In line with Annex 1 of the MoE SR Resolution No. 75/2002 Coll. the limit value for the protection of ecosystems is $20 \mu\text{g SO}_2.\text{m}^{-3}$ for the calendar year and the winter season.

Regional level of sulphate concentration calculated for sulphur was in 2006 the lowest at Chopok, $0.33 \mu\text{g.m}^{-3}$ and the highest at Topoľníky, $1.37 \mu\text{g.m}^{-3}$. Percentage of sulfates on total mass of atmospheric ozone was 14 - 20 %. Sulfates and sulfur dioxide concentration ratios expressed in sulfur is shown in the interval of 0.61- 1.31, which corresponds to the regional pollution level.

Nitrogen oxides, nitrates

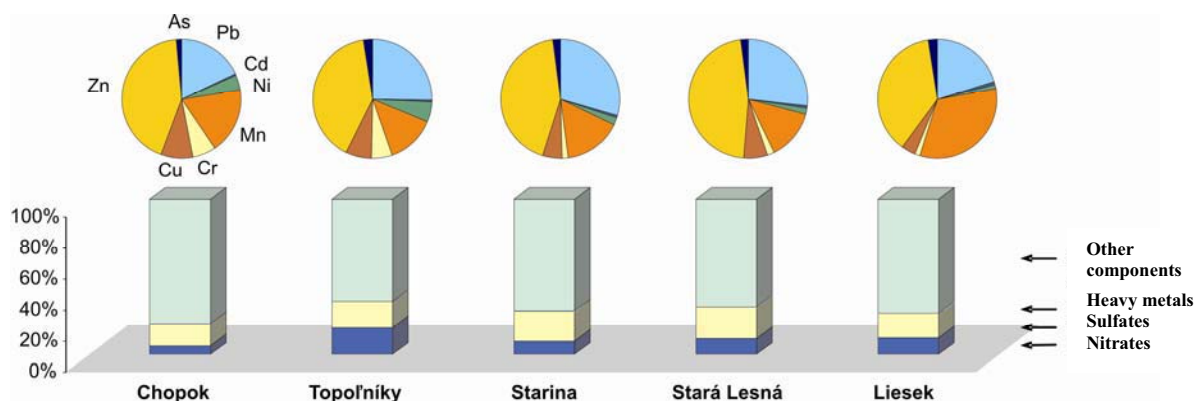
Concentration of nitrogen oxides at regional stations expressed in $\text{NO}_2\text{-N}$ varied in 2006 between $0.59 \mu\text{g.m}^{-3}$ (Chopok) – $2.80 \mu\text{g.m}^{-3}$ (Topoľníky). In line with Annex 1 of the MoE SR Resolution No. 705/2002 Coll. the **limit value for the protection of ecosystems is $30 \mu\text{g N.m}^{-3}$** for the calendar year. This value was not exceeded at any regional station. Maximum value of $9.2 \mu\text{g NO}_x.\text{m}^{-3}$ from all stations at Topoľníky is at the level lower than 30 % of the limit value.

Atmospheric **nitrates** at regional stations in Slovakia were mostly in the aerosol form, and at almost all the stations they showed values little increased than in 2006. Gaseous nitrates are in comparison with the aerosol ones lower at all stations and, compared to the previous year, differences were negligible. Despite the fact that gaseous and particulate nitrates are trapped and monitored separately, their sum is expressed in line with EMEP, since their phase distribution depends on atmospheric temperature and humidity. Percentage share of nitrates on atmospheric aerosol varied between 6 % and 17 %. Ratio of total nitrates ($\text{HNO}_3 + \text{NO}_3$) to NO_2 , as expressed in nitrogen, varied between 0.15 – 0.35.

Atmospheric aerosol, heavy metals

Percentage share of the sum of assessed heavy metals on air-borne dust at regional stations of Slovakia varies between 0.2 and 0.3 %.

Composition of atmospheric aerosol and percentage share of heavy metals in 2006



Source: SHMI

Volatile organic compounds C₂ – C₆

Volatile organic compounds C₂ – C₆ or the so-called light carbohydrates began to be captured at the Starina station in the Fall of 1994. Their concentrations range between individual units to hundreds of units ppb. Ethane presents the worst, next is propane and acetylene. Isoprene releases from ambient forest.

Average annual VOC concentrations in ambient air (ppb) - Starina 2006

ethane	ethene	propane	propene	i-butane	n-butane	acetylene	butane	pentene	i-pentane	n-pentane	isoprene	n-hexane	benzene	toluene	o-xylene
2.034	0.746	0.915	0.119	0.284	0.350	0.879	0.048	0.035	0.270	0.160	0.107	0.085	0.334	0.043	0.247

Source: SHMI





*Whoever is performing an activity, which could have an impact on the **condition of the surface waters and underground waters, and of water situation**, is obliged to exert the necessary effort to provide for their preservation and protection.*

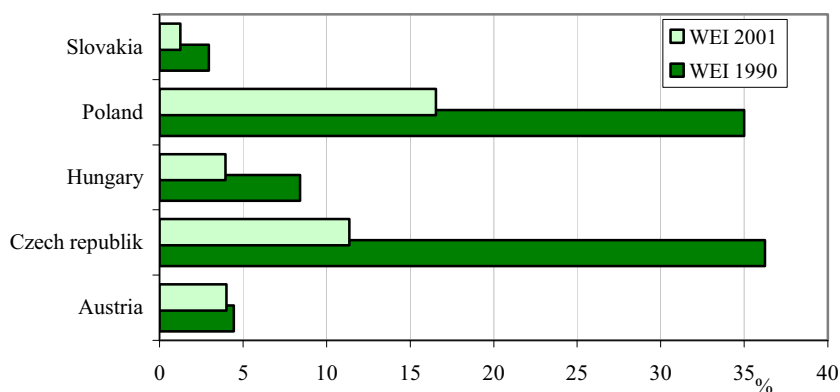
§ 30 par. 1 of the Act No. 364/2004 Coll. on Waters and on Amendment of Act No. 372/1990 Coll. on Offences as amended (Waters Act)

• WATER

Water sources and water fund

Significant part of the Slovak surface water fund flows in from the neighboring states and the usability of this fund is limited. In total, the long-term in-flow average is approximately $2.514 \text{ m}^3 \cdot \text{s}^{-1}$ of water, which is about 86 % of our total surface water fund. In the long run, there is approximately $398 \text{ m}^3 \cdot \text{s}^{-1}$ of water springing in Slovakia, which represents 14 % of the water fund.

Water sources exploitation index



Source: Eurostat

Surface water

◆ **Precipitation and runoff conditions**

Total **atmospheric precipitations** in the Slovak territory in 2006 reached the value of 740 mm, which represents 97 % of the normal level. In terms of precipitations, this year had been considered normal. Total deficit of precipitations reached the value of -22 mm.

Average total precipitation in the area of the SR

Month	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	Year
Mm	42	47	64	63	114	18	37	131	17	29	61	17	740
% normal	91	112	136	115	150	137	41	162	27	48	98	32	97,1
Surplus (+)/ Deficit (-)	-4	5	17	8	38	32	-53	50	-46	-32	-1	-36	-22
Character of rainfall period	N	N	V	N	V	V	VS	VV	VS	VS	N	VS	N

Characteristics of the precipitation season: N - normal, S - dry, SS - very dry, V – humid, VV – very humid, VVV – exceptionally humid
Source: SHMI

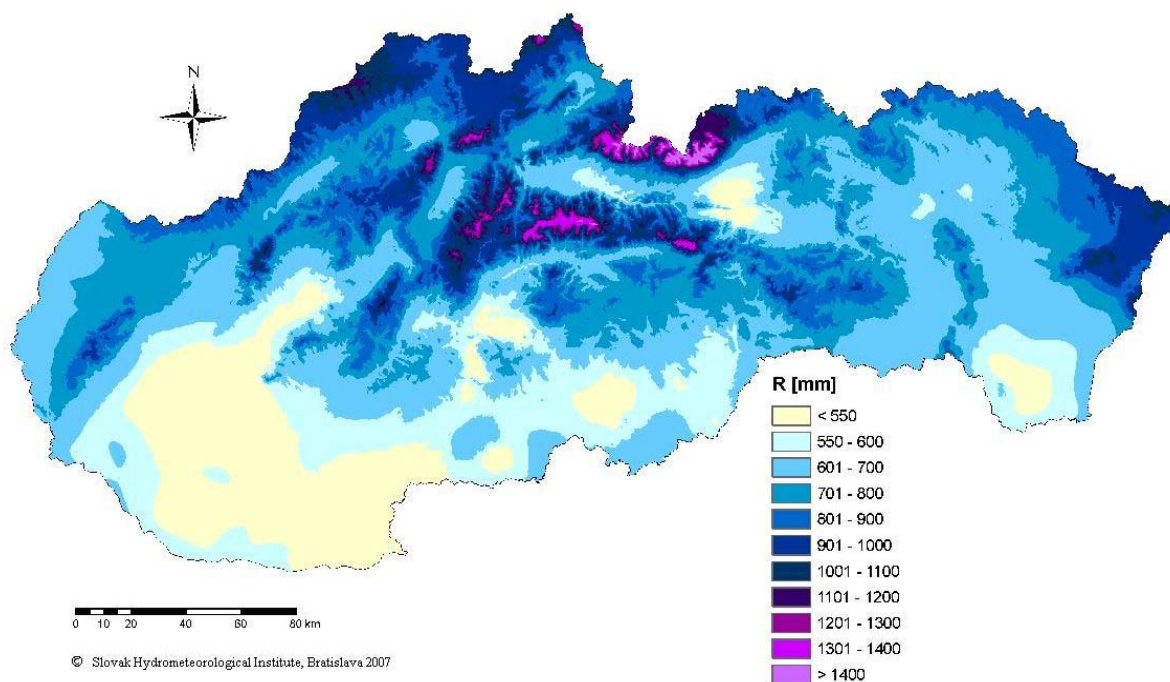
Characteristics of total precipitation figures for most watersheds was normal, with the exception of partial watersheds of Ipeľ, and Slaná with dry precipitation conditions. On the other hand, the Hornád watershed remained humid.

Average rates of precipitation and runoff in particular catchment areas

Catchment area	Dunaj		Váh		Hron			Bodrog a Hornád				SR
	*Morava	*Dunaj	Váh	Nitra	Hron	*Ipeľ	Slaná	Bodva	Hornád	*Bodrog	*Poprad and Dunajec	
Catchment area extent (km ²)	2 282	1 138	14 268	4 501	5 465	3 649	3 217	858	4 414	7 272	1 950	49 014
Average precipitation (mm)	731	574	802	660	727	600	697	729	758	754	887	740
% of normal	107	92	95	95	92	88	88	100	112	107	105	97
Character of rainfall period	N	N	N	N	N	S	S	N	V	N	N	N
Annual runoff (mm)	191	32	348	172	278	159	247	198	277	317	427	304
% of normal	162	89	98	109	87	102	117	94	122	135	115	116

* watercourses and corresponding data only for the Slovak part of the watershed
Source: SHMI
Characteristics of the precipitation season: N - normal, S - dry, SS - very dry, V – humid, VV – very humid, VVV – exceptionally humid

Annual atmospheric precipitation (mm) in Slovakia in 2006



© Slovak Hydrometeorological Institute, Bratislava 2007

Source: SHMI

Annual runoff volumes in SR in 2006 reached 116 % of the long-term average value. Runoff volume from partial watershed reached or exceeded 100 % of the long-term average in the Morava, Nitra, Ipeľ, Slaná, Hornád, Bodrog, Poprad, and Dunajec watersheds. The remaining watersheds showed values within 89 – 94 %.

◆ **Water balance**

In 2006, there was 70 711 mil.m³ flowing into Slovakia, which is by 905 mil.m³ more than in the previous year of 2004. **Runoff** from the territory, compared to the previous year, was greater by 5 667 mil.m³.

As of 1.1.2005, **total water volume** in water reservoirs was 721.0 mil.m³, which represented 62 % of total usable water volume in water reservoirs. As of 01.01.06, total available volume of the assessed accumulation tanks compared to the previous year dropped to 682 mil.m³, which represents 59 % of total exploitable water.

Total hydrological balance of water resources in the SR

	Volume (mil. m ³)		
	2004	2005	2006
Hydrological balance:			
Rainfall	41 715.00	46 029.00	36 274
Annual inflow to the SR	61 182.00	69 806.00	70 711
Annual runoff	71 279.00	79 979.00	85 646
Annual runoff from the territory of the SR	10 097.00	10 173.00	14 900
Water management balance			
Total abstraction of the surface and ground water in the SR	1 020.00	906.89	882.47
Evaporation from water reservoirs and dams	54.30	5.07	55.79
Discharge into surface waters	955.70	872.00	669.7
Impact of water reservoirs (WR)	355.60	111.61	7.8
	accumulation	improving	improving
Total volume in WR as of 1st January of the following year	631.80	721.00	681.60
% of supply volume in accumulation WR in the SR	54.00	62.00	59.00
Rate of water exploitation (%)	10.18	8.91	6.38

* Note: Data in the table were updated with results from the 2004 assessment

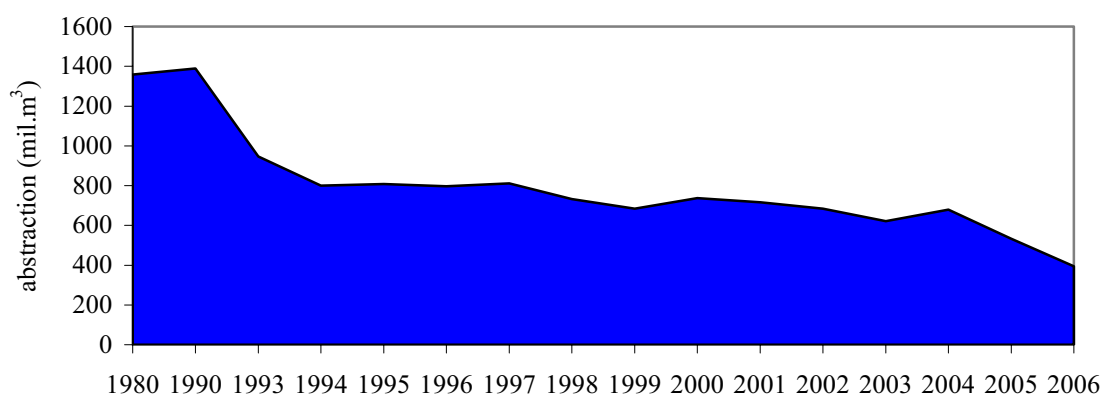
Source: SHMI

◆ **Surface water abstraction**

In 2006 **surface water abstraction** reached the value of 395.142 mil.m³, which, compared to the previous year, is a reduction by 35 %. Surface water abstraction for industrial purposes in 2006 represented as much as 82 % of total abstraction volume, which, compared to 2005, was a reduction by 144.248 mil.m³, that is 31 %. A slight increase was recorded also in surface water abstractions for waterlines, which, compared to the previous year, increased by 1.739 mil.m³, that is by 3.1 %.

