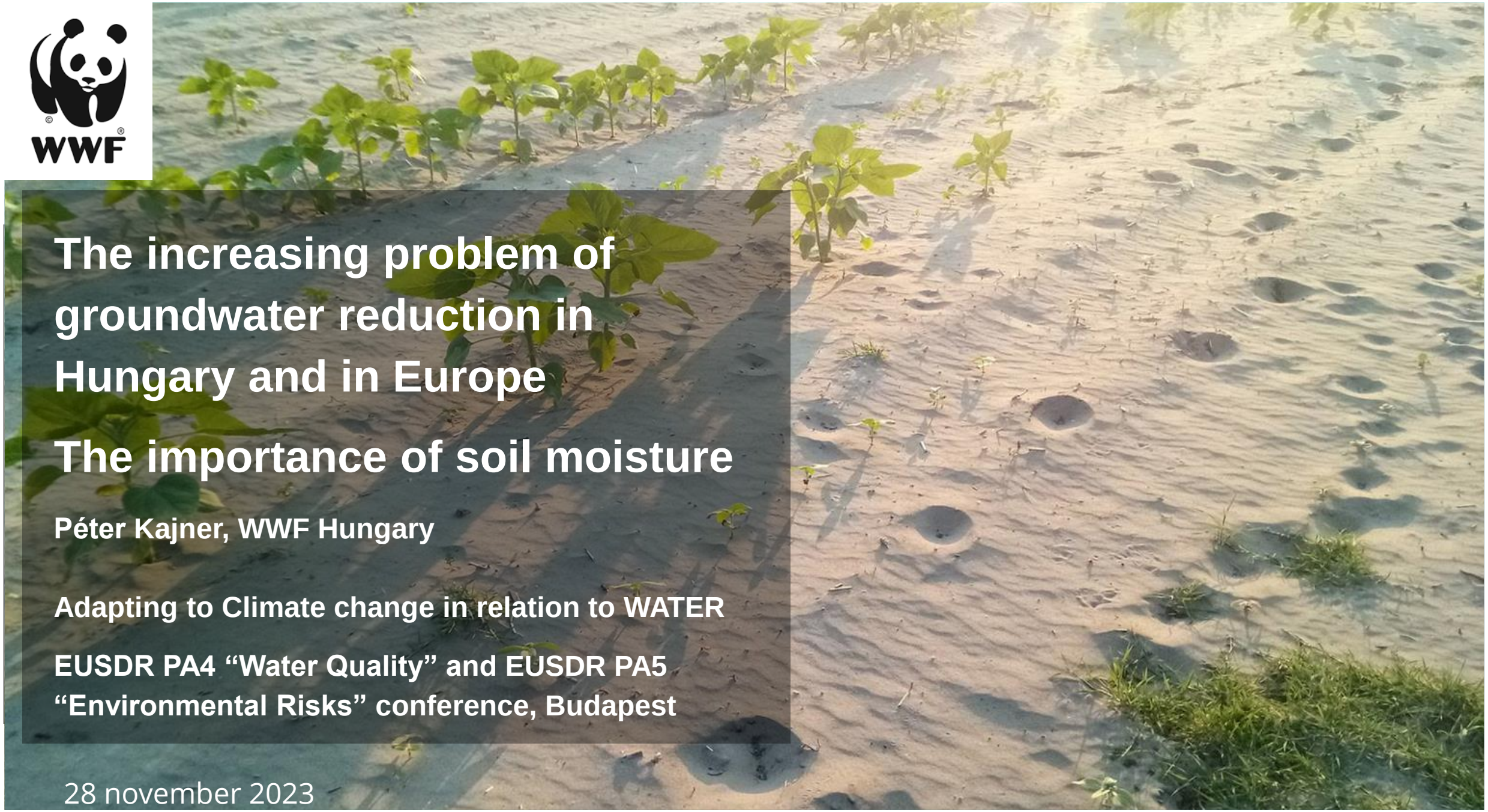


The increasing problem of groundwater reduction in Hungary and in Europe

The importance of soil moisture

Péter Kajner, WWF Hungary

Adapting to Climate change in relation to WATER

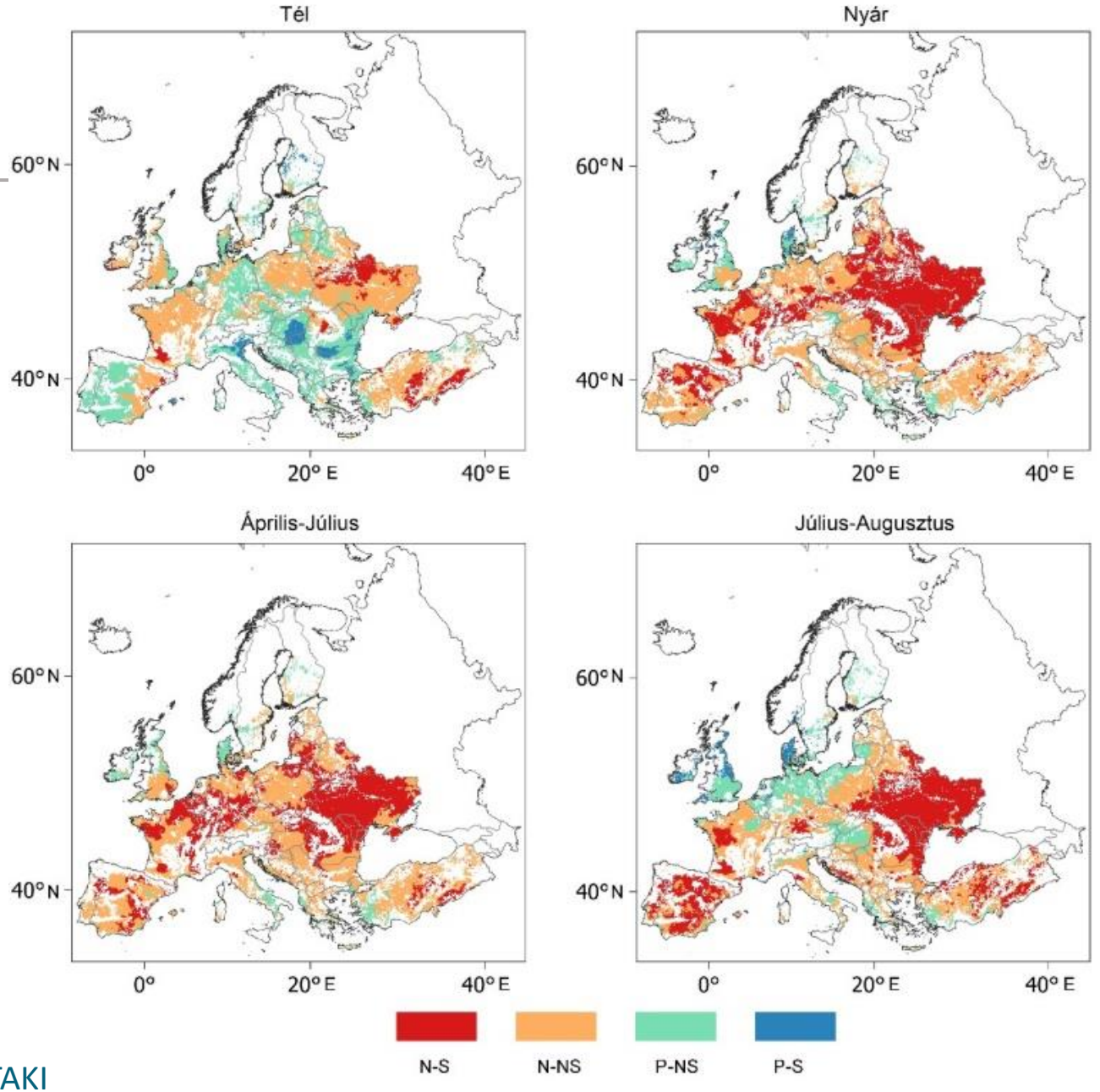
EUSDR PA4 “Water Quality” and EUSDR PA5 “Environmental Risks” conference, Budapest

28 november 2023

Long-term soil moisture decline across Europe

- The annual average soil moisture available for plants has been on a downward trend across most of the continent between 1981 and 2017
- In the summer half of the growing season, which covers most of the growing season, soil moisture decreased significantly in almost half of European agricultural areas
- The most significant decreases occurred in Eastern Europe, Ukraine, Moldova and Romania
- Without massive restoration of wetlands, a wave of land abandonment similar to that in southern Europe (19 M ha over 60 years) can be expected in Hungary

Source: Pinke et al. (2022) – ELTE, BME, CSFK, ATK TAKI



Seasonal trends in available moisture in the upper 0-28 cm layer of European agricultural soils between 1981 and 2017 (0.1◦ × 0.1◦ resolution)

N: negative trend; P: positive trend; S: significant change; NS: not significant change

Soil regeneration farming – enhancing the soil's capacity to store water

- 1 m^3 of living soil can store up to 500 litres of water
- The top one metre of soil could hold ~45 km^3 of water and store ~25-35 km^3 of water in Hungary
- This is nearly 2/3 of the precipitation
- 40-45% of this is "usable water" for plants
- Intensive farming degrades soil structure and reduces its living matter content
- No-tillage can restore living matter and improve water holding capacity

Data: LIFE-MICACC, Várallyay, Kolossváry

Challenges / opportunities of water retention and land use change in Bereg on Tisza floodplain

Péter Kajner, WWF Hungary

Adapting to Climate change in relation to WATER

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Water management optimised for draining, lost wetlands, drying

