NÁRODNÉ POĽNOHOSPODÁRSKE A POTRAVINÁRSKE CENTRUM
VÝSKUMNÝ ÚSTAV PÔDOZNALECTVA A OCHRANY PÔDY

Pedologické dny 2025
Antropogenně ovlivněné půdy
Most
17.–19. 9. 2025

Dopad antropizácie na poľnohospodárske pôdy v podmienkach Slovenska /Impact of anthropization on agricultural land in conditions of Slovakia/

Jozef Kobza

NPPC – Výskumný ústav pôdoznalectva a ochrany pôdy, Banská Bystrica
e-mail: jozef.kobza@nppc.sk

Hlavné ohrozenia pôd/Main threats to soil

- Klimatická zmena/Climatic change
- Zábery pôd/Soil sealing
- Degradation of soils (based on soil monitoring system)

Prognóza klimatickej zmeny
Prognosis of climatic change

- **Už v 5. správe IPCC (2013) sa konštatuje 95 %-ná istota, že človekom spôsobená klimatická zmena má väčší podiel na všetkých zmenách klímy ako zmeny prirodzeného charakteru.** Uvádza sa, že len samotné poľnohospodárstvo sa podieľa 12,5 % na otepľovaní klímy
- **Vedci odhadli,že globálna zmena klímy prevyšujúca v 30-ročných priemeroch 2° C za 100 rokov (oteplenie alebo ochladenie) predstavuje už značné riziko tak pre pôdohospodárstvo, ako aj pre ekosystémy a socio-ekonomickú sféru vo väčšej časti Zeme.** Globálna zmena priemerov teploty vzduchu menšia ako 1° C sa považuje za celkom bezpróblemovú z pohľadu adaptačných schopností a od 1° C do 2° C je ešte v intervale normálnych adaptačných schopností prirodzených ekosystémov a aj väčšiny socio-ekonomických sektorov.
- **Najnovšie modelové výstupy scenárov zmeny klímy však predpokladajú globálnu zmenu klímy až v rozsahu do 4° C (stredný horný odhad), pričom v citlivých regiónoch (Arktída, sever kontinentov na severnej pologuli...) by mohlo dosiahnúť oteplenie do roku 2100 (v 30-ročných kĺzavých priemeroch) aj viac ako 7° C.**

Zdroj: *M. Lapin, Zborník SAPV č. 74, Nitra 2014*

Situácia na Slovensku
Situation in Slovakia

- **Za posledné polstoročie sa priemerná ročná teplota zvýšila o približne 2°C, čo je viac ako je svetový priemer!**
- Pokles zrážok na juhu cca o 10-15 %,

