COMPONENTS OF THE ENVIRONMENT AND THEIR PROTECTION

• AIR

Key questions and key findings

What is the recent trend in the area of production of polluting substances in the Slovak Republic?

- **Basic pollutant emissions (PM, SO_2, NO_X, CO) over a long-term horizon (1993 - 2011) have been consistently declining; however, the speed of decline after 2000 has been significantly slower. There was a temporary increase in emissions detected in 2003 - 2005; however, after 2005 the trend was falling again until 2009. Positive year-to-year change was recorded in SO_2 and NO_X, on the contrary, PM and CO emissions showed a rising trend over the last year.**
- **Ammonia emissions have been persistently decreasing over a long time period.**
- **Non-metal volatile organic compounds (NMVOC) emissions over a longer time horizon (1993 - 2000) have been decreasing persistently. In the period of 2000 to 2010 the values were maintained more-less at the same level, with slight fluctuations in specific years. Growth in NMVOC emissions in 2011 (compared to 2010) was mostly influenced by increased volumes of solvents production and purchase.**
- **Persistent organic pollutants (POPs) emissions declined significantly over the period of 1993 - 2000. When the years 2000 and 2011 were compared, there was seen a decline in PCDD/PCDF emissions by 52.8%; however, PCB emissions increased by 1.9%, and the sum of PAH emissions increased by 42.6%. From year to year, PCDD/PCDF emissions show declining values. The same trend is seen in PCB. On the contrary, other PAH emissions show a slight increase.**

Is Slovakia fulfilling its obligations given by international conventions in the area of air protection?

- **Slovakia is fulfilling its obligations given by international legislation in the area of air protection.**

Are the air pollutants limit values for human health protection complied with?

- **Notwithstanding the persistent decrease in the pollutants emission, in 2012 a number of monitoring stations again detected exceeded limit values for selected air-borne pollutants (NO_X, PM_{10}, $PM_{2.5}$) designated to ensure human health protection.**

Are the air pollutants limit values for vegetation protection complied with?

- **Limit values of air-born pollutants (SO_2, NO_X) designated for the protection of vegetation have not been exceeded. Exceeded values were detected for ground ozone.**
- **The massive reduction in national emissions of ozone precursors over the last years has not resulted in reduced ground ozone concentrations in Slovakia. Some ground ozone characteristics in 2012 remained at a relatively high level achieved in the previous years.**

What has been the trend in the condition of the ozone layer and intensity of solar radiation over the SR territory?

- **Total atmospheric ozone was above the long-term average values, within a 5.4% deviation above the mean value; total sum of daily doses of the ultraviolet erythema radiation decreased.**

Is the SR fulfilling its international obligations in the area of the Earth's ozone layer protection?

- **Slovakia is fulfilling its obligations given by international legislation in the area of ozone layer protection.**

Emission situation

♦ Balance of basic pollutants emissions

Trend in emissions of particulate matter

Emissions of particulate matter 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.

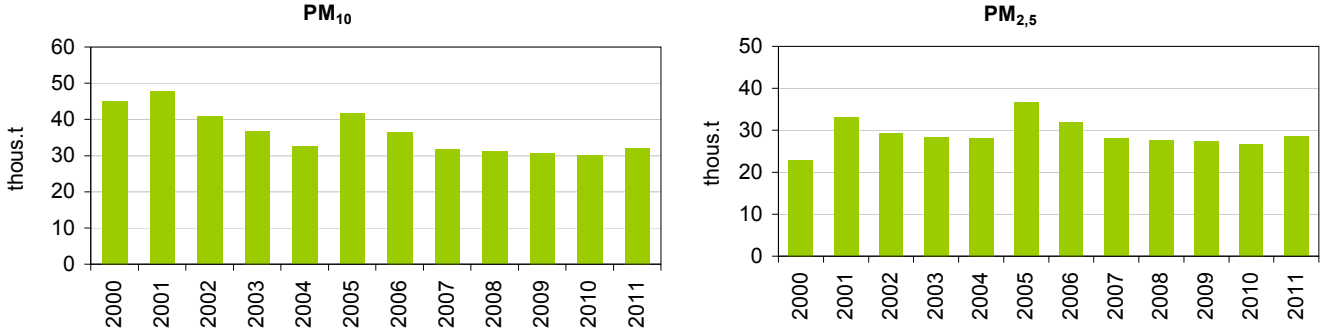
Increase in the PM emissions over 2004-2005 was caused by an increased consumption of wood within the sector of small-size sources (heating up of houses) due to increased natural gas and coal prices for small consumers. Reduction in the PM emissions in 2006 was caused mainly by reconstructions of the separation equipment in several power management and industrial installations. Further decrease in the PM emissions by large stationary sources in 2007 was caused by the fact that some incineration units installed at significant sources were out of operation. Since 2008, the PM emissions trend has continued to decrease slightly.

Slight increase in PM emissions in 2011 was recorded in the sector of small-sized sources - households with increased consumption of firewood at the expense of natural gas.

Balance of PM_{10}, $PM_{2.5}$ emissions

In the sector of road transport, diesel engines are among the major contributors to the PM_{10} and $PM_{2.5}$ emissions. The share of abrasion is less significant than in the case of the PM emissions. In total, the most significant contributors to the PM_{10} and $PM_{2.5}$ emissions include small sources (heating of houses). Increased emissions in this sector reflect the increased consumption of wood caused by growing prices of natural gas and coal.

Development trends in PM_{10} a $PM_{2.5}$ emissions



Source: SHMI

Trend in emissions of nitrogen oxides

Emission of nitrogen oxides since 1990 dropped slightly despite the fact that they grew slightly in 1994-1995 due to an increased natural gas consumption.

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 2006, there was a significant reduction in the NO_X emissions, especially in case of large and medium stationary sources. This reduction relates to reduced production (Zemianske Kostoľany and Vojany electrical power plants) and consumption of solid fuels and natural gas (Zemianske Kostoľany and Vojany electrical power plants and the Slovak gas industry company – transit, Inc. Nitra - /SPP/). Mobile sources also, mainly road transportation, have shown significant NO_X emissions.

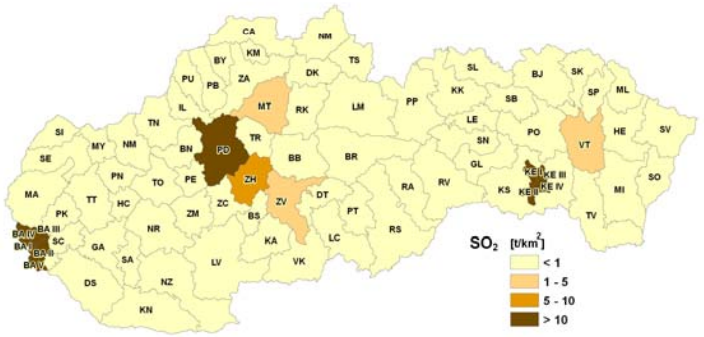
This reduction also relates to the modernisation of personal and freight vehicles, as well as the use of a more exact emission factor and it was the most important factor influencing emissions drop in 2011.

Trend in carbon monoxide emissions

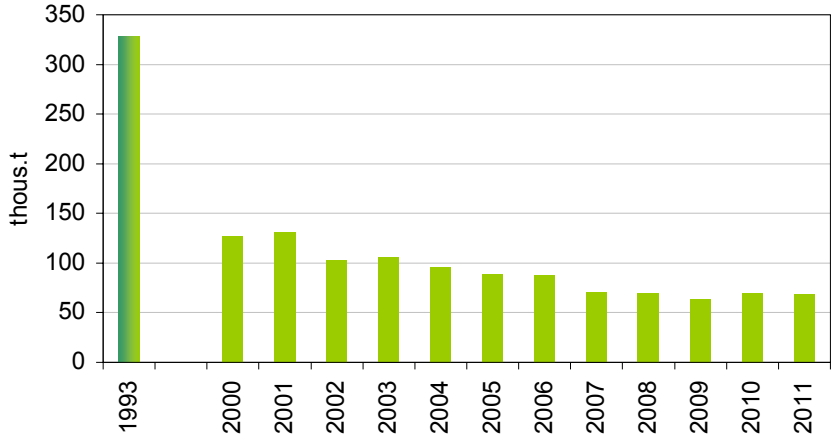
Carbon monoxide emissions (CO) since 1990 have shown a falling tendency, which was caused mainly by reduced consumption and change in fuel composition in the sphere of retail consumers. CO emissions from large sources were decreasing only slightly. The most significant share on CO emissions from large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

The decrease in CO emissions since 1996 was due to the effects of policy and measures (determined on the results of measurements) to reduce CO emissions from the most significantly sources. The emission trend changes of CO within 1997 and 2003 is also affected by the quantity of pig iron production as well as the fuel consumption. In 2004 the CO emissions slightly increased mainly at large sources (the CO emissions specified by continuous measurement in U.S. Steel Ltd., Košice), since then the emissions have had only moderately decreasing trend. In 2005 the decrease of CO emissions was announced atlarge sources too, mainly as a consequence of agglomerate production cutting down in U.S. Steel Ltd., Košice and by the implementation of a new technology with effective combustion at lime production (Dolvap Ltd., Varín). Significant decrease (22%) in CO emissions of major sources in 2009 was mainly due to decrease in iron and steel production as a result of economic recession. Increase of CO emissions was achieved only in the sector of small sources (residential heating) and it is related to the increase of wood consumption caused by the increasing price of natural gas and coal. The emission decrease in the sector road transport is associated with onward renovation of rolling stock by the generationally new vehicles equipped by the three-way catalysts. Emissions in year 2010 increased (about to the level of year 2002) due to increased production of iron and steel in facility U.S. Steel s.r.o., Košice. increase in CO emissions continued in 2011 but still below the level in the years 2004 to 2006, when emissions were the highest during the decades.

Element regional emission of SO_2 in 2011 ($t.km^{-2}$)

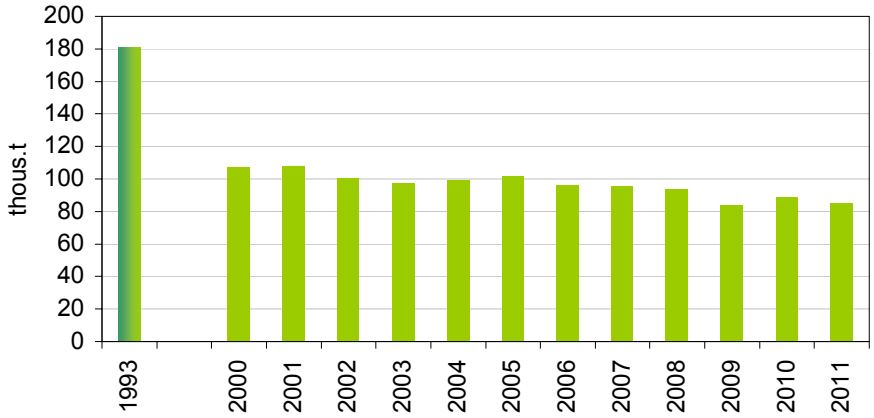


Trend in emission of SO_2

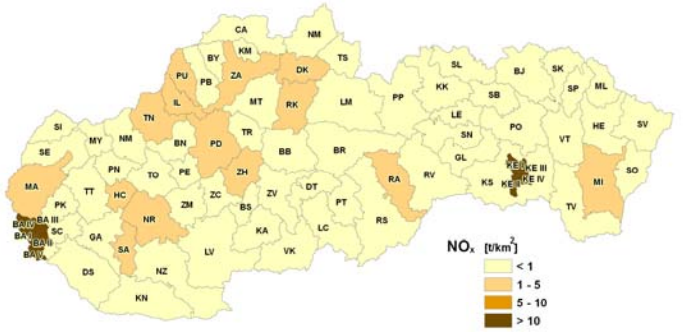


Source: SHMI

Trend in emission of NO_X

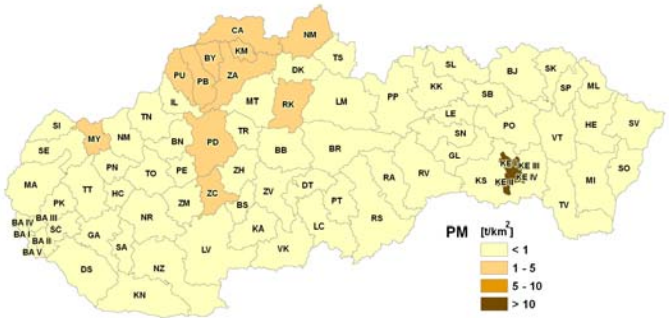


Element regional emission of NO_X in 2011 ($t.km^{-2}$)

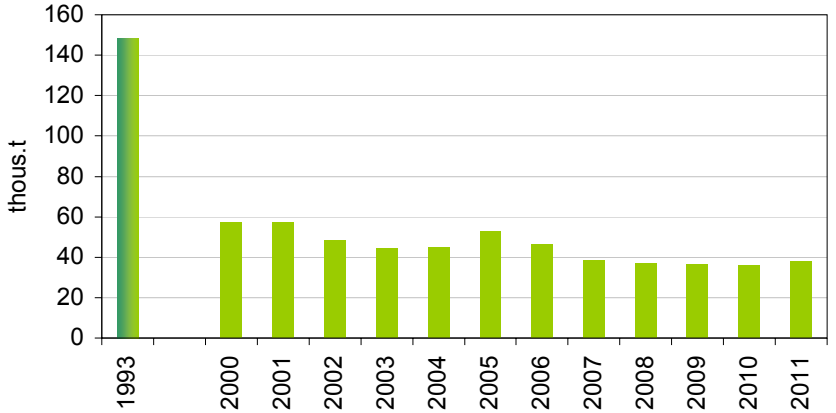


Source: SHMI

Element regional emission of PM in 2011 (t.km^{-2})

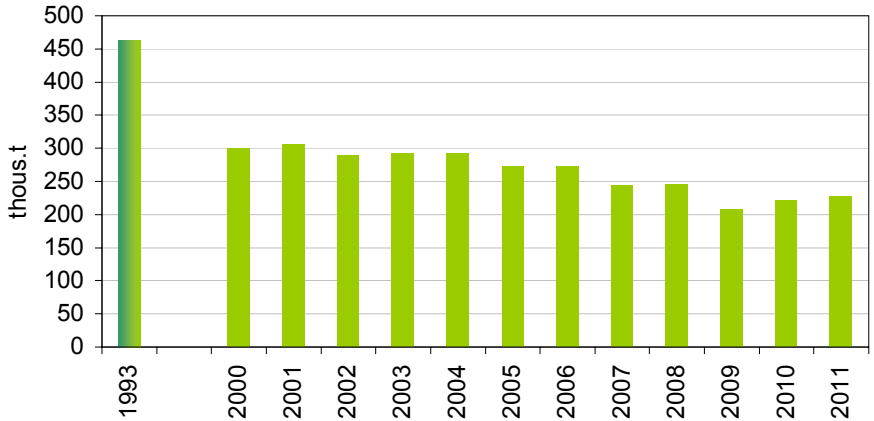


Trend in emission of PM

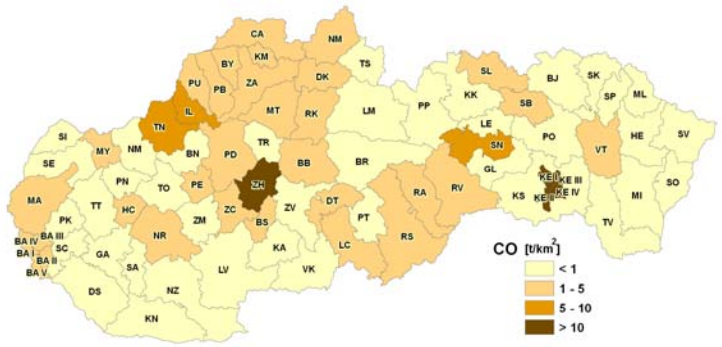


Source: SHMI

Trend in emission of CO



Element regional emission of CO in 2011 (t.km^{-2})



Source: SHMI

Meeting international obligations for the basic pollutants emissions

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

- ***Protocol on further reduction of sulphur emissions***

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

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

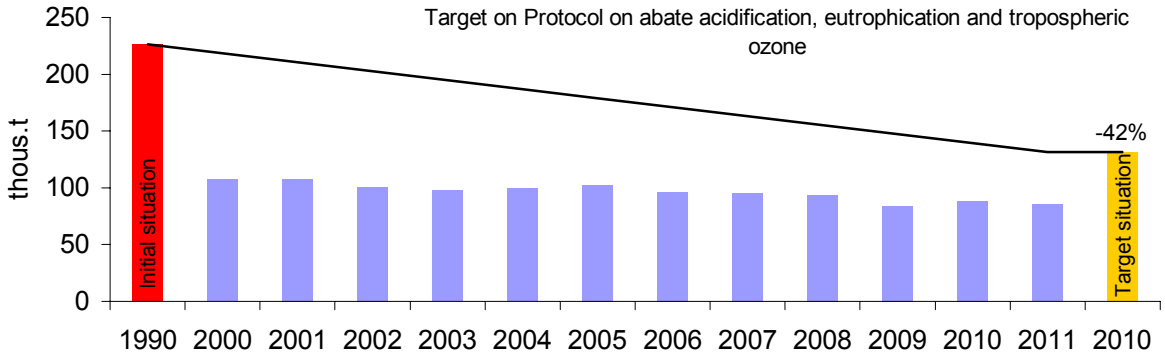
Year	1980 (initial year)	2000	2005	2010
SO_2 emission (thous. t)	843	337	295	236
SO_2 emission reduction (%)	100	60	65	72

Slovakia met one of its Protocol objectives to reduce the SO_2 emissions in 2000 by 60%, in 2005 by 65% and in 2010 by 72%, compared to the reference year of 1980. In 2000, sulphur dioxide emissions reached the level of 126.953 thousand tons, which is 85% less than in the years 1980. In 2005 it was 89 thousand t, which is 89% less than in 1980. In 2010, sulphur dioxide emissions reached the level of 63.393 thousand tons, which is 92% less than in 1980. The year 2011 shows a positive trend.

- ***Protocol on the Reduction of Acidification, Eutrophication and Ground Ozone***

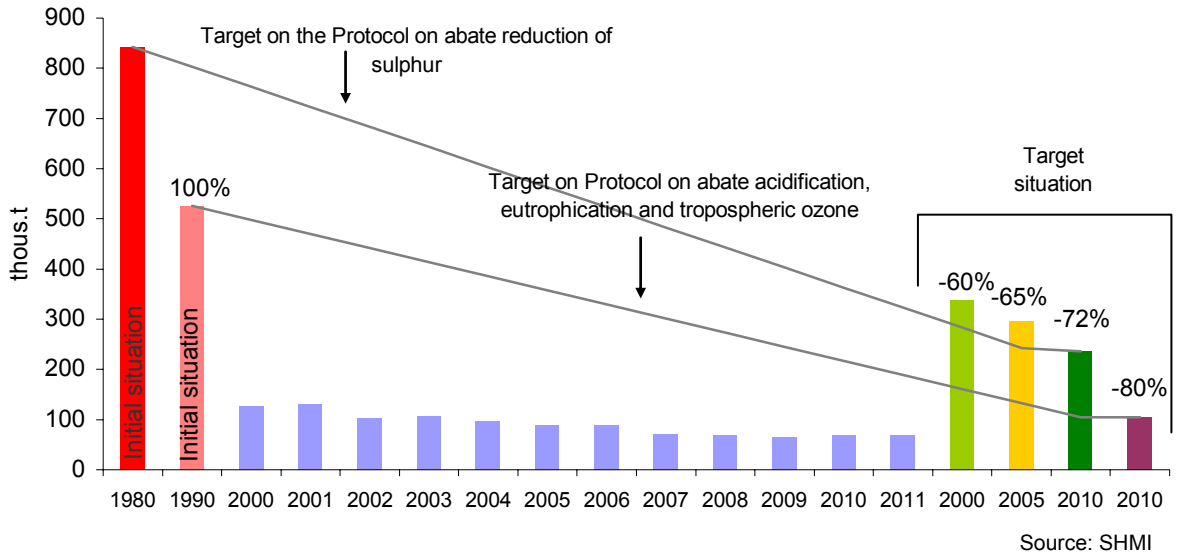
The protocol was signed in Göteborg in 1999. Slovakia signed the protocol in 1999 and ratified in 2005. Slovakia obliged itself to reduce the SO_2 emissions by 2010 by 80%, the NO_2 emissions by 2010 by 42%, the NH_3 emissions by 2010 by 37% and the VOC emissions by 2010 by 6% in comparison to the year 1990. As to date, the Slovak Republic achieved the set objective and continues in the same trend.

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



Source: SHMI

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



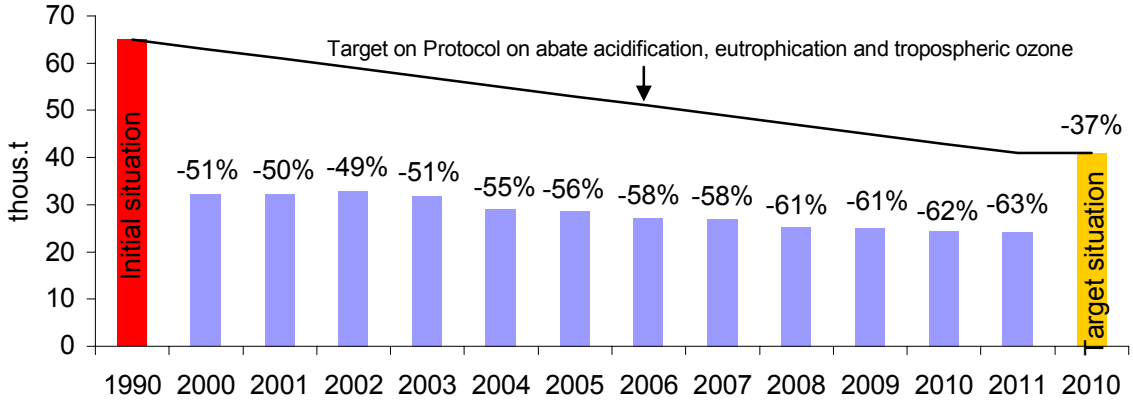
Source: SHMI

- **Balance of ammonia emissions (NH_3)**

Production of the NH_3 emissions$_3$ in 2011 was 24 184 tonnes. More than 95% of all NH_3 emissions originate in the sector of agriculture - livestock production and animal waste management. NH_3 emissions from the use of artificial nitrogen fertilisers also represent a significant category in the sector of agriculture. NH_3 emissions from the energy sector/industrial production and transport are less significant. NH_3 emissions from industrial production originate mainly from nitric acid production. NH_3 emissions from transport originate mainly from road transport.

Over a long-term period, there is a persistent decrease in total volumes of NH_3 emissions.