Environmental conditions

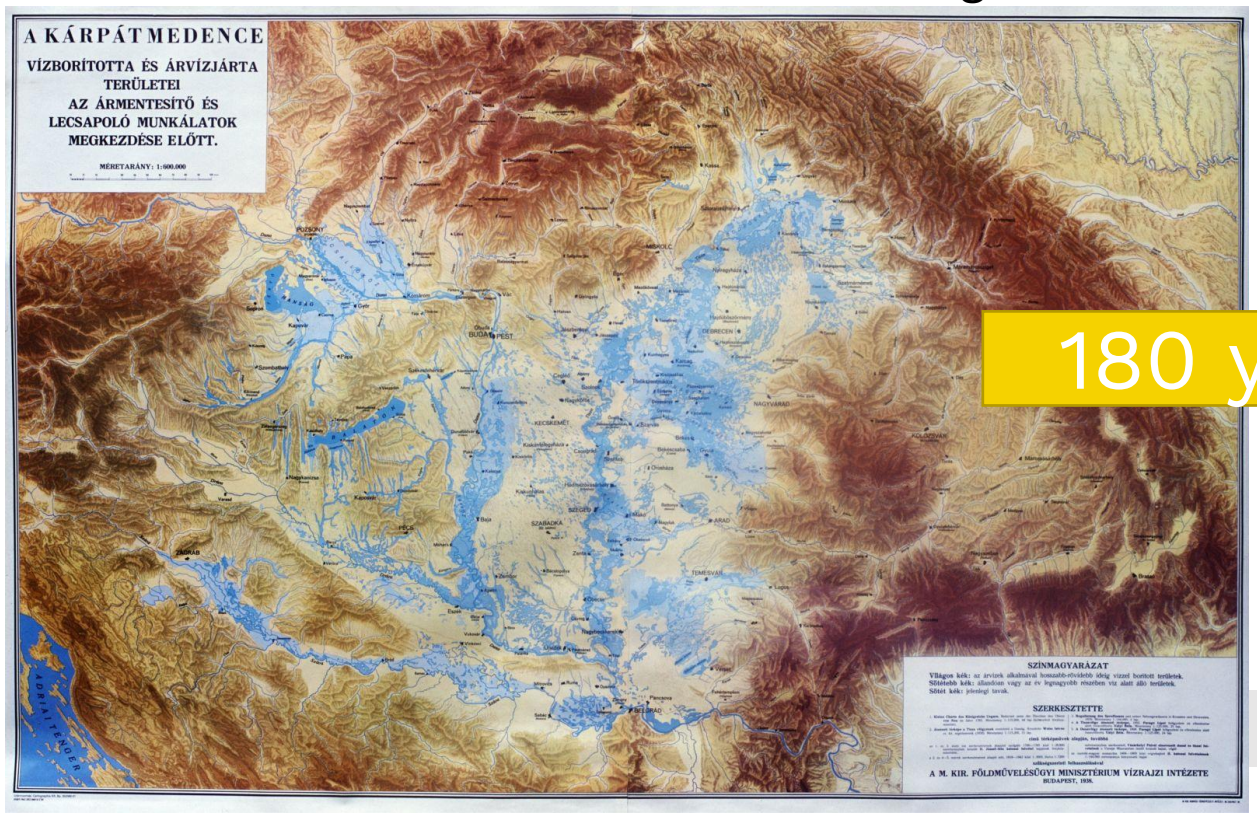
- Carpathian Basin
- Annual precipitation in Hungary: 500-750 mm
- Potential evapotranspiration in Hungary : 800 mm

