MINISTRY OF THE ENVIRONMENT OF THE SLOVAK REPUBLIC

STATE OF THE ENVIRONMENT REPORT

SLOVAK REPUBLIC 2006

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

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

• SOIL

Land use

- **Land Use on the basis of the Land Register's data**

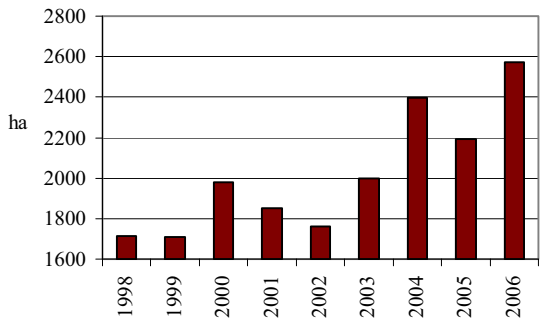
Land Use categories (state to the date 31st December 2006)

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

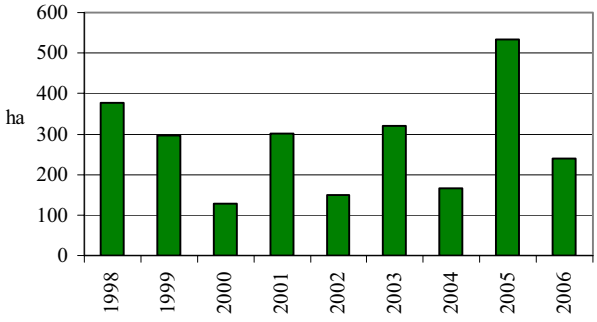
Source: IGCC SR

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

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



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



Source: IGCC SR

Soil properties

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

- **Chemical properties of soil**

Soil reaction

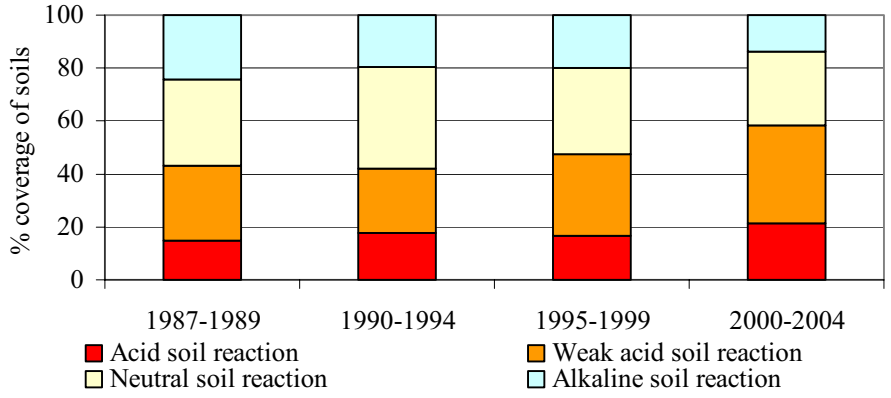
Trend in soil reaction (pH/H_2O) in the A-horizon of agricultural soil in Slovakia, based on the comparison of outcomes from three PMS-S cycles

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

AL – Arable Land, PG – Permanent Grassland Source: SSCRI

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

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



Source: IGCC

Most Slovak forest soil is mildly to strongly acid.

Trend in exchange soil reaction (pH/$CaCl_2$) in selected soil types of fores soil in the SR based on comparison of the PMS-F results

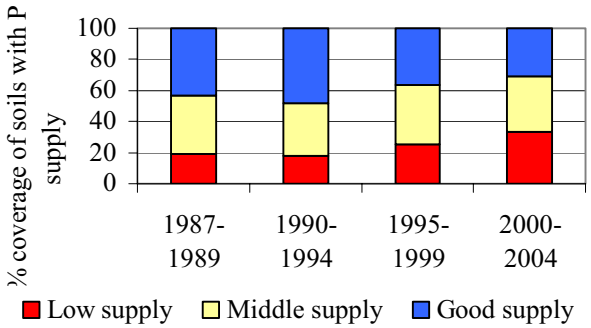
Main soil unit	1988	1993	1998	2006
Eutric Cambisols	4.23	4.10	4.14	4.05
Dystric Cambisols	3.57	3.30	3.65	3.62
Luvisols	4.16	4.10	4.14	4.25
Podzols	3.16	3.30	3.37	3.39
Rendzic Leptosols	6.36	6.85	7.04	6.54