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



Source: SHMI

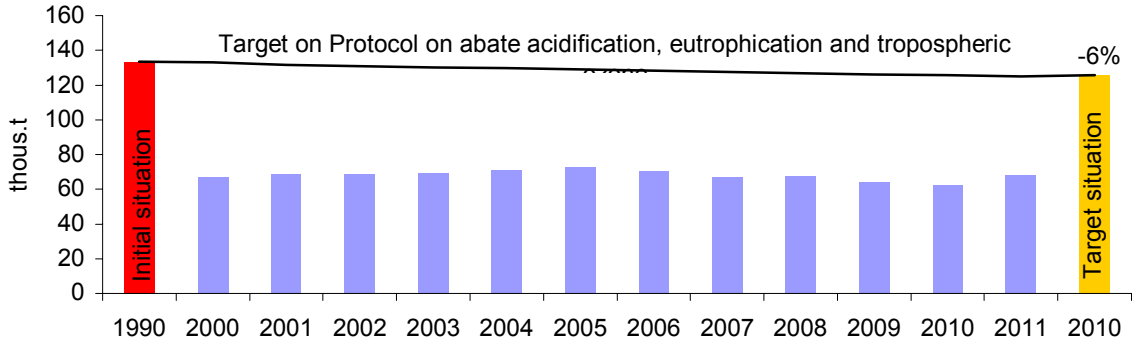
- **Emissions of non-methane volatile organic compounds**

Non-methane volatile organic compounds (NMVOC) are set in compliance with the requirements of the international methodology of EMEP/EEA. (Air Pollutant Emission Inventory Guidebook) Since 2001, inventories of NMVOC emissions have been included also emissions balance

from asphalting roads which resulted in adequate increase in total emissions in individual years. Emission factor used for the calculation of emissions from given sector was revised and changed in 2004. As for the sector of burning by households, emissions have increased slightly due to burning wood. In the sector of fuel distribution, emissions from LPG distribution was introduced since 2001.

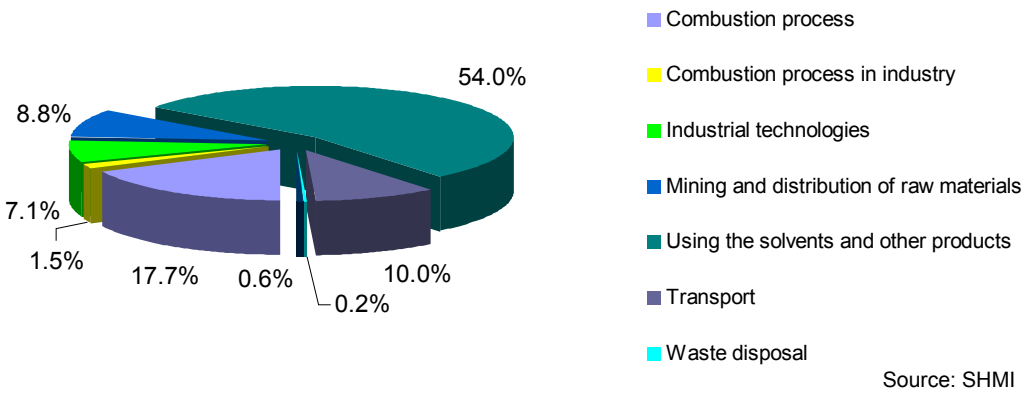
Decline in total NMVOC emissions was caused by a number of measures, such as reduction in using coating compounds and by gradual introduction of low-solvent types of coatings, extensive introduction of measures in the sector of crude oil processing and fuel distribution, introduction of gas technologies into incineration, especially in the energy area, and by the change to the portfolio of cars toward vehicles equipped with the operated catalyser. Since 2000, the NMVOC emissions in the area of paints and glues have increased by 54%, since the use of these products is part of a wide spectrum of industrial activities and various technological operations. The consumption and import of printer colours and solvent-based paint systems has been continually increasing. In 2004 and 2005 there was a growth in the production of cars, many paint shops were opened, thus increasing also the consumption of paint substances. In 2007 came into effect **Council Directive 1999/13/EC of 11 March 1999 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations** which obliged the operators to comply with the emission limits. In 2007, data over the entire time progression in the sector of chemical cleaning and degreasing were recalculated. In 2008, the entire time progression in the sector of waste land-filling and incineration was recalculated on the basis of the updated input data. Similarly, emissions from road transport were also recalculated due to the use of an updated version of COPERT IV model. In 2009, there was a decline in NMVOC emissions related to decreased industrial production. Emissions from road transport were recalculated as back as to 1990 due to the use of a newer version of the COPERT IV model in the inventory. Until the year 2010, trend in NMVOC emissions showed reducing values. In 2011, there was recorded a slight increase with total volume of NMVOC emissions reaching the volume of 68,285.859 tonnes.

Trend in NMVOC emissions with regard to fulfilling of the international agreements



Source: SHMI

The contribution of the NMVOC emission according to sector of their origin in 2011



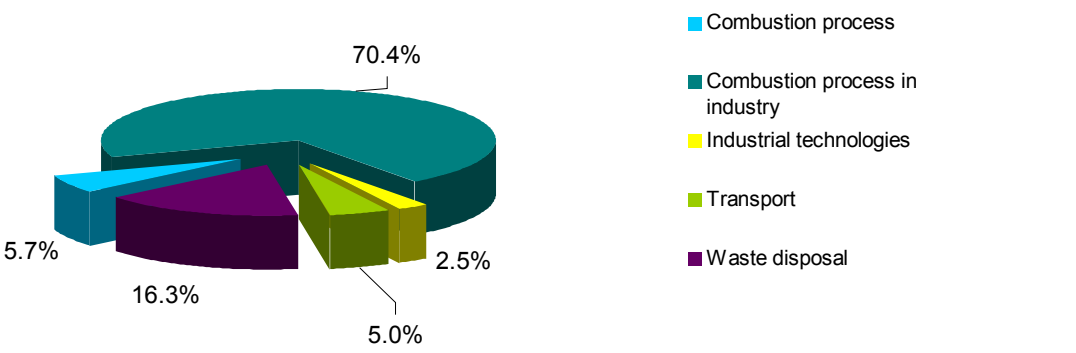
Source: SHMI

- **Balance of heavy metals emissions**

Heavy metal emissions have decreased significantly since 1990. Besides shutting off a number of old-fashioned and non-effective productions, this trend has been influenced by extensive reconstructions of separation equipment, change in raw material used, and, most of all, by transition to using unleaded petrol types since 1996. Since 2004, the register of heavy metals from household fuel burning has included the burning of wood. Trends in the heavy metal emissions over the recent years are characteristic for slight fluctuations. In 2007, lead and mercury emissions dropped, compared to the 2006 figures, due to a reduction in the ore agglomeration and glass production. At the same time, cadmium emissions increased in the same year, which related to an increased copper production. In 2008, lead, cadmium, copper, zinc, and selenium emissions increased due to an increased volume of incinerated industrial waste and increased emissions in the area of industrial, municipal power management , and system power industry.

In 2009, there was a reduction in heavy metal emissions which related to a reduction in the industrial production. In 2010, there was a recalculation carried out in the sector of waste handling for the years 2002, 2004, 2005, and 2008, due to an update in the input data. A new version of the COPERT IV model was used for the road transport emission analysis; therefore, emissions were recalculated until 2000. Next, cadmium emissions from glass production were calculated for the years 2007 and 2008, due to a revised emission factor for colour glass. Decrease in emissions of heavy metals in 2011 is affected by the decline of production in the industrial sector.

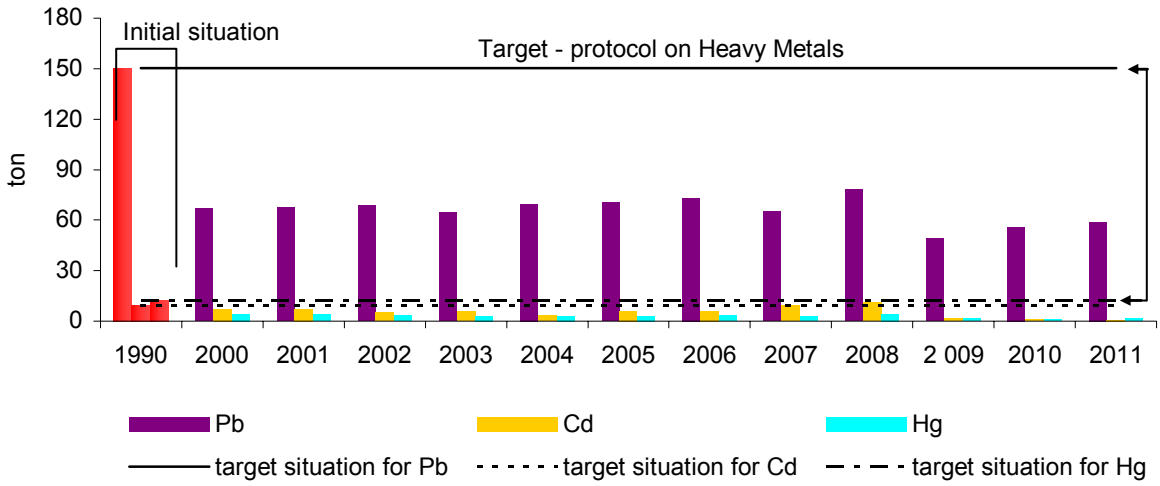
The contribution of the particular sectors in the Pb emission production for year 2011



Source: SHMI

Air-borne heavy metals 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 ECE Convention on Long - Range Trans-boundary Air Pollution, whose only objective is to decrease heavy metal emissions (Pb, Cd, Hg) to the level of 1990. Slovak Republic 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

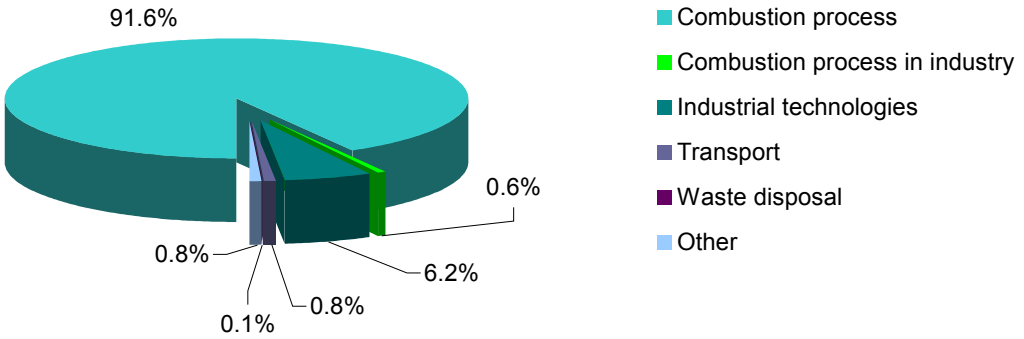
- **Balance of Persistent organic pollutants (POPs)**

Decreasing trend in the POPs emissions was most clearly seen in the 90ties for PAH where the reduction in emissions was mainly caused by a change to the aluminium production technology (using previously burnt anodes). Growth in the PCB emissions (polycyclic biphenyls) over the last years has been influenced primarily by an increased consumption of diesel in road transport and an increased consumption of wood by small sources (heating of households). Increased wood consumption in this sector influenced also the growth in total PAH emissions. PCDD/F emissions have dropped since 2000 due to the reconstruction of a number of installations (municipal waste incineration units). PCDD/F emissions are influenced by the volume of incinerated medical waste, volume of agglomerated iron ore, and by fuel composition in the sector of household heating. A slight increase in the emissions of polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAH) caused increased volume of modal split in road transport and an increased fuel consumption. Fluctuating emissions of hexachlorbenzene (HCB) reflects the fluctuating production of secondary copper together with a growth in the volume of modal split in road transport.

Fluctuating emissions of hexachlorbenzene (HCB) reflects the fluctuating production of secondary copper together with a growth in the volume of modal split in road transport.

In 2012, emissions from road transport were recalculated.

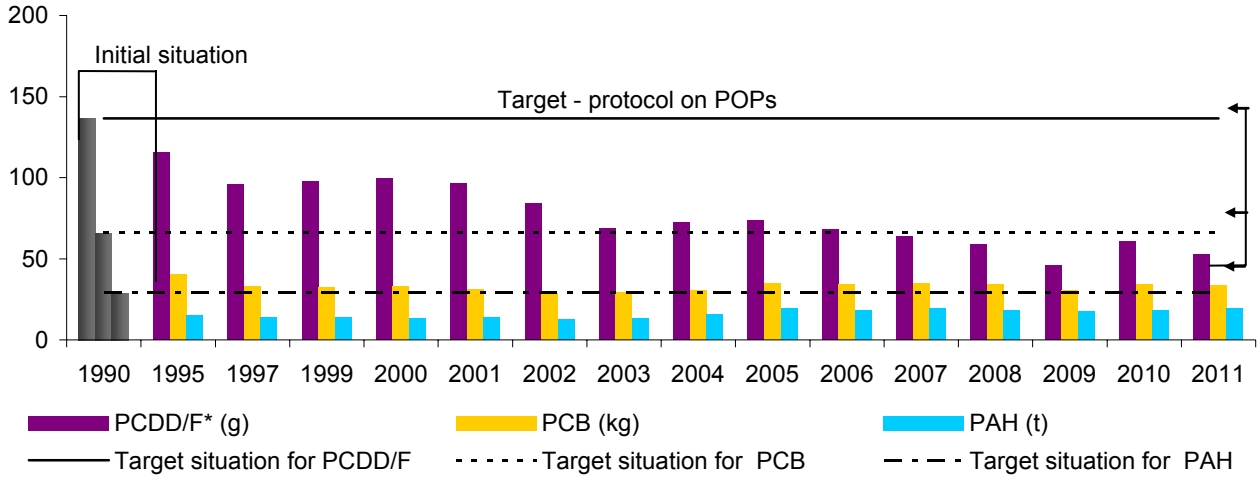
The contribution of the particular sectors in the PAH emission production for year 2011



Source: SHMI

In 1998, Slovak Republic also accessed to Protocol on Limitation of Persistent Organic Compounds (POP) 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. Slovak Republic signed this Protocol in that same year. This goal is still being followed.

Trend of POPs emissions regarding the fulfilment of the international conventions



Source: SHMI

Air pollution

♦ Air quality and its limits

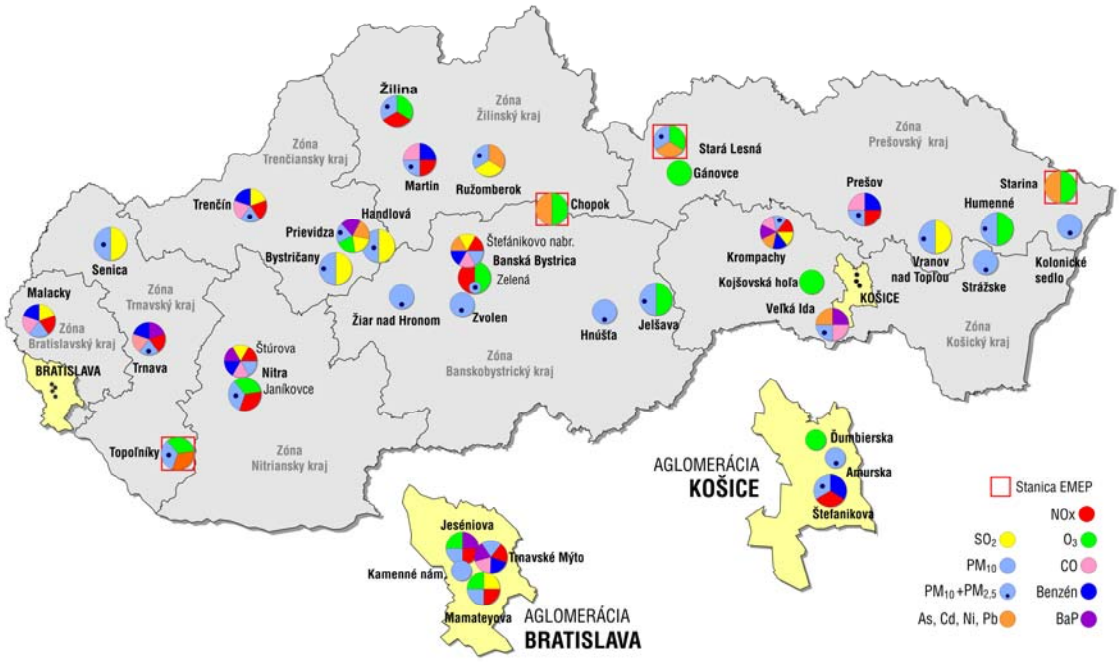
Air quality in general is determined by the contents of airborne pollutants in the upper atmosphere, Air quality assessment has been implemented in **compliance with Act 137/2010 Coll. on air.** Air quality criteria (limit and end values, tolerance thresholds, upper and lower assessment thresholds, and others) are published in **Decree of the Ministry of Environment No. 360/2010 Coll. on air quality.** Assessment of air quality in Slovakia is based on the outcomes of airborne pollutants' concentrations measurements by the Slovak Hydrometeorological Institute at the stations within its National Air Quality Monitoring Network. (NAQMN)

In line with regulations of the act on air protection, the whole Slovak territory was divided into 8 **zones** and 2 **agglomerations** that are further subdivided into 19 **air quality management areas.**

Air quality management area is an agglomeration or a designated part of the zone with exceeded:

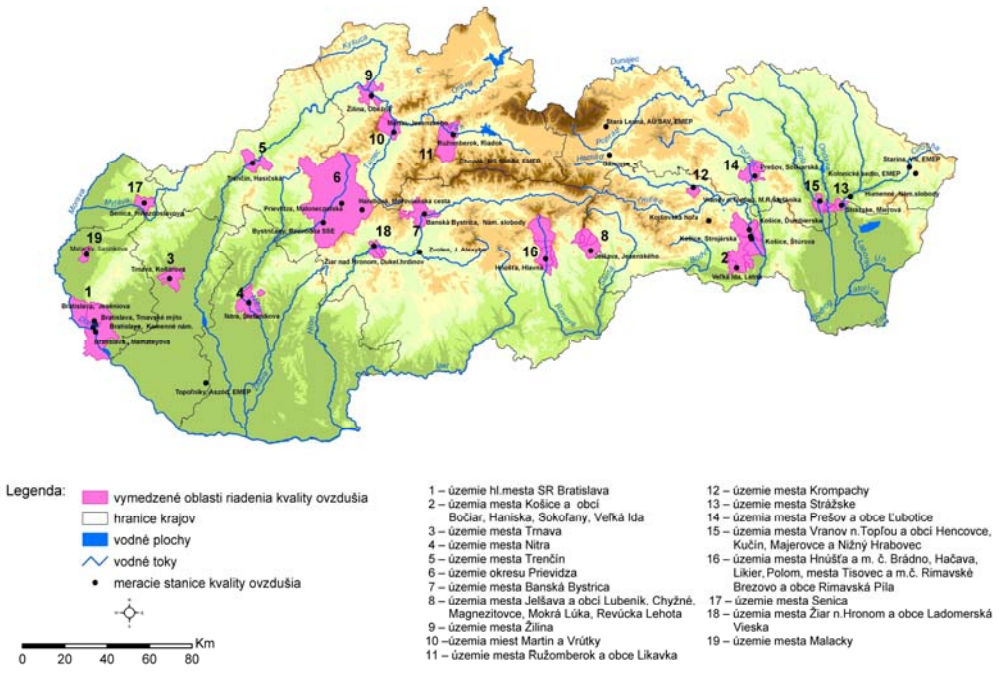
- limit values for one substance or more pollutants increased by tolerance threshold,
- limit value of one substance or more pollutants, if no tolerance threshold is set,
- target value for ozone, $PM_{2,5}$, arsenic, cadmium, nickel, or benzo(a)pyrene.

National monitoring air quality network – 2011



Source: SHMI

Air quality management areas



Source: SHMI

♦ Local Air pollution

Sulphur dioxide

Minimum range of SO_2 monitoring (number and localisation pursuant to Annex 5 to Decree 360/2010 Coll. on air quality) has not been achieved due to lacking measurements in the agglomeration of Košice. Monitoring of sulphur dioxide has been carried out through continual reference method at 12 stations. Required number of valid measured data (90%) was achieved at 7 monitoring stations. No limit values were exceeded in 2012.

Nitrogen dioxide

Minimum range of NO_2 monitoring (number and localisation pursuant to Annex 5 to Decree 360/2010 Coll. on air quality) was achieved. Monitoring of sulphur oxides has been carried out through continual reference method at 15 stations. Required number of valid measured data (90%) was achieved at 9 monitoring stations. In 2012, limit value was exceeded at the monitoring station of Banská Bystrica, Štefánikovo nábrežie.

PM_{10}

Minimum range of PM_{10} monitoring (number and localisation pursuant to Annex 5 to Decree 360/2010 Coll.) has been achieved. PM_{10} monitoring was carried out by equivalent, continual method of oscillation microbalance, by TEOM instruments at 32 stations. Required number of valid measured data (90%) was achieved at 19 monitoring stations.

A number of urban stations implemented equivalence testing through the gravimetric method. Currently, the results are analysed with the objective to have the whole process automated. Also, in 2012, permitted number of measurements with exceeded values at most monitoring sites was exceeded.

$PM_{2.5}$

Range of $PM_{2,5}$ monitoring (number and localisation pursuant to Annex 5 to Decree 360/2010 Coll. on air quality) was achieved. $PM_{2,5}$ monitoring was implemented through the same method as PM_{10} measurements with the use of TEOM instruments at 26 stations. Gravimetric measurements were carried out at one station. As for $PM_{2,5}$ particles, the annual limit of 25 μg/m3 will come into effect as of 01.01.2015, however, this value has been valid since 2010 as the end value that should not be exceeded. Required number of valid measured data (90%) was recorded at 8 monitoring stations and the number of measurements with exceeded values was recorded at 6 stations.

Carbon monoxide

Minimum range of CO monitoring (number and localisation pursuant to Annex 5 to Decree 360/2010 Coll. on air quality) has not been achieved due to lacking measurements in the agglomeration of Košice. Monitoring of carbon monoxide has been carried out through continual reference method at 10 stations. Required number of valid measured data (90%) was achieved at 6 monitoring stations. No limit values were exceeded in 2012.

Benzene

Minimum range of benzene monitoring (number and localisation pursuant to Annex 5 to Decree 360/2010 Coll. on air quality) was achieved. Monitoring of benzene has been carried out through continual reference method at 10 stations. Required number of valid measured data (90%) was achieved at half of the monitoring stations. No limit values were exceeded in 2012.

BaP

The end value that was to be reached by 31. 12. 2012 was in 2011 exceeded at the stations of Veľká Ida-Letná, Krompachy-SNP, and Prievidza-Malonecpalská, and Trnava-Kollárova.

♦ Regional air pollution and atmospheric precipitations

Regional air pollution *is a pollution of a boundary layer of a rural country at a sufficient distance from local industrial and urban sources. The boundary layer of the atmosphere is a mixing layer extending itself from the Earth surface up to a height of about 1 000 m. Residence time of these pollutants in the atmosphere is several days and thus they may be transported in the atmosphere over a distance of several thousand kilometres from the source. Pollutants coming from combustion processes such as sulphur dioxide, oxides of nitrogen, hydrocarbons or heavy metals, play an important role on a regional scale.*

In 2012, Slovakia operated 4 EMEP NAQMN stations for monitoring regional air pollution and chemical composition of precipitation water. All the stations are part of the EMEP network. EMEP represents a programme of cooperation for monitoring and assessment of remote travel of airborne pollutants in Europe under the scheme of UNECE Convention on Long - Range Trans-boundary Air Pollution CLRTAP (Geneva, 1979).

