Erosion in Serbia
- State, Legislative, Problems, Tasks -

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The EU Thematic Strategy on Soil Protection

The major treats to soil identified so far

→ Soil erosion

→ Decline in soil organic matter

→ Soil contamination

→ Salinization

→ Physical degradation (compaction)

→ Soil sealing

→ Floods and landslides

The national strategy for preserving national resources and goods (Serbia, 2010)

The major treats to soil identified so far – in order by intensity of a treat

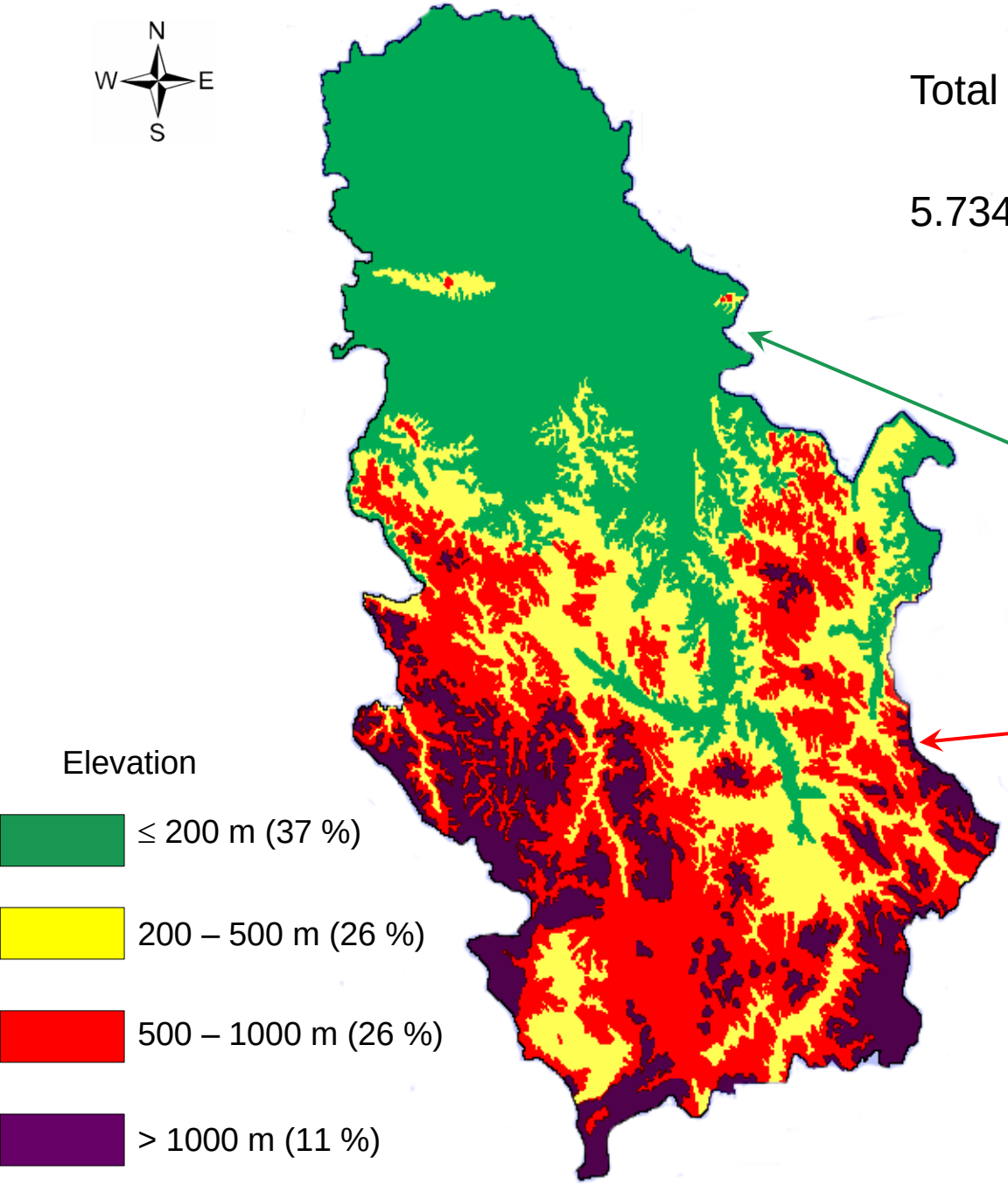
→ Soil sealing

→ Decline in soil organic matter

→ Soil acidification

→ Soil contamination

→ **Soil erosion**



Total territory 8.836.100 hectares

5.734.000 hectares of agricultural land

- 80 % of the total state territory is affected by erosion

Wind erosion

Water erosion

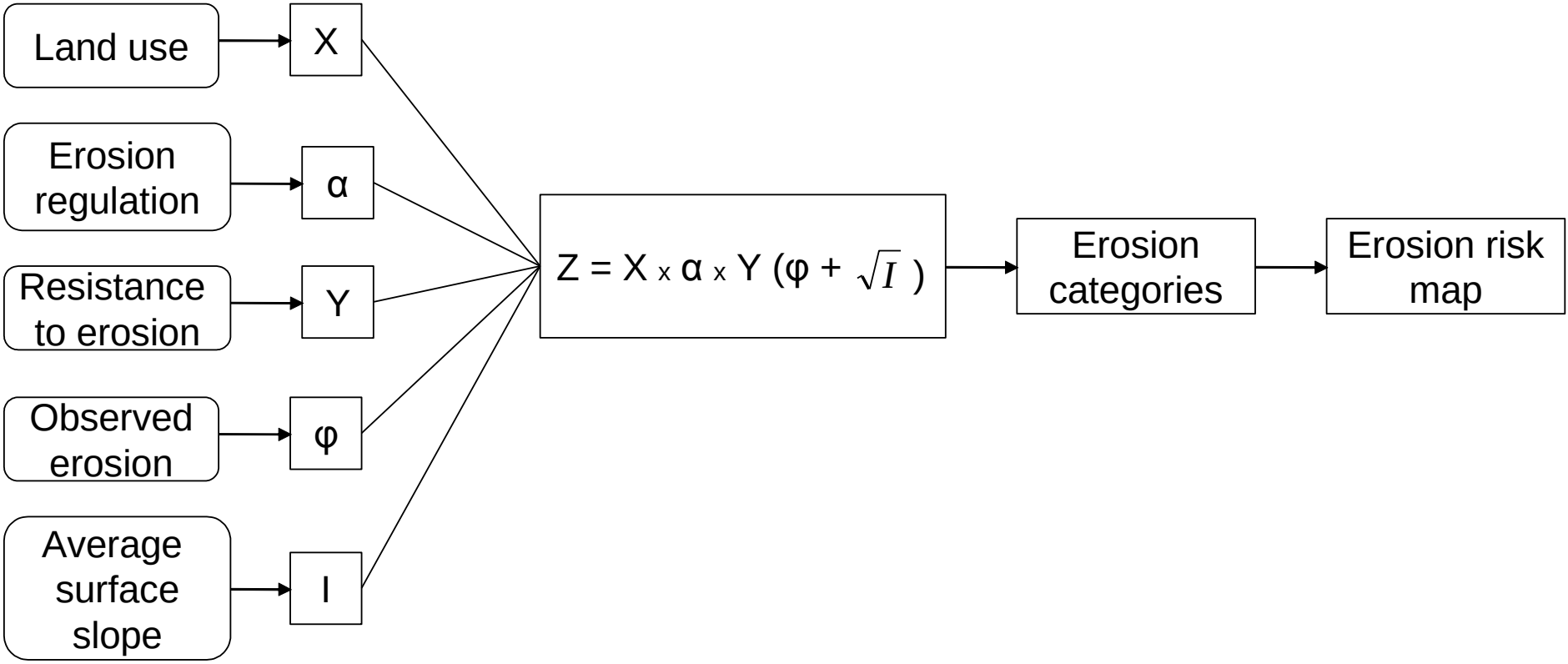
Methods for annual soil erosion risk estimation implementing in Serbia:

→ Universal Soil Loss Equation (USLE) (Wischmeier & Smith, 1978)

→**Erosion coefficient - Z** (Lazarević, 1985)

- Proposed by engineers from the Institute for Development of Water Resources “Jaroslav Černi”, Belgrade

- Official quantitative indicator of erosion risk, according to Regulation for program of systematic soil quality monitoring, indicators for evaluation of soil degradation risk and methodology for remediation programs development (Sl. glasnik RS 88/2010)



Flowchart for creating erosion risk map based on erosion coefficient (Z)

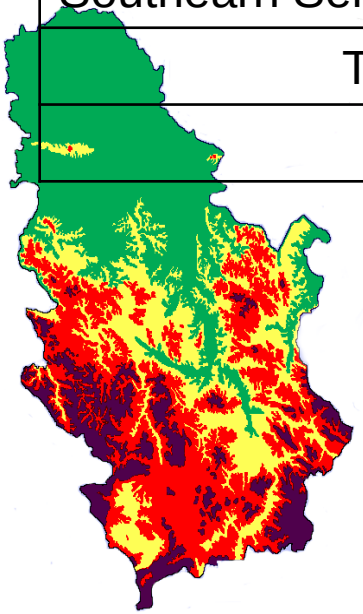
Erosion categories based in the erosion coefficient Z

Erosion category		Z (Erosion coefficient) interval	Wp* [t ha^{-1} y^{-1}]
I	Extreme erosion	Z > 1.0	> 45
II	Strong erosion	0.71 < Z < 1.0	37.5
III	Medium erosion	0.41 < Z < 0.7	15
IV	Light erosion	0.2 < Z < 0.4	7.5
V	Very light erosion	Z < 0.2	1.5