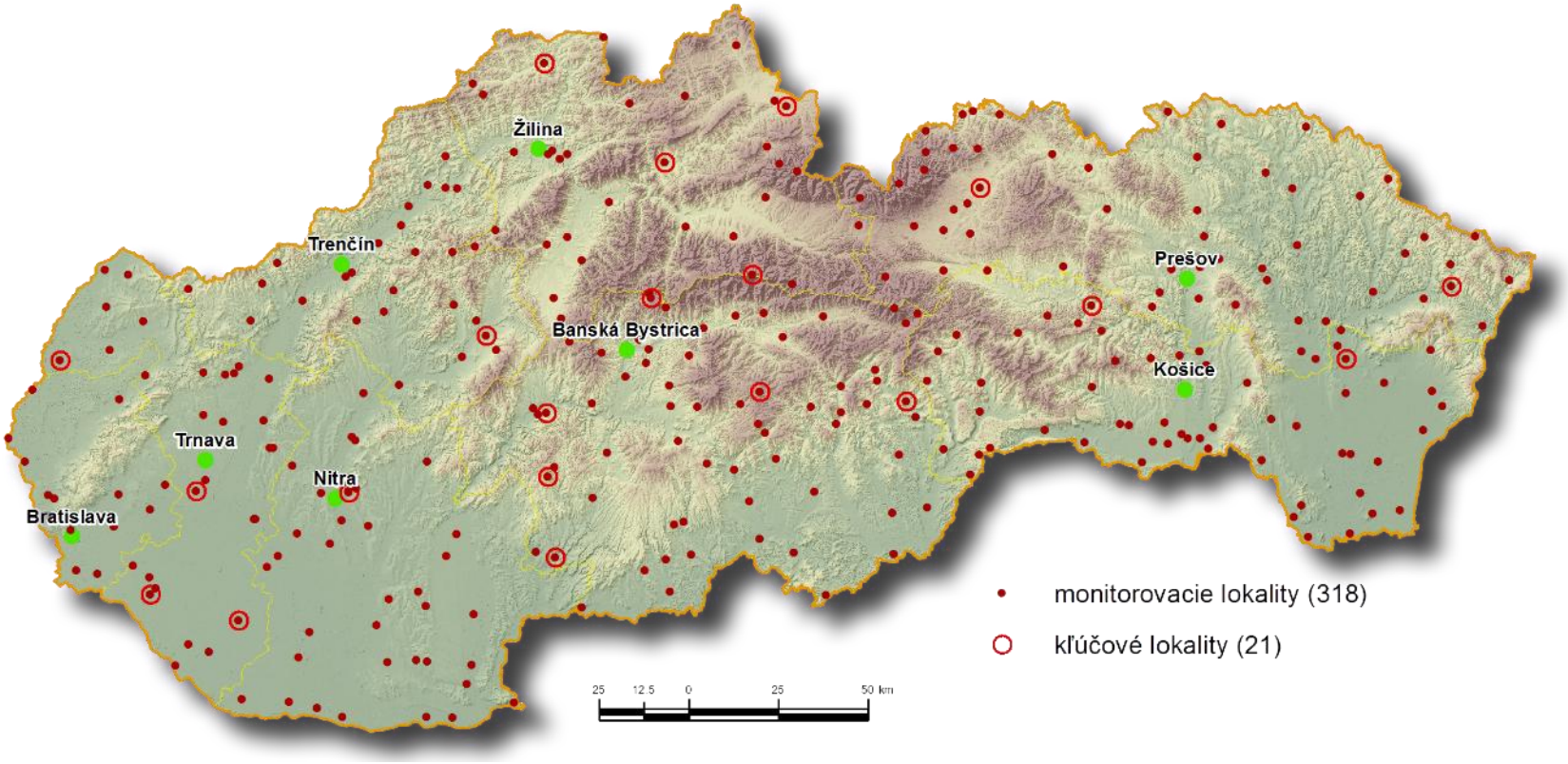
  nárast na S a SV o 3-5 %
- Extrémne klimatické obdobia (povodne, periódy sucha, početnosť), voči týmto vplyvom je práve poľnohospodárstvo najviac zraniteľné

  Zdroj: *M. Lapin, Zborník SAPV č. 74, Nitra 2014*

Zábery pôd/Soil sealing

Ďalším aktuálnym ohrozením poľnohospodárskej výroby je neustály záber našich často najkvalitnejších, najúrodnejších pôd. Podľa štatistickej ročenky SR máme na Slovensku 2 370 201 hektárov poľnohospodárskej pôdy a 1 403 004 hektárov ornej pôdy (údaje sú k 1.1. 2024). **Od roku 2000 do roku 2021 sa výmera ornej pôdy na Slovensku znížila o 202 572 hektárov, čo predstavuje v prepočte 9 646 hektárov za rok** a **26,4 hektárov za deň!** Pre lepšiu predstavu, za deň sa tak stratí plocha takmer 36 štandardných futbalových ihrísk (Roľnícke noviny 5.2.2025).