Sulphur dioxide, sulphates

In 2012 regional sulphur dioxide concentrations calculated per sulphur were 0.26 $\mu g.m^{-3}$ at Chopok, and 0.86 $\mu g.m^{-3}$ at Starina. Pursuant to Annex 13 to Regulation no. 360/2010 Coll., critical level for the protection of vegetation is 20 $\mu g\ SO_2.m^{-3}$ for the calendar year and the winter season. This level was exceeded neither for the calendar year (Chopok 0.52 $\mu g\ SO_2.m^{-3}$ and Starina 1.72 $\mu g\ SO_2.m^{-3}$) nor for the winter season (Chopok 0.4 $\mu g\ SO_2.m^{-3}$ and Starina 2.6 $\mu g\ SO_2.m^{-3}$). Percentage share of sulphates on total particulate matter mass was 12.1% at Chopok and 13.7% at Starina. Sulphates to sulphur dioxide concentration ratios expressed in sulphur was 0.9 at Chopok and 0.76 at Starina.

Nitrogen oxides, nitrates

Concentration of nitrogen oxides at regional stations expressed in NO_2-N were in 2012 0.81 $\mu g.m^{-3}$ at Chopok and 1.24 $\mu g.m^{-3}$ at Starina. Pursuant to Annex 13 to Regulation no. 360/2010 Coll., critical level for the protection of vegetation is 30 $\mu g\ NO_X.m^{-3}$ for the calendar year. This level was not exceeded over the last calendar year (Chopok 2.67 $\mu g\ NO_X.m^{-3}$ and Starina 4.09 $\mu g\ NO_X.m^{-3}$). Airborne nitrates at Chopok and Starina were detected mainly in their particulate form. Compared to gaseous nitrates, the difference recorded at Starina favours particulate nitrates more than at Chopok.

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 was 6.9 % at Chopok and 9 % at Starina. Ratio of total nitrates (HNO_3 + NO_3) to NO_X-NO_2, as expressed in nitrogen, was 0.15 at Chopok and 0.27 at Starina.

Ammonia, ammonium ions, and alkali metals

In compliance with the requirements of the EMEP monitoring strategy, measurements of ammonia, ammonium ions, and ions of sodium, potassium, calcium, and magnesium in the air at the station of Stará Lesná were initiated in May 2005. The measurements were completed in 2007. Measurements for these ions began at Starina in July 2007. Table shows average concentrations of the mentioned components (NH_3 and NH_4^+ calculated as per nitrogen) at Starina for the year 2012. For ammonia ions, annual concentration was 0.58 μg $N.m^{-3}$ and their percentage proportion in PM was 5.2 %. For ammonia, the annual concentration is 0.41 μg $N.m^{-3}$ and the ratio of the ammonia ions and ammonium concentration expressed in nitrogen is 1.4.

Ozone

Stará Lesná shows the longest time progression in ozone measurements since 1992. Ozone measurements at Topoľníky, Starina, and at Chopok started in the course of the year 1994. In 2012, the average annual ozone concentration at Chopok 93 $\mu g.m^{-3}$, 59 $\mu g.m^{-3}$ at Topoľníky, 63 $\mu g.m^{3}$ at Stará Lesná, and 60 $\mu g.m^{-3}$ at Starina.

Volatile organic compounds

Volatile organic compounds C2-C6 or the so-called light carbohydrates began at the Starina station in the fall of 1994. Starina belongs to the few European stations listed within the EMEP network, with regular monitoring of volatile organic compounds. The compounds are assessed in line with the EMEP methodology under NILU. Their concentrations range from decimals to several ppb units. However, since October 2008 until mid September 2011, it was impossible to detect VOC due to persistent problems with the operation of a new gas chromatograph installed at Testing laboratory. VOC measurements were resumed on 15. 9. 2011. Nowadays, VOC analyses for 2012 represent the first semester of 2012.

Percentage share of heavy metals in Starina 2011

ethane	ethene	propane	propene	i-butane	n-butane	acetylene	i-pentane	n-pentane	isoprene	n-hexane	benzene
1.804	0.884	0.801	0.205	0.885	0.582	0.364	0.172	0.170	0.034	0.114	0.355

Measurements were resumed on 15. 9. 2011 Source: SHMI

Atmospheric precipitations

- Major ions, pH, conductivity

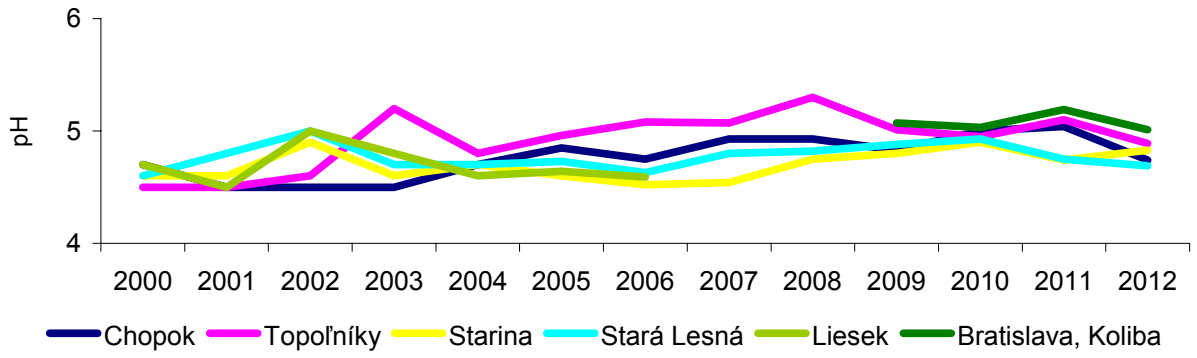
In 2012, total atmopheric precipitations at regional stations were between 432 and 993 mm. Upper limit of the interval was detected at the highest located station Chopok, while the lowest limit was

detected at the station Topoľníky of the lowest altitude. Acidity of atmospheric precipitations was greatest at Stará Lesná, copying the lower pH limit of 4.69 - 4.89. Time progression along with the pH trend over a longer period show a decrease in acidity. pH values well correspond with the pH values by the EMEP maps.

Dominant sulphates concentrations in precipitation water calculated per sulphur represented the interval between 0.41 - 0.55 mg/l. Sulphates concentrations copy the lower interval limit at Topoľníky and the upper limit at Starina. Chopok, Topoľníky, and Stará Lesná differ in the annual average only at a minimum level. Total decline in sulphates concentrations over a long time progression corresponds to a decline in SO_2 emissions since 1980.

Nitrates that contribute to the acidity of precipitations less than sulphates show concentration interval of 0.25 - 0.39 mg/l calculated as per nitrogen. Chopok and Stará Lesná represent the lower limit of the interval, while Topoľníky copies the upper limit. Ammonium ions also belong to majority ions and their concentration span was 0.30 - 0.48 mg/l.

Trend of pH precipitation



Source: SHMI

- Heavy metals in atmospheric precipitations

Since 2000, programme of heavy metals measurement has been gradually modified and more adopted to reflect relevant requirements of the CCC EMEP monitoring strategy. The station of Bratislava-Koliba introduced measurements of the same of portfolio of heavy metals as at other regional stations in the Slovak Republic; however, this station serves only for comparison purposes and is not assessed as a regional station.

Annual averages of heavy metals in monthly precipitation - 2012

	Precip. mm	Pb µg/l	Cd µg/l	Ni µg/l	As µg/l	Zn µg/l	Cr µg/l	Cu µg/l
Chopok	776	2.13	0.08	0.55	0.29	33.82	0.27	1.18
Topoľníky	429	1.10	0.04	0.30	0.12	8.18	0.23	1.18
Starina	616	1.40	0.07	1.26	0.17	9.70	0.27	1.56
Stará Lesná	633	1.08	0.06	0.57	0.13	7.50	0.08	0.84
Bratislava, Jeséniova	734	1.49	0.06	0.44	0.20	16.41	0.18	3.28

Source: SHMI

Tropospheric ozone

Average annual concentrations of ground ozone in Slovakia in contaminated urban and industrial locations in 2012 were within the interval of 49-93 $\mu g.m^{-3}$. Greatest average annual ground ozone concentrations in 2012 were recorded at the Chopok station (93 $\mu g.m^{-3}$).

The reason for this is a high ozone concentration within the tropospheric ozone accumulation zone above the territory of Europe located 800 to 1500 metres above the earth's surface.

Target value for ground ozone concentration in terms of public health protection is set by the MoE SR Resolution No. 360/2010 Coll. on air quality at 120 $\mu g.m^{-3}$ (max. daily 8-hour value). This value must not be exceeded on more than 25 days in of the year, for three consecutive years. The following table shows the summary of exceeding values measured over the period of 2010-2012. Public alarm threshold (240 $\mu g.m^{-3}$) and public information threshold (180 $\mu g.m^{-3}$) were not exceeded in 2012.

Number of days with exceeded target value for protection of public health

Station	2010	2011	2012	Averaged in 2010-2012
Bratislava, Jeséniova	24	24	48	**32**
Bratislava, Mamateyova	21	27	35	**28**
Košice, Ďumbierska	14	70	25	**36**
Banská Bystrica, Zelená	17	32	53	**34**
Jelšava, Jesenského	4	13	-	-
Kojšovská hoľa	55	58	37	**50**
Nitra, Janíkovce	16	11	43	**30**
Humenné, Nám. slobody	8	10	10	9
Stará Lesná, AÚ SAV, EMEP	15	17	14	15
Gánovce, Meteo. st.	7	25	12	15
Starina, Vodná nádrž, EMEP	2	7	7	5
Prievidza, Malonecpalská	9	14	12	12
Topoľníky, Aszód, EMEP	23	-	31	**27**
Chopok, EMEP	36	68	74	**59**
Žilina, Obežná	20	34	34	**29**

*Values that are **exceeding** the **limiting values** are printed in **bold** letters*

Source: SHMI

Target value for the **AOT 40 vegetation protection exposition index** is 18 000 $\mu g.m^{-3}.h$ (MoE SR Resolution No. 360/2010 Coll. on air quality). This value applies to the concentrations calculated as the average for the period of five years. Average values for the years 2008-2012 were exceeded at all reference urban and rural stations, with the exception of Bratislava, Jelšava, Humenné, Stará Lesná, Gánovce, Starina, Prievidza, Topoľníky, Chopok, Žilina.

Values for the AOT 40 for vegetation protection - the year 2008 and for the averaged period of 2008-2012

Station	2012	Averaged in 2008-2012
Bratislava, Jeséniova	24 255	**20 300**
Bratislava, Mamateyova	19 200	16 764
Košice, Ďumbierska	18 487	**22 399**
Banská Bystrica, Zelená	27 387	**20 748**

Jelšava, Jesenského	–	13 896
Kojšovská hoľa	20 181	**22 788**
Nitra, Janíkovce	25 206	**23 436**
Humenné, Nám. slobody	13 214	15 866
Stará Lesná, AÚ SAV, EMEP	12 607	14 439
Gánovce, Meteo. st.	11 819	15 438
Starina, Vodná nádrž, EMEP	9 320	10 289
Prievidza. Malonecpalská	16 014	14 289
Topoľníky, Aszód, EMEP	14 871	**19 390**
Chopok, EMEP	30 666	**28 169**
Žilina, Obežná	20 120	17 922

** the station did not measure data for enough years*
*Values that are **exceeding** the **limiting values** are printed in **bold** letters*
Source: SHMI

Ozone layer depletion

- **International liabilities concerning ozone layer protection**

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

Slovakia made effective the **Montreal Annex** to the Montreal Protocol on February 1, 2000. This document prohibits Slovakia to import and export all controlled substances, including methyl bromide, from and to non-signatory countries, as well as sets forth the obligation to introduce a licensing system for import and export of controlled substances. In 2002, Act 408/2000 Coll. was adopted, which amends Act 76/1998 Coll. on the Earth's ozone layer protection and on amendment to Act 455/1991 Coll. on small business (Small Business Act) as amended, which transposed the decisive majority of responsibilities stipulated under the European Parliament and Commission Directive 2037/2000 EC and banned the production of brom-chloro-methane, creating conditions for ratification of the **Beijing Annex** of the Montreal Protocol. (for Slovakia effective as from August 20, 2002). Since January 1, 2010, a new Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer. In 2012, in relation to the implementation of the European Parliament and of the Council 1005/2009/EC on ozone layer depleting substances, new act no 321/2012 Coll. on the Earth's ozone layer protection was adopted.

- **Consumption of controlled substances**

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

Group of substances	1986/ 1989#	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
A I - freons	1 710.5	0.996	0.81	0.533	0.758	0.29	0.43	0.46	0.34	0.49	0.19	0.067
A II - halons	8.1	-	-	-	-	-	-	-	-	-	-	-
B I* - freons	0.1	-	-	-	-	-	-	-	-	-	-	-
B II* - CCl_4	91	0.01	0.009	0.047	0.258	0.045	0	0.016	0.099	0.119	0.039	0.072
B III* - 1,1,1 trichloroethane	200.1	-	-	-	-	-	-	-	-	-	-	-
C I*	49.7	71.5	52.91	38.64	48.76	43.94	41.32	34.35	31.12	0.578	-	0.496
C II - HBFC22B1	-	-	-	-	-	-	-	-	-	-	-	-
E -** CH_3Br	10.0	0.48	0.48	0.48	-	-	-	-	-	-	-	-
Total	2 019.5	72.986	54.21	39.7	49.78	44.28	41.75	34.83	31.56	1.187	1.229	0.635

Initial usage
Source: MoE SR
∗ Initial year 1989
∗∗ Initial year 1991
Note 1*: 0.48 tons of methyl bromide were imported in 2001-2004 for Slovakofarma as a raw material for the production of medications, which is not considered as consumption, according to the valid methodology.*
Note 2*: Consumption of C1 substances in 2010 and 2012 represents the import of regenerated R22. As from January 1, 2010, Regulation no. 1005/2009/EC allows to introduce to the market and use only recycled or regenerated substances for the maintenance and service of mechanisms; import, introduction and use of pure C1 substances is prohibited.*

Usage of substances under control in 2012 (t)

Usage	Group of substances							
	A I	A II	BI	B II	B III	C I	C II	E
Coolant						0.496		
Detection gases, diluents, detergents	0.67			0.072				

Source: MoE SR

- **Total atmospheric ozone and ultraviolet radiation**

SHMU Aerological and Radiation centre in Gánovce pri Poprade has measured atmospheric ozone above the territory of Slovakia through the ozone spectro-photometer since 1993. Besides total ozone, this instrument regularly measures also the intensity of solar ultraviolet radiation within the spectre of 290 to 325 nm by individual time steps of 0.5 nm.

The average annual value of total atmospheric ozone in 2012 was 320.0 Dobson units (D.U.), which is 5.4% under the long-term average from measurements in Hradec Králové in 1962-1990. Values from these measurements have been used also for our territory as the long-term normal value.

Average monthly devations within 2012

Month	1	2	3	4	5	6	7	8	9	10	11	12	Year
Average (DU)	324	362	347	356	343	325	314	301	288	278	293	311	**320.0**
Deviation (%)	-5	-2	-9	-8	-8	-9	-8	-7	-4	-3	2	0	**-5.4**

Source: SHMI

Total sum of daily doses of ultraviolet erythema radiation

Total sum of daily doses of ultraviolet erythema radiation over the period of April 1 to September 30 measured at Gánovce was 450 644 J/m^2, which is by 4% less than the sum over the same period in 2011. Total sum of 479 411 J/m^2 detected at the station Bratislava-Koliba was 3% lower than in 2011.

• WATER

Key questions and key findings

What is the situation and trend in the use of water in terms of preserving the water sources?

- **Volumes of water usable per capita fluctuate due to climate conditions. Percentage of usable water abstraction after 2000 does not even reach 10%, the only exception being the year 2003 that was characterised as exceptionally dry and showing significant abstractions for irrigation purposes.**
- **Surface water abstraction after 1995 showed a significant decline despite minimal year-to-year increments and reductions. In 2012, volumes of abstracted surface water was 59.7% of abstracted volumes in 1995, and 55.8% of abstracted volumes in 2000. Between the years 2011 and 2012 abstracted volumes grew by 38.2%.**
- **Groundwater abstraction also declined after 1995; however, since 2000 its trend has been balanced, with very few increments and reductions. In 2012, volumes of abstracted groundwater were 41.6% of the abstracted volumes in 1995, and 24.6% of the abstracted volumes in 2000. Compared 2011, abstraction grew by 1.1%.**

Has there been a reduction to the pressure on the surface water quality expressed by the volume of pollution discharged into surface water?

- **Since 1994, volumes of discharged wastewater into surface water have been declining, despite year-to-year increments and reductions. In 2012, wastewater production declined by 47.2% compared to 1994, and by 38.3% compared to 2000. In 2012, volumes of organic pollution characterised by parameters of COD_{Cr}, BOD, and IS.**

What is the quality of water in Slovakia?

- **Surface water quality in 2012 at all monitored sites complied with the limits for selected general indicators and the radioactivity indicators. Exceeded limit values were recorded mainly for synthetic and non-synthetic substances, hydrobiological and microbiological indicators, and nitrite nitrogen. Until 2007, surface water quality was assessed under the norm STN 75 221 in 5 quality categories and 8 indicator groups. In the years 1995-2007, 40-60% of abstraction sites showed the IV. and V. quality categories for the groups of F - micropollutants, and E - biological and microbiological indicators.**
- **In line with the requirements of Directive 2000/60/EC (Water Framework Directive - WFD) water quality is expressed by the ecological and chemical balance of surface water bodies. Adverse and critically adverse ecological situation was recorded in 4.13% of water bodies, reaching the length of 1 485.18 km. 176 water bodies (10%) did not reach good chemical balance.**
- **Monitoring for groundwater chemical balance in 2012 was carried out within the framework of basic monitoring (171 objects) and operational monitoring (295 objects). Both types of monitoring showed exceeded values for set contamination limits. In 1995-2006, groundwater quality was assessed under norm STN 75 7111 in 26 water management significant areas.**
- **Drinking water quality in the SR has long been of the high level. In 2012, share of drinking water analyses that complied with the limits reached the value of 99.67%, while in 2000 it was 98.64%.**
- **In 2012, classification of water suitable for bathing under Directive 2006/7/EC was carried out at 32 natural sites. 23 sites (72%) showed excellent water quality, while 8 sites (25%) were classified as having good water quality for bathing. 1 natural bathing water pool (3%) was classified as a site with sufficient quality of bathing water. The natural water bathing body of Ružín has not been classified due to the unavailability of data for the last 4 years. Over the years 2000 to 2004, water quality in water bodies was monitored for eutrophication processes expressed by the indicator of chlorophyll-a. In 2000, the concentration of chlorophyll-a was exceeded at 18 monitored water bodies.**

What is the trend in connectedness of the public to public water supplies and sewerage systems?

- **Number of inhabitants connected to drinking water from public water supplies reached 87.0% in 2012. This value does not reach the values shown by the neighbouring countries. In 1993, 4 138 thousand of inhabitants (77.8%) were connected to water supplies, while in 2000 it grew to 4 479 thousand (82.9%).**
- **Connectedness of the public to public sewerage systems is significantly less than connectedness to water supplies. 51.5% of inhabitants were connected to public sewerage systems in 1993, while in 2000 this number grew to 54.7%, and in 2012 it reached 62.4%. This level is comparable to Hungary, Poland; however, it is significantly lower than that of the Czech Republic and Austria.**

Surface water

♦ Water balance

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 $m^3.s^{-1}$ of water, which is about 86% of our total surface water fund. In the long run, there is approximately 398 $m^3.s^{-1}$ of water springing in Slovakia, which represents 14% of the water fund.

Annual inflow to Slovakia in 2012 was 68 645 mil.m^3, which, compared to 2010, growth by 13 002 mil.m^3. **Runoff** from the territory has declined by 1 765 mil.m^3, compared to the previous year.

Total water volume as of 1.1.2012, in water reservoirs was 635.7 mil.m^3, which represented 55% of total usable water volume in water reservoirs. As of 1.1.2013, total available volume of the assessed accumulation tanks compared to the previous year 2012 incerased to 722.3 mil.m^3, which represents 62% of total exploitable water.

Total hydrological balance of water resources in the SR in years 1995, 2000 and 2012

	Volume (mil. m^3)		
	1995	**2000**	**2012**
Hydrological balance			
Rainfall	40 637	37 500	34 853
Annual inflow to the SR	74 717	77 999	68 645
Annual runoff	87 113	90 629	76 678
Annual runoff from the territory of the SR	12 793	12 842	7 597
Water management balance			
Total abstraction of the surface and ground water in the SR	1 386	1 172	675,39
Evaporation from water reservoirs and dams	52.20	60.00	57.25
Discharge into surface waters	1 120.30	989.80	646.60
Impact of water reservoirs (WR)	137.70	32.98	47.50
	improving	**improving**	**accumulation**
Total volume in WR as of 1st January of the following year	732.3	757.0	722.3
% of supply volume in accumulation WR in the SR	59.1	65.0	62.0
Rate of water exploitation (%)	11.0	9.1	8.89

Source: SHMI

Usable water per year per capita includes two factors: (1) increment in population, and (2) water resources provided by nature. In Central Europe, especially in Slovakia, usable water per capita and year reflects the trend in natural conditions, since the growth of population has been stagnant. Usable water fluctuates since it is has been impacted by climate conditions. For instance, in the year 2003 that was characterised as extremely dry, usable water declined by more than a half compared to the long-term mean values for the years 1931-1980 (1.29 vs. 2.84). Usable water also relates to the real water demand - water abstractions that, due to increased prices, declined significantly. Besides, the decline in abstractions below 10% points to inadequate water savings.

Usability of water per capita in the SR

	1993	2000	2003	2005	2008	2009	2010	2011	2012
Usable water ($m^3.10^3$/year/capita)	1.37	2.36	1.29	2.21	1.88	2.00	4.22	1.73	1.41
Real withdrawal (m^3/ year/capita)	297.6	220.8	196.4	170.8	122.8	115.8	111.0	109.7	125.0
% witdrawal from usable water	21.7	9.40	15.2	7.7	6.6	5.8	2.6	6.3	8.9

Source: SHMI

♦ Precipitation and runoff conditions

Total **atmospheric precipitations** in the Slovak territory in 2012 reached the value of 711 mm, which represents 93% of the normal level. In terms of precipitations, this year had been considered normal. Total excess of precipitations reached the value of 49 mm.

Based on the characteristics of the precipitation period, the year 2012 showed normal values in the watersheds of Nitra, Hron, Ipeľ, Bodva, Hornád, Bodrog, and Poprad. For the watersheds of Morava, Váh, and Slaná, the year was characterised as dry. For the watershed of Danube, the year 2012 was assessed as very dry.

Average rates of precipitation and runoff in particular catchment areas in 2012

Catchment area	**Dunaj**		**Váh**		**Hron**			**Bodrog a Hornád**			
Subcatchment area	***Morava**	***Dunaj**	**Váh**	**Nitra**	**Hron**	***Ipeľ'**	**Slaná**	**Bodva**	**Hornád**	***Bodrog**	***Poprad a 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
Average precipitation (mm)	570	490	755	640	771	630	704	697	704	727	804
% of normal	84	78	89	92	98	92	89	95	104	103	96
Character of rainfall period	S	VS	S	N	N	N	S	N	N	N	N
Annual runoff (mm)	86	13	246	85	159	36	79	50	109	148	307
% of normal	65	36	78	59	55	26	42	30	52	50	89

* 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, MV – exceptionally humid

Annual runoff volumes in SR in 2012 reached 59% of the long-term average value. Runoff volumes from partial watersheds did not exceed the long-term average for any watershed, as the values oscillated within the range of 26 to 89%.