These abstractions represented 14 % of total abstractions. Surface water abstractions for irrigation purposes increased, reaching the value of 15.85 mil.m³, which was 4 % of all abstractions.

Surface water abstraction between 1980-2006



Source: SHMI

Surface water exploitation in the SR (mil.m³)

Year	Public water-supplies	Industry	Irrigation	Other agriculture	Total	Discharging
2004	55.984	604.728	18.935	0.0076	679.723	919.222
2005*	53.828	467.957	11.006	0.0110	532.791	871.865
2006*	55.567	323.709	15.854	0.0120	395.142	748.537

*data from database „Aggregate balance sheet of water“

Source: SHMI

Approximately one third of water in Europe that people abstract is designated for crop irrigation. Another third is used in the cooling blocks of electric power plants. One quarter is used in households as tap water and toilet water. The remaining part, about 13 %, is used up in production. This division by sectors significantly varies within the continent.

◆ **Surface water quality**

Surface water quality assessment has been carried out on the basis of data obtained during the water level monitoring process. For the year 2006, surface water quality monitoring was split into the basic monitoring, operational monitoring, and monitoring of protected territories (PT). This division followed the provisions of **the MoE SR Resolution no. 221/2005 Coll., which sets forth details on detecting the occurrence and assessment of surface and ground water situation, its monitoring, keeping the water register and water balance records.** Surface water quality was implemented through an approved, reduced version of the Water situation monitoring programme in 2006. The programme was implemented at 397 abstraction sites. This included, within the basic monitoring activity, monitoring of 195 abstraction sites, 39 of them at national border streams. There were 104 sites included within the operational monitoring. Water management streams as part of PT were monitored at 98 sites, including also 8 water dams. Some abstraction sites were monitored for more purposes; hence, the normalised classification of assessed of surface water quality shows 226 abstraction sites.

General evaluation suggests negative surface water classification caused by microbiological indicators of the E group, nutrients (C), and micro pollutants (F), which place water quality into the

III. - IV. categories. For the groups A, B, and D, most abstraction sites are classified under the II. - III. quality categories.

In the years 2005-2006, more than 71 % of the category **A - oxygen demand** (224 abstraction sites) complied with the conditions of the quality groups I, II, and III. Indicator groups **B - basic physical-chemical** (224 abstraction sites), **C - nutrients** (224 abstraction sites), and **D - biological indicators** (193 abstraction sites) stayed at the level of the previous pairs of years and dominate in the II. and III. quality group. There was 84.4 % of abstraction sites that complied with the B indicators group (in 2004-2005 it was 88 % of abstraction sites), while there was 67.9 % of abstraction sites in the C indicators group (in 2004-2005 it was 64 %), and 85.5 % of abstraction sites fell under the D quality group (in 2002-2003 it was 83.14 %). For the assessed pair of years, the number of abstraction sites with acceptable quality category for the indicator E - micro biological indicators decreased to 21.6 % (in 2004-2005 it was 33.14 %), on the other hand, for the F category - micropollutants, the number of abstraction sites grew to 49.5 % (in 2004-2005 it was 46.2 %).

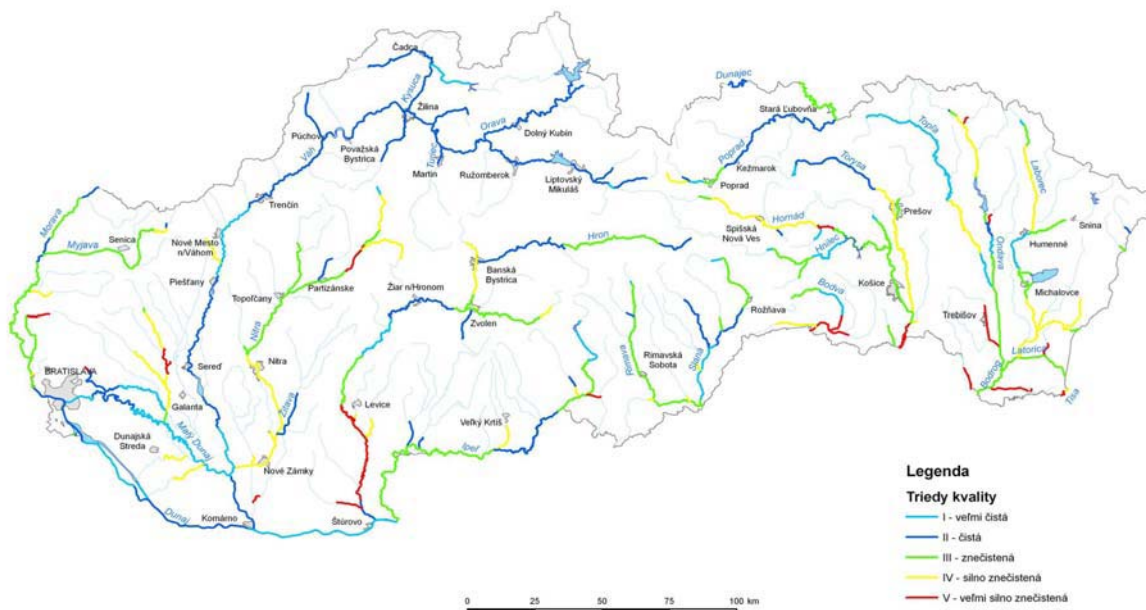
Negative situation still persists in the **E category - microbiological indicators** (204 abstraction sites) that falls under the IV. and V. quality categories, with 78.4 % of abstraction sites (in 2002-2003 it was 66.86 %).

Water quality for the **F category indicators - micropollutants**, was assessed at 168 abstraction sites for all groups. For the years 2005-2006, there was 49.5 % of samples with acceptable water quality (I - III. quality categories) at 83 abstraction sites. Unacceptable water quality (IV and V quality categories) was recorded for 50.5 %, which means 85 abstraction sites (for the period of 2002-2003 it was 53.8 %).

Water quality in the **H group of determinants - radioactivity** (31 sampling sites) for the monitored period complied with the I., II., and III. water quality class.



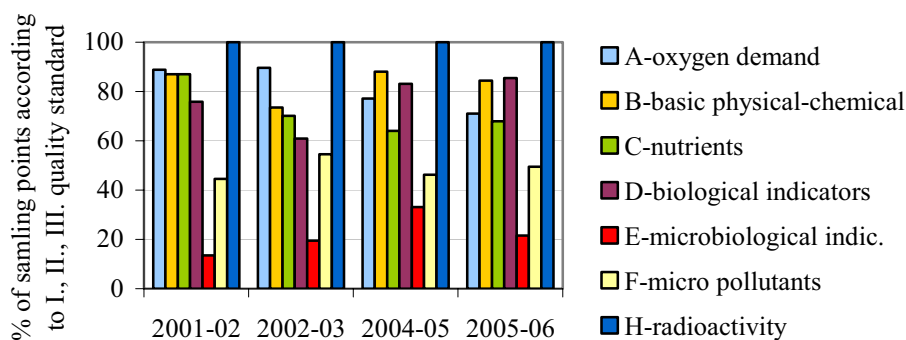
Surface water quality categories in the group A – oxygen demand in years 2005-2006



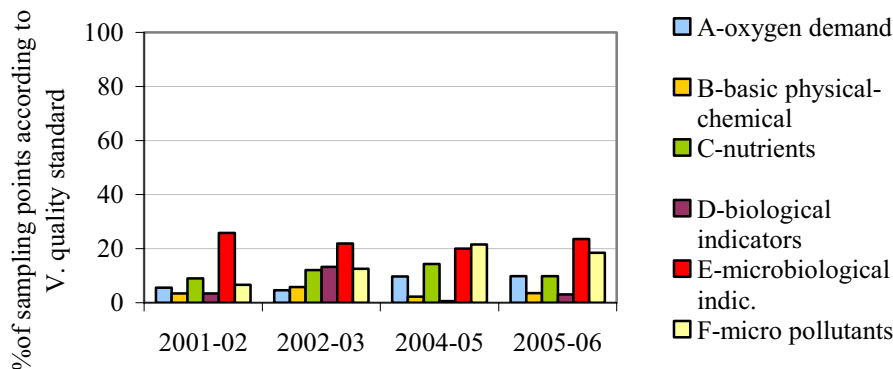
Source: SHMI

Legend: I. Class – very clean water (blue), II. Class – clean water (dark blue), III. Class – polluted water (green), IV. Class – heavily polluted water (yellow), V. class – very heavily polluted water (red)

Proportion of indicator groups for surface water quality involved in classification into the I., II., and III. quality categories (pursuant to STN 75 7221)



Proportion of indicator groups for surface water quality involved in classification into the V. quality categories (pursuant to STN 75 7221)



Source: SHMI

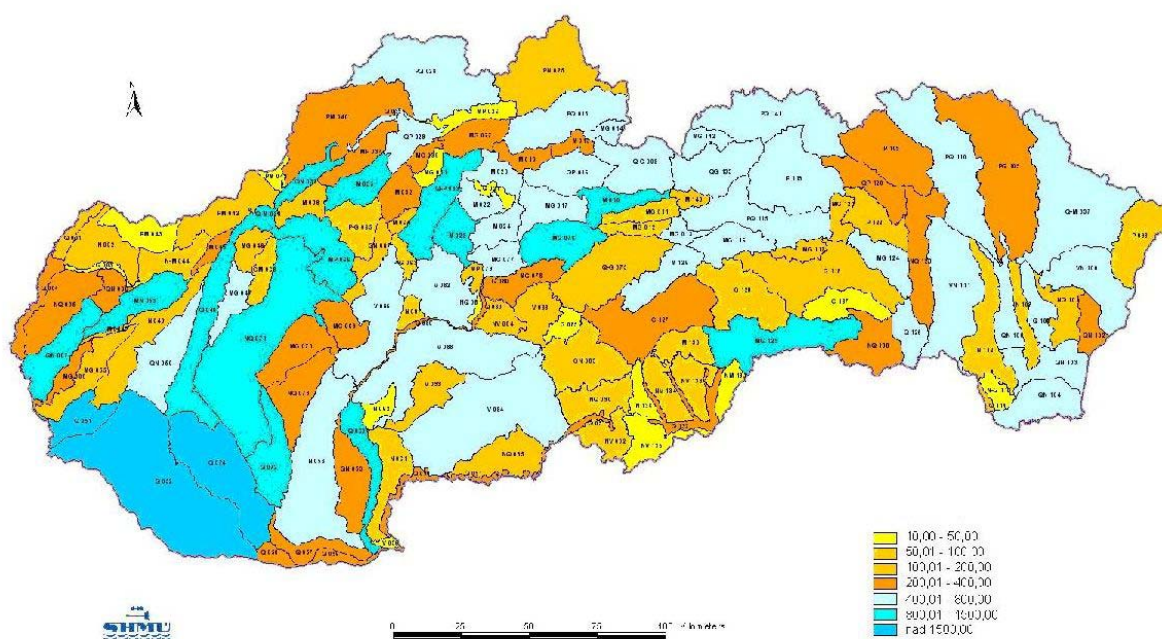
Ground water

◆ Water resources

In 2006, based on the hydro-geological assessment and surveys in Slovakia, there were **76 748 l.s⁻¹ available groundwater resources**. In the long run, increase in available volume is 1 973 l.s⁻¹, that is 2.6 %, compared to 1990.

The most significant groundwater volumes are recorded in the Bratislava and Trnava regions (46 %), while the least groundwater volumes are documented in areas of the Prešov and Nitra regions.

Efficient groundwater volumes in the hydrogeological regions in 2006 (l.s⁻¹)



Source: SHMI

On the basis of assessment of water management balance expressed by the balance status (proportion of abstractable volumes/abstractions), which is the indicator that shows the rate of water sources abstraction, we see that in **2006, out of total number of 141 hydro-geological regions in SR, 120 regions show good balance status, 18 regions show acceptable status, two regions show tense, and one region shows critical status**. No region showed emergency balance status.

◆ Groundwater levels

Trend in groundwater levels and spring yields over the course of the year copies climatic indicators that ultimately impact the year's characteristics. For this reason, trend in groundwater level

and spring yield is not uniform within the same territory, since the orographic character of the territory plays an important role in the overall trend.

In 2006, the highest annual recorded values of ground water levels and spring yields in lowlands were dominant in the Spring season, from the end of March till the beginning of June, occasionally in August. With increasing altitudes, occurrence of the greatest ground water levels and spring yields delays until May or June. Occurrences of maximal spring yields also in higher altitudes were recorded only at the local level. Minimal ground water levels and spring yields were recorded mainly during the winter season, in November and December, while for the springs alone, minimal yields persisted until March.

◆ **Gabčíkovo interest area**

In 2006, rainfall volumes in Žitný ostrov totalled more than long-term average annual totals, and still more than annual totals during the operation of Gabčíkovo waterworks. Highest monthly totals were reached their peak values in May through August, which, in connection to high levels in Danube, also caused an increase in ground water levels. Lowest monthly rainfall totals recorded in the whole Žitný ostrov were in October.

The runoff balance below the Gabčíkovo waterworks (just below the outflow of the draining canal) has been impacted only very little. This place shows more fluctuation in the momentary states and runoffs not only in the Danube watercourse itself, but also in ground water levels. Regulating the flows at the Dobrohošť feeding gateway, it is possible to maintain the flow and level balance similar to the one that existed naturally (including the floods during the flood period).