Current threats to soil based on Soil monitoring network in Slovakia



Monitored indicators according to main threats to soil

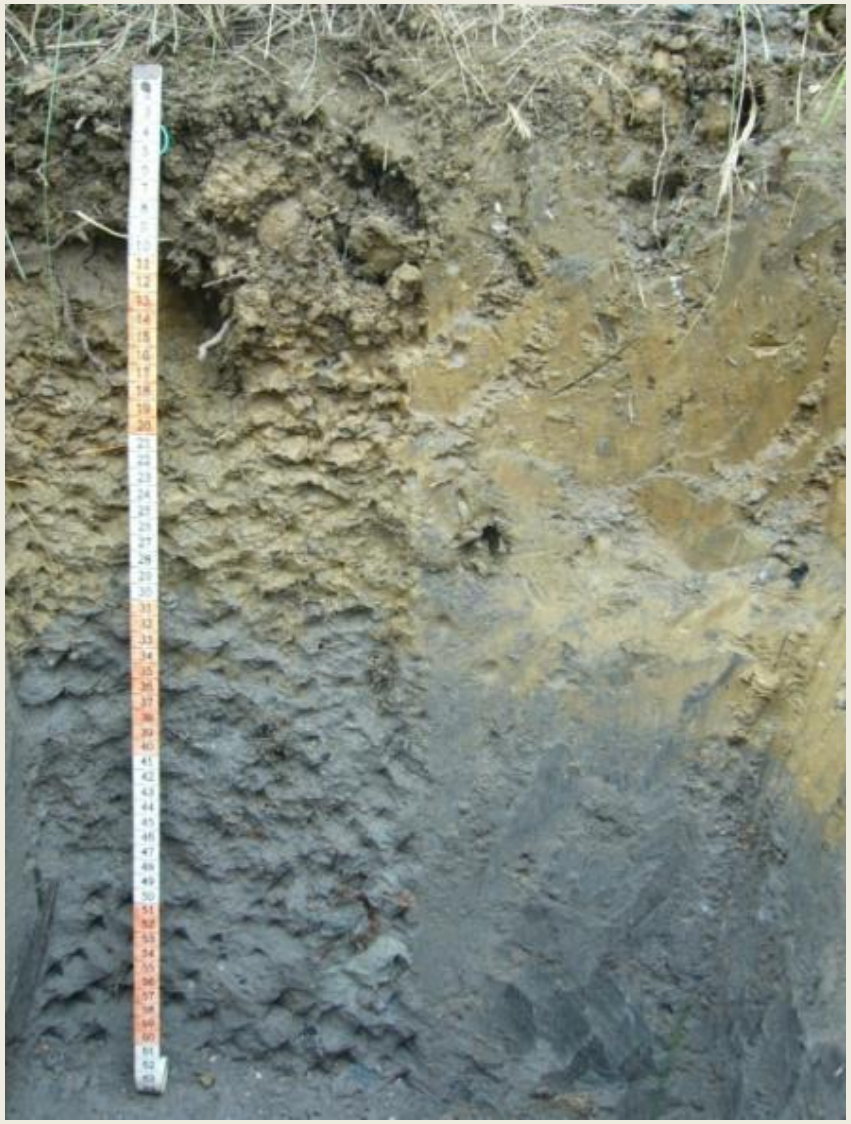
- **Acidification of soils:** pH/H_2O, pH/KCl, pH/$CaCl_2$, CEC (cation exchange capacity), exchangeable cations (Ca^{2+}, Mg^{2+}, K^+, Na^+), active Al (if pH/KCl < 6.0);
- **Salinization and sodification:** electrical conductivity (EC), content of exchangeable Na percentage in sorption complex of soil (ESP) sodium adsorption ratio (SAR), pH/H_2O, exchangeable cations and anions (Ca^{2+}, Mg^{2+}, K^+, Na^+, Cl^-, SO_4^{2-}, CO_3^{2-}, HCO_3^-); total content of salts (%);
- **Soil contamination:** Cd, Cr, Pb, Ni, Zn, Cu, As, Co (aqua regia extraction), Hg (total content – using analyzer DMA-1 evo);
- **Quantitative and qualitative composition of SOM:** SOC, N_t, C_{HA}/C_{FA}, Q^4_6 ;
- **Content of available macronutrients**: P, K, Mg (Mehlich III.);
- **Content of available micronutrients**: Cu, Zn, Mn (DTPA);
- **Soil compaction:** bulk density, porosity, maximal capillary capacity, mechanical fractional composition (USDA);
- **Soil erosion:** ^{137}Cs, pH/KCl, SOC, P, K, mechanical fractional composition (USDA).

Depth (cm)	Total content of salts (%)	ESP (%)	SAR	EC ($mS.m^{-1}$)	pH/H_2O
0-10	0.57	16.6	8.4	247	9.1
20-30	1.90	22.0	11.8	387	9.1
35-45	1.06	23.8	13.3	348	9.3
70-80	1.31	51.9	44.8	359	9.3

Polluted soil profile of Cambisol by Mg-imissions (Hačava)