♦ Surface water abstraction

In 2012, surface water abstractions increased to 326.429 mil.m^3, which is 38.2% more than in the previous year. Abstractions for industry in 2012 were at 259.2 mil. m^3, which was a significant growth by 82.6 mil.m^3, i.e. 46.8%, compared to 2011. A slight growth was recorded also in surface water abstractions for waterlines, which, compared to the previous year, increased by 0.55 mil.m^3, that is 1.1%. Surface water abstractions for irrigation grew and reached the value of 18.138 mil.m^3.

Surface water exploitation in the SR (mil.m^3)

Year	Public water-supplies	Industry	Irrigation	Other agriculture	Total	Discharging
1995	71.963	661.836	74.325	0.0360	808.159	1 120.29
2000	70.571	575.872	90.540	0.0440	737.027	989.825
2009*	50.433	217.009	12.319	0.0020	279.763	605.274
2010*	48.098	205.497	5.864	0.0010	259.460	742.818
2011*	48.545	176.610	10.125	0.9210	236.201	610.093
2012*	49.090	259.200	18.138	0.0013	326.429	646.600

*data from database „Aggregate balance sheet of water“ Source: SHMI

♦ Evaluation of surface water quality by the SR government Regulation 269/2010 Coll.

Surface water quality assessment has been carried out on the basis of data obtained during the water level monitoring process. In 2010, surface water quality monitoring in the Slovak Republic was divided by the **MoE SR Resolution 418/2010 Coll. on implementation of selected provisions of the Water Act** into basic monitoring, operational monitoring, and monitoring of protected areas (PA). Quality surface water indicators in 2012 were monitored in compliance with the approved Programme of Water Balance Monitoring for 2012. 314 sites were monitored under the basic and operational monitoring schemes.

Quality indicators monitored at all monitoring sites (basic and operational) in 2012 were assessed pursuant to the **SR government Regulation 269/2010 Coll. which sets forth criteria for achieving a favourable water balance.** General requirements for surface water quality were met at all monitoring sites for the following indicators: **general indicators** (part A) - magnesium, sodium, disulphate, free ammonia, fluoride, surface active substances, phenolic index, chrome (VI), vanadium, chlorobenzene, dichlorbenzenes. Also, **radioactivity indicators** complied with the requirements (part D): bulk volume alpha and beta activity, tritium, stroncium, and caesium.

Surface water quality criteria were exceeded in the **synthetic substances** category (part B) by the indicators for arsenic, cadmium, copper, lead, zinc. In the category of **non-synthetic substances** (part C) the following substances did not comply with the criteria for the annual average: alachlor, hexachlorobenzene, di-(2-ethyl hexyl) phtalate (DEHP), 4-methyl-2 6-di-tert-butylphenol, benzo(g,h,i)perylen+indeno(1,2,3-cd)pyren and cyanides. The highest permissible concentration has been exceeded in the indicators of mercury and 4-methyl-2 6-di-tert-butylphenol. **Hydrobiological and microbiological indicators** (part E) included the bioseston saprobic index, abundance of phytoplankton, chlorophyll a, coliform bacteria, thermotolerant coliform bacteria, intestinal enterococci and culturable microorganisms at 22 ^{o}C. Nitrite nitrogen indicator has often been exceeded in all partial watersheds for the **general indicators** group. Most exceeded criteria in the group of

hydrobiological and microbiological indicators included those for intestinal enterococci (in 6 partial watersheds), thermotolerant coliform bacteria (in 6 partial watersheds), and coliform bacteria (in 7 partial watersheds).

♦ Evaluation of status of surface water bodies

Assessment of surface water formations balance is based on the assessment of their ecological condition, i.e. their ecological potential and chemical balance.

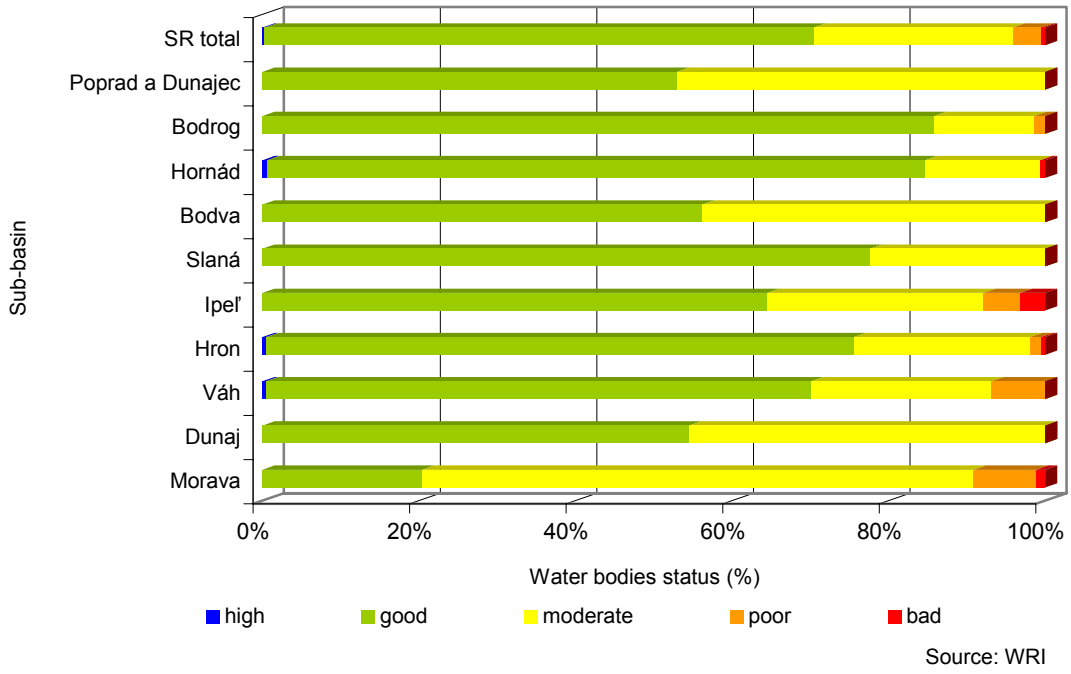
Resulting water balance is determined by the worse of the pair of chemical or ecological balance that forms the basis for the subsequent activities relating to the compliance with one of the environmental quality goals under Framework Water Directive (FWD) - to reach a favourable water balance for all water formations by 2015.

♦ Assessment of the ecological balance of surface water bodies

Assessment of the ecological balance of surface water bodies for the year 2010 was carried out at 1 648 natural surface water bodies. Best situation in terms of the ecological balance was recorded in partial watersheds of Bodrog, Hornád, Slaná, Hron, and Váh.

Very good and good ecological balance was recorded in 70.51% of water bodies in Slovakia. In terms of water bodies' length, the number represents 55.55% (10 524.11 km). A relatively high number of water bodies showed average balance, specifically 25.36% of them, which represents the length of 5 331.95 km. Condition of surface water bodies was classified as adverse and critically adverse in 4.13% of water bodies, reaching the length of 1 485.18 km.

Share of the total number of water bodies classified into the individual ecological status/potential in the river basin of SR (2010)



Source: WRI

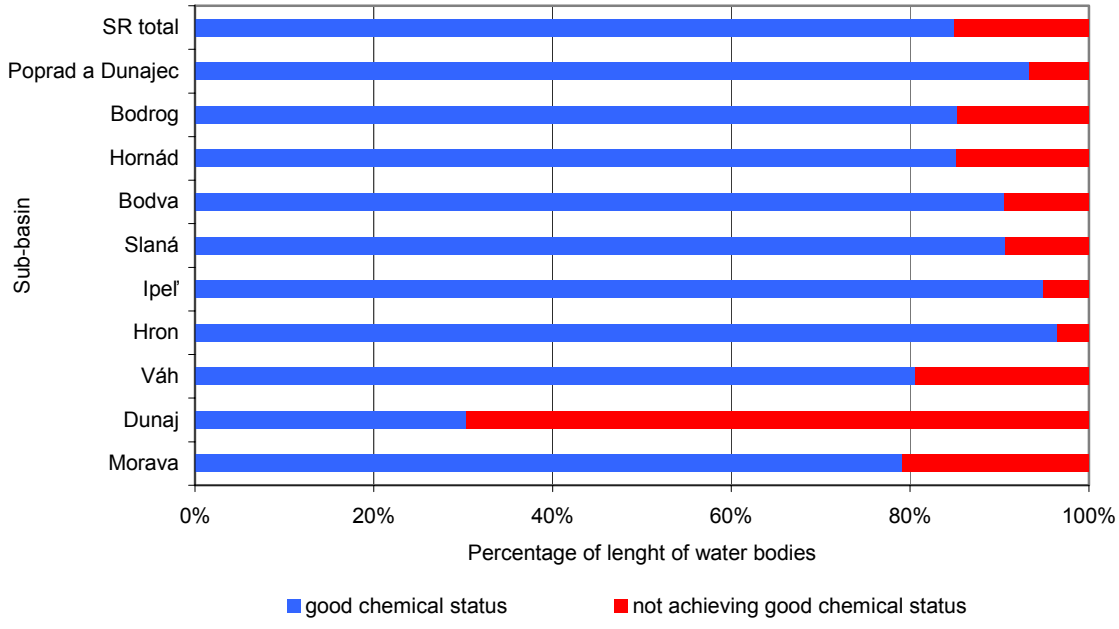
♦ Assessment of chemical balance of surface water bodies

Assessment of chemical balance of surface water bodies in 2010 was performed at 1 760 water bodies (these include 1 737 surface water bodies at rivers (flowing waters) and 23 surface water bodies at rivers with a changed category (standing waters). 1 584 (90%) water bodies in Slovakia showed good chemical balance, while 176 (10%) water bodies did not.

122 water bodies showed deficient chemical balance caused by specific synthetic pollutants, while 44 water bodies were in this condition due to specific non-synthetic priority pollutants. Seven water bodies showed exceeded environmental quality norms for both groups and no pollutants were identified in 13 water bodies since deficient chemical balance is determined on the basis of outcomes of risk analysis.

In total, 15.07% of the length of water bodies in Slovakia do not show good chemical balance. Most adverse situation exists in the partial watershed of the Danube River with almost 70% of its length not reaching good chemical balance. Watersheds of the Váh and Morava rivers follow with almost 20%.

Assessment of chemical balance of surface water bodies' lengths in 2010



Source: WRI

Groundwater

♦ Water resources

In 2012, based on the hydro-geological assessment and surveys in Slovakia, there were **78 939 l.s^{-1} available groundwater resources**. In comparison with the previous year 2011, there was observed a slight increase of the efficient groundwater volume by 138 l.s^{-1}, i.e. by 0.17%. In the long-term evaluation, the increase of the efficient volume in comparison with 1990 makes 4 164 l.s^{-1}, i.e. 5.6%.

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 wate sources abstraction, we see that in **2012, out of total number of 141 hydro-geological regions in SR, 130 regions show good balance status, 10 regions show acceptable status and one region show critical status.** Emergency balancing state did not occur in any region.

♦ Groudwater levels

Average annual levels in 2012 in Slovakia showed decline, compared to 2011. Average annual values of groundwater levels declined within the interval of -20 to -100 cm. A single and non-typical increase has been recorded in the watershed of the middle and upper Váh River.

Average annual levels in 2012, compared to long-term average annual levels declined for most parts from -10 cm to -30 cm, occasionally by -80 cm in the whole territory. Occasional increases have been recorded in all watersheds, especially Danube (mostly up to +70 cm).

♦ Well capacities

Given the **average spring yields** and comparing them with the previous year, almost unified decline in yields has been observed, down to the level of -40% to -90% of last year's figures. The figures for Slaná and Bodva watersheds show only 3% - 40%. Occasional increments (mainly in the watersheds of Morava and Hornád) reached up to 125% of last year's average yields.

Average annual yields compared to long-term average yields declined in most part by 50% - 90% or less in few sites. Increments are prevalent in the watershed of the Poprad River (up to 190%), their occurrence has been recorded in the watersheds of these rivers: Morava, Nitra, Hron, Bodva, and Hornád (in most parts up to 140%).

♦ Groundwater abstraction

In 2012 there was being **extracted 10 719 l.s^{-1} of ground water in average** by the users (which are subjects to reporting obligation) in Slovakia that was 13.58% of the documented efficient volume. During the year 2012 the groundwater extractions slightly increase by 117.6 l.s^{-1} which means 1.11% in comparison with year 2011.

Groundwater extraction according to the purpose of use in years 1995, 2000- 2012 (l.s^{-1})

Year	Public water supplies	Food-processing industry	Other industr.	Agricult. and Livestock	Vegetable prod. Irrigation	Social purposes	Others	Total
1995	14 373.10	390.60	2 327.20	727.10	25.00	286.50	202.70	18 332.20
2000	11 188.38	321.23	1 177.18	446.78	18.20	432.99	632.66	14 217.42
2008	8 468.82	284.98	823.02	253.29	67.52	271.23	953.23	11 122.09
2009	8 475.40	268.13	762.18	232.07	93.80	249.44	963.58	11 044.60
2010	8 295.00	265.00	781.00	217.20	48.70	254.40	967.20	10 819.50
2011	8 071.10	206.20	802.20	210.20	81.10	237.80	993.20	10 601.80
2012	8 149.70	256.60	797.80	221.20	108.40	218.40	967.25	10 719.35

Source: SHMI

♦ Monitoring of groundwater quality

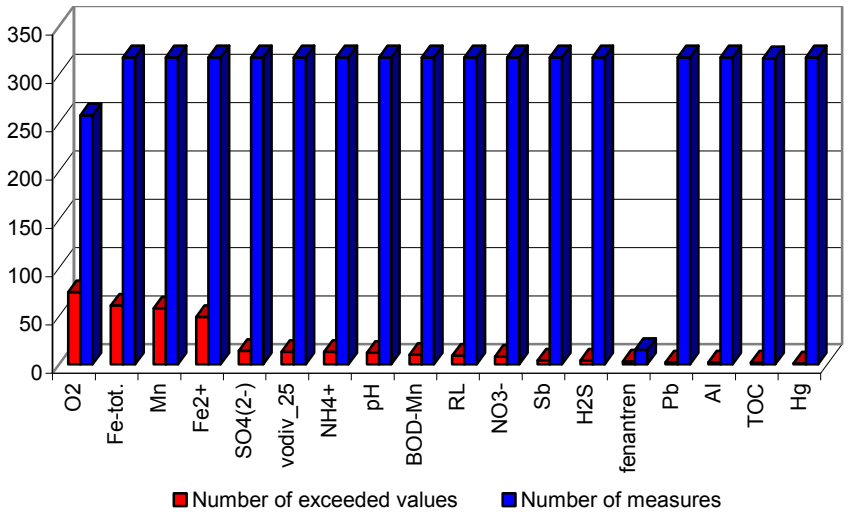
Pursuant to the WFD requirements, the older system of dividing Slovakia into significant water management areas was abandoned. Since 2007, classification has been based on delineation of groundwater formations. Monitoring of ground water chemical situation has been divided into:

- basic monitoring,
- operation monitoring.

In 2012, ground water quality was monitored at 171 **basic monitoring facilities**. Ground water samples were extracted 2 times from 39 quaternary objects, 1 times in 67 pre-quaternary objects and 11 quarternary objects, and 3 times in 54 pre-quaternary karst objects.

Recommended value for oxygen saturation percentage determined in situ was achieved in 72.09% of samples. pH values fluctuated within the limit values, with the exception of 12 samples. Of the total number of 318 measurements, conductivity exceeded the indicative value set by the government regulation in 13 cases. The issue of adverse **oxidation-reduction** conditions becomes predominant within the groundwater object basic monitoring as witnessed most frequently by exceeded admissible concentrations of total Fe (61 times), Mn (58 times), and NH_4^+ (13 times). Besides these indicators, there has been a single case of exceeded values for NO_3^- (8 times), SO_4^{2-} (14 times), and soluble substances at 105°C, COD_{Mn}, TOC and H_2S. In **trace elements**, increased concentrations were recorded for Al (2 times), Pd (2 times), Sb (4 times), and Hg (1 time). Pollution by specific organic pollutants within the basic monitoring objects shows only local character. In 2012, there was recorded a single case of increased concentration exceeding the set limit, specifically within the group of polyaromatic hydrocarbons. (phenanthrene) Majority of **specific organic substances** was below the detection limit. In the group of general organic compounds indicators, all the analyses complied with the set limit.

Occurrence of exceeded indicators at basic monitoring facilities pursuant to the SR Government Directive 496/2010 Coll. in 2012



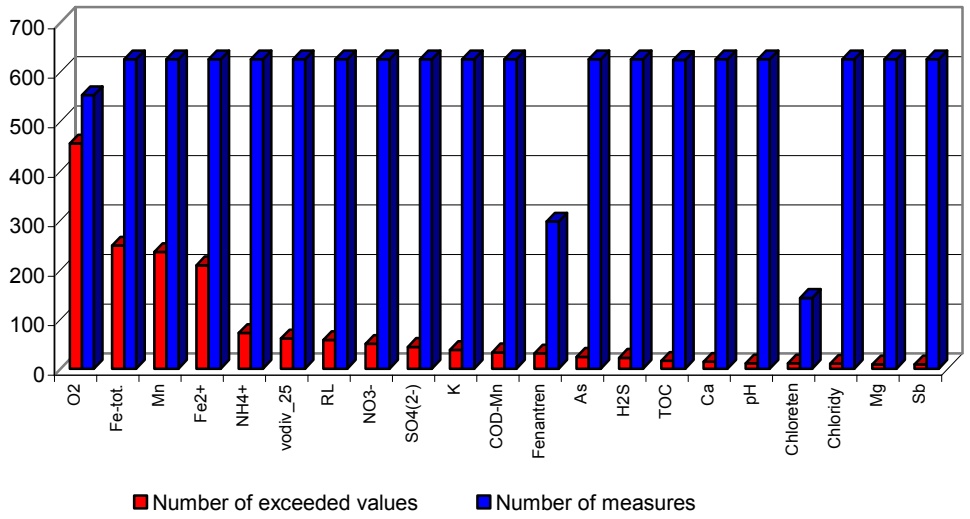
Source: SHMI

Operational monitoring was conducted at all ground water formations that were assessed as high-risk in terms of not being able to reach a favourable chemical balance. In 2012, within the operational monitoring 295 objects were monitored with the assumption to detect a potential penetration of contaminants from a potential contamination source or group into the ground water. The area of Žitný ostrov forms a separate part of the SHMI monitoring network, since it plays an important role within the whole process of water quality changes in Slovakia, and since the area itself represents a reservoir of drinking water for our territory.

Ground water at **operation monitoring** is relatively low in oxygen, with the exception of the Žitný ostrov area. This is also apparent from the fact that the recommended percentage value for oxygen water saturation was reached only in 17.72% of the samples. Most frequently exceeded indicators include Mn and total Fe, which suggests persisting adverse **oxidation-reduction situations.** Exceeded Cl^- and SO_4^{2-} limit values also indicate the impact of anthropogenic pollution on ground water quality. The limits for the following basic parameters were exceeded: soluble substances at 105°C (58 times), H_2S (22 times), Mg (9 times) and Na (3 times). Character of land use (agricultural exploitation) is reflected into increased contents of oxidized and reduced nitrogen forms in ground water, with ammonia ions NH_4^+ (72 times), NO_3^- (50 times) and NO_2^- (1time) being the most prevalent. In 2012, the acceptable value set by legislation was exceeded in **5 trace elements** (Al, As, Sb, Ni, and Zn) at operation monitoring facilities. Most frequently recorded increased contents include As (24 times) and Sb (9 times). The impact of anthropogenic activity on groundwater quality is indicated by the increased concentration of COD_{Mn} (33 times).

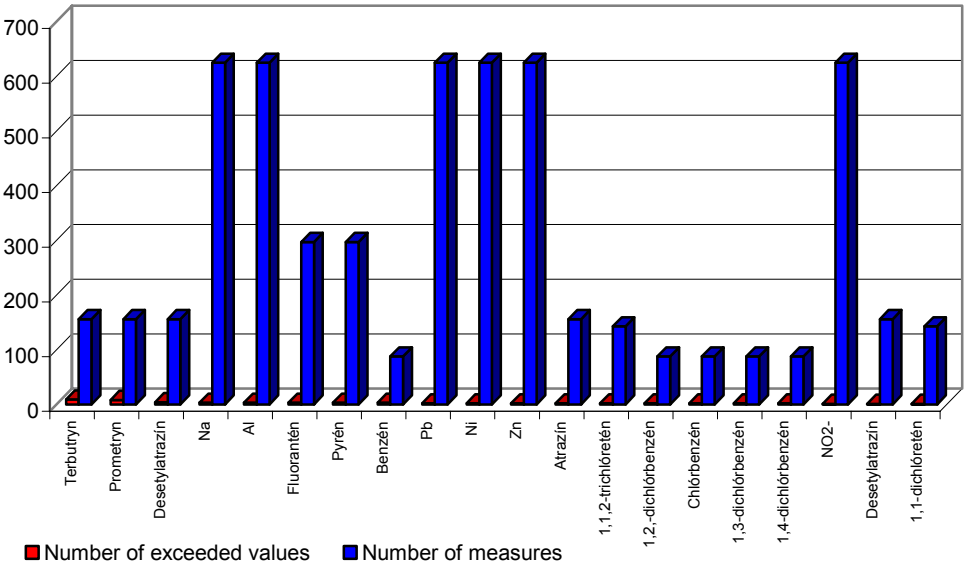
In the group of general organic compounds, values for total organic carbon exceeded the limit value as many as 16 times, while the limit values for hydrocarbon index for non-polar extractable substances (NPE-UV) in 2012 were not exceeded. Presence of **specific organic compounds** in groundwater indicates impacts by human activities. Objects of operational monitoring recorded a wider range of specific organic compounds. Most frequently exceeded values were recorded for indicators pertaining to the category of polyaromatic hydrocarbons (phenanthrene, fluoranthene, pyrene, chloroethylene, dichlorobenzene, and trichlorethylene) and pesticides (desethylatrazine, atrazine, deethylatrazine).Exceeded were also the limit values for the category of volatile aliphatic hydrocarbons and volatile aromatic hydrocarbons.

Occurrence of exceeded indicators at operation monitoring facilities pursuant to the SR Government Directive 496/2010 Coll. in 2012



Source: SHMI

Occurrence of exceeded indicators at operation monitoring facilities pursuant to the SR Government Directive 496/2010 Coll. in 2012



Source: SHMI

♦ Assessment of the condition of groundwater bodies

Assessment of the condition of groundwater bodies has been carried out by assessing their chemical balance and the quantitative balance.

In Slovakia, 101 groundwater bodies have been designated, including 16 quaternary, 59 pre-quaternary, and 26 geothermal groundwater bodies. For the purposes of groundwater chemical balance assessment in 2012, all quaternary and pre-quaternary groundwater bodies were covered with monitoring objects, with the exception of 2 pre-quaternary bodies. Groundwater quality was monitored at 466 objects including 164 within pre-quaternary and 302 within quaternary bodies. Geo-

thermal groundwater formations have not been assessed due to the absence of data on their usable potential and on their monitoring and use.