Water management

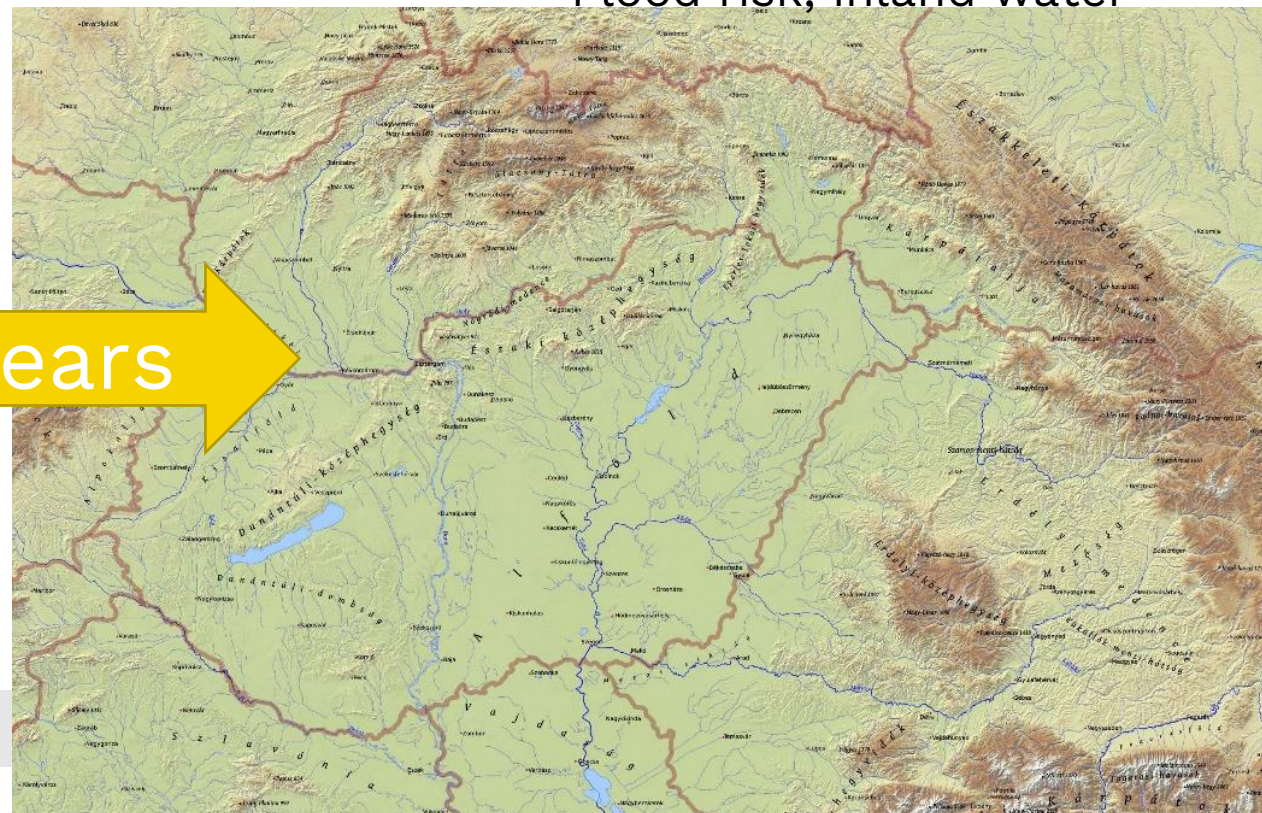
- Drainage channels: ~43,000 km
- Flood protection dikes: 4,200 km
- 25% of the country flood protected (30% of arable land)
- Negative climatic water balance

River regulation

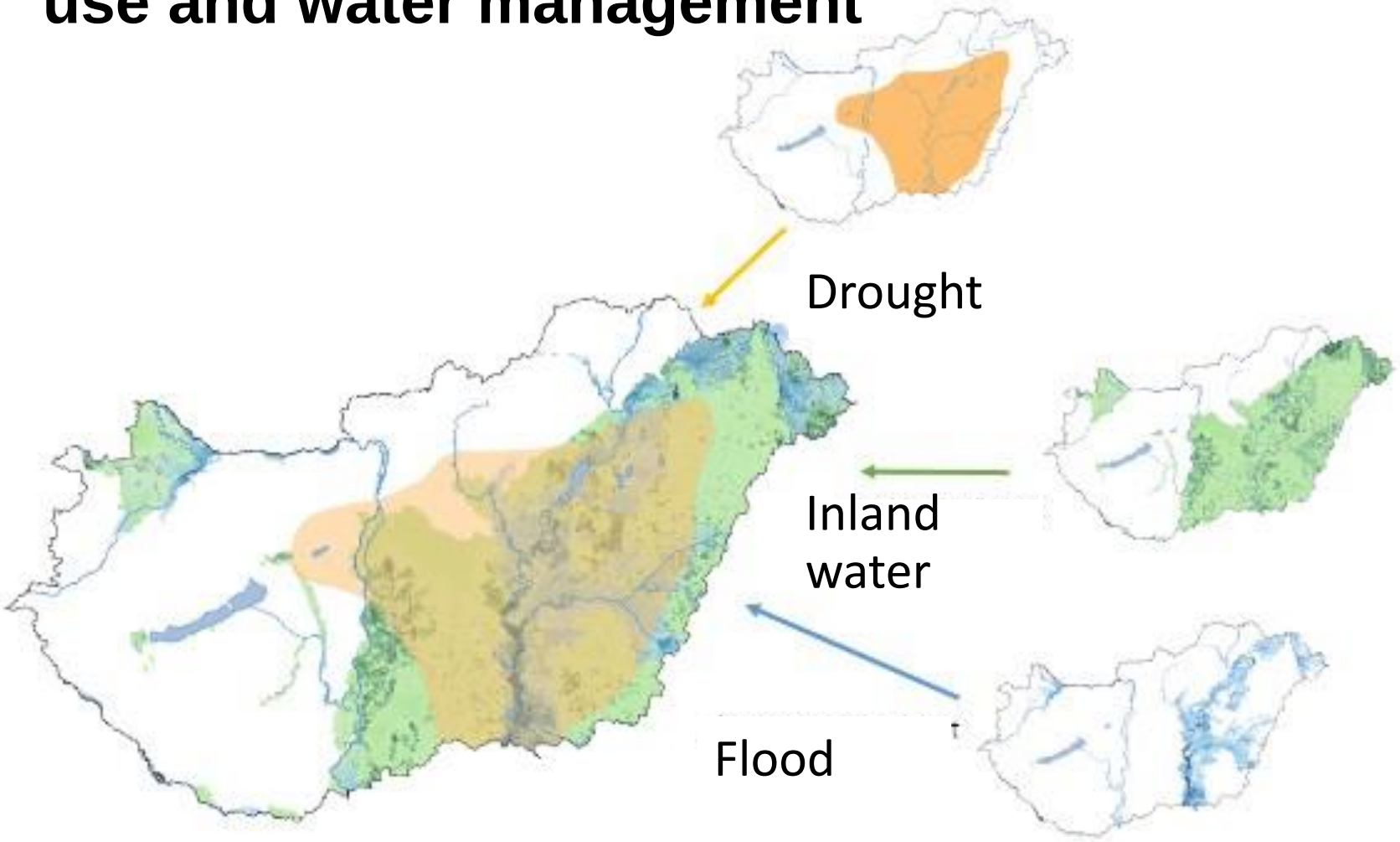
- A lot of arable land gained
- 90% of floodplains lost
- 97% of wetlands lost
- Decreasing groundwater
- Flood risk, inland water