Source: NFC - FRI

Available nutrients

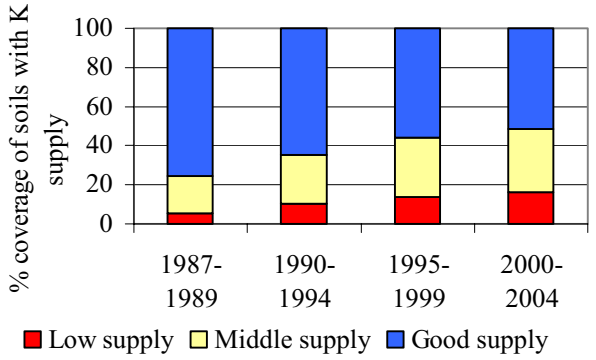
During the period VIII. (1987-1989) through XI. (2000-2004) of Agrochemical soil testing there was an **increase in low supply of all three available nutrients (phosphorus, potassium, and magnesium).** In phosphorus, it was by 14.6 %, by 10.7 % in potassium, and by 5.3 % in magnesium). However; during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

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



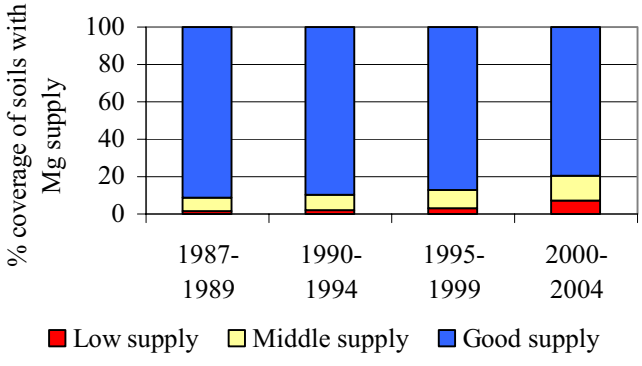
Source: IGCC

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



Source: IGCC

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



Source: IGCC

Humus

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

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

AL – Arable Land, PG – Permanent Grassland

Source: SSCRI

♦ Physical properties of soil

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

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

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

Source: SSCRI

Soil degradation

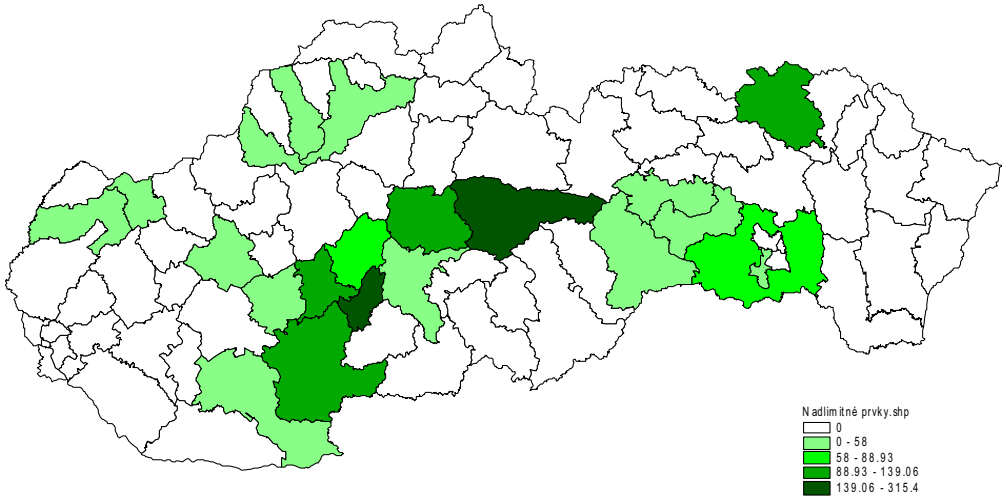
Serious soil degradation includes contamination with heavy metals and organic pollutants, acidification, as well as alkalinization and soil salinization. Recently, soil degradation through desertification grows in significance.