Objects were assessed for each water formation based on compliance to the Slovak Government Resolution no. 496/2010 Coll. which amends Slovak Government Resolution No. 354/2006 Coll. **which sets forth criteria for water for human consumption and its quality assessment.** Objects showing the exceeded threshold value set by legislation by at least one indicator were labelled as unfavourable.

On the basis of assessment of the ground water chemical balance, of the total number of 75 ground water formations:

- 13 ground water formations were declared as those with unfavourable chemical balance - 7 quaternary and 6 pre-quaternary
- 62 ground water formations were declared as those with favourable chemical balance.

Summary of chemical status evaluation in the groundwater bodies in SR

SR water bodies	Chemical status classification				Total area
	good		poor		
	km^2	%	km^2	%	
Quaternary	6 081	57.1	4 565	42.9	10 646
Pre - quaternary	39 446	80.5	9 536	19.5	48 982
SR total	**45 527**	**76.4**	**14 101**	**23.6**	**59 628**

Source: MoE SR

Favourable chemical balance was indicated for 82.7% of groundwater formations, i.e. 76.4% of total size of formations (quaternary and pre-quaternary). Favourable chemical balance was indicated for 17.3% of groundwater formations, i.e. 23.6% of total size of formations (quaternary and pre-quaternary).

Quantitative balance of groundwater formations involves assessing the impact of the documented phenomena on the groundwater formation as such. In Slovakia, this involves assessing the impact of groundwater abstractions. For the purposes of assessment of the quantitative balance of groundwater formations within quaternary sediments and pre-quaternary rocks, outcomes of four assessments have been summarised. 5 groundwater formations in the territory of the Slovak Republic have been classified as having an adverse quantitative balance.

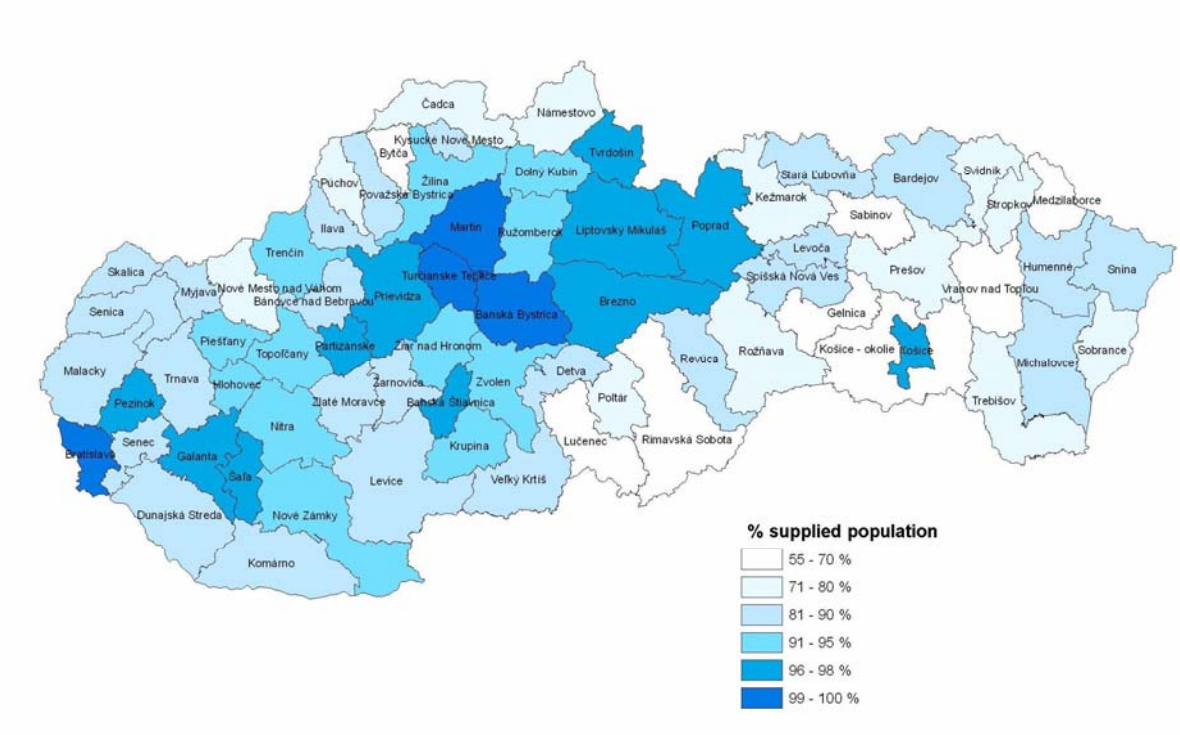
Public water supplies

♦ Infrastructure in supplying the public with drinking water

Number of inhabitants supplied with water from public water supplies in 2012 declined compared to the previous year by 15.8 thous. inhabitants down to 4 707.0 thous., however, the percentage of supplied inhabitants grew to 87.0% of total Slovak population. Decline in the number of supplied inhabitants was due to decreased figures in the Slovak population as shown by the census of 2011. In 2012, there were in the SR 2 349 individual municipalities that were supplied with public supply water, and their share in total SR municipalities was 81.3%.

In 2012, major changes were registered in drinking water abstraction. **Volume of produced drinking water** reached the value of 302 mil.m^3 of drinking water, which, compared to 2011, represents an increase by 3 mil.m^3. Of all groundwater sources, 256 mil.m^3 was produced (increased by 2 mil.m^3), while 46 mil.m^3 of drinking water was produced of all surface water sources (increased by 1 mil.m^3) Of total water produced at water management facilities, **water losses** by pipe network were 27.6% in 2012. **Specific water consumption by households** decreased to 80.8 l per person per day. This is alarming not only due to the fact that these abstractions are close to the sanitary limits, but mainly because the high drinking water prices motivate the people to build their own drinking water sources whose drinking water quality is, in most cases, far below the sanitary standards.

Drinking water supplying of the inhabitants from the public water supplies in 2012 (%)



Source: WRI

♦ Drinking water quality monitoring and assessment

Drinking water indicators are defined under the **SR Government Regulation 354/2006 Coll.,** which stipulates requirements on water designated for human consumption and its quality control. Water quality control for radioactivity follows the **Resolution of the Ministry of Health no. 528/2007 Coll.** which stipulates details on requirements to limit the level of irradiation from natural radiation.

Besides the **complete water analysis**, the implemented **minimum analyses** - e.g. analyses of 28 water quality indicators, is carried out to monitor and obtain periodic information on the stability of water bodies and effectiveness of water treatment, mainly water desinfection, biological quality and the sensoric properties of drinking water.

In 2012, were analysed at operation laboratories of water management companies 9 274 samples. The samples were abstracted at sites located within distribution networks and 251 195 analyses were

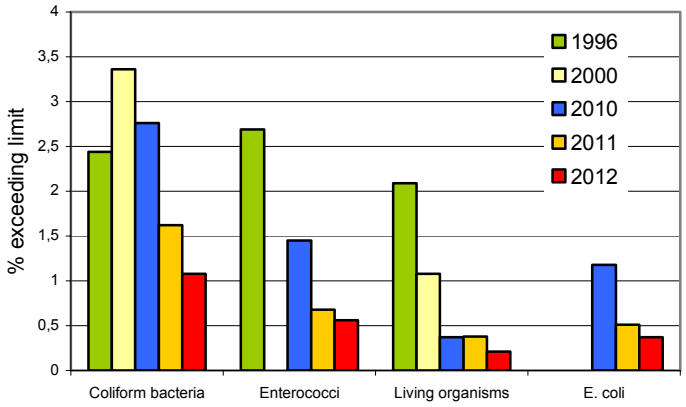
carried out to monitor individual drinking water quality indicators. Share of drinking water analyses that complied with the sanitary limits in 2012 reached 99.67% (in 2011 it was 99.60%). Percentage of samples that meet drinking water quality demands for all indicators reached 94.27% (in 2011 it was 92.05%). 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

Year	2000	2005	2012
Share of drinking water samples that do not meet the NMH and MHRR limit.	4.54 %	2.10 %	0.65 %
Share of drinking water quality indicators analyses that do not meet NMH and MHRR	1.36 %	1.15 %	0.73 %
NMH - maximum threshold values, MHRR – threshold values of the reference risk			

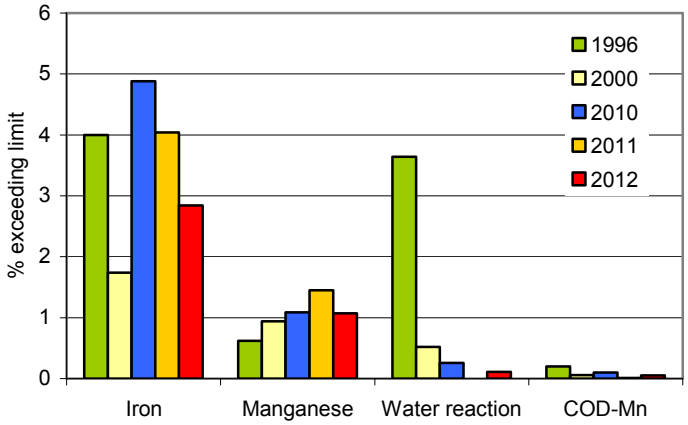
Source: WRI

Results of monitoring the microbiological and biological indicators of drinking water within Slovakia's distribution networks (1996-2012)



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 (1996 – 2012)



Source: WRI

Waste water discharge and treatment

♦ Waste water production

In 2012, 647 159 thous.m^3 of **waste water** were discharged into the surface water, which represents a growth by 34 784 thous.m^3 (5.7%) compared to the previous year. When compared with 2000, it is less by 400 522 thous.m^3 (38.3%).

Compared to the previous year, volumes of organic contamination of surface water continued to decline. The contamination was characterised by the following oxygen regime parameters: chemical oxygen demand by dichromate (COD_{Cr}) by 1 500 tonnes per year, biochemical oxygen demand (BOD) by 263 tonnes per year, and for the parameter of insoluble substances (IS) by 1 037 tonnes per year.

Major sources of organic contamination of water bodies include residential agglomerations, industry, and agriculture.

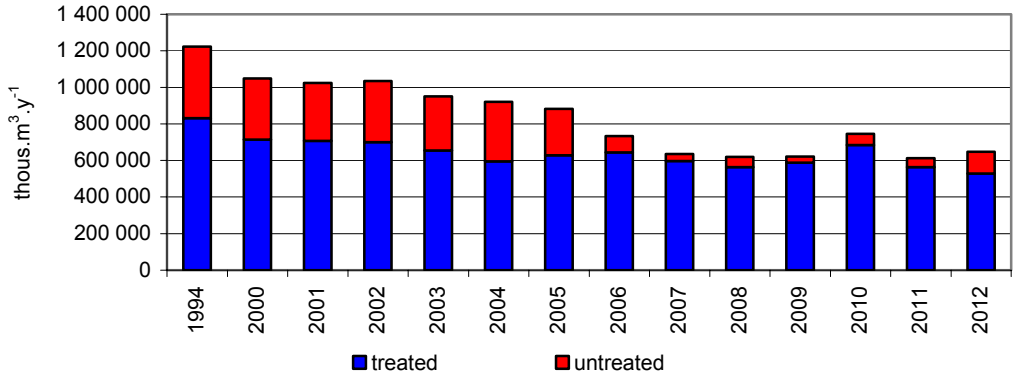
Percentage of discharged treated waste water to **total volumes of waste water** discharged into watercourses in 2012 was 81.62 %.

Load of the balanced contamination sources discharged into surface watercourses in the period of years 1994, 2000-2012

Discharged waste water	Volume (thous.$m^3.y^{-1}$)	IS ($t.y^{-1}$)	BOD_5 ($t.y^{-1}$)	COD_{Cr} ($t.y^{-1}$)	NES_{uv} ($t.y^{-1}$)
1994	1 223 549	41 446	34 275	106 960	772
2000	1 047 681	23 825	20 205	61 590	298
2001	1 024 320	22 998	19 707	61 599	270
2002	1 035 068	22 790	18 803	59 204	252
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	773 594	11 200	9 026	31 563	44
2007*	634 419	9 405	6 521	26 913	58
2008*	619 286	8 736	6 641	26 688	31
2009*	620 340	7 707	5 546	25 660	31
2010*	744 756	9 018	5 580	25 750	32
2011*	612 375	7 258	4 825	21 358	28
2012*	647 159	6 221	4 562	19 858	25

*data from database „Aggregate balance sheet of water“ Source: SHMI

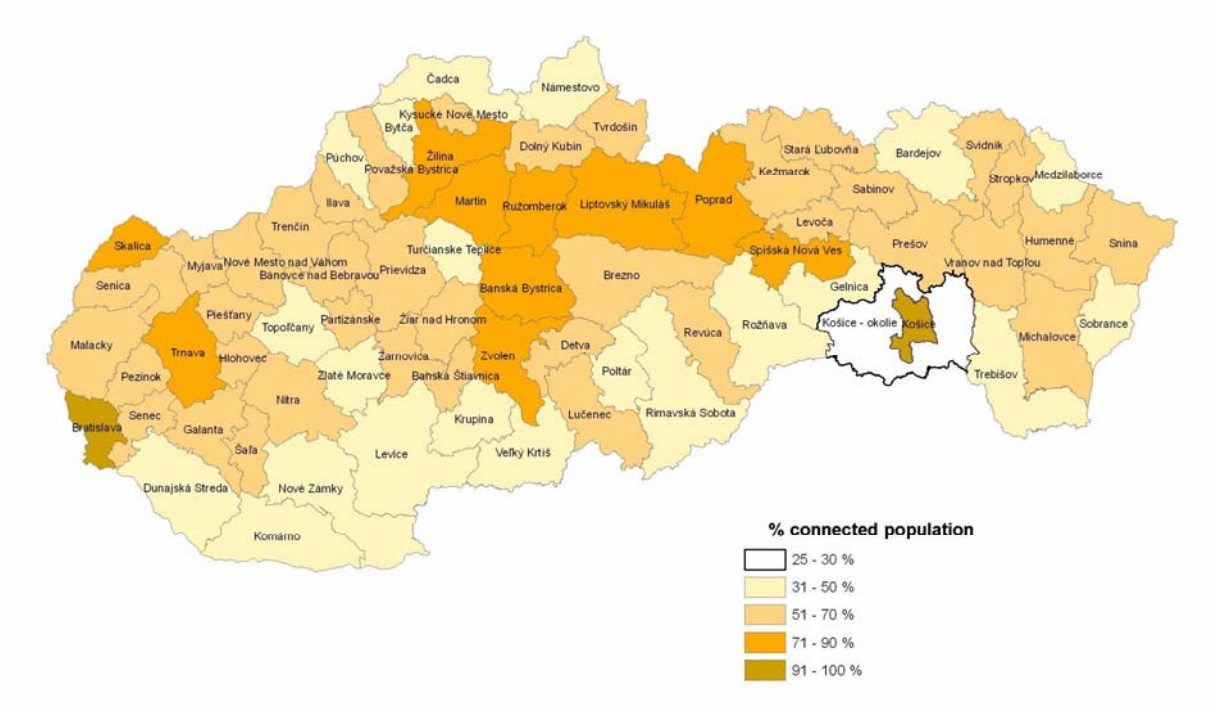
Trend in discharging of the treated and untreated waste waters into watercourses in the period of 1994, 2000-2012 Source: SHMI



♦ Waste water discharge

Development of public sewerage systems lags behind that of public water supplies. **Number of inhabitants** living in households **connected to public sewerage systems** in 2012 reached the number of 3 376 thous. inhabitants, which is 62.4% of all inhabitants. Of the number of 2 891 of stand-alone municipalities in 2012, 953 of them had public sewerage systems in place (i.e. 33.0% of all Slovak municipalities).

Connecting of the inhabitants to the public sewerage network in 2012 (%)



Source: WRI

♦ Waste water treatment plants

In 2012, 631 waste water treatment plants were administered by water management companies, municipal governments, and other subjects, most of these plants have been mechanical-biological WWTPs. Total capacity of WWTPs in 2012 was 2 010.3 thous.m^3 per day.

In 2012, watercourses with public sewerage system (administered by municipalities and water management companies) received 389 mil.m^3 of discharged waste water, which was by 25 mil.m^3 less than in the previous year, and the volume of treated waste water discharged into the public sewerage system reached 380 mil.m^3.

Volume of the discharged wastewater by the public sewerage system (in administration of VaK and in administration of the municipalities) in 2012

Water discharged by the public sewerage and WWTP	Sewage	Industrial and other	Precipitation	Separate	Total
	(thous.m^3.$year^{-1}$)				
Treated	111 921	86 263	44 895	137 898	380 977
Untreated	3 215	615	1 047	3 066	7 943
Total	**115 136**	**86 878**	**45 942**	**140 964**	**388 920**

Source: WRI

Sludge from WWTPs is a necessary by-product of the waste water treatment process. Sludge volumes produced in Slovakia at WWTPs operated by regions or water management companies remained virtually unchanged, with fluctuations within 53 - 58 thous. tonnes of sludge dry matter.

Sludge produced in the waste water treatment plant

Year	Amount of the sludge (tons of dry residue)						
	Total	Applied into the agricultural soil	Applied into the forest soil	Composted and used in other way	Incinerated	Land filled	In other way
2007	55 305	0	0	42 315	0	3 590	9 400
2008	57 810	0	0	38 368	0	8 676	10 766
2009	58 582	0	0	47 056	0	2 696	8 830
2010	54 760	923	0	35 289	0	16	6 681
2011	58 718	358	0	50 111	0	2 306	5 943
2012	58 706	1 140	0	49 642	0	7 924	0

Source: WRI

Bathing water quality

Through **Act no. 355/2007 Coll. on protection, support and promotion of public health and amendments to other laws as amended by Act no. 140/2008 Coll., as well as through the Slovak Government Regulation no. 87/2008 Coll. on requirements on natural recreational water formations**, the Slovak Republic designated a responsibility for carrying out monitoring of water formations appropriate for bathing for the National and Regional Public Health Authority of the Slovak Republic and for site operators, in line with the appropriate frequency and methods set forth by Directive 2006/7/EC concerning the management of recreational water quality.

Assessment of natural bathing waters in 2012 included 84 sites that are used also for recreational purposes. Of this, recreational activities are organised at 23 sites and their operation was licensed by the Regional Public Health Authority (RPHA). In cases of non-organized recreational activities, monitoring of sites was carried out by the RPHA depending on the number of visitors and the existing situation. Frequency in water quality monitoring was roughly every other week and depended on the site's significance.

Over the season, 506 water samples were extracted and 7 245 tests were done on chemical, physical, microbiological, and biological water quality indicators. Limit value (LV) for set indicators was exceeded for 195 samples and in 352 indicators, which is 38.3% of total number of samples. (increased by app. 4 %, compared to the previous year). When assessed by indicators, proportion of non-compliant indicators is only 4.86%, since with almost each non-compliant sample only one water quality indicator was exceeded. A number of water surfaces showed physical and chemical indicators that were impacted by weather conditions. These represented 68.45% of total number of non-compliant indicators. Most frequently occurring physical and chemical indicators included: transparency, colour, water oxygen saturation, water reaction and less frequently total phosphorus and phenols. The greatest number of non-compliant microbiological indicators included intestinal enterococci, less E. coli, and occasional coliform bacteria.

In 2012, Slovakia carried out the second assessment and qualification of bathing waters, also in

line with the Directive 2006/7/EC. This assessment has been applied to 32 sites that have been declared so-called bathing waters by the general binding decrees of regional environmental offices. 23 sites of bathing waters have been classified as sites with excellent bathing water quality, 8 sites showed good bathing water quality, and one site had sufficient bathing water quality. The natural bathing site of Ružín has not been assessed since it did not have available data for 4 years that is needed to assess water for bathing purposes under the methodology published in Directive 2006/7/EC.

Notwithstanding the occasionally exceeded limit values for microbiological and biological indicators, over this year's recreation season no diseases or health complications have been detected that would relate to bathing at a natural bathing water surface.

Eutrophication

Eutrophication under article 2 of Council Directive 91/27/EEC on treatment of municipal wastewater means enriching the water with nutrients, mainly nitrogen and phosphorus compounds, which causes an increased growth of algae and higher plant forms. This may bring about an undesirable deterioration in the biological equilibrium and quality of such water. The indicators that characterise eutrophication of surface water include $N\text{-}NH_4$, $N\text{-}NO_3$, $N\text{-}NO_2$, N_{total}, and $P_{total.}$and biomass of phytoplankton (chlorophyll-a (CHLa) and the abundance of phytoplankton (ABUfy)).

356 abstraction sites were assessed in the period of 2008-2011 in order to evaluate eutrophication of watercourses in Slovakia. Oligotrophic state was recorded in 30.89% of abstraction sites, while the mesotrophic state in 37.92% of abstraction sites. About one fifth of sites was in the eutrophic state (31.34%) while 9.83% of sites were in the hyper-eutrophic state. These included mainly monitoring stations at streams that have been impacted, besides agriculture, also by point pollution sources. Of the towns assessed under the French methodology, those sites that show trophic conditions as eutrophic or hyper-eutrophic may be considered threatened by eutrophication or with existing eutrophication. These sites call for close attention and in cases of continuing stagnation or deterioration, adequate measures for water quality improvement should be proposed.

• ROCKS

Key questions and key findings

What is the trend in the development of geological hazards that threaten the natural environment and ultimately also the humans?

- **Activity of slope deformations is closely related to climatic conditions, especially to long-term intensive precipitations. The years 2011 and 2012 were poor in long-term intensive precipitations (unlike the year 2010 that was characteristic for extreme precipitations during the spring and summer months) which resulted in reduced groundwater levels within the landslide body. Reduction in the levels has been closely connected to reduced yield of draining wells and decreased movement dynamics of slope deformations, which was a positive trend that dominated at almost all monitored slope deformations.**
- **While two earthquakes were recorded as macro-seismic in Slovakia in 2011, in 2012 there were six earthquakes recorded - the earthquake of 05.03.2012 in the region of Záhorie, earthquakes on 02.05.2012 and 22. 06. 2012 in eastern Slovakia in the region of Vihorlatské hills, earthquakes on 31. 05. 2012 and 01.06.2012 in the region of High Tatras, and an earthquake on 18.11.2012 in the region of Dobrá Voda.**
- **Contamination of the environment by anthropogenic sediments of the character of environmental loads in monitored landfills and sludge beds has remained at approximately the same level as in 2011. Anticipated negative safety condition existing at the sludge beds of Slovinky and Nižná Slaná was confirmed by the report on technological and safety supervision of sludge beds elaborated by the state-owned company of Vodohospodárska výstavba š.p. in Bratislava.**
- **Monitoring of alluvial sediments points to a long-term contamination with fluctuating contents of pollutants in the water streams of Nitra, Štiavnica, Hornád, Hnilec, and Hron.**

In what condition has been the use of the geo-thermal energy in Slovakia?