◆ **Groundwater abstraction**

In 2006, total volume of **abstracted groundwater average was 11 665.2 l.s⁻¹**, which is 15.2 % of all recorded available volumes. Over the course of 2006, ground water abstractions again showed a reduction, this time it was milder - only by 202.3 l.s⁻¹, which is a reduction by 1.7 %, compared to 2005.

After a more rigorous evaluation of groundwater abstraction in Slovakia by individual purposes, we could see reduced water abstraction for most of the monitored abstraction categories.

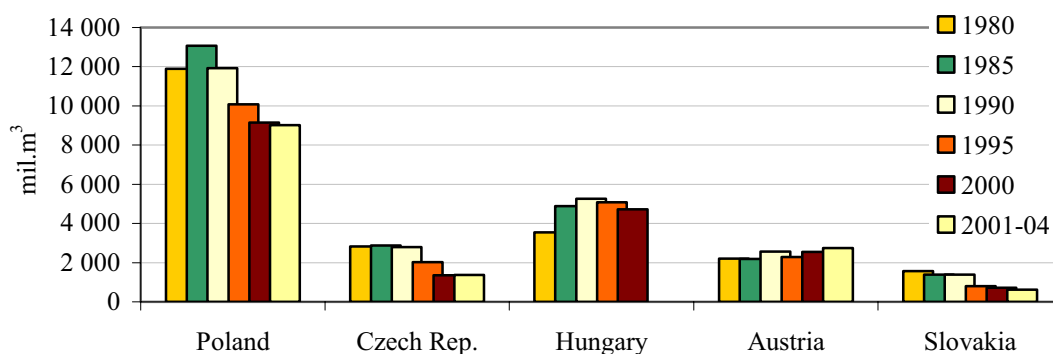
Groundwater extraction in 2006 according to the purpose of use

Year	Public water supplies	Food-processing industry	Industry excl. Food-processing	Agricult. and Livestock	Vegetable prod. Irrigation	Social purposes	Others	Total
2003	10 064.94	329.51	999.29	385.49	380.87	320.74	822.52	13 303.60
2004	9 431.53	322.04	901.65	320.51	65.17	327.02	832.93	12 200.85
2005	9 159.87	288.25	856.75	308.82	95.07	279.72	878.98	11 867.46
2006	8 836.13	295.62	852.34	275.80	94.96	340.15	970.20	11 665.20

Source: SHMI

Groundwater abstraction balance has changed since 1980 also in the neighboring countries and groundwater use shows a falling trend.

Groundwater abstraction in the neighboring countries



Source: SHMI

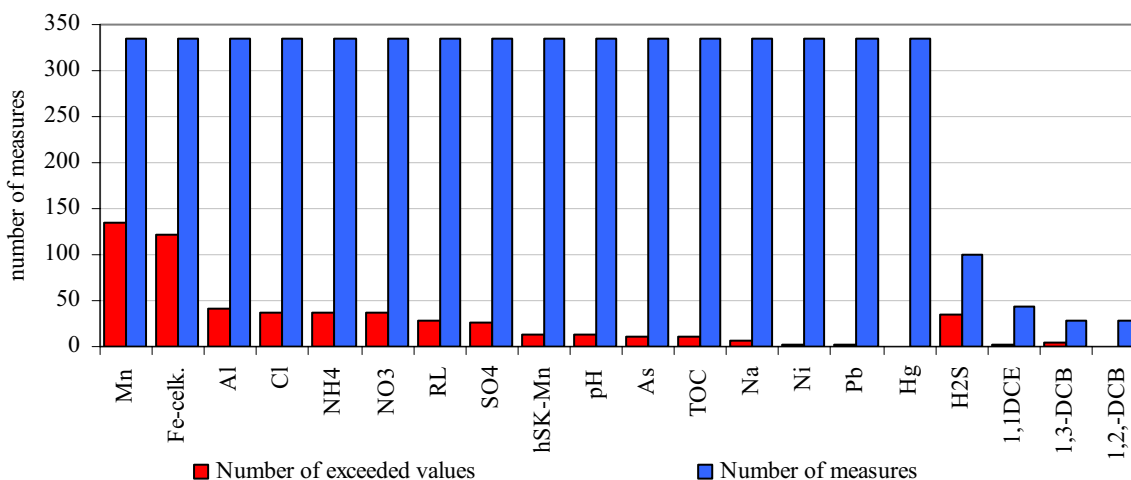
◆ Groundwater quality

Systematic groundwater quality monitoring has been carried out since 1982 under the **national monitoring program**. At present there are 26 monitored significant water management areas (river alluviums, Mesozoic and Neo-volcanic complexes). The monitoring now also includes the pre-Quaternary formations to meet the needs to obtain information on the trend in water quality in areas with a low anthropogenic impact.

In 2006 there were 334 objects monitored in total which included 219 bores within the basic SHMI network 27 used and 17 idle bores (investigative bores), 46 used and 25 idle springs.

Acceptable concentration figures (maximum acceptable concentration) defined under Regulation of the MoH SR No. 354/2006 Coll. on drinking water demands and drinking water quality, were exceeded in 2005 mostly for the following indicators: Fe_{total} (122 times), Mn (134 times), and Al (42 times) out of the all 334 assessments.

Number of exceedings of the limit values of the concentrations of the particular indicators



Source: SHMI

The Figure suggests that there is a major issue of adverse **oxidation-reduction conditions** within the groundwater monitored areas documented by frequently increased concentrations in Fe, Mn, and NH_4^+ .

Besides the already mentioned **physical-chemical indicators** concentrations of $\text{RL } 105$, SO_4^{2-} , and Cl^- anions were also exceeded.

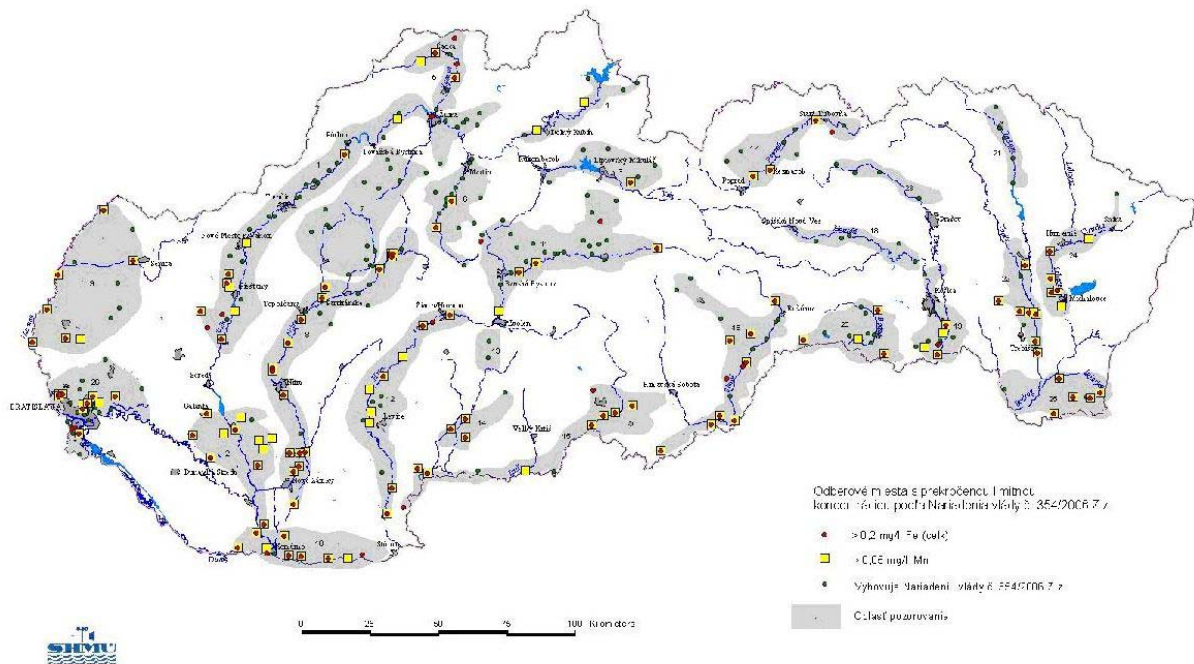
Just like in the previous years, contamination by **organic substances**, indicated by exceeded acceptable COD_{Mn} concentration, is still present. Since in 2006, non-polar extractable substances were determined as the hydro-carbon index, we did not record any exceeding values for this indicator at any groundwater quality monitoring sites.

The on-going utilization of landscape within the monitored areas (urbanized and agriculture territories) is reflected in increased contents of the **oxidized and reduced nitrogen** forms in water (36 times in nitrates).

Most frequently recorded **trace elements** included increased aluminium (42 times), arsenic (11 times), nickel (2 times) and mercury (1 times) concentrations.

Contamination by specific organic substances shows only local character and the majority of specific organic substances was recorded below the detection limit.

Groundwater quality in Slovakia in 2006 – concentration Fe (tot.) a Mn



Source: SHMI

◆ **Ground water quality assessment on Žitný ostrov in the years 2005-2006**

Limit values (highest threshold values) defined under the SR Government Resolution 354/2006 Coll., which sets forth criteria for water for human consumption and control thereof, were exceeded in Žitný ostrov in 2005, most often for the following indicators: total Fe (93-times), Mn (79-times), NH_4

(14-times) a NO₃ (12-times). In 2006 were exceeded indicators: total Fe (97-times), Mn (79-times), NH₄ (15-times) a NO₃ (10-times) from total number 248 analyses.



In 2005, 55.65 % of all analyses did not meet the criteria under the SR Government Resolution 354/2006 Coll., while in 2006 it was 54.44 %. This means that of total number of 248 analyses in 2005, 138 of them were those that showed at least one indicator that exceeded the criteria set forth in the government resolution. In 2006, the number was 135.

Waste Water

Decreasing trend in discharged waste water remained also in 2006, 733 594 thous.m³ of **waste water** was discharged into surface watercourses in Slovakia, which represents a reduction by 148 352 thous.m³ (16.8 %) compared to 2005, and a drop by 406 386 thous.m³ (35.6 %) compared to 1996. Reduction in waste water load remained also for the selected indicators of contamination, most markedly seen in chemical oxygen balance by dichromate, by 5 749 t.year⁻¹, compared to 2005. For the other indicators, the reduction was less dramatic: insoluble substances (NL) by 1 470 tons/year, biochemical oxygen demand by 1 635 tons/year, and NEL_{uv} by 11 tons/year.

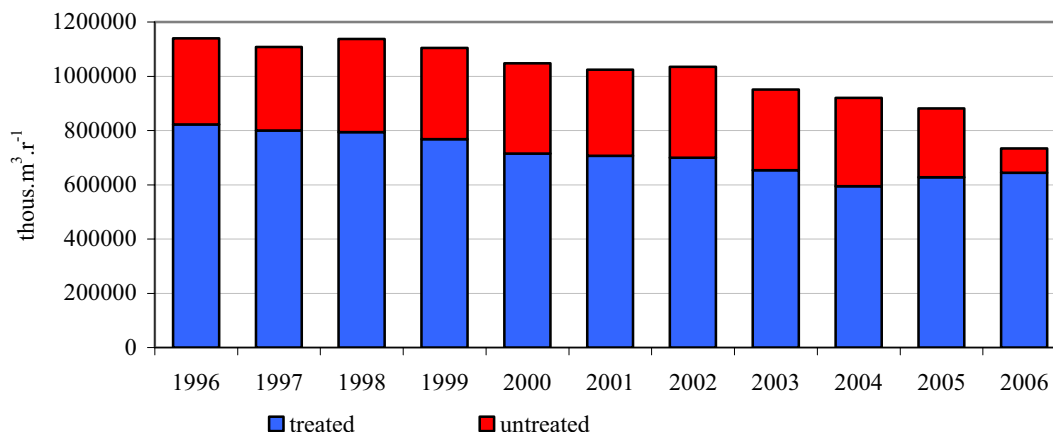
Percentage of discharged treated waste water to total volumes of waste water discharged into watercourses in 2006 was 87.9 %.

Load of the balanced contamination sources discharged into surface watercourses in the period of years 1996-2006

Discharged waste water	Volume (thous.m ³ .y ⁻¹)	IS (t.y ⁻¹)	BOD ₅ (t.y ⁻¹)	COD _{Cr} (t.y ⁻¹)	ENP _{uv} (t.y ⁻¹)
1996	1 139 980	41 107	27 370	75 843	627
2003	950 686	21 193	17 372	56 829	232
2004	919 869	21 389	13 702	45 162	57
2005	881 946	12 670	10 661	37 312	55
2006	733 594	11 200	9 026	31 563	44

Source: SHMI

Trend in discharging of the treated and untreated waste waters into watercourses in the period of 1996-2006



Source: SHMI

Proportion of waste water treatment in specific parameters of Directive 91/271//EEC

Category	< 2000 EO	2001 – 10 000 EO	10 001 – 15 000 EO	15 001 – 150 000 EO	> 150 001 EO	Average
COD_{Cr}	78.2 %	91.5 %	90.0 %	90.4 %	66.7 %	85.37 %
BOD₅	64.1 %	78.0 %	80.0 %	76.9 %	66.7 %	72.20 %
IS	73.1 %	91.5 %	80.0 %	88.5 %	66.7 %	82.44 %
N_{total}	-	-	20.0 %	19.2 %	33.3 %	20.59 %
P_{total}	-	-	10.0 %	23.1 %	50.0 %	23.53 %

Source: WRI

Mentioned values show that the level of treatment in the smallest agglomerations that are not so demanding in terms of the depth of purification is relatively poor, and the ratio of acceptable waste water treatment plants to all plants is little below three quarters. Medium and large size waste water treatment plants remove organic contamination with good efficiency; however, they stay behind in their capacity to remove nutrients. In fact, the largest waste water treatment plants show several cases of overload, when they are not able to remove all received contaminants. This, in turn, is reflected in a lower proportion of acceptable parameters of basic organic contamination.