180 years

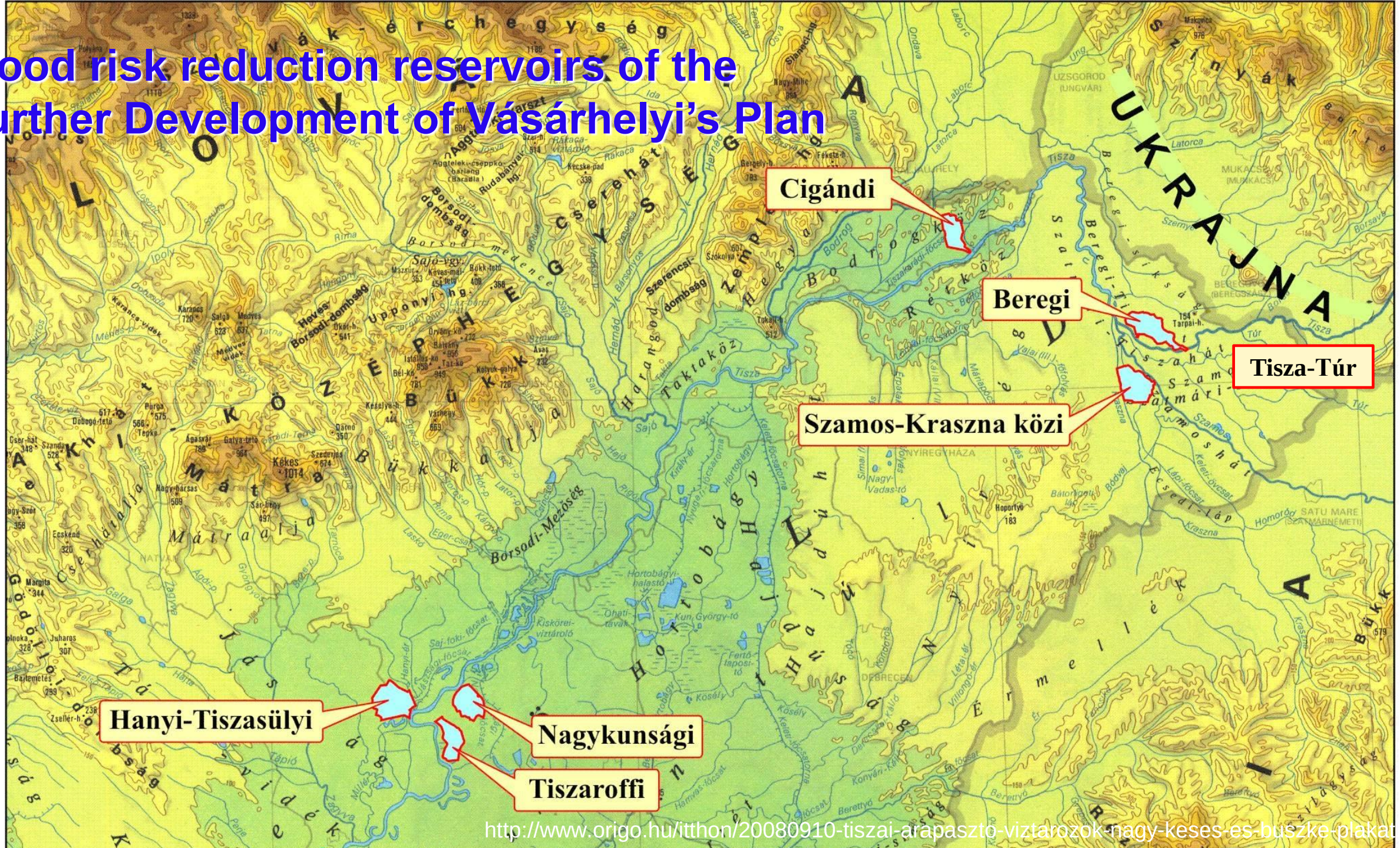


Extremities caused by climate change, land use and water management

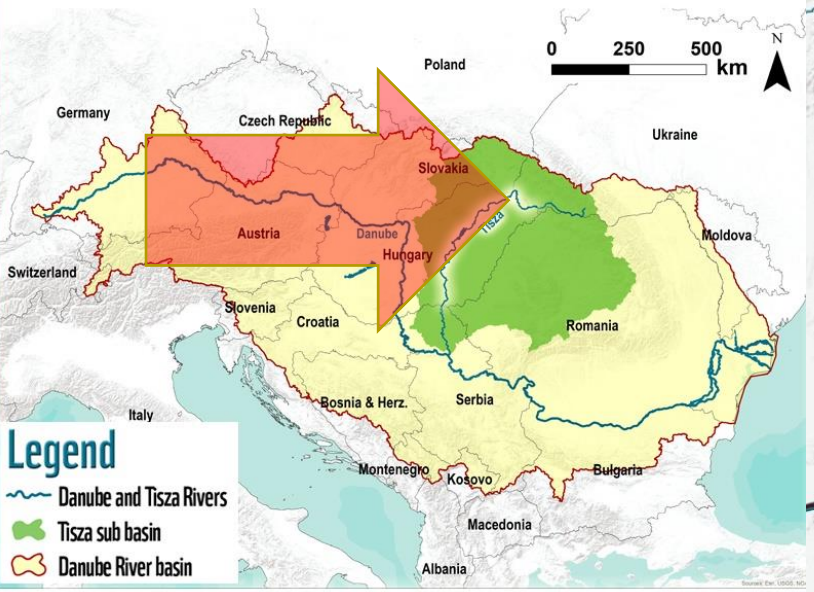


Reference: Vári et al. / NÖSZTÉP (2021)

Flood risk reduction reservoirs of the Further Development of Vásárhelyi's Plan



http://www.origo.hu/itthon/20080910-tiszai-arapaszto-viztarozok-nagy-keses-es-buszke-plakat



WWF HU – Tisza 21 Program

Long term goal

→ To preserve and enhance the naturalness of floodplains, river ecosystems along Tisza River

Target by 2030

→ Water retention based, nature friendly floodplain management systems are introduced in the Hungarian part of the Tisza River Water basin, wherever possible, but at least on 150,000 ha, in order to improve biodiversity and provide benefits for local communities

Extensive grazing [1]

River Tisza near Nagykörű [1]

Sustainable land use [1]

Retaining water in flood reservoirs [1]

Nesting and feeding place for birds [2]

Tiszadob
Tisza
Ihrány
Bereg
Besenyszög
Fokorúpuszta
Kenderes-Bánhalma
Nagykörű
Tiszakécske
Martfű
Tiszaföldvár
Cibakháza
Móricgát
Szank
Jászszentlászló
Latorica
Bodrog
Hernád
Sajó
Hron
Ipeľ
Zagyva
Hortobágy-főcsatorna
Hortobágy-Berettyó
Berettyó
Körös
Crișul Repede
Crișul Negru
Maros
Szamos