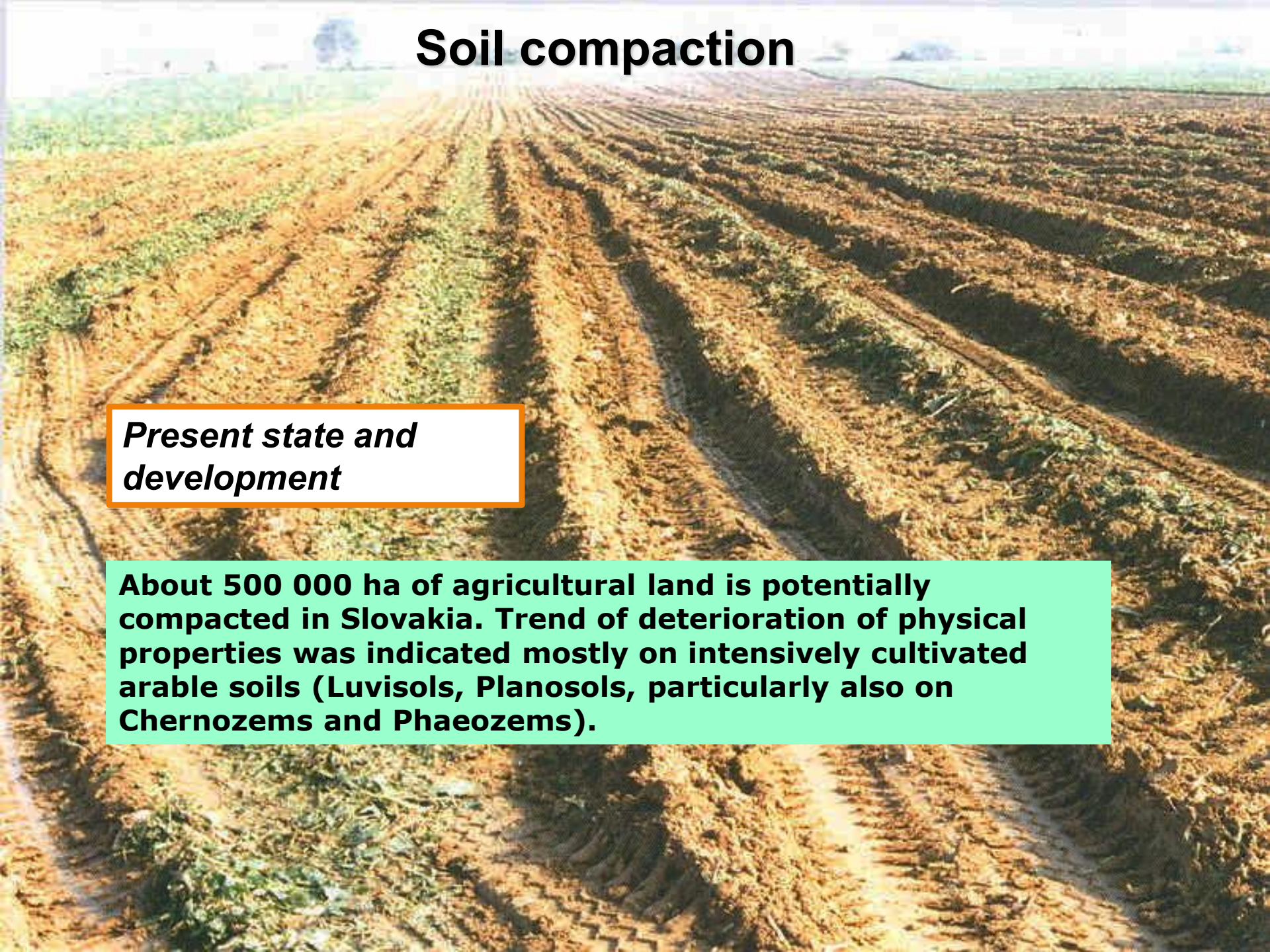
Depth cm	Mg $mg.kg^{-1}$	pH/KCl	P (Mehlich III.) $mg.kg^{-1}$	K (Mehlich III.) $mg.kg^{-1}$	SOC %	C_{HA}/C_{FA}	Q^4_6
0 – 10	**20 500**	**9.2**	27.77	118.85	1.28	0.42	4.0
20 – 30	**2 022**	**8.4**	21.83	110.89	-	-	-
35 – 45	**1 245**	**7.6**	27.12	90.41	-	-	-
60 - 70	**1 047**	**7.4**	27.87	80.17	-	-	-

Occurrence of grey ash in soil profile of Fluvisol
(region Horná Nitra)



Polluted alluvial deposit of Nitra river (region Horná Nitra)