Public water supply, sewerage systems and waste water treatment plants

◆ **Public water supplies**

In 2006 number of inhabitants supplied with drinking water from the public water supply reached the number of 4 654 thousand, which represented 86.3 % of supplied inhabitants. There were in the SR 2 208 individual municipalities that were supplied with public water supply, and their portion on total SR municipalities was 76.4 %. The highest proportion of supplied municipalities is in the Bratislava region. Compared to 2005, share of supplied municipalities increased in the Trenčín

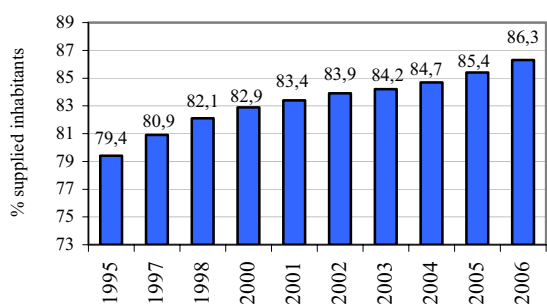
region (91.7 %), Bratislava region (97.3 %), and Žilina region (98.7 %). However, compared to 2005, Banská Bystrica, Prešov, and Košice regions showed unchanged number of municipalities with public water supply.

Capacity of operated water sources in 2006 reached the value of 33 690 l/s, while ground water sources represented 27 860 l/s, and surface water sources 5 830 l/s.

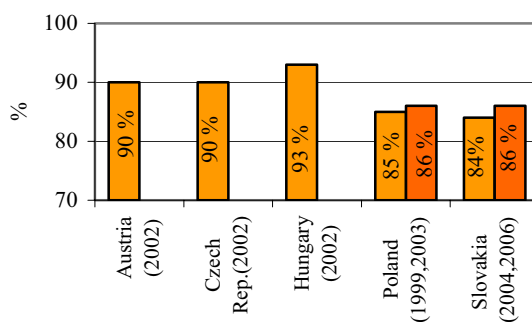
The year 2006 showed only a minimal reduction in drinking water abstraction. **Volume of produced drinking water** in 2006 reached the value of 334 mil.m³, which compared to 2005, represents a reduction only by 18 mil.m³. Of all the ground water sources, 281 mil.m³ was produced (reduction by 18 mil.m³), while 53 mil.m³ of drinking water was produced of all surface water sources, (same level as in 2005). Of total water produced at water management facilities, **water losses** by pipe network were 32.8 % in 2006. **Specific water consumption for households** increased in 2006 to 107 l.inhab⁻¹.day⁻¹ (in 2005 it was 104 l.inhab⁻¹.day⁻¹).

Also other countries showed a decreasing trend in the annual water consumption from public water supplies per capita. Czech Republic and Slovakia are approximately at the same level in terms of water consumption, while Poland shows the least consumption – only 57 m³.inhab⁻¹.year, Hungary shows the best characteristics with having as much as 93 % of its inhabitants supplied with drinking water from public water supplies.

Drinking water supplying of the inhabitants from the public water supplying in the SR **Comparison of the drinking water supplying of the inhabitants from the public water supplying in selected countries**



Source: SO SR



Source: OECD, SO SR

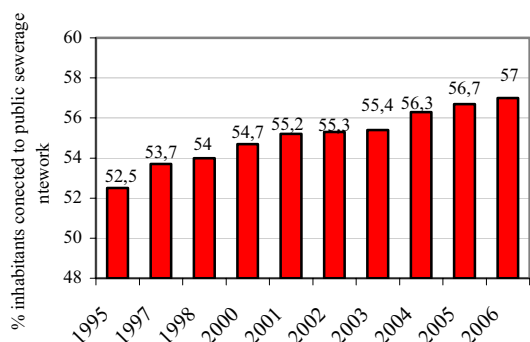
◆ **Sewerage system**

Development of public sewerage systems lags behind that of public water supplies. **Number of inhabitants** living in households **connected to public sewerage systems** in 2006 grew by 20 thousand, compared to 2005, and reached the number of 3 075 thous. inhabitants, which is 57.1 % of all inhabitants. Of the number of 2 891 of stand-alone municipalities in 2006, 614 of them had public sewerage systems in place (i.e. 21.2 % of all Slovak municipalities), while 552 municipalities (i.e. 19.1 % of all Slovak municipalities) had their wastewater sent directly off to the wastewater treatment

plant. Adverse situation remains also in individual regions of Nitra, Trnava, and Prešov, these regions stay behind the national average.

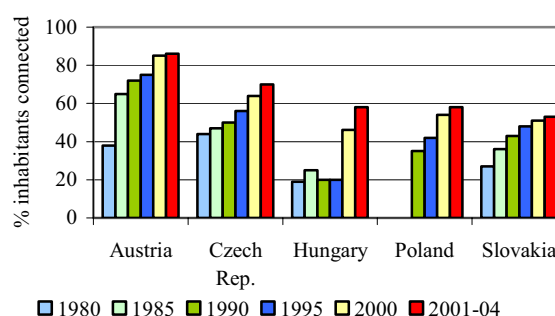
Greatest level of connectedness of the public to the public sewerage system from among the V4 countries reached Austria (86 %), and the Czech Republic (70 %), Poland, Hungary, and Slovakia show approximately the same level of connectedness, 56 % on average.

Connecting of the inhabitants to the public sewerage network in the SR (%)



Source: SO SR

Comparison of the connecting of the inhabitants to the public sewerage network in the selected countries (%)



Source: OECD

◆ Waste water treatment plants

In 2006, 12 waste water treatment plants were added into the Administration of water supplies and water sewerage systems (VaK) scheme, reaching the number of 454. Greatest share on these had mechanical-biological WWTPs (86.2 %). Increase in WWTP’s capacity was still on the rise, reaching the value of 2 200.7 m³.day⁻¹ in 2006.

In 2006, watercourses with public sewerage system (administered by municipalities and water management companies) received 452 mil.m³ of discharged waste water, which was by 9 mil.m³ more than in the previous year, and the volume of treated waste water discharged into the public sewerage system in 2006 reached 440 mil.m³.

Volume of the discharged wastewater by the public sewerage system (in administration of VaK and in administration of the municipalities) in 2006

Water discharged by the public sewerage and WWTP	Sewage	Industrial and other	Precipitation	Separate	Adminis -tration of the municipalities	Total
	(thous.m ³ .year ⁻¹)					
Treated	119 734	85 351	62 558	162 435	10 538	440 616
Untreated	2 559	1 635	1 690	4 522	1 444	11 850
Total	122 293	86 986	64 248	166 957	11 982	452 466

Source: WRI

In 2006, there were 54 780 tons of the sludge dry matter produced in municipal WWTPs. Of this, 39 405 tons (71.9 %) were used for soil processes, 6 130 tons (11.2 %) were temporarily stored, and 9 245 tons were landfilled (16.9 %). In 2006, there was direct application of sludge into the

agricultural soil. 33 630 tons of sludge dry matter was used for compost production, while 5 775 tons of sludge were used for soil processes (reclamation of landfills, areas, etc.).

Sludge produced in the waste water treatment plant

Year	Amount of the sludge (tons of dry residue)							
	Total	Used			Incinerated	Disposed		
		Applied into the agricultural soil	Applied into the forest soil	Composted and used in other way		Total	Suitable for the further use	In other way
2003	54 340	16 640	605	22 085	0	8 110	7 610	6 900
2004	53 085	12 067	0	30 437	0	4 723	3 470	5 858
2005	56 360	5 870	0	33 250	0	8 530	6 960	8 710
2006	54 780	0	0	39 405	0	9 245	8 905	6 130

Source: WRI

Drinking water

◆ **Drinking water quality monitoring and assessment**

As from June 1, 2006, new **SR Government Resolution no 354/2006 Coll.** came into effect, which sets forth criteria for water for human consumption and control thereof, and which has led to minor changes to drinking water quality criteria and assessment criteria (e.g. saprophytic molds were left out of the range of microbiological and biological indicators). Due to the transitory nature of the year 2006, drinking water quality for microbiological and physical and chemical indicators was still assessed under the MZ SR Resolution 151/2004 Coll. Radiological indicators were determined in accordance with the Regulation of MoH SR No. 29/2002 Coll, on demands to ensure radiation control. Water quality was assessed on the basis of the number or proportion of individual limits shown to have exceeded the pertinent sanitary norms. In 2006, were analyzed at operation laboratories of water management companies 13 334 samples. The samples were abstracted at sites located within distribution networks and 366 397 analyses were carried out to monitor individual drinking water quality indicators. Share of drinking water analyses that complied with the sanitary limits in 2006 reached 99.44 % (in 2005 it was 99.32 %). Percentage of samples that meet drinking water quality demands for all indicators reached 91.18 % (in 2005 it was 89.59 %). These samples did not include the active chlorine indicator, as this test was done separately, in relation to the microbiological quality of drinking water.

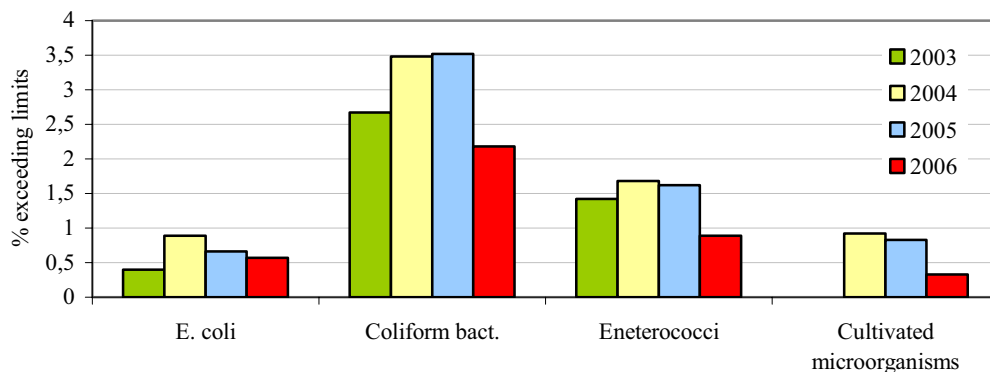
Exceeding limits in drinking water samples in accordance with the Regulation MoH SR No. 151/2004 Coll. on demands on drinking water and drinking water control

Year	2004	2005	2006
Share of drinking water samples that do not meet the NMH and MHRR limit.	2.03 %	2.10 %	1,32 %
Share of drinking water quality indicators analyses that do not meet NMH and MHRR	0.54 %	0.55 %	0,32 %
Share of drinking water samples that do not meet the MH, NMH, MHRR and IH limit.	22.56 %	19.29 %	17,84 %
Share of drinking water indicator analyses that do not meet the MH, NMH, MHRR, and IH limits, pursuant to STN 75 711.	1.48 %	1.15 %	1,05 %

Source: WRI

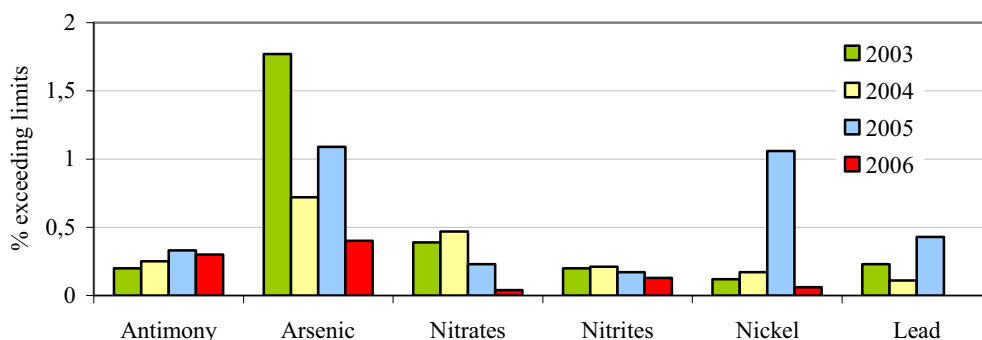
IH – indicative values, MH - threshold values, NMH - maximum threshold values, MHRR – threshold values of the reference risk

Results of monitoring the microbiological and biological indicators of drinking water within Slovakia's distribution networks



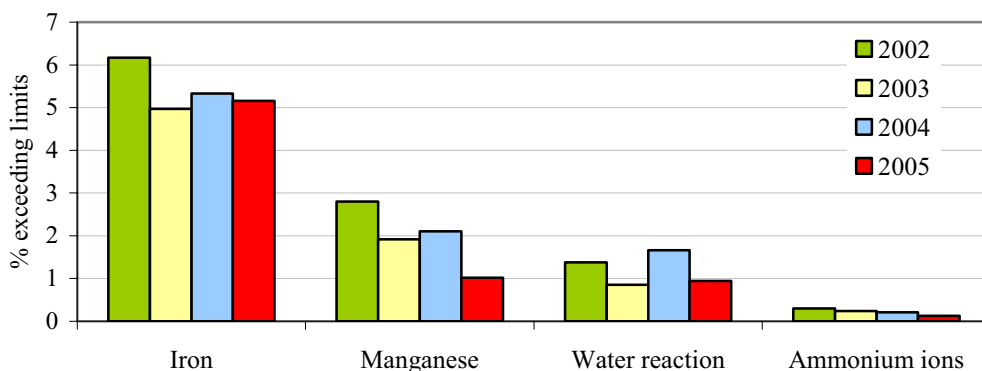
Source: WRI

Results of physical and chemical drinking water indicators monitoring within Slovakia's distribution networks - inorganic indicators



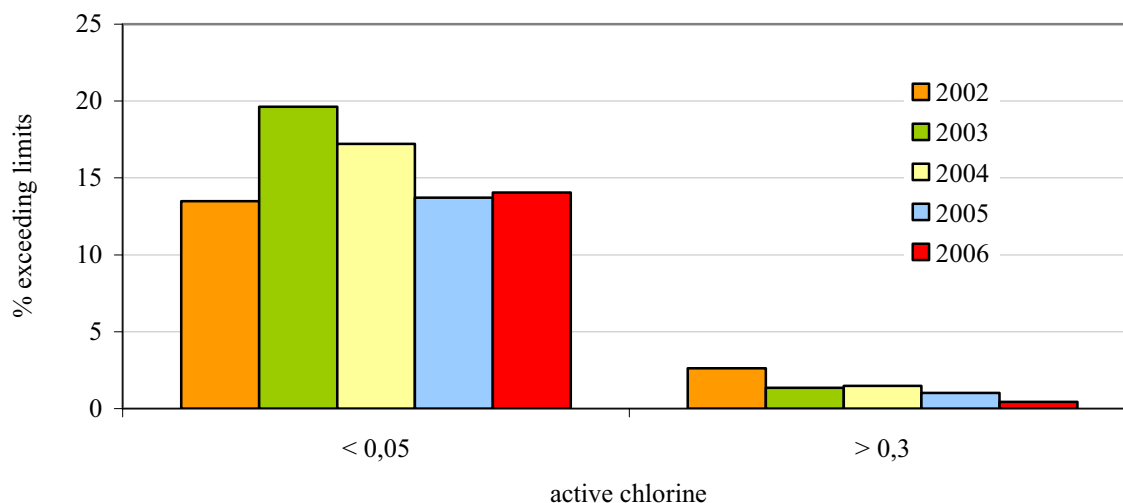
Source: WRI

Results of physical and chemical drinking water indicators monitoring within Slovakia's distribution networks - indicators that cannot adversely affect drinking water sensorial quality



Source: WRI

Results of monitoring for the presence of disinfection agents and their by-products in drinking water within Slovakia's distribution networks



Source: WRI

Quality of recreational water in 2006

Since 35.9 % of sites in Slovakia in 2005 showed values below the limits for recreational use of water, which was caused also by inadequate water monitoring, the Slovak government established a competency to monitor water designated for recreational use through its **Act 126/2006 Coll. on public health and on amendments of some laws, as well as through the SR Government Resolution 225/2006 Coll. on details regarding the operation of swimming areas, water suitable for swimming, and its control**. The commissioned, competent authorities are PHA SR (Public Health Authority of the Slovak Republic), and regional PHA in SR, along with operators of individual sites, that are to follow the frequency and methods in line with the EEC Resolution 76/160 regarding the quality of water designated for bathing.