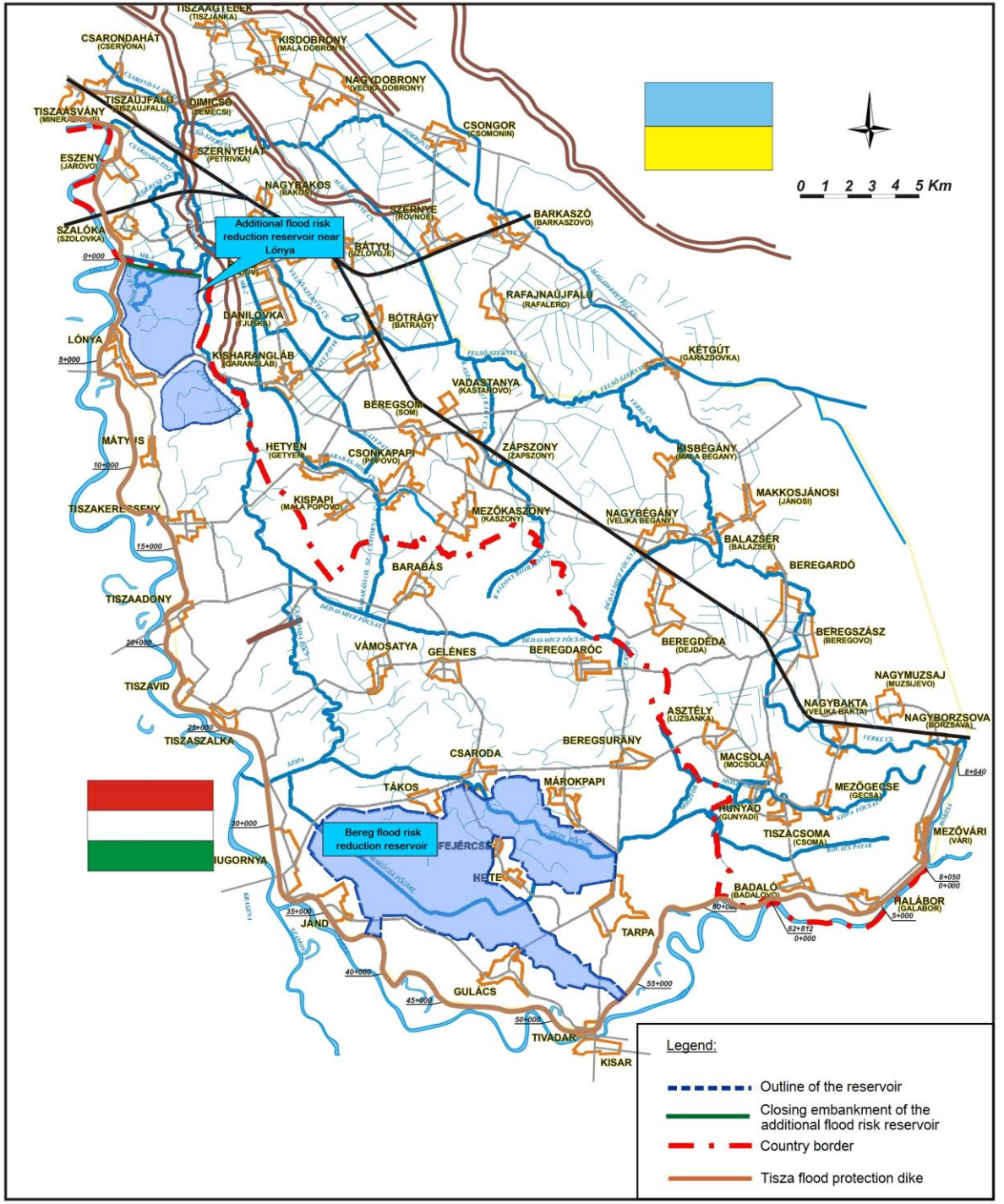
The photos are illustrations from the Hungarian Tisza River Basin. © [1] WWF Hungary, [2] Bence Máté. Map sources: WWF, ICPDR, Esri, USGS, NOAA

0 25 50 100 km

Bereg

- 380 km^2
- Water reservoir system built to be able to retain water from the floods of the river Tisza
- Water replenishment by
  - gravity
  - solar powered pumping (planned)
- 3 water inundation scenarios