Soil compaction



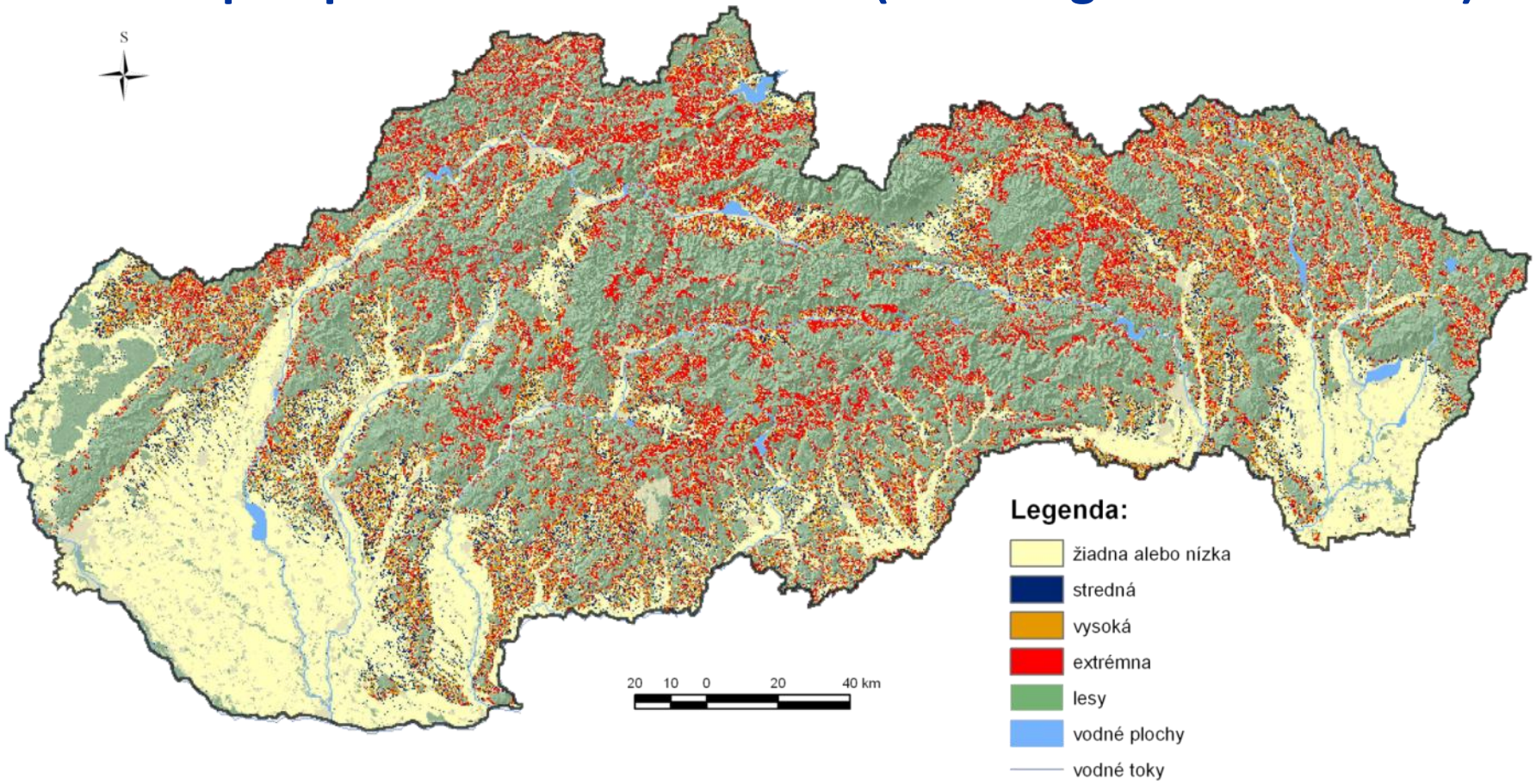
Present state and development

About 500 000 ha of agricultural land is potentially compacted in Slovakia. Trend of deterioration of physical properties was indicated mostly on intensively cultivated arable soils (Luvisols, Planosols, particularly also on Chernozems and Phaeozems).

Water erosion:

- loss of the most fertile layer of soil
- *loss of SOM and available nutrients*
- *deterioration of soil structure*
- *deterioration of soil and quality of water sources*
- *deterioration of landscape potential and quality of life*
- *reduce of land use*

Map of potential water erosion (base: register GSAA 2024)



➢ ***52.4 % of agricultural land is affected by potential erosion***.