Soil contamination by hazardous substances

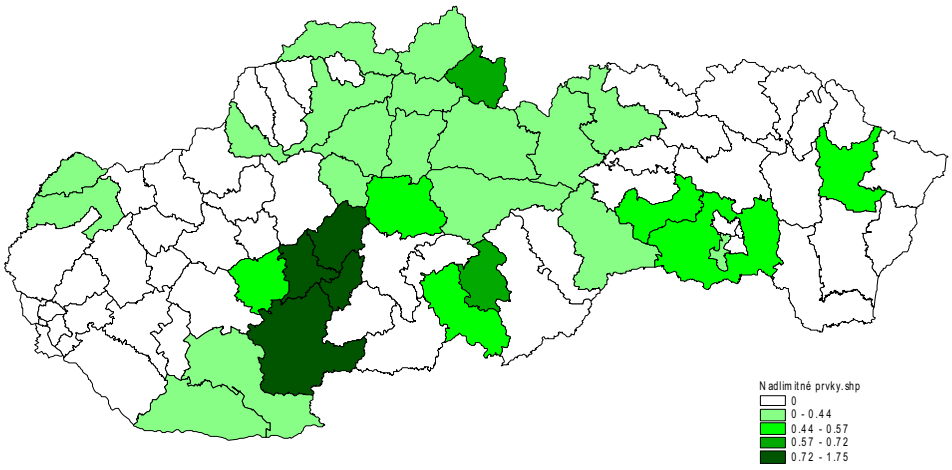
Results from the III. cycle of PMS-S with samples extracted in 2002 showed that the contents of the majority of hazardous substances in selected agricultural land of Slovakia are below the limit, especially being the case of arsenic, chromium, copper, nickel, and zinc. In case of cadmium, excessive limit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

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

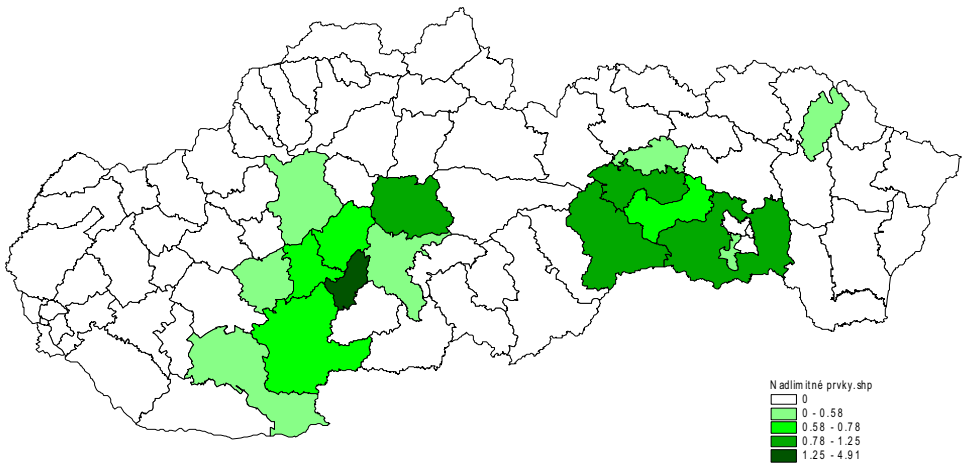
Overview of limit-exceeding values of lead in agricultural soils of the SR for the period of 2001-2005 (Pb limit = 30.00 mg/kg)