- Land use change is being planned involving farmers and stakeholders
- New CAP subsidies proposed
- New value chains will be built for floodplain farming
- Organizing cooperation of stakeholders
- Interest representation
- Complex rural development

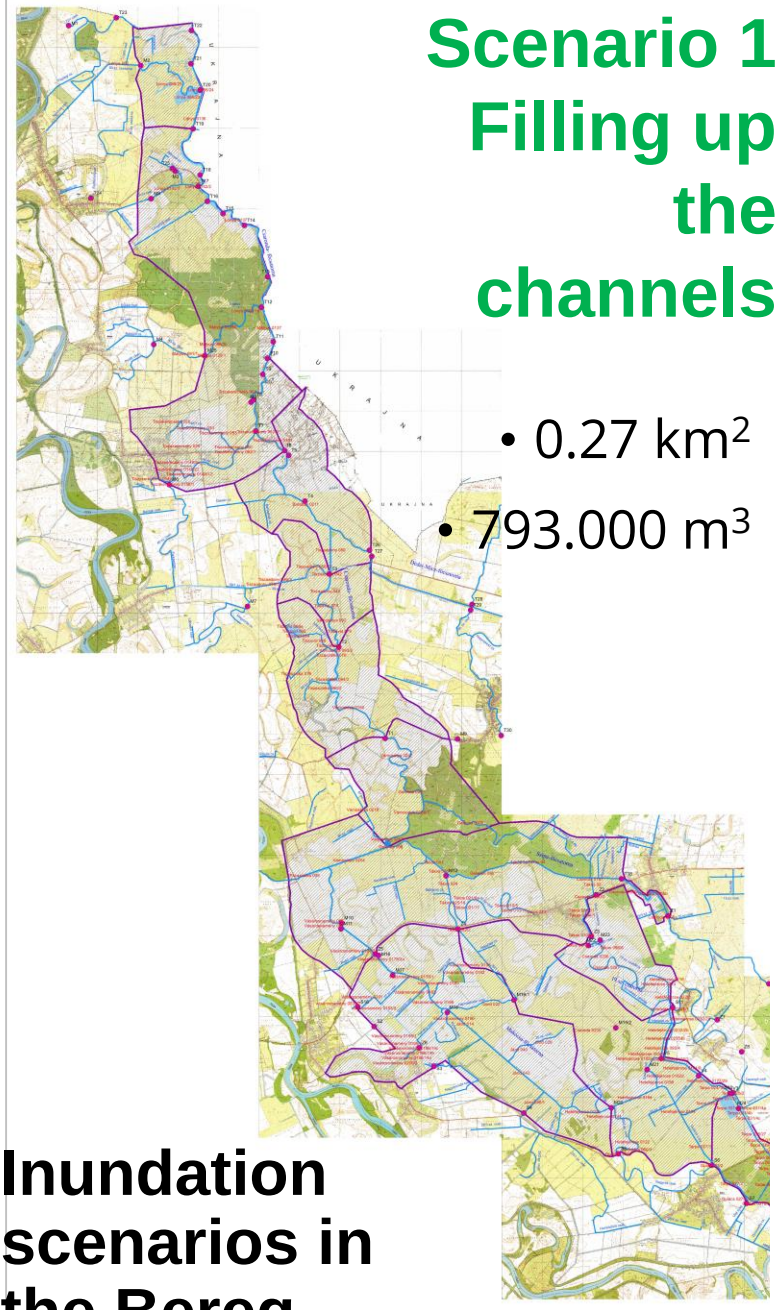
Challenges / opportunities of water retention and land use change in Bereg on Tisza floodplain