Over the season, 463 water samples were extracted and 7 219 tests were done on chemical, physical, microbiological, and biological water quality indicators, 344 indicators exceeded the national limit values. The most frequent cause for unacceptable water quality included changes to color and clarity, above-limit content of microbiological indicators for coliform bacteria and enterococcus, above-limit content of algae, chlorophyl a, and total phosphorus. In comparison with the previous years, the occurrence of blue-green algae over the monitored time period was generally lower, in most cases below the limit values.

Quality of water suitable for recreational use during the summer season of 2006



Source: IoPH, SEA

The SR report on the quality of water for recreational use in 2006 was developed on the basis of article 13 of Resolution 76/160/EEC on quality of water suitable for recreational use. For 2006, the report included 38 swimming areas, 71.7 % of which complied with more stringent water quality criteria. 92.1 % of swimming areas complied with the minimum standards, while 5.3 % did not. Swimming was prohibited in 2.6 %.





The purpose of this law is to establish the principles of protection and rational exploitation of mineral resources, especially by carrying out geological researches, openings, preparation and breaking of mineral deposits, enrichment and refining of minerals, performed in relation with their extraction, as well as providing for security of operations and environment protections during these operations.

§ 1 of the Act on Protection and Exploitation of the Mineral Resources No. 44/1988 Coll. (Mining Act) as subsequently amended

• ROCKS

Geological environmental factors

Partial Monitoring System - Geological Factors (PMS - GF) as part of environmental monitoring in Slovakia, is focused mainly on so-called geological hazards or harmful natural or anthropogenic geological processes that threaten the natural environment and eventually the humans.

From 1.1.2006 data are monitored:

- 01: Landslides and other slope deformation
- 02: Tectonic and seismic activity of the territory
- 03: Anthropogenic sediments of environmental loads sediments
- 04: Influence of mineral exploitation upon environment
- 05: Monitoring of the volume activity of Radon in the geological environment
- 06: Stability of massifs underlying historic objects
- 07: Monitoring of stream sediments
- 04: Volume unstable soils

Summary of the major outcomes from the monitoring activities in 2006:

In 2006, monitoring of three basic types of **slope movements** was carried out – slides, creep, and signs of activated falling movements. Measurements were for in 15 selected sites.

Tectonic movements were observed within a testing operation of the Slovak spatial observing service for the usage of satellite GPS equipment. Reports from seismic stations supplied for interpretation more than 6 140 teleseismic, regional, or local seismic phenomena. About 70 micro temblors were localized (earthquakes with no macro-seismic impacts) with their epicenter in the studied area of Slovakia. In 2006, there were in Slovakia 5 earthquakes observed as macro-seismic. Epicenters of 4 of these zones

were in the Slovak territory (2 in the source area of Dobrá voda, and 2 in the source area of Považský Inovec). Furthermore, there was in Slovakia 1 observed earthquake with its epicenter in Ukraine.

Of all **anthropogenic sediments of the character of environmental loads** in 2006, there were 145 report cards processed from *abandoned landfills*.

Processed abandoned landfills

District	Number of processed loads	Monitoring of loads
Liptovský Mikuláš	44	2
Poprad	10	-
Rožňava	36	1)
Michalovce	14	3
Sobrance	17	2
Trebišov	19	5
Prievidza	5	-
Total	145	13

Source: SGI DS

In 2006, the following sites of *tailings dumps* were monitored: Nováky – ENO (Electric power plants of Nováky) temporary, Nováky – ENO original, Nováky – ENO definite, Banská Štiavnica – Lintich, and Sedem žien (sampled and analysed 10 non-damaged and 20 damaged samples of floating sludge), Duslo Šaľa - Amerika 1, Duslo Šaľa - RSTO (Operated solid waste landfill).

A way of relative **environmental impact assessment of mineral exploitation** and risk potential of individual sites was suggested, along with processing of information on the existing monitoring and demolition activities at sites that pose most risks. The following sites were proposed for further monitoring:

- Area of brown coal extraction (Upper Nitra region – Handlová, Cígel', Nováky)
- Area of magnesite and talc extraction (Jelšava - Lubeník – Hnúšť'a, Košice – Bankov)
- Areas of ore deposits (Middle Spiš – Rudňany, Slovinky, Smolník, Novoveská Huta, Rožňava-Nižná Slaná, Banská Štiavnica – Hodruša – Kremnica. Špania Dolina, Dábrava – Magurka, Pezinok).

Monitoring of the volume Radon activity was done in 2006 at six sites that showed medium to high Radon risk (Bratislava – Vajnory, Banská Bystrica – podlavice, Novoveská Huta, Teplička, Hnilec a Košice).

Total number of **radon** monitoring activities **in water** includes 28 in-field monitoring days per year, and 56 extracted ground water samples.

Monitoring of stability of rock massifs below historic objects was carried out on selected castles. In June 2006, a measuring devise was also installed at the Trenčín castle.

48 reference sampling sites for **alluvial sediments monitoring** were analysed. Strong contamination of alluvial sediments was found at the following sampling sites: Nitra – Chalmová, Nitra – Lužianky, Nitra – pod Šuranmi, Štiavnica – river mouth, Hornád, and Hnilec. **Monitoring of quality of solid precipitations** was carried out at 43 sampling sites. Highest pH values were found at Bratislava –

Slovnaft site, highest arsenic content was found at Horná Nitra, highest Pb content was found at Bratislava – Slovnaft, and highest Al content was found at Lehôtka pod Brehy.

During monitoring of **volume volatile soils** on the territory of the Poddunajská lowland, there were 94 damaged objects documented in towns and villages, while such objects were found in 58 towns and villages of the Východoslovenská lowland.

Geothermal energy

Geothermal energy represents a significant, thermo-energetic potential of Slovakia. At present, there are 26 designated hydro-thermal areas in Slovakia, taking up 27 % of the state's territory. Rocks that function as thermal water collectors outside the spring areas are found in the depth of 200-500 m and contain geothermal water with the temperature of 20 – 150 °C.

Summary **thermo-energetic potential of geothermal water** of all prospective areas represents 5 538 MW_t. Monitoring wells carried out to date documented 1 787 l/s of water with the outflow temperature of 18-129°C. Their heat output represents 306.8 MW_t (when used at the reference temperature of 15°C).

Register of geological mapping

Registers of geological mapping (as of December 31, 2006)

Registers of	Accumulation in 2006	Total number
surveyed territories	39	467
surveyed territories drafts	61	420
landslides	2	11 395
wells	2 201	735 157
hydro-geological wells	186	22 981
landfills	1	8 450
map drawing and purpose mapping	249	9 617
geophysical mapping	765	4 382
abandoned mining works	52	16 569

Source: SGI DS

Abandoned mining works

Pursuant to **Act No. 44/1988 Coll. on protection and exploitation of mineral deposits (Mining Act)**, as amended, MoE SR also ensures searching for abandoned mining works. The State Geological Institute of Dionyz Stur in Bratislava was commissioned to maintain the Register.

Abandoned mining works as of December 31, 2006

Type of abandoned mine	Number
Mining shaft	4873
Pit (hole)	517
Chute	63
Cut, excavation	88
Pingo	3 987
Pingo field	109
Pingo draw	128
Dump	6 125
Old randing	205
Sink mark	292
Placer	20
Tailings dump	10
Other	152
Total	16 569

Source: SGI DS



Survey territories

Under the geology legislation and pursuant to the GS SR status - the GEOFOND department keeps the register of survey areas for selected geological activities. In 2006, there were 39 survey areas and 61 registered proposals to designate a survey area. As of December 31, 2006, there were 108 recognised areas.

Overview of deposits in Slovakia

Energy deposits (state to the date 31st December 2006)

Raw material	Number of deposits included into balance	Number of free balance deposits	Number of deposits for mining in 2005	Unit	Balance deposits free	Geological deposits
Anthracite	1	1	0	thous. t	2 008	8 006
Bitumen sediments	1	1	0	thous. t	9 780	10 797
Brown coal	11	6	4	thous. t	145 068	468 382
Flammable natural gas – gasoline gas	8	6	2	thous. t	202	399
Lignite	8	3	1	thous. t	112 235	619 810
Non-resinous gases	1	0	0	mil. m ³	0	6 360
Underground stores of natural gas	8	0	0	mil. m ³	0	2 151
Crude oil non-paraffinic	3	3	0	thous. t	1 632	3 422
Crude oil - semi-paraffinic	8	4	4	thous. t	140	6 435
Uranium ores	2	1	0	thous. t	1 396	5 272
Natural gas	39	22	11	mil. m ³	8 824	27 059
Total	90	47	22		281 285	1 158 093

Ore deposits (state to the date 31st December 2006)

Type of ore	Number of deposits included into balance	Number of free balance deposits	Number of deposits for mining in 2005	Unit	Balance deposits free	Geological deposits
Sb ores	9	1	0	thous. t	85	3 276
Complex Fe ores	7	2	0	thous. t	5 751	57 762
Cu ores	10	0	0	thous. t	0	44 350
Hg ores	1	0	0	thous. t	0	2 426
Poly-metallic ores	4	1	0	thous. t	1 623	23 671
Wolfram ores	1	0	0	thous. t	0	2 846
Gold and silver ores	11	5	0	thous. t	26 480	31 960
Fe ores	2	2	1	thous. t	15 909	20 262
Total	45	11	1		49 848	186 553

Source: SGI DS

Non-metallics deposits (state to the date 31st December 2006)

Raw material	Number of deposits included into balance	Number of free balance deposits	Number of deposits for mining in 2005	Unit	Balance deposits free	Geological deposits
Anhydride	7	6	2	thous.t	806 497	1 250 527
Asbestos and asbestos rock	4	1	1	thous. t	3 710	26 904
Baryte	6	2	2	thous. t	9 556	12 741
Bentonite	23	17	6	thous.t	28 912	42 192
Cast basalt	4	4	1	thous. t	22 906	40 081
Decorative rock	19	16	2	thous. m ³	19 907	25 465
Diatomite	2	1	0	thous. t	3 342	4 955
Dolomite	20	20	11	thous. t	610 723	637 190
Precious stones	1	1	0	ct	1 205 168	2 515 866
Graphite	1	0	0	thous. t	0	294
Halloysite	1	0	0	thous. t	0	2 249
Rock salt	4	4	1	thous. t	839 633	1 350 615
Kaolin	14	13	3	thous. t	54 602	59 884
Ceramic clays	36	33	6	thous. t	115 767	190 358
Quartz	7	7	0	thous. t	310	327
Quartzite	15	13	1	thous. t	18 352	26 951
Magnesite	11	6	3	thous. t	748 198	1 128 121
Talc	5	2	0	thous. t	86 637	235 201
Mineralized I - Br waters	1	1	0	thous. m ³	3 658	3 658
Pearl stone	5	5	1	thous. t	30 265	30 585
Pyrite	3	0	0	thous. t	0	18 717
Gypsum	6	5	2	thous. t	62 768	93 528
Sialitic raw material	5	5	2	thous. t	82 802	96 165
Glass sands	4	4	1	thous. t	411 657	590 383
Mica	1	1	0	thous. t	14 073	14 073
Building rock	129	123	77	thous. m ³	632 613	746 715
Gravel sands and sands	26	24	18	thous. m ³	164 444	186 185
Brick clay	32	29	11	thous. m ³	96 319	120 690
Technically usable mineral crystals	3	1	0	thous. t	253	2 103
Limestone – unspecified	29	26	13	thous. t	1 870 562	2 207 526
High-content limestone	10	10	4	thous. t	3 198 368	3 362 290

Zeolite	6	6	2	thous. t	106 160	111 384
Foundry sands	14	14	1	thous. t	294 311	509 347
Refractory clays	7	6	0	thous. t	3 105	3 263
Feldspars	6	6	0	thous. t	10 402	11 640
Total	475	419	173		11 722 671	15 827 116

Source: SGI DS

Classification of mineral deposits by state of extraction (state to the date 31st December 2006)

Extraction symbol	Characteristics	Number of deposits
1	<i>Deposits with developed extraction activity</i> include exclusive mineral deposits sufficiently open and technically apt for extraction of industrial deposit.	208
2	<i>Deposits with fading extraction activity</i> include extraction mineral deposits where extraction activity will cease in a near future (within 10 years)	29
3	<i>Deposits before completion</i> include exclusive mineral deposits with documented deposits that give basis to one of the construction phases (starting with the projection phase)	29
4	<i>Deposits with ceased extraction</i> include exclusive mineral deposits with definitely or temporarily stopped extraction activity.	96
5	<i>Non-extracted deposits</i> include documented exclusive mineral deposits soon to be constructed and extracted.	50
6	<i>Non-extracted deposits</i> include documented exclusive mineral deposits with no plans for their extraction.	184
7	<i>Surveyed deposits</i> include deposits of exclusive and non-exclusive minerals with various degree of mapping.	13

Source: SGI DS

Non-limited mineral deposits (as of December 31, 2006)

Raw material	Number of listed deposit sites	Number of sites with extraction activities
shale	3	1
floating sand	1	0
tailings, waste	6	0
clays	1	0
building stone	144	40
ballast and sand	194	81
brick raw material	57	0
tuff	1	0
dried sludge – brucit	1	1
Total	408	123

Source: SGI DS

◆ **Ground water volumes**

Ground waters deposits in the SR (state to the date December 31, 2006)

Category	A	B	C	Total
Efficient deposits of the ground waters (I.s-1)	-	96.06	2 841.10	2 937.16
Efficient amounts of the ground waters (I.s-1)	-	-	9 851.76	9 851.76

Source: SGI DS

Legend:

C calculated on the basis of assessment of the existing hydrogeological mapping
B calculated on the basis of hydrogeological mapping with long-term extraction test
A calculated on the basis of hydrogeological mapping with semi-operational test



The terms sustainable exploitation of the arable land and farming the farmland mean exploitation and protection of the properties and functions of the soil by the means and to the extent, which would keep its biological diversity, fertility, restoration ability and potential to perform all functions.