- **Geo-thermal waters have been exploited at 36 agricultural sites, for heating purposes of buildings, and for leisure activities. In agriculture, geo-thermal water has been used for heating up greenhouses at the production of vegetable (cucumbers, tomatoes, peppers, eggplants) and flowers (Bešeňová, Podhájska, Čilližská Radvaň, Topoľníky, Tvrdošovce, Horná Potôň, Dunajská Streda, Vlčany, Veľký Meder, Topoľovec, Dunajský Klátov, Kráľová pri Senci, Nováky) and for fisheries. (Vrbov, Turčianske Teplice).**
- **Geo-thermal energy has been used to heat up office space and technological facilities in Galanta, Topoľníky, Komárno, Bešeňová, Liptovský Trnovec, and Poprad, while hotel facilities are heated in Bešeňová, Veľký Meder, Podhájska, and in Štúrovo. In Galanta, geo-thermal water is used for heating up residential apartments, hospital, and pension house. In Nováky - Koš, geo-thermal water has been used to heat up locker rooms for miners and to heat up air for air conditioning in lignite mines.**
- **At 32 sites, geo-thermal water has been used for leisure purposes, especially for filling up swimming pools. (Poprad, Vrbov, Liptovský Trnovec, Bešeňová, Oravice, Podhájska, Senec, Kráľová pri Senci, Dunajská Streda, Galanta, Veľký Meder, Lehnice, Diakovce, Topoľníky, Tvrdošovce, Nové Zámky, Šaľa, Poľný Kesov, Gabčíkovo, Štúrovo, Komárno, Patince, Bánovce nad Bebravou, Malé Bielice, Partizánske, Chalmová, Koplotovce, Kremnica, Sklené Teplice, Rajec, Dolná Strehová, Tornaľa).**

Geological environmental factors

In line with the approved **Programme of monitoring for the year 2012,** monitoring has been carried out within the subsystem for **three basic types of slope displacements** - landslide (28 monitored sites), creep (4 sites) and indications of slope displacements of the character of tumbling. (9 sites) Stabilisation water levy in Handlová forms an individual specific category within the environment stability assessment process. Compared to the previous year, monitoring has been suspended in the landslide area above the municipality of Chmiňany where it has been carried out by the National Highway Company, Inc. of Bratislava.

The monitoring process included, beyond the scope of the Monitoring Programme in 2012, the most prominent slope deformations that occurred or have been reactivated in 2010 - the sites of Kapušany, Ruská Nová Ves, Petrovany, Nižná Myšľa, and Vyšná Hutka. Geological and engineering surveys were carried out on the said landslides in the period of years 2011/2012 and they provided the background for design and implementation of geological environment sanation activities. Sanation works were carried out mainly in 2012.

In 2012, as many as 7 415 tele-seismic, regional or local seismic phenomena were interpreted. More than 32 540 seismic phases were defined in seismic records. Approximately 70-80 earthquakes were localized, with the epicentre in the Slovak Republic. Macro-seismic observations confirmed 6 detected earthquakes in Slovakia.

In 2012, **environmental loads of the character of waste landfills and sludge beds** were monitored at these 12 sites: Bojná, Dunajská Streda, Krompachy - Halňa, Modra, Myjava-Surovín, Nižná Slaná, Poša, Prakovce - I., II.,Šaľa, Slovinky, Šulekovo, and Zemianske Kostoľany.

In 2012, continuing monitoring of **ore deposit areas** included Rudňany, Slovinky, Smolník, Novoveská Huta, Rožňava, Pezinok, Kremnica, Špania Dolina, Dúbrava, Nižná Slaná, and Štiavnicko-hodrušský ore district, as well as areas of lignite mining within the Upper-Nitra mining district.

Geothermal energy

At present, there are 26 designated geothermal areas in Slovakia, taking up 27% of the state's territory. To this day, 144 geothermal wells have been made in these designated areas, analysing 2 084 $l.s^{-1}$ of water with the outflow temperature of 18 – 129°C. Geo-thermal water was detected through wells with the depth of 56 – 3 616 m. Yield at the free overflow from these wells fluctuated within the interval of 1.50 $l.s^{-1}$. to 100 $l.s^{-1}$.Dominating are water types of Na-HCO_3, Ca-Mg-HCO_3-SO_4 and Na-Cl with the mineralization of 0,4 - 90,0 $g.l^{-1}$. Thermal output of geo-thermal water of these wells used up to its reference temperature of 15°C is 347.61 MWt, which represents 5.58% of the total mentioned geo-thermal energy potential in Slovakia.

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 Dionýz Štúr in Bratislava was commissioned to maintain the Register.

Abandoned mining works (state to the date 31st December 2012)

Type of abandoned mine	
Mining shaft	5 566
Pit (hole)	696
Chute	65
Cut, excavation	133
Pingo	3 988
Pingo field	107
Pingo draw	130
Dump	6 454
Old randing	204
Sink mark	281
Placer	26
Tailings dump	53
Other	149
Total	**17 852**

Source: SGI DS

Minerals deposits balance

Energy deposits (state to the date 31st December 2012)

Raw material	Number of deposits	Number of deposits for mining	Unit	Balance deposits free	Geological deposits
Anthracite	1	-	thous. t	2 008	8 006
Bitumen sediments	1	-	thous. t	9 776	10 793
Brown coal	11	4	thous. t	113 565	463 706
Flammable natural gas – gasoline gas	9	1	thous. t	199	394
Lignite	8	1	thous. t	111 211	618 331
Underground stores of natural gas	13	2	mil. m^3	807	6 510
Crude oil non-paraffinic	3	-	thous. t	1 592	3 421
Crude oil - semi-paraffinic	8	4	thous. t	126	6 341
Uranium ores	2	-	thous. t	5 427	9 303
Natural gas	36	13	mil. m^3	7 9111	24 480
Total	**91**	**24**	thous. t mil. m^3	243 904 8 718	1 120 295 30 990

Source: SGI DS

Ore deposits (state to the date 31st December 2012)

Type of ore	Number of deposits included into balance	Number of deposits for mining in 2005	Unit	Balance deposits free	Geological deposits
Sb ores	9	-	thous. t	85	3 291
Complex Fe ores	7	-	thous. t	5 751	57 762
Cu ores	10	-	thous. t	-	43 916
Hg ores	1	-	thous. t	-	2 426
Poly-metallic ores	4	-	thous. t	1 623	23 671

Wolfram ores	1	-	thous. t	-	2 846
Gold and silver ores	12	1	thous. t	58 402	172 628
Fe ores	2	-	thous. t	14 476	18 743
Total	**46**	**1**	**thous. t**	**80 337**	**325 283**

Source: SGI DS

Non-metallics deposits (state to the date 31st December 2012)

Minerals and minerals based products	Number of deposits included into balance	Number of deposits for mining	Unit	Balance deposits free	Geological deposits
Anhydride	7	1	thous. t	658 748	1 249 891
Baryte	6	1	thous. t	9 205	12 655
Bentonite	29	11	thous. t	35 758	48 906
Cast basalt	5	1	thous. t	22 373	39 548
Decorative rock	22	2	thous. m^3	11 760	26 142
Diatomite	3	-	thous. t	6 556	8 436
Dolomite	21	10	thous. t	667 969	694 436
Precious stones	1	-	ct	1 935 867	2 309 085
Graphite	1	-	thous. t	-	294
Halloysite	1	-	thous. t	-	2 249
Rock salt	4	-	thous. t	838 697	1 349 679
Kaolin	14	1	thous. t	50 884	59 771
Ceramic clays	38	4	thous. t	117 739	192 622
Quartz	7	-	thous. t	301	327
Quartzite	15	-	thous. t	17 448	26 950
Magnesite	10	3	thous. t	764 138	1 157 950
Talc	5	1	thous. t	93 699	242 162
Mineralized I - Br waters	2	-	thous. m^3	3 658	3 658
Pearl stone	5	2	thous. t	30 166	30 436
Pyrite	1	-	thous. t	-	14 839
Gypsum	6	2	thous. t	49 176	93 412
Sialitic raw material	5	2	thous. t	108 770	122 133
Glass sands	4	2	thous. t	410 354	589 080
Mica	1	-	thous. t	14 073	14 073
Building rock	131	84	thous. m^3	659 541	788 645
Gravel sands and sands	25	12	thous. m^3	139 785	158 811
Brick clay	37	7	thous. m^3	92 122	114 398
Techn. usable miner. crystals	3	-	thous. t	253	2 103
Limestone – unspecified	29	14	thous. t	1 923 921	2 160 868
High-content limestone	10	4	thous. t	3 185 405	3 349 327
Limestone-marl	8	2	thous. t	163 911	166 163
Zeolite	6	3	thous. t	113 876	119 475
Foundry sands	14	1	thous. t	306 228	543 076
Refractory clays	7	1	thous. t	3 085	5 309
Feldspars	8	-	thous. t	20 548	21 786
Total	**1** **273** **217**	**-** **66** **105**	**ct** **thous. t** **thous.m^3**	**1 935 867** **9 613 281** **906 866**	**2 309 085** **12 317 956** **1 091 654**

Source: SGI DS

Classification of mineral deposits by state of extraction (state to the date 31st December 2012)

Extraction symbol	Characteristics	Number of deposits
1	Deposits with developed extraction activity include exclusive mineral deposits sufficiently open and technically apt for extraction of industrial deposit.	229
2	Deposits with fading extraction activity include extraction mineral deposits where extraction activity will cease in a near future (within 10 years)	31
3	Deposits before completion include exclusive mineral deposits with documented deposits that give basis to one of the construction phases (starting with the projection phase)	32
4	Deposits with ceased extraction include exclusive mineral deposits with definitely or temporarily stopped extraction activity.	87

5	Non-extracted deposits include documented exclusive mineral deposits soon to be constructed and extracted.	46
6	Non-extracted deposits include documented exclusive mineral deposits with no plans for their extraction.	191
7	Surveyed deposits include deposits of exclusive and non-exclusive minerals with various degree of mapping.	12
Total		**628**

Source: SGI DS

Non-reserved mineral deposits (state to the date 31st December 2012)

Raw material	Number of listed deposit sites	Number of sites with extraction activities
Slate	3	-
Floatation sand	1	-
Tailing rocks	7	2
Clay	1	-
Other minerals	23	3
Sialitic raw material	6	-
Building stone	187	60
Gravel sand and sands	215	90
Brick clay	46	-
Tuff	2	-
Brucite	1	1
Total	**492**	**156**

Source: SGI DS

• SOIL

Key questions and key findings

What is the trend in the situation of the agricultural land types in terms of their contamination by risk elements?

- **Monitored concentrations of risk elements in agricultural soils in Slovakia have been below the limit for the most part. Records showed only increased contents of cadmium and lead in certain fluvisols, especially in lower regions of watercourses.**
- **Risk substances from the first three monitoring cycles (abstraction years of 1993, 1997, and 2002) were assessed under already invalid Decision of the Ministry of Agriculture of the Slovak Republic no. 521/1994 - 540 on highest permissible values of pollutants in the soil. Outcomes of the 3. cycle (abstraction year of 2002) showed that the contents of the majority of risk substances in selected agricultural land types in Slovakia did not exceed the set limit of that time. In case of cadmium and lead, excessive limit values were recorded only in soils situated in higher altitudes, podsols, andosols, which may relate to remote transfer of emissions. Since between the 3. and 4. abstraction cycle (abstraction years of 2002 and 2007) there was a change in legal policies, it has not been possible to carry out comparisons in the contamination by risk substances under the currently valid legal framework.**

What is the current balance of soil organic carbon (SOC) as one of the key indicators of soil quality?

- **Currently, due to climatic changes and intensive changes in the use of land, the supplies of organic carbon in the soil has been changing quite rapidly. Based on the outcomes of the monitoring of land in Slovakia it has been shown that the average values of organic carbon within the arable land (AL) horizon of the same soil types are significantly lower that those on permanent grassland (PG), which has been the result of a long-term intensive tilling activities on AL. Mollicfluvisols show the highest SOC values, while pseudogley soils and brunisolic soils show the leat SOC values.**
- **When comparing the SOC situation for the 1. (abstraction year of 1993) and the last 4. (abstraction year of 2007) monitoring cycle, there was a growth in the contents of SOC in all major soil types, including arable land, as well as permanent grassland. The highest growth of SOC on AL has been recorded on mollicfluvisols and fluvisols.**
- **Changes to the SOC contents between the last two monitoring cycles 3 and 4 (abstraction years of 2002 and 2003) have not been so evident as when comparing cycles 1 and 4 (abstraction years of 1993 and 2007). This period clearly shows minimal increment in the soil organic carbon on monitored permanent grasslands. Arable land types in the cases of cambisols and chernozems showed stagnation in SOC and a very slight decline in the SOC contents was shown in pseudogley soils and brunisolic soils. Fluvisols and mollicfluvisols showed statistically significant growth in SOC in the period between the last two cycles.**

What is the share of the agricultural land types threatened by erosion?

- **Approximately 39% of total agricultural land size was threatened by water erosion in 2012, while 5.5% was threatened by wind erosion.**
- **Since the end of the 2. monitoring cycle (year 2001) up to the present day, potential water erosion has been on decline. Sizes of the potential wind erosion have not been high and have not significantly changed over the recent years.**
- **When comparing the size of land threatened by potential erosion expressed by erosion categories of the middle to extreme character at the end of the 1st monitoring cycle (the year 1996) compared to the year 2012 this size experienced decline by 183 677 ha for water erosion and by 20 190 ha for wind erosion.**

Land use

Total size of the Slovak Republic is 4 903 557 ha. In 2012, the share of agricultural land was 49.07% of total land size, while the share of forestland was 41.07%, and the share of non-agricultural and non-forest lands was 9.86%.

Land Use categories (state to the date 31st December 2012)

Land category	Area (ha)	% of total area
Agricultural land	2 405 971	49.07
Forest land	2 014 059	41.07
Water areas	94 764	1.93
Build-up land	232 599	4.74
Other land	156 163	3.19
Total area	**4 903 557**	**100.00**

Source: GCCA SR

Anthropogenic pressure to use soil for purposes other than its primary production and environmental functions brings about its gradual decrease. Development in the size of the land in Slovakia in 2012 was impacted by **a continuous decline in the size of agricultural and arable land.**

The greatest percentage growth compared to 2000 has been recorded in the category of built-up areas and courtyards by 6.05% (+13 261 ha) that grew at the expense of all other categories, with the exception of forests and water bodies.

Artificial built-up areas within the EU comprise 4.3% of total land cover. As for Slovakia, this area takes up 2.4%, which is the least area size of all the neighbouring countries.

Monitoring of soils and their quality

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.

♦ Soil contamination by hazardous substance

Present situation in the contamination of the analysed land types with extraction carried out in 2007 was first monitored pursuant to annex 2 of Act 220/2004 Coll. on the protection and use of agricultural land and on amendment to Act 245/2003 Coll. on integrated environmental pollution prevention and control and amendments to selected laws as amended, which sets forth the limit values for high-risk elements within the agricultural land. For this reason it is not possible to compare contamination with the previous monitoring cycles there were assessed pursuant to the legislation then valid.

Limit values of risk elements in the agricultural land types defined on the basis of the soil structure and value of soil reaction as well as the critical value of risk elements within the agricultural soil to plant relationship

Risk element	Limit values for risk elements in agricultural soil (in mg.kg^{-1} of dry matter, aqua regia decomposition, Hg total content)			Critical values for risk elements as they relate to the agricultural soil and plant (in mg.kg^{-1} of dry matter, in leachate of 1 mol/l amonnium nitrate, F in water leachate)
	Sandy, loam-sandy soil	Sand-loamy, loamy soil	Clay-loamy soil, clay	
Arsenic (As)	10	25	30	0.4
Cadmium (Cd)	0.4	0.7 (0.4)*	1 (0.7)*	0.1
Cobalt (Co)	15	15	20	-
Chromium (Cr)	50	70	90	-
Copper (Cu)	30	60	70	1
Mercury (Hg)	0.15	0.5	0.75	-
Nickel (Ni)	40	50 (40)*	60 (50)*	1.5
Lead (Pb)	25 (70)*	70	115 (70)**	0.1
Selenic (Se)	0.25	0.4	0.6	-
Zinc (Zn)	100	150 (100)*	200 (150)*	2
Fluorine (F)	400	550	600	5

Note: Supplied data apply to samples obtained in arable land types from the upper layer of 0.2 m and air-dried to reach constant weigh, * if pH (KCl) is less than 6, ** if pH (KCl) is less than 5,

Assessed **concentrations of the risk elements (Cd, Pb, Cr, Cu, Zn, Ni, As, Hg)** within agricultural land types of Slovakia have **mostly been under the limit.** Some fluvisols showed increased contents of Cd and Pb, especially in the lower areas of water courses, which points to their frequent transport from more remote areas. Increased contents of Cd have been recorded in some rendzinas. Accumulation of Cd has been favoured by the organic matter and the neutral soil reaction at which this element becomes less dynamic.

The sites that in the past were contaminated (close to industrial facilities and within the geo-chemical anomalies impact area) are contaminated also nowadays, which means that soils have retained this adverse condition over a long time. The example of water-soluble fluoride in the **area of Žiarska basin** points to the fact that after a significant improvement in the contents of fluoride in emissions within that given area especially after 1998 there has been only a slight improvement in the soil. In fact, even at the present time, **values of water-soluble fluoride exceed almost 5 times the valid sanitary limit** (opposite the aluminium factory on pseudogley soils). As for the future, it will be necessary to continue with monitoring of these types of soils.

♦ Acidification of soils

Acidification as a process of raising the soil's acidity, represents one of the important processes of chemical soil degradation. The optimum value of soil reaction belongs to the key aspects of soil assessment. Each owner of agricultural land is obliged to implement the appropriate agro-technical measures focused on preserving soil quality and protection against its damage. Although acidification is a reversible process, consequences of acidification within the agro-eco-system are irreversible.

Development of the soil reaction (pH/H_2O) in the soils of Slovakia on the basis of comparing the outcomes of four cycles

Major land unit	1993	1997	2002	2007
Mollicfluvisols AL	7.29	7.24	7.03	7.08
Fluvisols AL	7.13	6.95	6.84	6.75
Chernozem AL	7.28	7.31	7.22	7.14
Brunisolic soil AL	6.71	6.85	6.90	6.66
Pseudogley soil AL	6.66	6.70	6.47	6.45
Pseudogley soil PG	6.31	6.24	6.13	5.88
Rendzinas AL	7.27	7.25	7.54	7.97
Rendzinas PG	7.17	7.18	6.57	7.27
Regosols	6.68	6.54	6.95	6.90
Cambisols AL	6.56	6.42	6.18	6.24
Cambisols PG	5.61	5.56	5.29	5.48
Solonchaks and solonetz PG	8.29	7.88	8.45	8.34
Podsols, rankers, lithomorphic soils PG	4.21	3.93	3.88	3.77

AL – arable land, PG – permanent grassland Source: SSCRI

Outcomes of the partial monitoring system - P have shown **more significant acidification tendencies mainly on cambisols and pseudogley soils** where it is possible to assume, given the limitation of agro-technical measures focusing on optimisation of the soil reaction values, a slow growth of soil reaction on the substrates that are naturally acidic. Acidification trends in soils with soil reaction showing mild acidic values may in the future result in deteriorated sanitary condition of the environment witnessed by the increased penetration of diverse pollutants that include especially heavy metals and aluminium into the food chain.

Active aluminium in agricultural soils in Slovakia has been significantly **lower in arable lands as opposed to grassland,** which is the consequence of the relationship between the soil quality and its use. Despite of this, high maximum values have been recorded also on arable land and they are in direct correlation with the lower soil reaction.

♦ Salinisation and sodification

The processes of salinisation and sodification have been monitored since 2000 on the built network of 8 stationary monitoring sites of which 6 are situated in the Poddunajská plane. These include mollicfluvisols in different stages of development of salinisation and sodification, along with solonchanks. In the area of the East-Slovakian lowland the monitoring network includes the solonchak in the municipality of Malé Raškovce. Anthropogenic sodification of soil by industrial emissions from aluminium production has been monitored in the vicinity of Žiar nad Hronom.

Process of sodium salts accumulation has been indicated over the period of three monitoring cycle. First of all it addressed over-limit values of total salt contents in all monitored lands. This process has been weak in the soils of Iža and Zemné and the values of total salt contents found in the interval of 0.10 - 0.15% point to the initial stage of salinisation. The sites of Gabčíkovo and Zlatná na Ostrove within the lower horizons recorded a transition into the middle salinisation level with the salts content of 0.15 - 0.35%. Middle level of salinisation was recorded also in the overall soil profile at the site Komárno-Hadovce where however occurred a decline in the overall salts contents for the whole

monitored period. The sites of Malé Raškovce, Kamenín, and Žiar nad Hronom showed extreme contents of salts, especially within the 3 rd monitoring cycle, which may qualify them as **solonchaks.** Highest values were recorded mainly within the lower strata of arable land and substrate horizons. This proves that the process of salinisation takes place from the lower horizons up to the soil surface.

Soil sodification as a process of binding exchangeable sodium onto the sorption complex of monitored soils in 2012 is comparable to the previous years. Contents of exchangeable sodium within the sorption complex of 5 - 10% indicating a weak sodification was detected within the lower horizons of these sites: Iža, Zemné, Gabčíkovo, Komárno-Hadovce site. **High** (10 - 20%) **to very high** (above 20%) **contents of exchange sodium** have been recorded **at the sites of Zlatná, Malé Raškovce, Kamenín,** as well as within anthropogenicaly salinised soil at the site of **Žiar nad Hronom.** Soil sodification has been defined by soil reaction of pH > 7.3. The recorded values suggest that soil reaction of the majority of the monitored soils and horizons is mid – alkaline (pH 7.3 - 8.5). Only the sites of Kamenín and Žiar nad Hronom have been regularly recording strongly alkaline soil reaction values (pH above 8.5).

♦ Organic carbon in the soil

Contents and quality of the soil organic matter (SOM) is the energy basis for a number of biological processes. While it affects the productive function of soil, it also takes part in its extra-productive, mainly ecological functions.

Currently, due to climatic changes and intensive changes in the use of land, the supplies of organic carbon in the soil has been changing quite rapidly. Based on the outcomes of the monitoring of land in Slovakia it has been shown that the average values of organic carbon within the arable land (AL) horizon of the same soil types are significantly lower than those on permanent grassland (PG), This condition has been the result of long-term intensive mineralisation on AL during the ploughing of pastures along with a long-term tilling of the arable land. Mollicfluvisols on arable land show the highest SOC values, while pseudogley soils and brunisolic soils show the leat SOC values.

♦ Soil erosion

Potential erosion means possible threat to agricultural land types by processes of water erosion if we do not take into account the soil-protective effect of the vegetation cover. Water erosion (of different intensity) impacts 941 990 ha of agricultural land types in Slovakia.

Exchange of water erosion categories for the year 2012

Erosion categories	Water erosion	
	Land area in ha	% from Agricultural Land
No erosion or slightly	1 463 981	60.85
Medium	248 281	10.32
Strong	355 955	14.79
Extremely strong	337 753	14.04
Total	**2 405 971**	**100.00**

Source: SSCRI

Size of agricultural land types potentially impacted by wind erosion is 131 366 ha. These are mainly light granulated soil types with lower content of organic matter that are highly vulnerable to drying (and thus to wind erosion) especially when they are without vegetation cover.