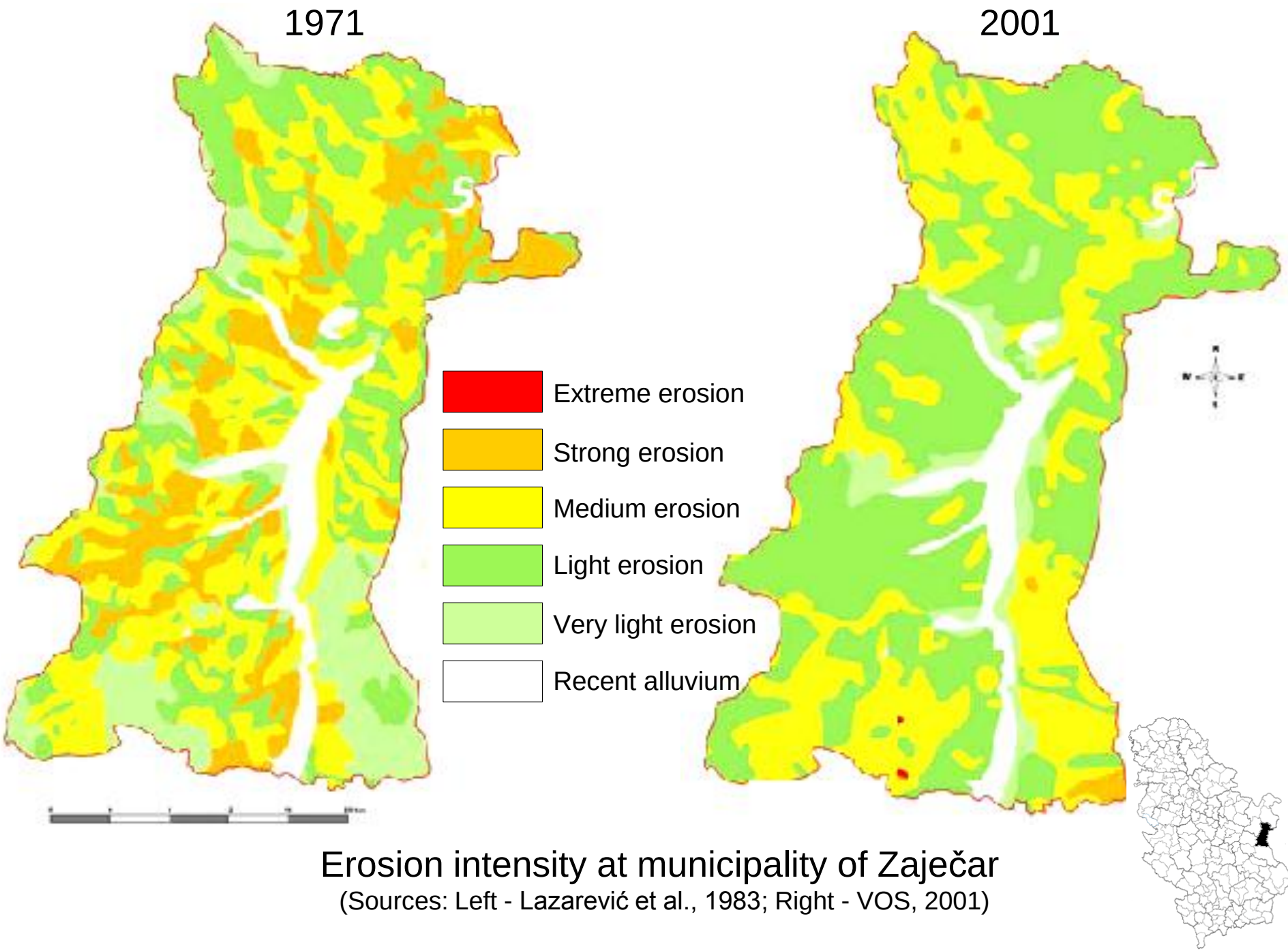
*Wp – Predicted sediment yield = Soil loss

Estimated distribution of water erosion in Serbia (based on erosion categories)

Region	Area [hx1000]	Water erosion category				
		Extreme (>45 $tha^{-1}y^{-1}$)	Strong (37.5 $tha^{-1}y^{-1}$)	Medium (15 $tha^{-1}y^{-1}$)	**Light** (7.5 $tha^{-1}y^{-1}$)	**Very light** (<1.5 $tha^{-1}y^{-1}$)
		[hx1000]				
Northern Serbia	2150.6	4.8	33.6	94.7	1519.3	498.2
Westearn Serbia	1490.2	57.8	214.9	487.0	539.4	191.1
Central Serbia	1118.0	11.0	140.7	293.5	450.4	222.4
Eastearn Serbia	1500.9	62.9	178.9	444.8	684.0	130.3
Southearn Serbia	1487.7	105.0	206.0	313.2	740.3	123.2
Total	7747.4	241.5	774.1	1633.2	3933.4	1165.2
%	100	3.12	9.99	21.08	**50.77**	**15.04**



Estimated soil loss is below EU set target of 10 t h^{-1} annually at approximately 65 - 70 % of the territory