Interactive model for soil loss calculation is available on the page:

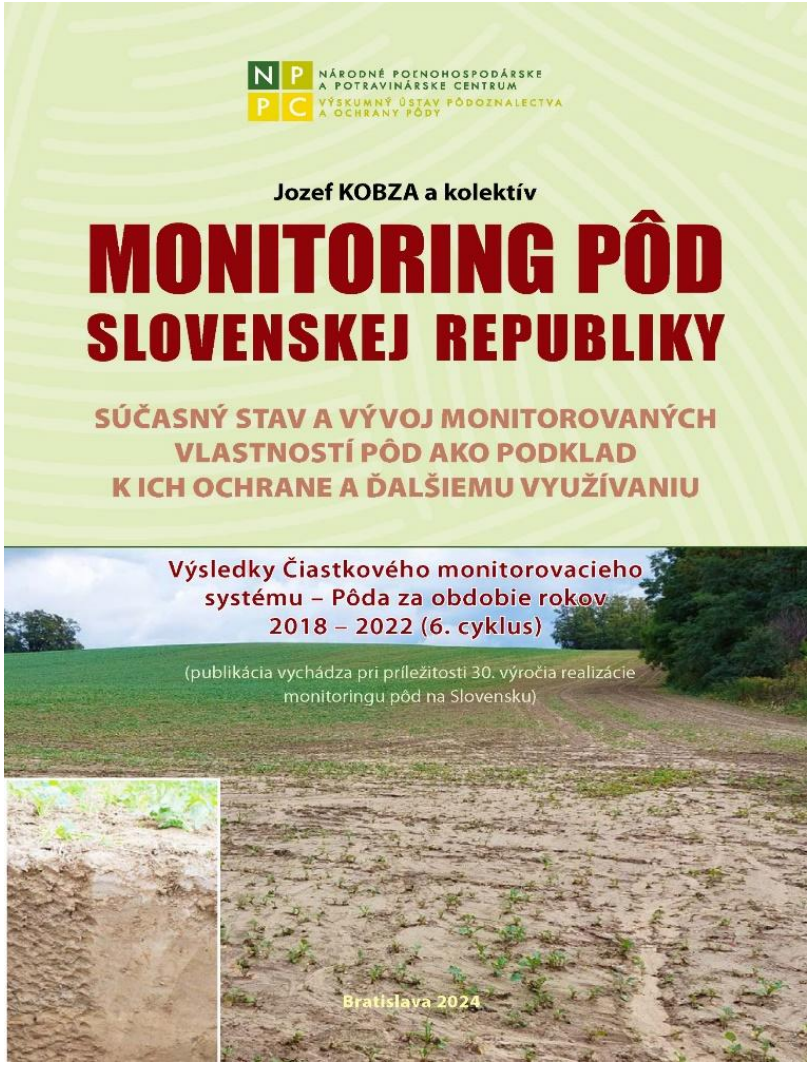
www.podnemapy.sk

Categories of erosion	Area in ha	% of agricultural land
No or very slight	845 046.5	**47.6**
Medium	172 463.8	**9.7**
High	247 162.1	**13.9**
Very high	511 901.2	**28.8**
Total	1 776 573.6	**100**

Current development of main soil degradation processes in conditions of Slovakia since 1993

Soil contamination	without significant change, soils which were contaminated in the past, are contaminated also at present.
Soil acidification	acidification trend on acid soils and substrates (lack of liming)
Salinization and sodification	It was indicated that processes of salinization and sodification are running more or less paralelly, where process of sodification seems to be dominant. Smaller areas occur on Podunajská and Východoslovenská nížina (lowland). Total area of salty soils is max. 3 thous. ha in Slovakia.
Content of macro- and micronutrients	Decrease of available macronutrients (especially P and K) about 10 – 30 % was indicated. Content of available Mg is good to high. Content of available micronutrients (Cu, Zn, Mn) is mostly medium, even though the slight decrease of them was indicated at present.
Content and quality of humus	After slight decrease of humus content on the beginning of soil monitoring process, later its stabilization was indicated. The highest humus content on Podzols, Andosols and Lithosols, the lowest content of humus on Regosols was indicated. Qualitative indicators of SOM are without significant change – these ones are relevant to genetic type of specific soil.
Soil compaction	It is a reversible degradation process.Its deterioration was observed in arable layer on loamy Cambisols and loamy-clayey Planosols, also in subsoil of loamy Fluvisols and loamy-clayey Planosols. There are about 500 thous. ha of potentially compacted soils and about 200 thous. ha of currently compacted soils in Slovakia.
Soil erosion	About 52.4 % of agricultural land is affected by potential water erosion and 12.3 % of agricultural land by current water erosion is affected in Slovakia. Wind erosion is dominant mostly in western part of Slovakia (mostly on Záhorie region) – 6.1 % of agricultural land of Slovakia. Interactive model for soil loss calculation is on the web page www.podnemapy.sk

The latest publication: Soil monitoring in Slovakia




A nation that destroys its soils destroys itself
(Franklin Delano Roosevelt, 1937)
Thank you for your attention