§ 2 letter e/ of the Act on Protection and Use of Farmland No. 220/2004 Coll., including the change of Act on Integrated Pollution Prevention and Control No. 245/2003 Coll., and on change and amendment of some laws

• SOIL

Land use

◆ Land Use on the basis of the Land Register's data

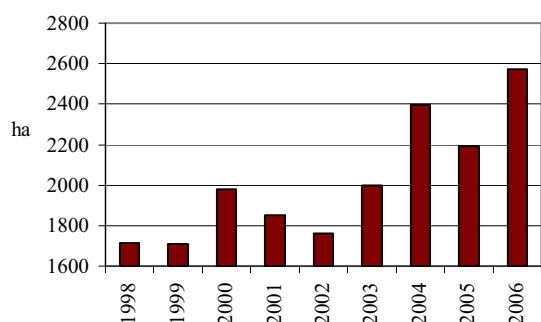
Land Use categories (state to the date 31st December 2006)

Land category	Area (ha)	% of total area
Agricultural land	2 430 683	49.57
Forest land	2 006 939	40.93
Water areas	93 325	1.90
Build-up land	227 092	4.63
Other land	145 357	2.96
Total area	4 903 397	100.00

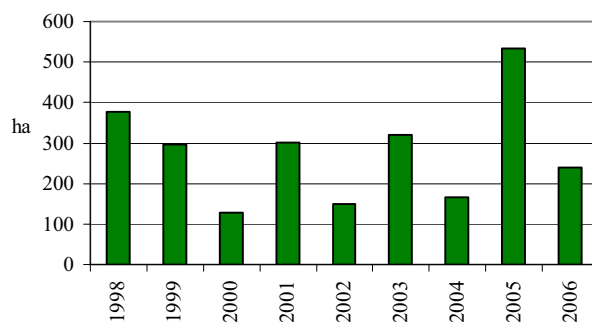
Source: IGCC SR

Anthropogenic pressure to use soil for purposes other than its primary production and environmental functions brings about its gradual decrease. In the years 1999-2006, **losses of agricultural soil to construction** grew on the year-year basis, mainly for public, house, and industrial construction purposes (1 380 ha in 2006).

Trend in agricultural soil loss including the losses of arable soil to forestland, non-agricultural and non-forested soil in the SR



Trend in forestland loss to agricultural soil, non-agricultural and non-forested soil in the SR



Source: IGCC SR

Soil properties

Information on state and trend in agricultural soil properties and their degradation may be obtained from the Partial Monitoring System - Soil (PMS-S) carried out by the Soil Science and Conservation Research Institute (SSCRI) and from the Agrochemical soil testing (AST) carried out by Central Controlling and Testing Institute in Agriculture (CCTIA). Information on state and trend in forest soil properties may be obtained from the Partial Monitoring System – Forests (PMS-F) carried out by the National Forest Centre – Forest Research Institute.

♦ Chemical properties of soil

Soil reaction

Trend in soil reaction (pH/H₂O) in the A-horizon of agricultural soil in Slovakia, based on the comparison of outcomes from three PMS-S cycles

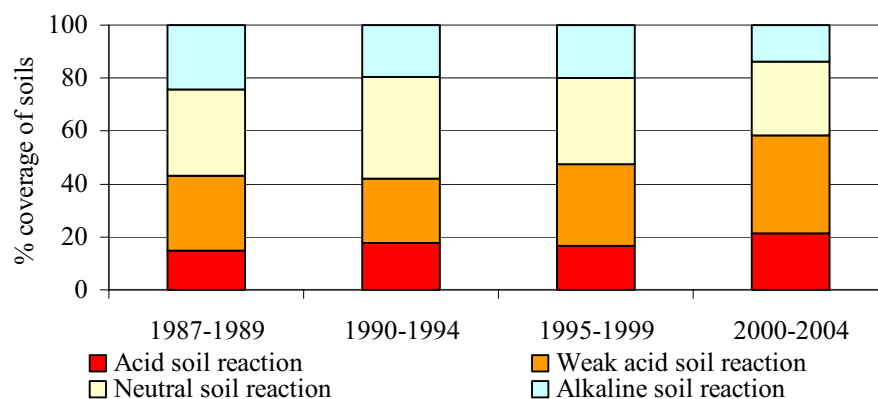
Main soil unit	1993	1997	2002
Mollic Fluvisols AL	7.29	7.24	7.03
Fluvisols AL	7.13	6.95	-
Chernozems AL	7.28	7.31	-
Haplic Luvisols AL	6.71	6.85	-
Planosols AL	6.66	6.70	-
Planosols PG	6.31	6.24	-
Rendzic Leptosols AL	7.27	7.25	7.54
Rendzic Leptosols PG	7.17	7.18	6.57
Regosols AL	6.68	6.54	6.95
Cambisols AL	6.56	6.42	6.18
Cambisols PG	5.61	5.56	5.29
Solonchaks and Solonetz PG	8.29	7.88	8.45
Podzols PG	4.21	3.93	3.88

AL – Arable Land, PG – Permanent Grassland

Source: SSCRI

Outcomes from agrochemical soil testing for the VIII. (1987-1989) through XI. (2000-2004) cycle show an **increase in the proportion of agricultural soil with acid (+6.2 %) and weak acid (+8.8 %) soil reaction**. On the other hand, a reduction was seen in the proportion agricultural soil with neutral (-4.7 %) and alkaline (-10.3 %) soil reaction.

Trend in agricultural soil reaction in the SR (in KCI) based on the outcomes from Agrochemical soil testing



Source: IGCC

Most Slovak forest soil is mildly to strongly acid.

Trend in exchange soil reaction (pH/CaCl₂) in selected soil types of fores soil in the SR based on comparison of the PMS-F results

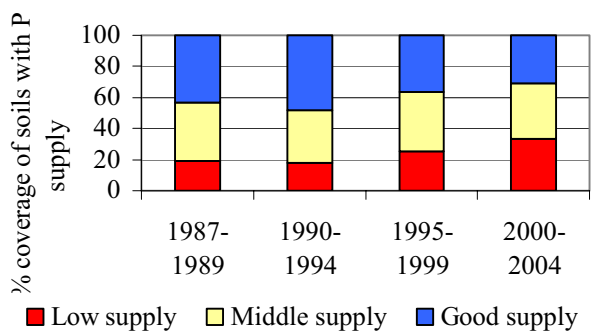
Main soil unit	1988	1993	1998	2006
Eutric Cambisols	4.23	4.10	4.14	4.05
Dystric Cambisols	3.57	3.30	3.65	3.62
Luvisols	4.16	4.10	4.14	4.25
Podzols	3.16	3.30	3.37	3.39
Rendzic Leptosols	6.36	6.85	7.04	6.54

Source: NFC - FRI

Available nutrients

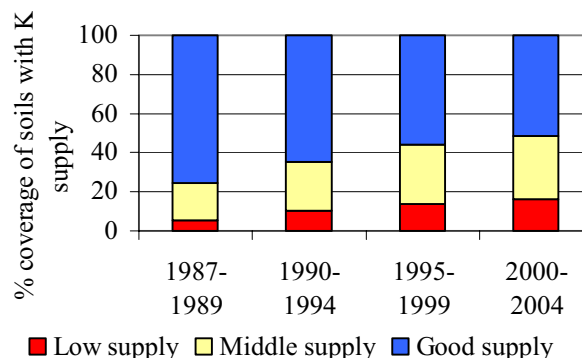
During the period VIII. (1987-1989) through XI. (2000-2004) of Agrochemical soil testing there was an **increase in low supply of all three available nutrients (phosphorus, potassium, and magnesium)**. In phosphorus, it was by 14.6 %, by 10.7 % in potassium, and by 5.3 % in magnesium). However; during this period, good supply of all three available nutrients were reduced (by 12.4 % in phosphorus, by 24.2 % in potassium, and by 12 % in magnesium), which, in terms of plant nutrition, is a negative tendency.

Trend in phosphorus content in agricultural soil in the SR based on outcomes of Agrochemical soil testing



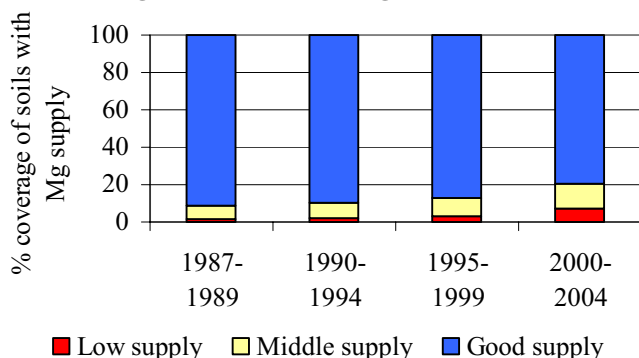
Source: IGCC

Trend in potassium content in agricultural soil in the SR based on outcomes of Agrochemical soil testing



Source: IGCC

Trend in magnesium content in agricultural soil in the SR based on outcomes of Agrochemical soil testing



Source: IGCC

Humus

Trend in humus content in the A-horizon of agricultural soil in the SR, based on the comparison of outcomes from three PMS-S cycles (%)

Hlavná pôdna jednotka	1993	1997	2002
Chernozems AL	2.74	2.17	-
Mollic Fluvisols AL	3.69	3.14	3.74
Fluvisols AL	2.72	2.26	-
Haplic Luvisols AL	2.07	1.71	-
Planosols and Luvisols AL	2.07	1.69	-
Planosols and Luvisols PG	3.85	3.47	-
Cambisols on vulcanites PG	5.00	3.62	5.69
Cambisols on vulcanites AL	3.65	3.17	4.52
Stagnic Cambisols PG	4.55	3.52	4.98
Stagnic Cambisols AL	2.86	2.26	3.17
Cambisols on acid substrates PG	6.17	4.72	6.76
Cambisols on acid substrates AL	3.09	2.41	3.71
Cambisols on carbonate substrates PG	6.47	5	6.72
Cambisols on carbonate substrates AL	2.98	2.52	3.40
Cambisols PG	5.55	4.22	6.04
Cambisols AL	3.15	2.59	3.70
Regosols AL	1.76	1.57	2.05
Podzols, Skeletic Leptosols, Lithic Leptosols PG	18.79	20.00	24.79
Solonchaks and Solonetz PG	2.40	2.02	2.83
Rendzic Leptosols AL	3.05	2.62	2.76
Rendzic Leptosols PG	6.03	5.34	7.59

AL – Arable Land, PG – Permanent Grassland

Source: SSCRI

◆ Physical properties of soil

The table shows changes to values of total porosity in the A-horizon of agricultural land during three PMS-S cycles.



Trend in overall porosity in the A-horizon of agricultural soils in the SR, based on the comparison of outcomes from three PMS-S cycles

Main soil unit	Volume %								
	Light soils			Medium heavy soils			Heavy soils		
	1993	1997	2002	1993	1997	2002	1993	1997	2002
Mollic Fluvisols	-	-	-	46.42	49.52	49.79	53.45	48.8	48.57
Rendzic Leptosols	-	-	-	53.71	41.76	46.79	46.66	50.29	55.55
Regosols	44.64	44.31	45.90	-	-	-	-	-	-
Cambisols	32.70	45.50	-	40.20	48.30	50.92	51.90	51.60	53.24

Source: SSCRI

Soil degradation

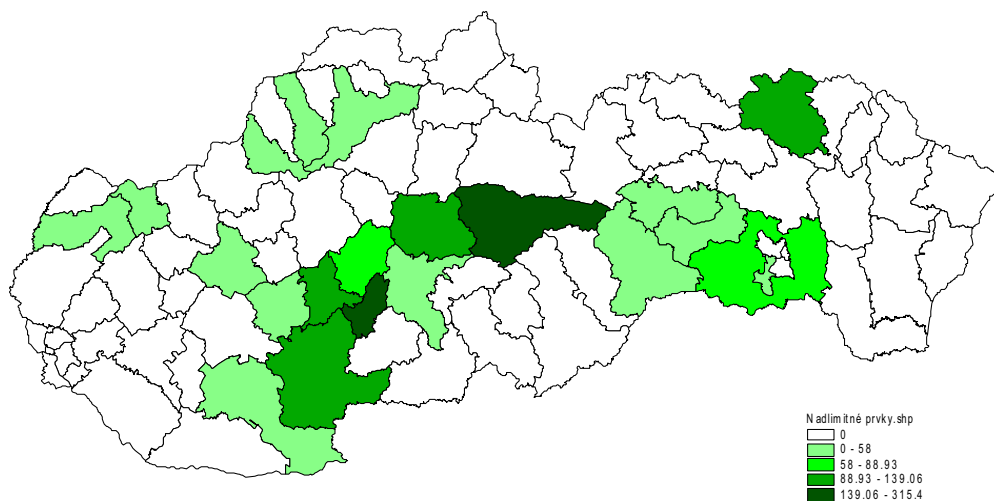
Serious soil degradation includes contamination with heavy metals and organic pollutants, acidification, as well as alkalization and soil salinization. Recently, soil degradation through desertification grows in significance.