Exchange of wind erosion categories for the year 2012

Erosion categories	Wind erosion	
	Land area in ha	% from Agricultural Land
No erosion or slightly	2 274 605	94.54
Medium	55 337	2.30
Strong	45 473	1.86
Extremely strong	30 556	1.27
Total	**2 405 971**	**100.00**

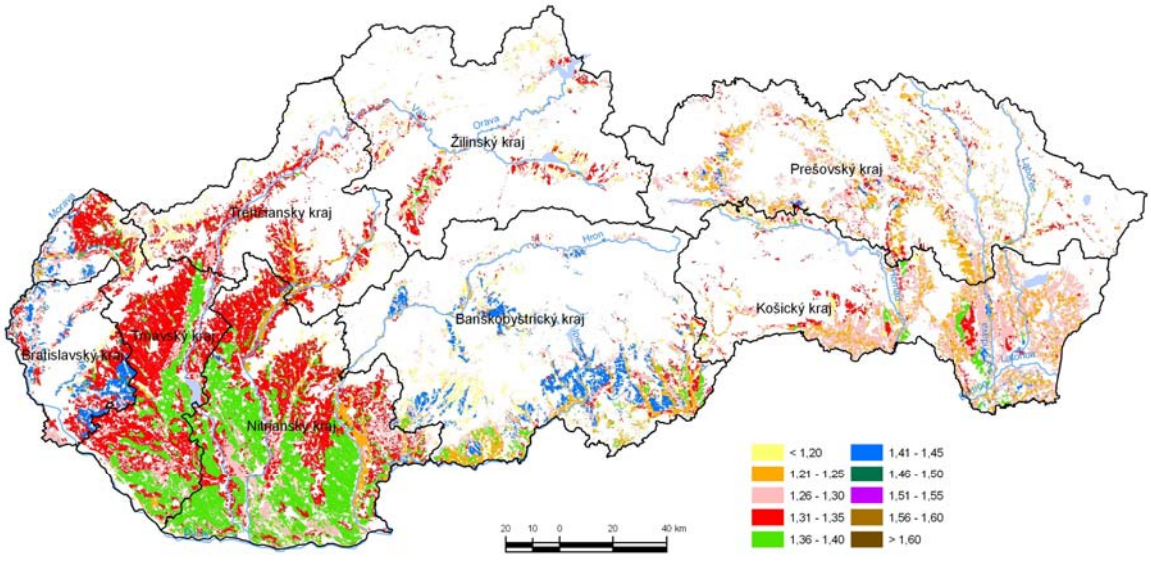
Source: SSCRI

♦ Soil compaction

Compaction of agricultural land represents a negative state that has been caused by the increase in volumetric weight. Compaction occurs as a consequence of faulty sowing and fertilizing procedures along with insufficient application of lime, and the incorrect use of agricultural machines. **Limit values of volumetric weigh of compacted soil** for individual soil types are published in **Act 220/2004 Coll.** on protection and use of agricultural land and on amendment to Act 245/2003 Coll. on integrated prevention and pollution control of the environment and on amendment and supplementation of certain laws.

State of the volumetric weigh within the arable land that contains the most part of the root system of plants categorised by the volumetric weigh (g.cm^{-3}) is shown by the following map.

State of the volumetric weigh of the land in the Slovak Republic on the basis of data of the last completed sampling cycle of soil monitoring - arable land



Source: SSCRI

• FLORA, FAUNA AND PROTECTED PARTS OF NATURE

Key questions and key findings

What is the state of endangerment of wild growing plant taxons?

- In the **90-ties** the red lists of Bryophytes and seed-bearing plants of Slovakia then valid contained 1 009 threatened and rare species. In the year **2001,** still valid red list of plants was published. The list categorizes as many as 3 057 species of plants into different threat categories (there have been added categories that were missing). Of this, threats to **non-vascular plants** represent **17.6%** and threats to **vascular plants** represent **42.6%.** In **2012**, preparation of red lists of threatened habitats, species of plants and animals was initiated for the whole Carpathian region.

What is the state of endangerment of the animal wildlife?

- In **the 90-ties** the valid red lists of animals contained altogether **466** threatened species of **invertebrates** and **153** species of **vertebrates.** The still valid red lists were published in **2001**. According to them, **2 058** species of **invertebrates** (**8.5%**) are threatened along with **257** species of **vertebrates** (**60.9%**). Increase in the numbers does not necessarily mean increased threats to species but rather their thorough knowledge and their consequent addition in the lists.

What is the trend in the network of protected areas in Slovakia?

- In the period of the years **1992 - 2012** in the legislation addressing nature protection and also protected areas was amended and revised on two occasions. Since 1955 **until 1994** there were categories of protected areas different than the ones that exist today. As of 1994, the overall number of declared **protected areas** was **922** with the size of **1 306 741 ha** (**26.7%** of the size of Slovakia). In 1994, a new act on nature and landscape protection revised the categories of protected areas. Currently, in Slovakia there are **1,128 protected areas** within the national network in the size of **1 142 151 ha,** which takes up **23.3%** of the size of Slovakia. Reduction has been mainly provoked by cancelling PLA protective zones as well as adjustments to "large-size" protected areas (NP and PLA). **From 2011 to 2012,** the situation with "large-size" PA (protected areas) has not changed. In the case of so-called "small-size" PA there was an increase by 14 areas (i.e. by 3 578 ha).

What is the trend in the number of protected trees?

- Since **2004** until 2012 there were **declared 15** protected trees (PT) and **49 were removed,** which **reduced** the number to **446** (mainly due to the extinction of the object to be protected). Compared to the previous year, there has been a reduction by 2 PT (from the category of "degraded").

Flora

♦ Monitoring of plant taxons

Monitoring of 35 plant species of the European importance was carried out at about 200 localities in 2012.

♦ Endangerment of wild growing plant taxons

State of endangerment for individual taxons is elaborated on the basis of the *Red List of Plants and Animals of Slovakia, 2001.*

Overview of endangerment for individual plant taxons

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	1 585	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

Level of **endangerment of non-vascular plants** in Slovakia is presently **17.6%** (including fungi), or 11.3% (for the CR, EN, and VU categories). Level of **endangerment of vascular plants** is **42.6%**, or **30.3%** (for the CR, EN, and VU categories).

Recently, preparation of **red lists** started within the BioREGIO Carpathians project funded from a South-Eastern Europe international programme. Updated national lists will become the basis for the whole-Carpathian red lists.

Comparison of the vascular plant endangerment* in selected countries

	Slovakia	Austria	Hungary	Poland	Czech Rep.
Vascular plants (%)	30	33	7	11	42

Source: OECD

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

♦ Protection of plant species

Number of the **state protected species** is now **1 419** (vascular plants – 1,285; bryophytes – 47; higher fungi – 70; lichens – 17). Also the species of European importance classified under the **Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora** not found in Slovakia are protected by pertinent legislation. Of total number of 1 419 protected species, **823 species** are found **in Slovakia** (713 of vascular plants, 23 of bryophytes, 70 of higher fungi, 17 of lichens).

Wild growing plant taxons in Slovakia protected by international conventions and EU regulations

	Cyanophytes and Algae	Fungi	Lichens	Bryophytes	Vascular plants
In attachment II of **Habitats Directive**	-	-	-	9	40
In attachment IV of **Habitats Directive**	-	-	-	-	42
In attachment V of **Habitats Directive**	-	-	-	2*	3**
In attachment I and II of **CITES**	-	-	-	-	110
In attachment I of **Bern Convention**	-	-	-	8	35

* The entire genus *Sphagnum*, excluding *Leucobryum glaucum*

Source: SNC SR

** The entire genus *Lycopodium*, excluding *Artemisia eriantha*, *Galanthus nivalis*

State of protection of plants of European importance, 2004-2006[1)] (%)

Taxons	Favourable	Inadequate	Bad	Unknown	Total
Vascular plants	10	40	10	40	100
Other plants	20	40	30	10	100

1) Assessment of 200 species registered pursuant to article 17 of the Habitat directive Source: MoE SR
New reporting for the European Commission for the years 2007 - 2012 will take place in 2013

Within the implementation of **transfers** of endangered plant species, there was a transfer of 21 individual plants within 5 species (*Fritillaria meleagris, Onosma visianii, Pulsatilla grandis, Adonis vernalis, Campanula xylocarpa*). Total costs of the transfers reached approximately 199 EUR.

In 2012, no drafted **rescue programmes** were submitted for approval. There were implemented rescue programmes for 9 species of vascular plants (*Liparis loeselii*, *Tephroseris longifolia* ssp. *moravica*, *Herminium monorchis*, *Spiranthes spiralis*, *Drosera anglica*, *Radiola linoides*, *Lycopodiella inundata*, *Alkanna tinctoria* and *Colchicum arenaria*).

♦ Invasive plant species

In 2012, the total of 85 sites of invasive plant species of the size of 662.5 ha, and 106 sites of areas with the first degree of protection of the size of 565 ha were **mapped** all over the protected areas or their protective zones.

Protection of natural species living in ecosystems has been performed through **regulating the occurrence** of non-native plant species. Elimination of the non-native invasive and invasive-like plant species was carried out at 145 sites (94 sites in protected areas, 51 sites out of protected areas). Interventions were carried out in the area of 1 201.5 ha (89.21 ha in protected areas and 1 112.28 ha out of protected areas).

In 2012, the **National strategy for invasive non-native plants** was **revised**. The issue of invasive species at the same time became part of the drafted revised National biodiversity strategy in the Slovak Republic for the years 2012 - 2020.

Overview of the most spread invasive plant species

	Name
The most spread **invasive species**	*Fallopia japonica*
	Fallopia sachalinensis
	Helianthus tuberosus
	Impatiens glandulifera
	Impatiens parvifora
	Solidago gigantea
	Solidago canadensis
	Aster novi-belgii
	Aster lanceolatus
	Heracleum mantegazzianum
	Asclepias syriaca
	Stenactis annua
	Galinsoga parviflora
	Bidens frondosa
	Parthenocissus quinquefolia
	Robinia pseudoacacia
	Negundo aceroides

	Ailanthus altissima	
Total	**number of known taxons of invasive sp. in the SR**	**% of total number of vascular plants taxons**
	125*	**3.7**

Data as shown in the publication **Gojdičová, E., Cvachová, A., Karasová, E., 2002: Zoznam nepôvodných, inváznych a expanzívnych cievnatých rastlín Slovenska 2.** and includes categories of invasive taxons (neophytes - 28, archaeophytes - 19) potentially (regionally) invasive taxons - 49, and expansive taxons - 29.

Fauna

♦ Monitoring of animal species

Monitoring of animal species involved the monitoring of **nest/nesting boxes occupancy** and the monitoring of the **nests of the bird of prey.** Monitoring the number of **dead birds** under electricity poles within the monitored routes was continuously performed, along with monitoring of the effectiveness of the adopted technical measures. Functionality of the existing **fish passes** was monitored at water courses. Slovak Caves Administration carried out monitoring of **bats** in 15 caves.

♦ Endangerment of animal wildlife

State of endangerment for individual animal species is elaborated on the basis of actual red lists (2001, 2005, 2008).

State of endangerment of the particular invertebrate taxons

Taxons	Number of taxons		Categories of endangerment (IUCN)							Endanger-ment total*	Endang. %
Group	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

* without the category of NE Source: SNC SR

Endangerment of invertebrates in Slovakia is now about 8.5% (or **6.4%** just within CR, EN and VU categories). For **vertebrates**, 60.9% of them are endangered (or **23.5%** when limited to only CR, EN and VU categories).

State of endangerment of the particular vertebrate taxons

Taxons	Number of taxons		Categories of endangerment (IUCN)							Endanger-ment total*	Endang. %
Group	World [1)]	SR	EX	CR	EN	VU	LR	DD	NE		
Lampreys		4	-	-	1	1	1	-	-	3	75.0
Pisces	25 000	79	4	-	6	9	40	-	-	59	74.7
Amphibians	4 950	18	-	-	3	5	10	-	-	18	100.0
Reptiles	7 970	12	-	1	-	4	6	-	-	11	91.7
Birds[2)]	9 946	219	2	7	23	19	47	4	19	102	46.6
Mammals	4 763	90	2	2	6	12	27	15	4	64	71.1

* without the category of NE Source: SNC SR

[1] Source: UNEP – GBO
[2] only nesting birds – of total number of 341 birds of Slovakia, only the all 219 species of nesting birds were assessed

In **the 90-ties,** red lists of animals contained altogether **466** threatened species of **invertebrates** and **153** species of **vertebrates.** Revised red lists were published **in 2001.** They list **2 085 threatened invertebrates** and **257 species of vertebrates** today. Increase in the numbers does not necessarily mean increased threats to species but rather their thorough knowledge and their consequent addition to the lists (especially in invertebrates).

In **2012**, **preparation of red lists** of threatened animals **for the whole Carpathian region** was started. It involved works of experts on the assessment of selected animal categories - Molluscs, Spiders, Malacostraca, Dragonflies, Day butterflies, Lampreys, Fishes, Amphibians, Reptiles, Birds and Mammals.

Comparison of animals endangerment[1] in selected countries (%)

	Slovakia	Austria	Hungary	Poland	Czech Rep.
Invertebrates	5.3	-	> 0.9	-	13.1
Pisces	24.1	50.6	43.2	21.0	41.5
Amphibians	44.4	60.0	27.8	-	61.9
Reptiles	38.5	64.3	33.3	33.3	72.7
Birds	14.0	27.7	14.5	7.8	50.0
Mammals	21.7	22.0	37.8	13.5	20.0

Source: OECD

[1] "endangered" taxons include species under categories: CR, EN, and VU under IUCN
Austria) invertebrates: *insecta, decapoda, mysidacea* and *mollusca*, birds: only nesting birds
Czech Rep.) data refer to autochthonous species and EX including, birds: only nesting birds, pisces: including lampreys
Hungary) birds: all species recorded in Hungary since 1800
Poland) pisces: including lampreys.

♦ Protection of animal species

The number of **animal taxons under state protection** is now **813 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

	Invertebrates	Pisces	Amphibians	Reptiles	Birds	Mammals
In annex II of Habitats Directive	53	23	5	1	-	24
In annex IV of **Habitats Directive**	50	1	10	9	-	46
In annex I of **Birds Directive** [1]	-	-	-	-	114	-
In annexes I and II **of CITES**	2	2	-	1	53	5
In annexes II and III of **Bern Convention**	33	38	19	12	357	65
In annexes II and III of **Bonn Convention**	-	3	-	-	209	24
In annex of **AEWA**	-	-	-	-	129	-

[1] including migratory birds

Source: SNC SR

State of protection of animals of European importance[1], 2004-2006 (%)

	Favourable	Inadequate	Bad	Unknown	Total
Mammals	5	30	20	45	100
Pisces	10	10	0	80	100
Amphibians	5	70	20	5	100
Reptiles	30	60	10	0	100
Mollusca	30	10	30	30	100
Arthropoda	30	10	30	30	100
Other species	0	100	0	0	100

Assessment of 200 species registered pursuant to article 17 of the Habitat directive
New reporting for the European Commission for the years 2007 - 2012 will take place in 2013

Source: MoE SR

♦ Care of protected and threatened animal species

In 2012, no new animal **rescue programmes** were drafted. 3 rescue programmes were processed (for *Bison bonasus, Castor fiber* and butterflies of *Maculinea* genus).

In **rehabilitation stations** operated by the nature and landscape protection organizations there were **adopted** in 2012 altogether **812** injured individuals or otherwise disabled animals (165 animals more than in 2011). Back to wild nature there were **released** altogether **474** individuals (increase by 88 animals).

In 2012, **guarding** of 97 nests of 6 bird of prey species (*Aquila chrysaetos*, *Aquila pomarina*, *Aquila heliaca*, *Haliaetus albicilla*, *Falco peregrinus*, *Buteo buteo*) within the SNC SR organisation units was provided. There were successfully **brought up 85 nestlings**. Financial costs for guarding the nests of the bird of prey achieved more than 3 000 EUR.

In term of in situ animal preservation in 2012 there were organized **transfers** of frogs and bats and **restitutions** of *Rhodeus sericeus* into proper nature biotopes by nature and landscape protection organizations.

In the area of practical care of the protected animal species, State Nature Conservancy of the SR ensures the **installation of foil barriers** in the problematic areas of roads at the time of spring migration of amphibians and the subsequent carrying of amphibians, mainly frogs, across the road. In total, **81 246 of amphibians were carried over** in 2012 (this was 16 thous. more than in the previous year) and 16 846 m of barriers were installed, which is an increase by 106%.

♦ Game stock and hunting and fishing

In 2012, it was possible to stop the undesirable growth in **spring stock** of the ungulate game. The number of almost all animal species was stabilised. Hunting for the rare animal species is strictly regulated.

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

Species	2009		2010		2011		2012	
	stock	hunting	stock	hunting*	stock	hunting	stock	hunting*
Deer	46 207	18 854	51 856	19 374	58 106	22 157	58 932	24 010
Fallow deer	10 511	3 654	11 240	4 214	12 831	4 984	13 027	5 747
Roe deer	96 650	27 035	100 080	22 382	110 943	23 658	110 989	23 960
Wild boar	31 652	31 473	34 577	38 903	37 092	36 390	37 667	49 997
Brown hare	205 028	32 570	196 994	11 965	177 747	13 219	176 783	14 207
Wild duck	-	-	-	-	0	10 743	53 791	19 797
Grey partridge	12 562	342	10 956	419	9 199	450	6 590	782
Pheasant	200 863	115 730	186 494	88 694	162 986	77 063	168 538	79 369
Chamois	882	11	823	0	745	0	827	0
Bear	1 940	27	2 001	47	2 067	8	2 080	47
Wolf	1 698	130	1 823	149	2 065	118	2 006	149
Northern lynx	1 558	0	1 616	0	1 724	0	1 667	0
Catamount	2 480	0	2 715	0	2 963	0	3 191	0
Moorcook	1 343	1	1 211	0	1 260	0	1 232	0
Wood-grouse	1 011	0	902	0	814	0	835	0
Beaver	-	-	-	-	1 767	2	1 851	0

* Actual hunting in numbers, excluding other kills

Source: SO SR, NFC

In 2012, amount of the fish **caught** in the fish ponds, water dams and water flows for economic and sport purposes again increased, compared to the previous year and achieved **3 232 t**. The waters were **stocked** by **43 171 869 pieces of setting**, which shows a reduction by 13.3% compared to 2011.

Overview of fishing for the economic and sport purposes (t)

Fish species	2009		2010		2011		2012	
	total	of this SFA*	total	of this SFA*	total	of this SFA*	total	of this SFA*
Fish total Of these:	**2 584.2**	1 751.5	**2 295.9**	1 596.3	**2 750.4**	1 921.3	**3 232.1**	1 925.7
Carp	1 394.6	1 235.4	1 275.7	1 151.9	1 621.0	1 421.5	1 773.6	1 404.5
Trouts	698.6	58.4	608.8	55.9	638.8	60.3	830.2	61.5
Crucians	76.0	70.4	51.9	50.2	56.8	51.9	81.0	58.1
White amur	61.5	50.2	39.9	34.9	82.4	61.1	71.6	62.3
Bighead carps	14.4	4.5	11	3.1	5.9	5.5	122.3	9.0
Sheat fish	40.2	39.1	36.6	35.2	49.3	47.3	62.5	56.5
Maskalonge	51.1	50.6	52.4	51.5	70.1	61.5	55.9	54.0
Sand-eel	62.2	61.5	62.1	61.7	56.6	54.5	53.0	50.3
Grayling	5.9	5.8	3.9	3.3	4.2	4.2	2.0	5.8
Huchen	0.5	0.5	0.4	0.4	0.9	0.9	0.6	0.6
Breams	81.6	81.6	65.6	65.5	65.5	65.5	87.0	74.5
Torgoch	2.2	0.8	2	0.0	7.1	0.1	6.1	0.5
Chevins	13.9	13.9	11.6	11.6	12.5	12.5	14.2	14.2
Other fish species	81.5	78.7	74	71.1	19.2	15.7	19.2	16.9

SFA – Slovak Fishing Association

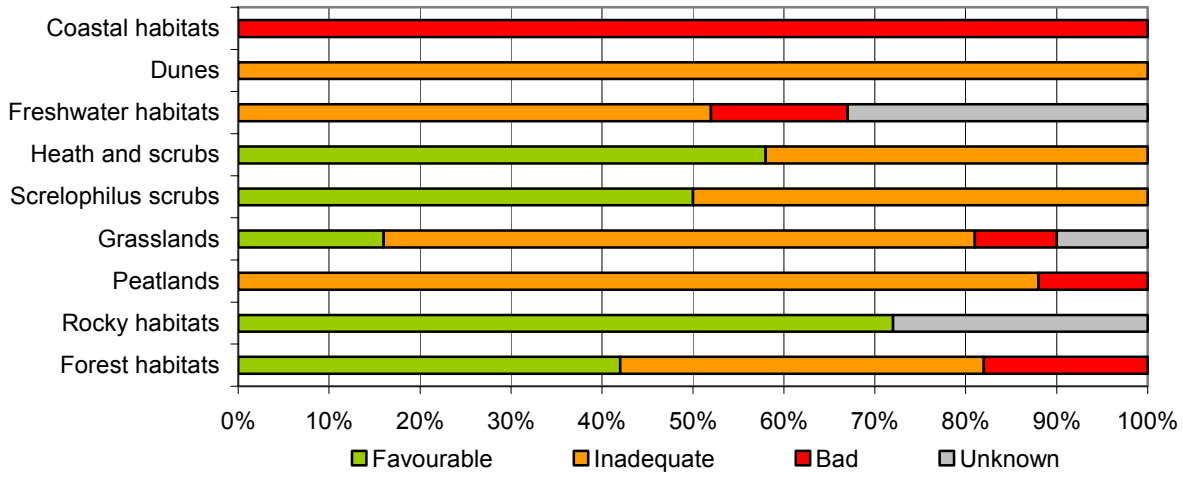
Source: SO SR

Habitats

Most endangered in Slovakia are saline habitats, which is the result of the decline in the level of ground water, extinction of traditional farming and secondary succession. On the other hand, best characteristics are recorded for rock habitats thanks to their inaccessibility and forest habitats thanks to a relatively sensible management of forests. The **endangered habitats** within the whole of Central Europe include peats and bogs, wetlands, flooded meadows, saline grassland, and sands.

Systematic **monitoring of habitats** in Slovakia was not carried out. However, it was to be implemented within the framework project under the Operation programme of Environment.

Conservation of the state of habitats of the European importance*



* data from reporting pursuant to article 17 of the Habitat directive - assessment of 66 habitats

Source: SNC SR

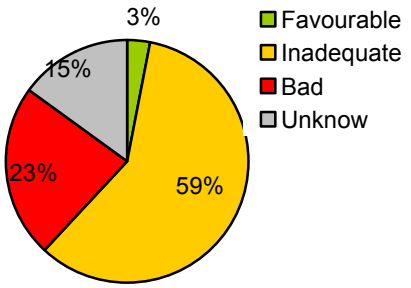
In 2012, management measures were implemented to **improve the favourable state of habitats** and plants at 137 sites within protected areas on total size of 379.95 ha, excluding protected areas at 53 sites (gene pool areas) taking up the size of 44.1 ha.

♦ Wetlands

Biodiversity of wetlands is more threatened than biodiversity of terrestrial ecosystems. Wetlands are becoming more and more **threatened** as a consequence of mainly intensive agricultural practices, meliorations, eutrophication, landscape fragmentation, changes in water balance. Also, traditional management approaches to meadows (scything) have been abandoned, which results in excessive vegetation growth of wetlands and peat bogs. Water courses have been locally contaminated or suffer from the consequences of past regulation activities. Construction of new hydro-electric power plants leads to the fragmentation of river habitats.