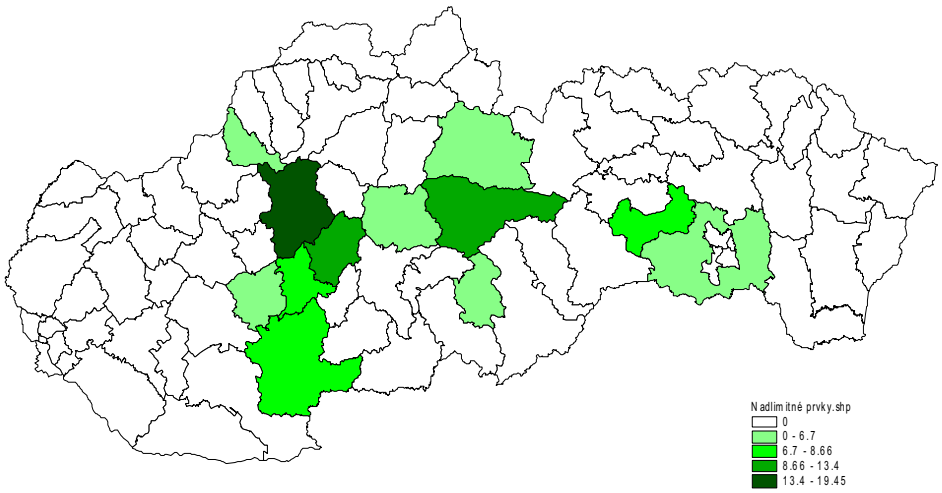
Overview of limit-exceeding values of cadmium in agricultural soils of the SR for the period of 2001-2005 (Cd limit = 0.30 mg/kg)



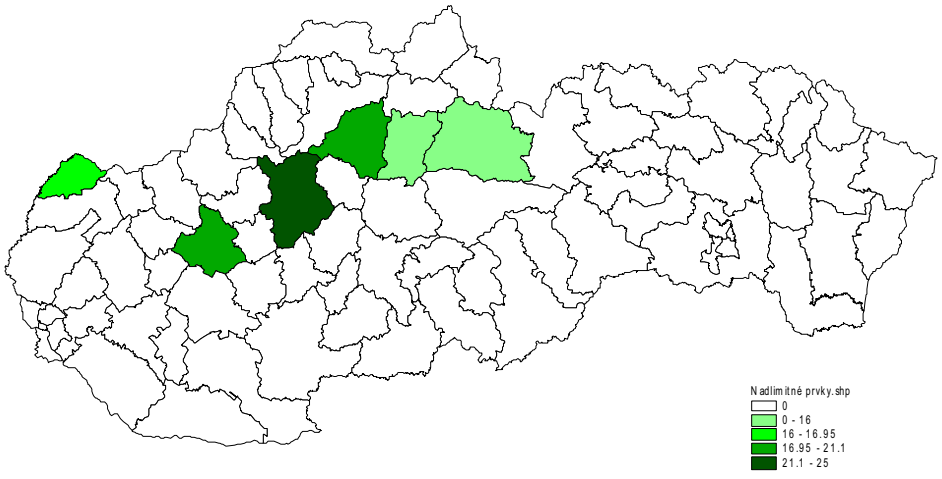
Overview of limit-exceeding values of mercury in agricultural soils of the SR for the period of 2001-2005 (Hg limit = 0.30 mg/kg)



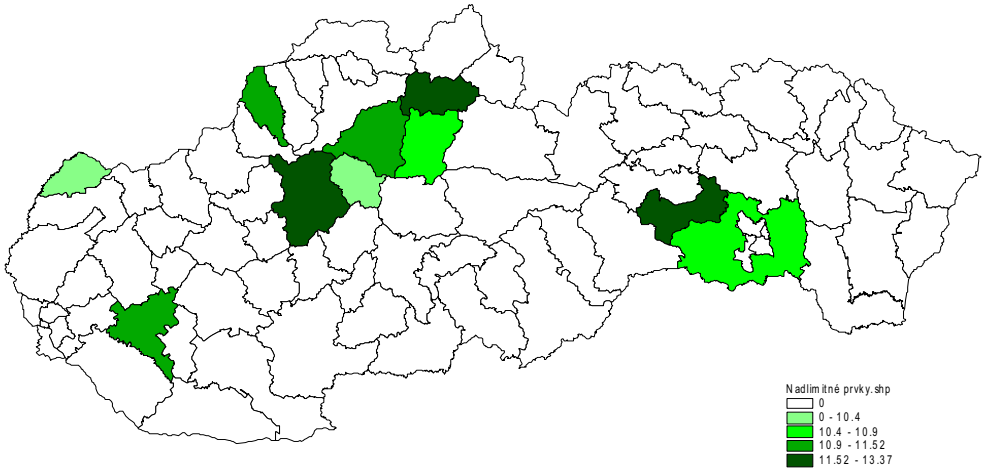
Overview of limit-exceeding values of arsenic in agricultural soils of the SR for the period of 2001-2005 (As limit = 5.00 mg/kg)