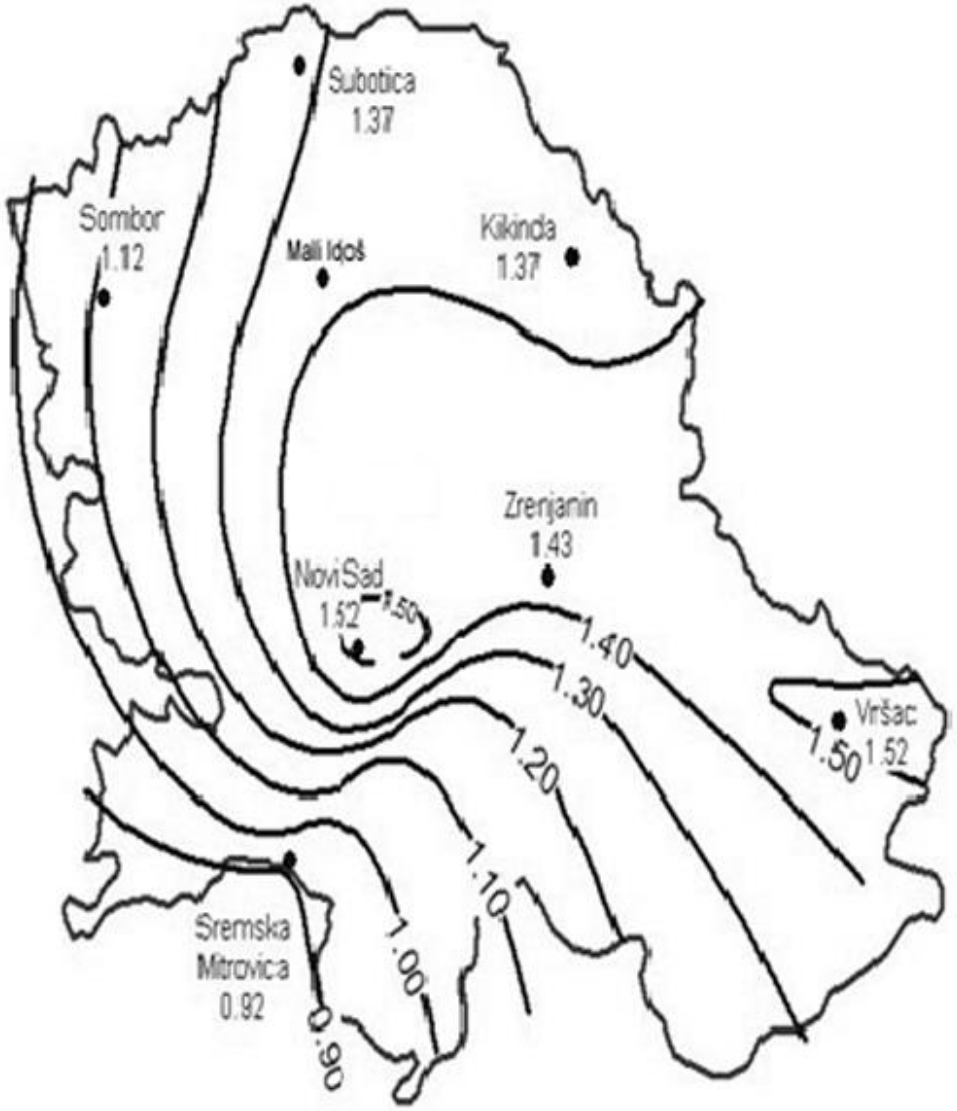
Erosion intensity at municipality of Zaječar

(Sources: Left - Lazarević et al., 1983; Right - VOS, 2001)

Wind erosion in Serbia

Affects approximately 25 % of the state territory

- 18 % in province of Vojvodina



Intensity of wind erosion (t h^{-1} y^{-1}) in autonomous province of Vojvodina

(Source: Vlatkovic, 2001)

Legislative frame for soil protection against erosion

Low on agricultural soil
(Sl. Glasnik 62/2006)

Low on water
(Sl. Glasnik 30-10/2010)

Regulation for program of systematic soil quality monitoring, indicators for evaluation of soil degradation risk and methodology for remediation programs development
(Sl. glasnik RS 88/2010)

National strategy for preserving national resources and goods (2010)

Elements for identification of erosion area

- Soil type
- Soil texture
- Soil water/temperature properties
- Topography
- Soil cover density
- Soil use
- Climate
- Hydrological conditions
- Erosion causing factors
- Coefficient of erosion Z

Erosion areas identification, monitoring, mapping, protection and repairing are obligatory provided by districts – regional centers of authority (29) and municipalities