On the basis of the assessment for the European Commission, Slovakia is known to have 24 types of habitats of European importance that are classified as water, river, wetland, or dependent on the aquatic environment. All over Europe, 85% of wetland habitats are in **unfavourable state**. Slovakia has a similar situation.

State of wetland-type habitats



Source: SNC SR

State of wetlands in Slovakia

	Number of sites	Area (ha)	% of SR territory
Wetlands of international importance	18	41 704	0.9
of which Ramsar sites	14	40 697	0.8
Wetlands of national importance	72	147 260	3.0
Wetlands of regional importance	467	10 431	0.2
Wetlands of local importance	1 050	4 550	0.1
Total	**1 607**	**203 945**	**4.2**

Source: SNC SR

In 2011, a draft of **Action plan for the years 2012-2014** was produced and subsequently approved. This document accompanied the revised **Slovak Wetland Management Programme for the years 2008-2014.**

Ecosystem services, ecological footprint

Assessment of ecosystem services **has been performed** in the national park of Slovenský raj. Partial assessments of ecosystem services have been produced for selected forest ecosystems. **In 2012**, assessment in the national park of Muránska planina began.

"To preserve and renew ecosystems and their services by 2020" belongs to the objectives of the new EU biodiversity strategy. In the same context, the Slovak Ministry of Environment initiated workshops with the pertinent institutions that resulted in drafting the LIFE+ project for ecosystem accounting.

Care of the protected nature parts

♦ Implementation of law and strategic activities within the area of biodiversity conservation

CITES

Slovak Ministry of Environment acting as the **executive body of the CITES Convention** in 2012 published **370 exceptions** from the ban of commercial activities pursuant to Council Regulation (EC) no. 338/97 of 9th December 1996 on the protection of species of wild fauna and flora by regulating trade therein, **3 permissions** to relocate live animals, **133 permits to import** and **63 permits to export.** The most frequently imported products are leather bands for wristwatch made of crocodile (Mississippi alligator) and other reptiles' skin. Besides, in 2012 several parrots were imported, along with trophies (brown bear, leopard, and cheetah), etc.

State Nature Conservancy of the SR acting as **scientific CITES body** in Slovakia assisted customs authorities, police, and inspections (identification of individual animals, assessment of social and customs values of individual animals).

Cooperation with the police improved significantly in 2012. Customs authorities were **successful for the first time** in tracing and identifying illegal import of 2 deliveries of Asian medicine that contained endangered species. In 2012, the Slovak Ministry of Environment distributed information pamphlets for the public (tourists) crossing the customs border points.

Strategic documents

Preparation of the revised National Biodiversity Strategy for the next period continued in 2012. On the basis of the outcomes of the 10th session of the Conference of the parties to the Convention on Biological diversity in Nagoya in Japan and the adopted revised Strategic plan for biodiversity 2011-2020 and strategic targets (Aichi biodiversity targets) as well as the targets and measures of the EU Biodiversity Strategy to 2020 of May 2011. **Direction** in biodiversity conservation as compared to the strategy from 1997 has been **supplemented** especially with reactions to the new threats and trends in biodiversity conservation over the past years, and the reaction to the implementation of selected EU strategies that impact biodiversity and began to be seen only after Slovakia entered the EU.

♦ Protected minerals and fossils

The list of **protected minerals** includes:

- 12 typological minerals, first time scientifically documented from the Slovak territory,
- 61 significant minerals or rare occurrence in Slovak sites, and having European significance, or minerals with specific morphological shape or trend,
- meteorites found in Slovakia's territory.

The list of **protected fossils** includes:

- 655 typological fossils that represent an irreplaceable, unique material of extinct plants and

animals that served to describe the specific taxonomic group for the first time,

– selected groups of fossils with rare occurrence that thanks to their characteristics and degree of preservation are unique testimonies of the evolution of organisms in the Slovak geological past.

The samples of protected minerals and protected fossils are deposit especially in the collections of state nature scientific museums.

♦ Protection of caves

There are **more than 6 691 caves** registered in Slovakia. They are natural monuments at the same time. Of these, 44 most significant were classified among the national natural monuments.

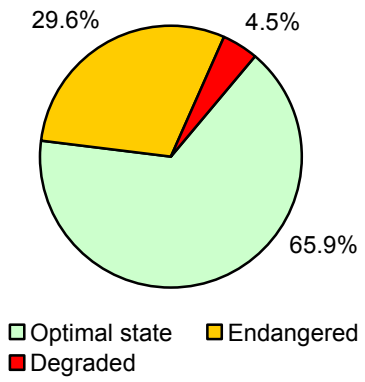
Presently, there are **18 accessible caves**. Total number of **publicly accessible caves** grew to **41**.

♦ Protected trees

The network of protected trees (PT) in 2012 was created by **446 protected trees** and their groups including alleys - protected objects (2 PT less than in the previous year). Physically it is represented by 1 256 solitary trees of 65 taxons, including 32 domestic and 33 alien taxons.

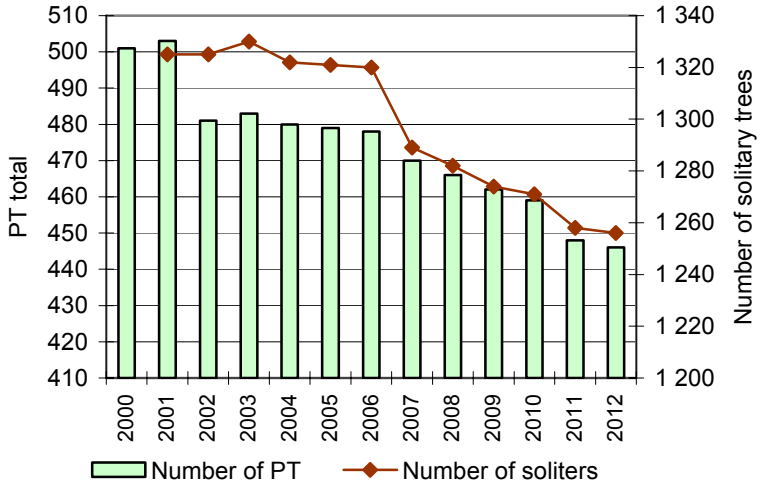
There were 294 in the **optimal** state, 132 were **endangered** and 20 **degraded** of the protected trees and their groups. This is stagnation in the situation, compared to the previous year.

State of protected trees and their groups



Source: SNC SR

Trend in number of protected trees



Source: SNC SR

♦ Protected areas

Legal protection of protected areas

15 new "small-size" protected areas were declared in 2012 of total size of 3 250 ha (including 12 PS, 2 NR a 1 NM). All of the areas belong to the Natura 2000 network under the Sites of Community Importance. A **decree was published** on declaring the **most recent Special Protection Area -** Levočské vrchy.

Policies regarding **9 protected areas** have been **updated.** Besides, decrees were also published on declaring other 5 nature monuments - publicly accessible caves and 1 more NM.

Decrees on **repealing 6 protected areas** (5 PS and 1 NR) came into effect.

Overview of the national network of protected areas

Overview of protected areas in the SR – in categories of PLA and NP

Category	Number	Size of core area (ha)	Size of protective zone (ha)	% of SR territory (incl. PZ)
Protected landscape areas (PLA)	14	522 582	-	10.66
National parks (NP)	9	317 890	270 128	11.99

Source: SNC SR

Size of all so-called **"small-size" protected areas (SSPA)** including their protective zones (PZ) takes up **2.44%** of Slovakia's territory. This represents an increase by 14 areas (3 578 ha or 0.07% of Slovakia's territory) compared to the previous year.

Overview of protected areas in the SR – in categories of PLA and NP

Category	Number	Size of core area (ha)	Size of protective zone (ha)	% of SR territory (incl. PZ)
Protected landscape fragments	1	3	-	0.00
Protected sites	173	11 023	2 425	0.27
Nature reserves (including 2 private)	392	14 246	301	0.30
National nature reserves	219	84 189	2 239	1.76
Natural monuments (without caves and waterfalls)	218	1 586	207	0.04
Natural monuments - publicly accessible caves	35	0	31	0.00
Natural monuments - other declared caves	7	0	261	0.01
Natural monuments - natural waterfalls	0	0	0	0.00
National natural monuments (without caves and waterfalls)	11	59	27	0.00
National natural monuments - caves	44	0	3,055	0.06
National nature monuments - natural waterfalls	5	0	0	0.00
SSPA total	**1 105**	**111 105**	**8 545**	**2.44**

Source: SNC SR

Besides the already mentioned objects, there are in Slovakia also territories that **are not classified under protection levels** - 40 declared **special protection areas** with total size of 1 237 213 ha, and 20 **caves** (14 NNM and 6 NM) with declared protective zone of total size of 3 347 ha (major part of their territories reaches into other protected areas).

In total, **in the territory of PLA** there are **247** SSPA (this represents 2.4% of total PLA territory, incl. their PZ), **in the territory of NP** there are **209** SSPA (**22.8%** of the NP area, incl. their PZ), while **in the territory of NP protective zones** there are **68** SSPA (**0.9%** of the NP protective zones area).

Outside PLA, NP, and PZ of NP, which means **the open landscape**, there are **581** SSPA (0.9% of the open landscape area and 27% of total SSPA territory, incl. their PZ).

Agricultural land (AL) and forest land (FL) in protected areas

	Size of AL (ha) in PA*	%	Size of FL (ha) in PA	%
2012	187 190	16.4	830 330	72.7

*only permanent grasslands according to LPIS (inventory of actively used agricultural land)

In the period of the years 1993-2012, legislation addressing nature protection and also protected areas was amended and revised on two occasions. Since 1955 until 1994 there were categories of protected areas different than the ones that exist today. **As of 1994**, the overall number of **protected areas** was **922** with the size of **1 306 741 ha** (**26.7%** of the size of Slovakia). Currently, in Slovakia there are **1 128 protected areas** within the national network in the size of **1 142 151 ha,** which takes up **23.3%** of the size of Slovakia. Reduction has been mainly provoked by cancelling PLA protective zones as well as adjustments to "large-size" protected areas (NP and PLA).

Overview of protected areas in the SR by types and levels of protection (as of 31.12.2012)

Level of protection*	Category	Area (ha)	% of SR territory
1th level	„ open landscape “	3 761 249	76.70
2th level	PLA**, NP PZ**, D zones	759 917	15.50
3th level	NP**, PS, PS PZ, NR PZ, NNR PZ, NM PZ, NNM PZ, C zones	269 992	5.51
4th level	NNR, NR, NNM, NM, PS, NR PZ, NNR PZ, NM PZ, NNM PZ, B zones	18 833	0.38
5th level	NNR, NR, NNM, NM, A zones	93 409	1.91

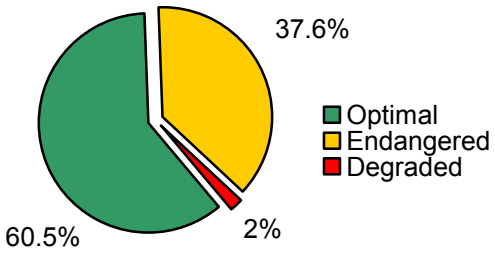
Source: SNC SR

* excluding territories without the level of protection (SPAs and PZs of caves and natural waterfalls)
** area out of SSPA

Endangerment and degradation of protected areas

Of the total number of 1 105 small-size protected areas, there were **degraded** 22 territories of area of 276 ha (this area presents 0.2% of total area of SSPA), 415 were **endangered** of area of 20 161 ha (16.9% of SSPA) and in the **optimal condition** there were 668 territories of area of 99 213 ha (82.9% of SSPA). Compared to the previous year, a slight improvement has been recorded, since 2003.

Endangerment of SSPA in terms of their number



Source: SNC SR

Care of protected areas

Professional nature protection organisations carried out **regulatory intervention** in the field of practical care of the specially protected nature and landscape parts - major activities included mowing and mulching, together with elimination of self-seeded trees.

State Nature Conservancy of the SR elaborated 9 241 **expert viewpoints**. The biggest rate was created by the department of tree species protection (18.9%) and building and regional planning activities (18.5%).

As of 2012, **71 education paths**, **49 education localities and 13 information centres of nature protection** were documented (only within the State Nature Conservancy of the SR organisation units).

Protected areas within the international context

European Diploma of Protected Areas

So far, there have been 2 protected areas that received the European Diploma:

- NNR Dobročský prales (A category) and
- NP Poloniny (B category).

Man and the Biosphere* Programme *(MaB):

The following 4 protected areas have been included into the biosphere reserves in Slovakia:

- Poľana biosphere reserve (1990)
- Slovak karst biosphere reserve (1977)
- East Carpathian biosphere reserve (1998) (trilateral BR: Poland/Slovakia/ Ukraine)
- Tatra biosphere reserve (1992) (bilateral BR: Poland/Slovakia).

As of 2012, **14 wetlands** were declared and registred in *List* of *Wetlands* of International Importance as **Ramsar sites** with total size of **40 697 ha** (0.8% of SR territory) under the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat* (**Ramsar Convention**):

Name of wetland	Area (ha)	District	Date of registration
1. Parížske swamps	184.0	Nové Zámky	2.7.1990
2. Šúr	1 136.6	Pezinok	2.7.1990
3. NNR Senné - ponds	424.6	Michalovce	2.7.1990
4. Donau floodplains	14 488.0	Bratislava II, V, Senec, D. Streda, Komárno	26.5.1993
5. Flat of Morava river	5 380.0	Bratislava IV, Malacky, Senica, Skalica	26.5.1993
6. Latorica river	4 404.7	Michalovce, Trebišov	26.5.1993
7. Alluvium of Rudava river	560.0	Malacky, Senica	17.2.1998
8. Wetlands of Turiec	750.0	Martin, Turčianske Teplice	17.2.1998
9. Poiplie	410.9	Levice, Veľký Krtíš	17.2.1998
10. Wetlands of Orava basin	9 287.0	Námestovo, Tvrdošín	17.2.1998
11. Orava river and its confluents	865.0	Dolný Kubín, Tvrdošín	17.2.1998
12. Domica cave	621.8	Rožňava	2.2.2001
13. Tisa river	734.6	Trebišov	4.12.2004
14. Caves of Demänovská valley	1 448.0	Liptovský Mikuláš	17.11.2006

Source: SNC SR

Review of Biosphere Reserves and Ramsar sites in selected countries

		Slovakia	Czech Rep.	Poland	Hungary	Austria
Biosphere Reserves (BR)	Number	4	6	10	6	7
Ramsar sites	Number	14	14	13	29	22
	area (km^2)	407	603	1 451	2 449	1 239

CR) BR: one common with Poland
Slovakia) BR: one common with Poland and one with Poland and Ukraine together
Poland) BR: one common with Czech Republic, one with Slovakia and one with Slovakia and Ukraine together

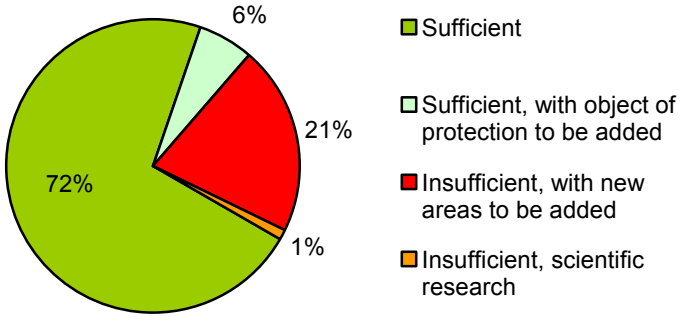
Source: SNC SR

NATURA 2000 in Slovakia

Sites of Community Importance (SCI)

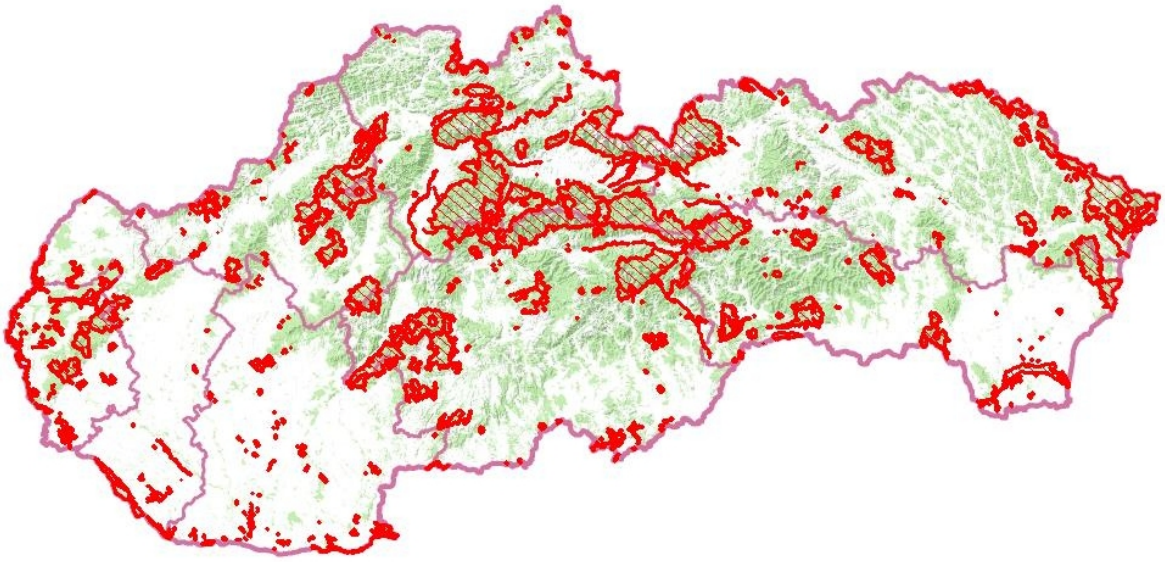
- National list of SCI was approved on 17.3.2004 by the Slovak Republic government and published *on the basis of the MoE SR Edict* of July 14, 2004 and was sent to the European Commission for approval;
- SCI are proposed for **44 plant taxons**, **96 animal species** and **66 types of biotopes**;
- Into the **proposed list** of the SCI there were originally listed **382 territories** with the area of **573 690 ha**. The territories cover **11.7% of the SR area**, lapping with present network of protected areas is **86%**;
- In 2011, first **enlargement of the SCI national list** of 2004 was implemented. On the basis of the EC requirements stemming from the outcomes of bio-geographical seminars as well as the Slovak Government Resolution No. 577 of August 31, 2011, **97 new sites** were added to the national list of European importance. At the same time, **6 original areas were excluded** from the national list. **Total share of SCI** on the size of Slovakia **grew** from 11.7% to **11.9%.** Relevant **total number of SCI** is **473 areas** of the size of **584 353 ha**;
- **Negotiations with the EC** took place in Bratislava in **March of 2012** in the presence of independent experts from the Slovak Academy of Sciences, non-government organisations, State enterprise Forests of the Slovak Republic, National Forest Centre, and private forest owners. Negotiations centred around the **level of sufficiency in demarcation of sites of community importance.** The negotiations showed that for **approximately 78% of species and habitats** of the European importance, there is **sufficient number of sites of community importance.** In the years to come, however, new **sites** will have to be added also for the remaining habitats and species, **especially the fish**;
- The process of **declaring new SCI** continued in the national categories of protected areas (especially PS or NR). Areas should be declared within 6 years following their approval by the EC, which in the case of the SCI submitted in 2004 is by November 2013 or January 2014 respectively. **Less than 60%** of these sites were **declared** in 2012. Among the declared areas were 15 new "small-size" protected areas of the size of 3 250 ha (12 PS, 2 NR, and 1 NM) that are at the same time sites of community importance, and still others are to be completed or legally approved.

Sufficiency of demarcation of sites of community importance expressed by the number of species and habitats



Source: SNC SR

Updated overview of Sites of Community Importance in the SR

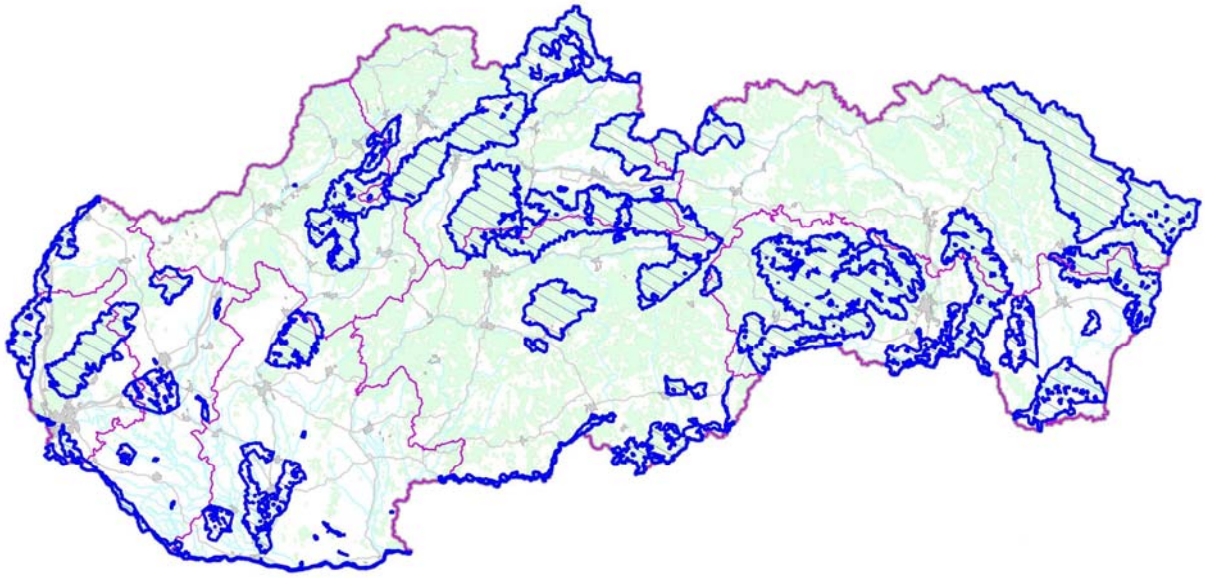


Source: SNC SR

Special protection areas (SPA)

- the Slovak Government approved the SPA national list on July 9, 2003. In 2004 began the process of creating resolutions and care programmes for individual SPA. National list includes **38 SPA** with total area of **1 154 111 ha** and covers **23.5% of the SR area** and lapping of SPA with the existing network of protected areas in the SR presents **55%**;
- Slovak Government Resolution 345/2010 of 25/05/2010 **revised and amended** the national list. **5 new** areas were added to the list and **2** areas were **taken out**;
- **In 2012 was declared also the last** territory belonging to the national list of **41 SPA. Size** of all SPA reached the size of **1 282 811 ha,** which is **26.16%** of Slovakia's territory.

Updated overview of Special protection areas in the SR



Source: SNC SR

Agricultural and forest land in the NATURA 2000 territories

NATURA 2000	Number	Area (ha)	Agricultural land area (ha)	Share of agricultural land (%)	Forest land area (ha)	Share of forest land (%)
SPA	41	1 282 811	365 102	28.4	828 110	64.3
SCI	473	584 353	58 640	10.0	503 926	86.2

Source: SNC SR