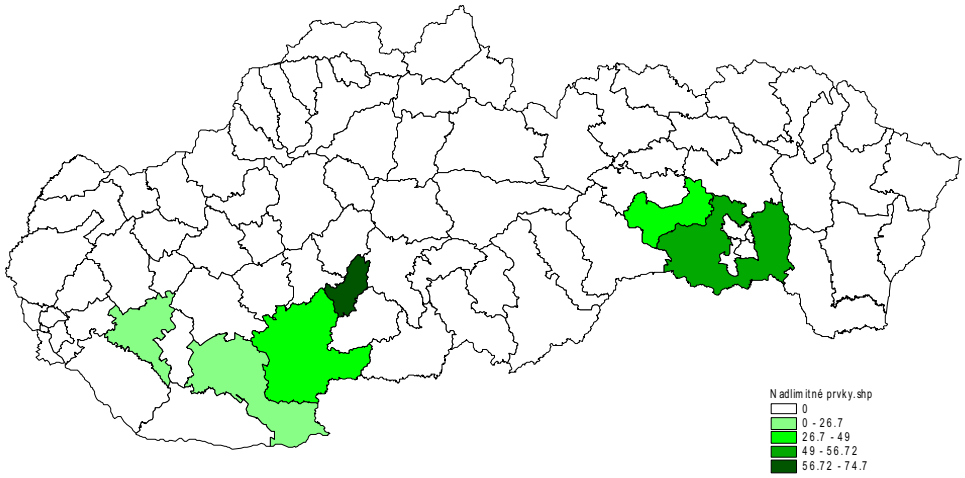
Overview of limit-exceeding values of chromium in agricultural soils of the SR for the period of 2001-2005 (Cr limit = 10.00 mg/kg)



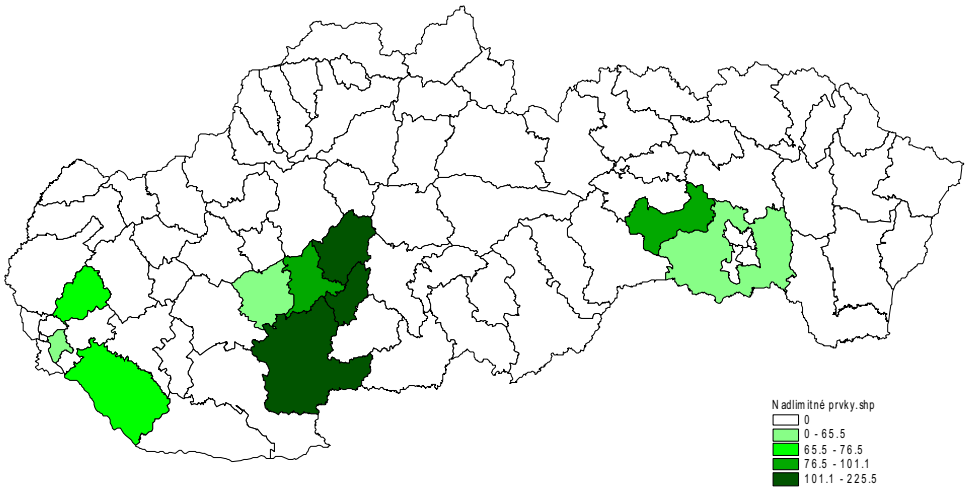
Overview of limit-exceeding values of nickel in agricultural soils of the SR for the period of 2001-2005 (Ni limit = 10.00 mg/kg)



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



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



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

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

- **Physical degradation**

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

Soil erosion

Water erosion is prevalent in Slovakia.

Agricultural land endangered by erosion in the SR

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

Source: SSCRI

Soil compaction

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

Desertification

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

Application of the sewage sludge and bottom sediments into the soil

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

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