Measures to prevent erosion (Low on Agricultural soil, 2006)
1) Temporarily or permanent prohibition of pastures and meadows (and other terrains) plowing for establishment of annual crops
2) Crop rotation
3) Tillage systems
4) Planting shelterbelts
5) Planting perennial trees
6) Ban on grazing livestock for a limited time, or limiting number of grazing animals on a certain surfaces
7) Infrastructure constructions
8) Ban on felling of forests and forest plantations above the affected parcels
9) Other measured

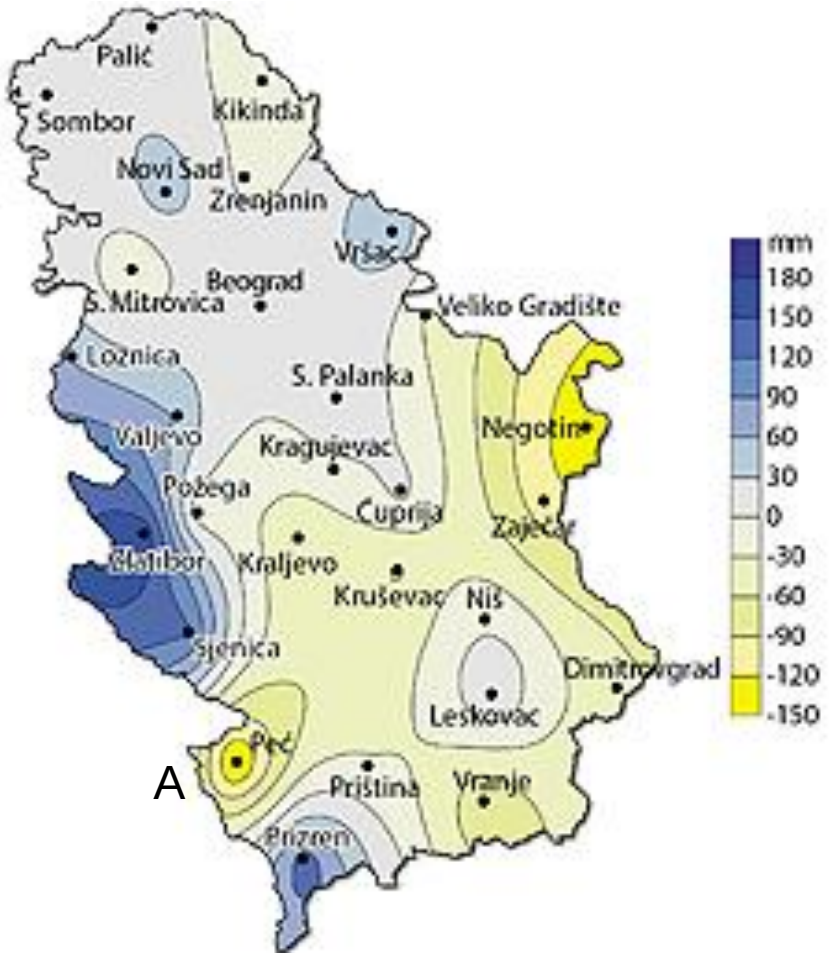
→ Control of the implementation of the erosion measures is provided by competent body of the local community