Soil contamination by hazardous substances

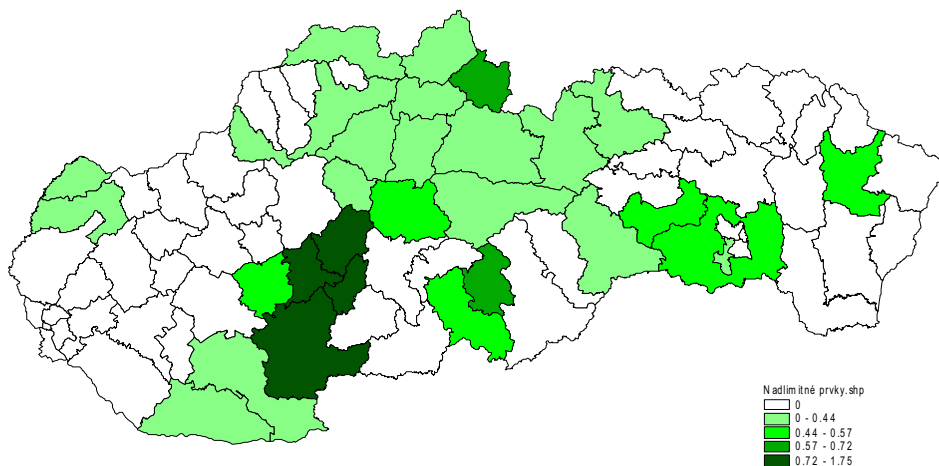
Results from the III. cycle of PMS-S with samples extracted in 2002 showed that the contents of the majority of hazardous substances in selected agricultural land of Slovakia are below the limit, especially being the case of arsenic, chromium, copper, nickel, and zinc. In case of cadmium, excessive limit values were recorded only in soils situated in higher altitudes, podzols, and andosols, which might relate to remote transfer of emissions (Kobza and coll., 2002).

Central Controlling and Testing Institute in Agriculture implements the **spatial soil contamination survey (SSCS)** as the PMS-S subsystem. SSCS monitors contaminants in agriculture soils in selected cadastre territories. Overview of limit-exceeding hazardous substances in agricultural soils of the SR is shown on maps.

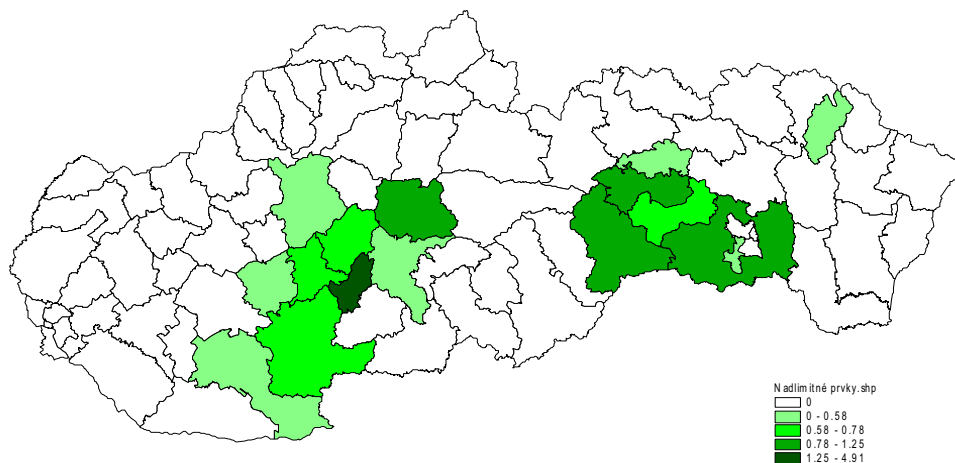
Overview of limit-exceeding values of lead in agricultural soils of the SR for the period of 2001-2005 (Pb limit = 30.00 mg/kg)



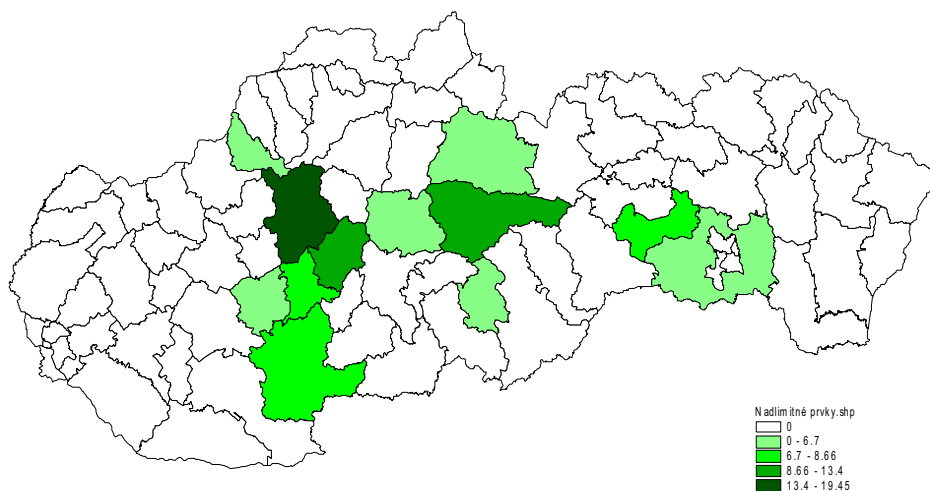
Overview of limit-exceeding values of cadmium in agricultural soils of the SR for the period of 2001-2005 (Cd limit = 0.30 mg/kg)



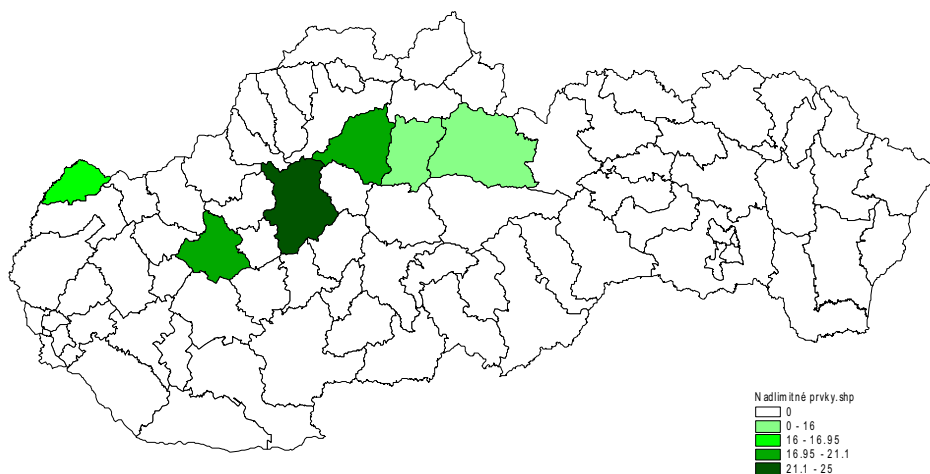
Overview of limit-exceeding values of mercury in agricultural soils of the SR for the period of 2001-2005 (Hg limit = 0.30 mg/kg)



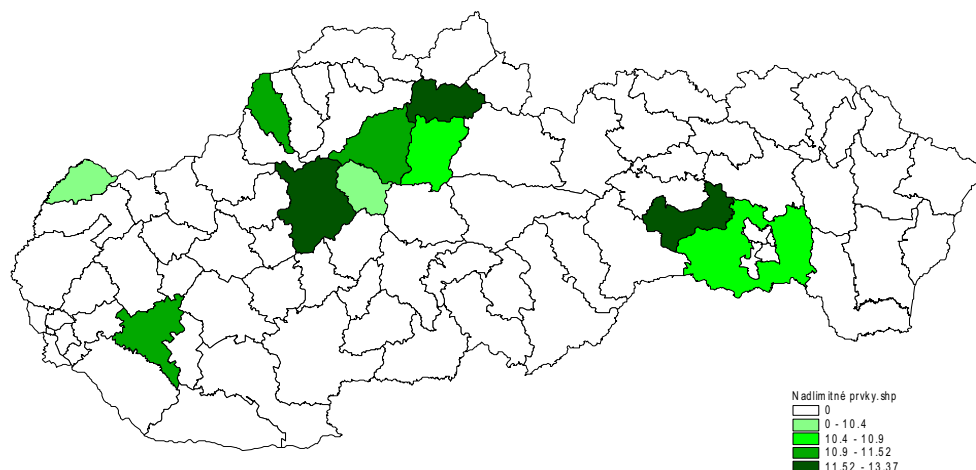
Overview of limit-exceeding values of arsenic in agricultural soils of the SR for the period of 2001-2005 (As limit = 5.00 mg/kg)



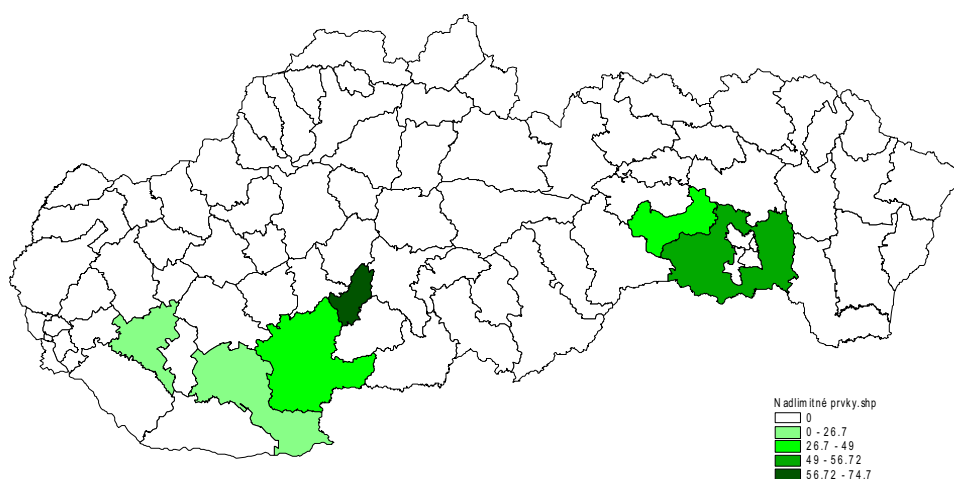
Overview of limit-exceeding values of chromium in agricultural soils of the SR for the period of 2001-2005 (Cr limit = 10.00 mg/kg)



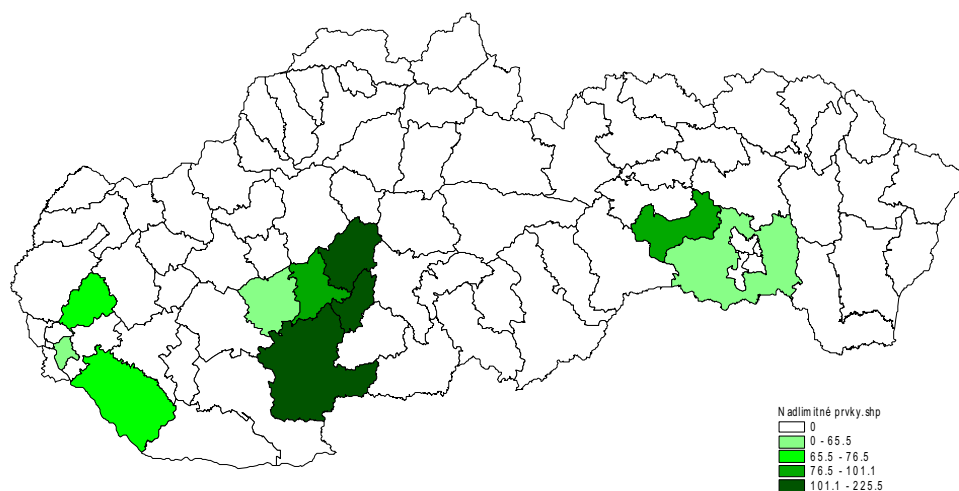
Overview of limit-exceeding values of nickel in agricultural soils of the SR for the period of 2001-2005 (Ni limit = 10.00 mg/kg)



Overview of limit-exceeding values of copper in agricultural soils of the SR for the period of 2001-2005 (Cu limit = 20.00 mg/kg)



Overview of limit-exceeding values of zinc in agricultural soils of the SR for the period of 2001-2005 (Zn limit = 40.00 mg/kg)



Complex monitoring for heavy metals **on forestland** has been carried out in a coordinated way throughout Europe. Over the monitored time period, there has been a significant **reduction in lead content in cover humus**, for other heavy metals the differences were not that significant.

Average content of polycyclic aromatic hydrocarbons (PAH) in agricultural soils of the SR in the I. monitoring cycle was around 200 µg.kg⁻¹, which represents **reference values**. Values beyond 1000 µg.kg⁻¹ were only of local character (Žiar nad Hronom, Strážske, Danube and Morava river flats). In the III. monitoring cycle covering 274 agricultural hunts with the size of 15 802 ha, **no excessive limit pollutants (PAH, PCB, chlorinated hydrocarbons) were found in the monitored hunts**.

♦ **Physical degradation**

Erosion and soil compaction belong among the major phenomena of physical degradation in Slovakia.

Soil erosion

Water erosion is prevalent in Slovakia.

Agricultural land endangered by erosion in the SR

Erosion categories	Water erosion		Wind erosion	
	Land area in ha	% from Agricultural Land	Land area in ha	% from Agricultural Land
No erosion or slightly	1 274 857	52.3	2 286 822	93.8
Medium	217 487	9.0	73 186	3.0
Strong	368 704	15.1	45 753	1.9
Extremely strong	575 831	23.6	31 118	1.3
Total	2 436 879	100.0	2 436 879	100.0

Source: SSCRI

Soil compaction

Based on the results of the PMS-S for the years 1993-2002, there was an improving tendency in physical soil properties. This also suggests less dramatic compaction of heavy and medium heavy arable soil types. In case of subsoil, greater proportion of compacted sites was found. Heavy soil types show higher rate of compaction over the whole soil profile.