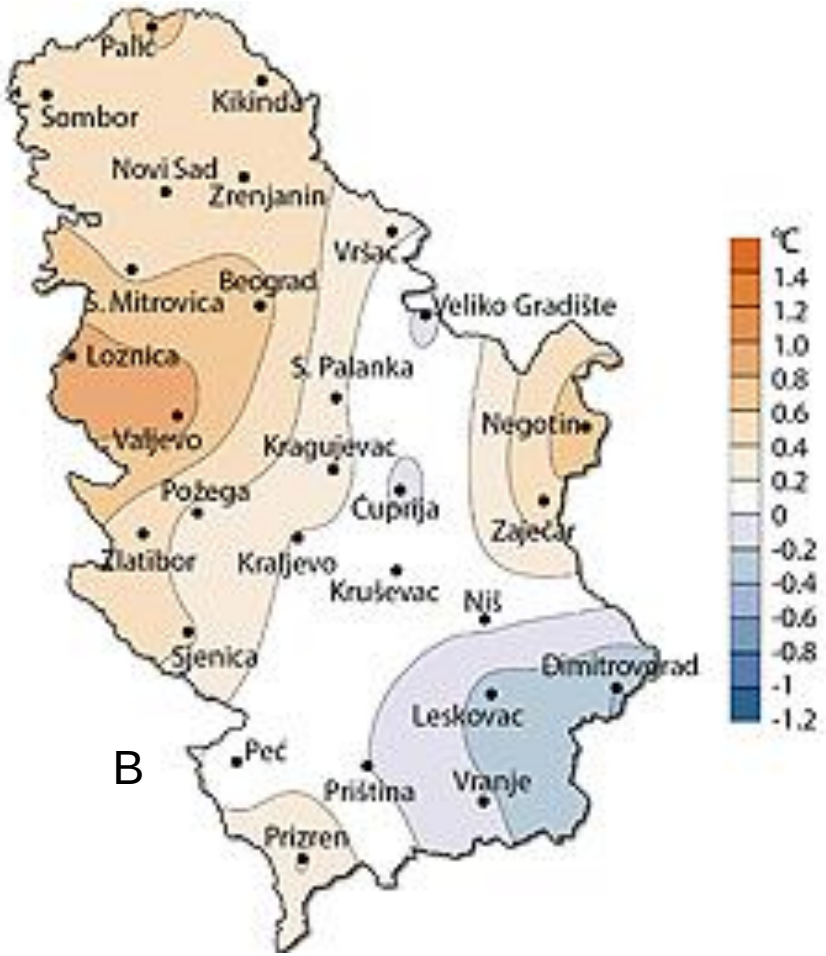
→ The Low on Agricultural soil obligate that biological measures should be implementing each year to at least 4% of new areas of total area affected, susceptible or endangered by erosion

Problems to be solved
1) Creation of erosion risk map for the entire state territory, rather then for separate districts
2) Harmonization of the risk assessment method on two levels (national and EU)
3) The low should obligate standardized procedure for erosion risk assessment, instead of different (new) projects for each district
4) The low should consolidate the current terms “erosion zone” (terrain affected by erosion at different intensity) and “erosion area” (terrain susceptible to erosion, but without visible signs of erosion)
5) The low should oblige the land users to implement the measures to prevent erosion or allow implementation of repair project, if necessary (financed by state or local governments)

Work currently in progress….
1) Formation of digital erosion map for the entire state territory
2) Constitution of *Serbia's Water Information System - VIS* (geo-informative system for monitoring the status of the torrent flows, the changes in erosion, and the facilities for protection against erosion)
3) State Project for planned planting of shelterbelts in the province of Vojvodina
4) Projects for torrent flows regulation at the most endangered areas

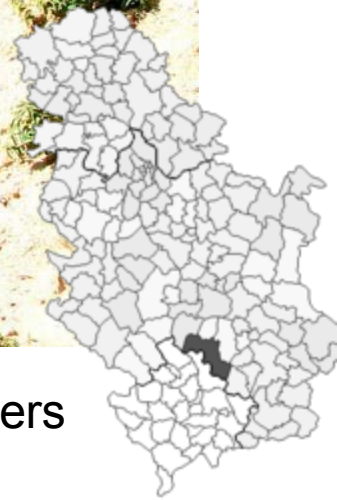
Trends in the average annual precipitation (A) and temperature (B) from 1954 to 2004





(Source: Republic hydrometeorogical service of Serbia)

Possible effects of climate change on soil erosion?



Đavolja Varoš (“Devil’s town”) was a nominee in the New Seven Wonders of Nature campaign started in 2007