Desertification

Methodologically, recent soil monitoring process has shown the solution in its initial phase. Slightly observable phenomena have so far been recorded mainly in the south of Slovakia, in some monitored sites (e.g. slight increase in ground water mineralization).

Application of the sewage sludge and bottom sediments into the soil

Applying the sewage sludge from waste water treatment plant to agricultural soil and forestland follows the provisions of the SR National Council Act 188/2003 Coll. on application of sewage sludge and river bed sediments to soil, and on amendment to Act 223/2001 Coll. on waste and amendments to certain laws as amended.

In 2006, the overall sludge production in the SR was 54 780 tons of dry matter, while **sludge was not applied directly to agricultural soil.**





Everybody, while performing an activity, which could endanger, harm or destroy **plants or animals**, or their biotopes, are obliged proceed so that there is no pointless death loss or damage and destruction.

§ 4 par. 1 of the Act No. 543/2002 Coll. on Nature and Landscape Protection as subsequently amended

• FLORA AND FAUNA

Flora

State of endangerment of plant taxons in 2006

Group	Total number of taxons		Endangered (IUCN cat.)						Ed
	World (global estimation)	Slovakia	EX	CR	EN	VU	LR	DD	
Cyanophytes and Algae	50 000	3 008	-	7	80	196	-	-	-
Lower fungi	80 000	1 295	-	-	-	-	-	-	-
Higher fungi	20 000	2 469	5	7	39	49	87	90	-
Lichens	20 000	1 508	88	140	48	169	114	14	-
Bryophytes	20 000	909	26	95	104	112	85	74	2
Vascular plants	250 000	3 352	77	266	320	430	285	50	220

Source: SNC SR

Legend:

Ed – endemic species

IUCN categories of endangerment:

EX – extinct

CR – critically endangered

EN – endangered

VU – vulnerable

LR – less endangered

DD – data deficient

The basic **reason** of plants endangerment is especially **the destruction of the sites**. **The most endangered habitats** in Slovakia include: inland salt marshes and salt meadows, Carpathian travertine salt lakes, inland Pannonic sand dunes, alpine and sub-alpine grassland, alpine snow beds, xeric grassland and scrub vegetation on calcareous substrate with species of the *Orchideaceae* family, active raised bogs, transition mires and quaking bogs, Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*, alkaline fens, petrifying springs with tufa formation.

Comparison of the vascular plant endangerment* in selected countries (2004)

	Slovakia	Austria	Hungary	Poland	Czech Rep.
Vascular plants (%)	30.3	33.4	19.8	11.2	42.5

Source: OECD

* Among “endangered” taxons are those taxons classified under categories: CR, EN, and VU under IUCN.

◆ **Protection of plant taxons**

Protection of plant taxons is in the presence regulated by the **Decree of MoE SR No. 24/2003 Coll.** to the *Act on Nature and Landscape Protection No. 543/2002 Coll.* as amended by Resolution 492/2006 Coll. Number of the **state protected taxons** is now **1 406** (vascular plants – 1 272; bryophytes – 47; higher fungi – 70; lichens – 17). There are **850 taxons** occurring in Slovakia (vascular plants – 713, bryophytes – 23, higher fungi – 70, lichens – 17).

Wild-growing plant taxons in Slovakia protected by international conventions and EU regulations (2005)

	Cyanophytes and Algae	Fungi	Lichens	Bryophytes	Vascular plants
In attachment II of Habitats Directive	-	-	-	9	328
In attachment IV of Habitats Directive	-	-	-	-	530
In attachment I and II of CITES	-	-	-	-	110
In attachment I of Bern Convention	-	-	-	8	34

Source: SNC SR

There were processed and realized **rescue programmes** for the following species of vascular plants:

Rescue programmes (RP)	Vascular plants species
Processed in 2006	There were processed RP for 1 critically endangered species in 2006: <i>Pedicularis sceptrum-carolinum</i> (still not approved)
Realized in 2006	There were realized RP for the following species in 2006: <i>Orchis coriophora subsp. coriophora, Ophrys holubyana, Drosera anglica, Rhynchospora alba, Scheuchzeria palustris, Lycopodiella inundata, Pulsatilla zimmermannii, Pulsatilla pratensis subsp. flavescens, Orchis palustris, Orchis elegans, Anacamptis pyramidalis, Carex chordorhiza, Carex pulicaris, Glaux maritima</i>

Source: SNC SR

Actual problem endangering the diversity of plant species in last years has been becoming **invasive species**. In 2006, **elimination** of invasive plant species was carried out at 52 sites in protected areas of the size of almost 80 ha. This activity followed up on the measures implemented also in the previous years. 18 species of introduced and invasive plant species were thus eliminated. Outside the protected areas, eliminated were 7 species of invasive plants at 58 sites of the size of 50 ha.

COMPONENTS OF THE ENVIRONMENT AND THEIR PROTECTION

There was observed approximately **175 allochthonous species** of plants in Slovakia, whereof in the presence about **20** species behaves as invasive ones. **The most spread** invasive plant species in our country are *Fallopia japonica*, *Helianthus tuberosus*, *Heracleum mantegazzianum*, *Impatiens parviflora*, *Solidago canadensis*, *Fallopia sachalinensis*, *Impatiens glandulifera*, *Solidago gigantea*, *Aster novi-belgii*, *Aster lanceolatus*, *Robinia pseudoacacia*, *Ailanthus altissima*, *Rudbeckia laciniata*.

Fauna

State of endangerment of the particular invertebrate taxons in 2006

Taxons Group	Number of taxons		Categories of endangerment (IUCN)							Endang erment total	Endang. %
	World	SR	EX	CR	EN	VU	LR	DD	NE		
Mollusca	128 000	277	2	26	22	33	45	8	135	136*	49.1
Aranea	30 000	934	16	73	90	101	97	45	-	422	45.2
Ephemers	2 000	132	-	8	17	16	-	-	-	41	31.1
Odonata	5 667	75	4	-	14	11	13	5	-	47	62.7
Orthoptera	15 000	118	-	6	7	10	20	10	-	53	44.9
Heteroptera	30 000	801	-	14	7	6	4	-	-	31	3.9
Coleoptera	350 000	6 498	2	15	128	490	81	2	-	718	11.1
Hymenoptera	250 000	5 779	-	23	59	203	16	-	-	301	5.2
Lepidoptera	100 000	3 500	6	21	15	41	17	11	-	111	3.2
Diptera	150 000	5 975	-	5	10	71	19	93	-	198	3.3

Source: SNC SR

* without the category of NE

State of endangerment of the particular vertebrate taxons in 2006

Taxons Group	Number of taxons		Categories of endangerment (IUCN)							Total	%
	World ⁴⁾	SR	EX	CR	EN	VU	LR	DD	NE		
Lampreys		4	-	4	-	-	-	-	-	4	100.0
Pisces	25 000	79	6	7	8	1	22	2	-	45 ¹⁾	57.0
Amphibians	4 950	18	-	-	3	5	10	-	-	18	100.0
Reptiles	7 970	12	-	1	-	4	6	-	-	11	91.6
Birds ²⁾	9 946	219	2	7	23	19	47	4	19	121	55.3 (35.5 ³⁾)
Mammals	4 763	90	2	2	6	12	27	15	4	68	75.6

Source: SNC SR

¹⁾ taxon has two forms listed under two different categories (EX, CR)

²⁾ only nesting birds – of total number of 341 birds of Slovakia, only the all 219 species of nesting birds were assessed

³⁾ % of total number of birds 341

⁴⁾ Source: UNEP – GBO

IUCN Categories:

EX - extinct taxon

CR - critically endangered taxon

EN - endangered taxon

VU - vulnerable taxon

LR - lower risk taxon

DD - data deficient taxon

NE - non evaluated taxon

Comparison of vertebrates endangerment ¹⁾ in selected countries (%) (2004)

	Slovakia	Austria	Hungary	Poland	Czech Rep.	EU*
Invertebrates	5.3	-	> 0.9	5.6	0.3	13.9
Pisces	24.1	41.7	32.1	14.5	29.2	38.1
Amphibians	44.4	100.0	100.0	-	90.0	46.7
Reptiles	38.5	75.0	100.0	33.3	100.0	85.7
Birds	14.4	26.0	18.8	14.5	55.9	100.0
Mammals	22.2	22.0	71.1	15.7	33.3	82.4

Source: OECD

¹⁾ "endangered" taxons include species under categories: CR, EN, and VU under IUCN

* proportion of globally endangered species according to IUCN, included in the European instruments (EU directives, Bern convention)

Austria) only autochthonous species; endangerment of the mammals: including EX and/or extinct species; birds: only nesting species in the area of the country; pisces: only freshwater ones, invertebrates: insecta, decapoda, mysidacea and mollusca.

Czech Rep.) data refer to autochthonous species and EX including.

Hungary) Endangerment of the mammals: protected and highly protected species; pisces: freshwater species, whereof there are 2 autochthonous species; "Endangered" pisces species including undetermined species. "Endangered" reptiles and amphibians refer to the protected and highly protected species.

◆ **Protection of animal species**

Protection of animal species is regulated by the **Decree of MoE SR No. 24/2003 Coll.**, which implements the *Act on nature and landscape protection No. 543/2002 Coll.* The number of **animal taxons under state protection** is now **808 taxons** on the level of species and subspecies and to **12 taxons** on the level of genus.

Animal wildlife in Slovakia protected by international conventions and EU regulations (2006)

	Invertebrates	Pisces	Amphibians	Reptiles	Birds	Mammals
In annex II of Habitats Directive	48	24	5	1	-	22
In annex IV of Habitats Directive	46	1	10	8	-	28
In annex I of Birds Directive	-	-	-	-	112	-
In annexes I and II of CITES	2	-	-	-	61	6
In annexes II and III of Bern Convention	26	36	11	8	120	26
In annexes II and III of Bonn Convention	-	3	-	-	54	-
In annex of AEWA*	-	-	-	-	122	-

* AEWA – African-Eurasian Migratory Water Bird Agreement

Source: SNC SR

Rescue programmes in 2006 were realized for the following taxons: *Marmota marmota*, *Lutra lutra*, *Aquila chrysaetos*, *Aquila pomarina*, *Falco cherrug*, *Falco peregrinus*, *Crex crex*, *Emys orbicularis*, *Paranssius apollo* and *Umbra krameri*.

In **breeding and rehabilitation stations** operated by the nature and landscape protection organizations (including ZOO Bratislava and ZOO Bojnice) there were **adopted** in 2006 altogether **589** injured

individuals or otherwise disabled animals. Back to wild nature there were **released** altogether **351** individuals and there was spent more than 420 thous. SKK.

There was provided **the guarding** of 75 nests of 6 bird of prey species (*Aquila heliaca*, *Aquila chrysaetos*, *Aquila pomarina*, *Haliaeetus albicilla*, *Falco peregrinus*, *Falco vespertinus*) - information only for the organization organs of SNC SR. There were successfully **brought up** 104 nestlings, which is in average 1.4 brought up nestlings per nest and there were **spent** about 300.4 thous. SKK.

In term of in situ animal preservation in 2006 there were organized **transfers and restitutions** of protected and endangered animals into proper nature biotopes by nature and landscape protection organizations. There were these animals – *Spermophilus citellus*, *Bison bonasus*, *Castor fiber*, *Amphibia* and there was **spent** altogether 204 thous. SKK.

Within the **improvement of nesting and living conditions** of animals, there were realized 1 332 actions, while there was invested more than 700 thous. SKK.

In concern of preventing the collisions of **migrating Amphibians** with the car transport, **over 23 kilometres of barriers** in total were build in 2006, with investment of about 180 thous. SKK.

◆ **Numbers and quotas for fishing and hunting game**

To 31st March 2006, the **spring stock numbers** of the ungulate game species, without Fallow deer species, were higher in comparison to the previous year. Hunting for the rare animal species is strictly regulated.

Spring stock of game and game hunting as of March 31 (pieces)

Species	2003		2004		2005		2006	
	stock	hunting	stock	hunting	stock	hunting	stock	hunting
Deer	38 030	13 064	38 264	13 118	39 738	14 030	41 105	12 888
Fallow deer	7 501	2 109	7 475	2 011	8 425	2 529	8 010	2 208
Roe deer	83 756	20 770	84 547	20 269	85 124	20 659	87 324	17 313
Wild boar	28 779	21 118	27 415	23 727	27 116	22 551	27 175	17 820
Brown hare	219 450	28 144	201 316	31 842	199 226	36 511	208 946	17 560
Grey partridge	22 594	1 042	18 622	832	17 293	484	15 579	10
Pheasant	204 856	115 598	180 105	116 050	181 374	143 373	187 139	110 113
Chamois	553	8	522	7	625	12	665	8
Bear	1 318	13	1 419	34	1 483	35	1 577	16
Wolf	973	112	1 158	86	1 165	74	1 219	91
Otter	304	0	315	0	343	0	380	0

Source: SO SR

Amount of the fish **caught** in the fish ponds, water dams and water flows for economic and sport purposes achieved **2 979 t** in 2006. The waters were **stocked by 41 327 114 pieces of setting**.

Fishing for the economic and sport purposes in 2006 (t)

Fish species	2003		2004		2005		2006	
	total	of this SFA*	total	of this SFA*	total	of this SFA*	total	of this SFA*
Fish total	2 528	1 631	2 783	1 565	2 652	1 663	2 979	1 697
Of these:								
Carp	1 186	1 040	1 360	988	1 281	1 092	1 597	1 169
Trouts	743	50	878	52	800	49	837	49
Crucians	101	71	80	75	76	71	117	71
White amur	36	34	28	28	33	24	39	33
Bighead carps	10	4	8	5	12	6	12	4
Sheat fish	36	35	36	35	37	35	34	33
Maskalonge	59	56	66	60	74	67	62	60
Sand-eel	78	78	78	76	83	82	65	64
Grayling	12	12	9	8	13	7	8	7
Huchen	1	1	1	1	1	1	1	1
Breams	99	98	98	98	106	105	95	94
Torgoch	1	0	0	0	9	1	2	1
Chevins	27	27	21	21	16	16	16	16
Other fish species	139	125	120	117	111	107	94	95

*SFA – Slovak Fishing Association

Source: SO SR