WWF 'More space for water and life' Vízpótlás a Bereg

Scenario 1
Filling up the channels

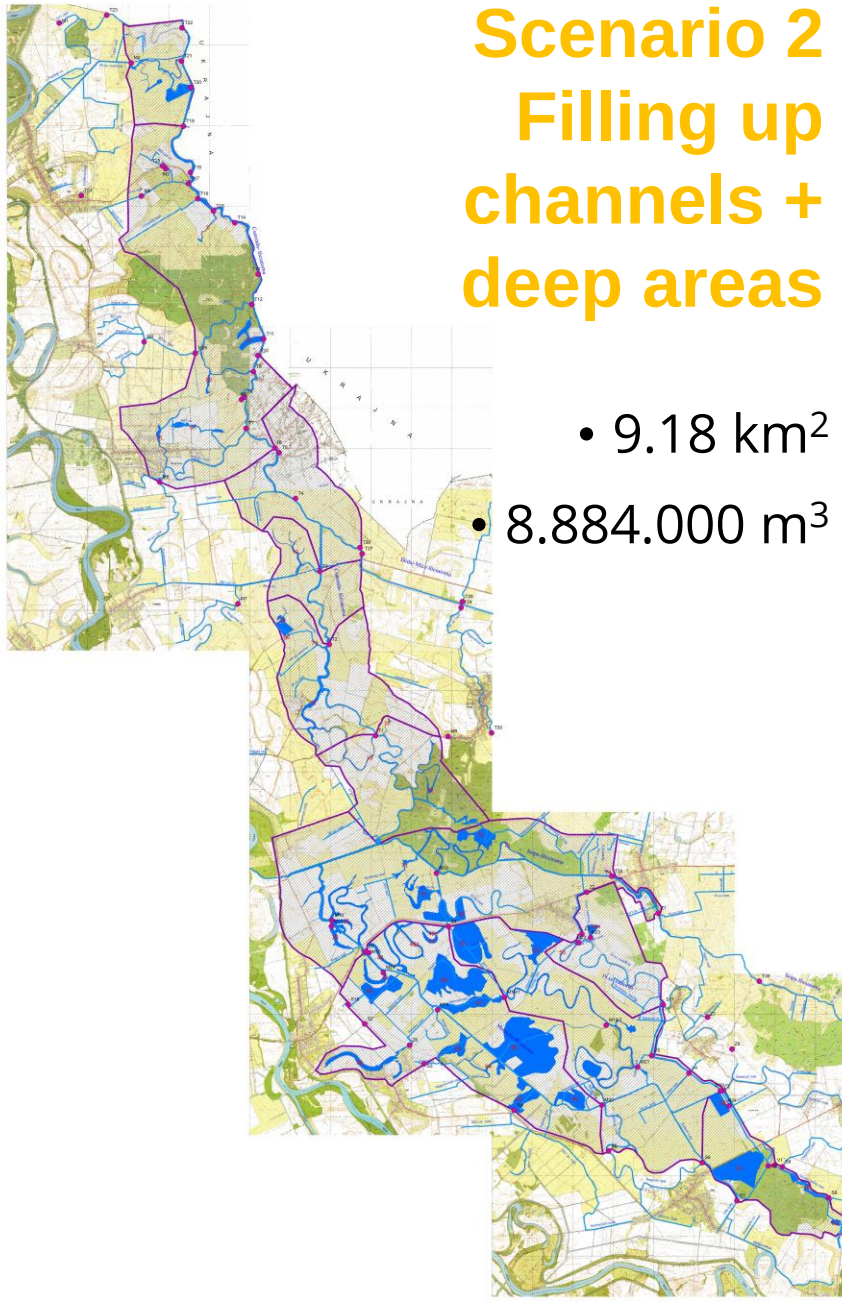
- 0.27 km²
- 793.000 m³



WWF 'More space for water and life' Vízpótlás a Beregben II.

Scenario 2
Filling up channels + deep areas

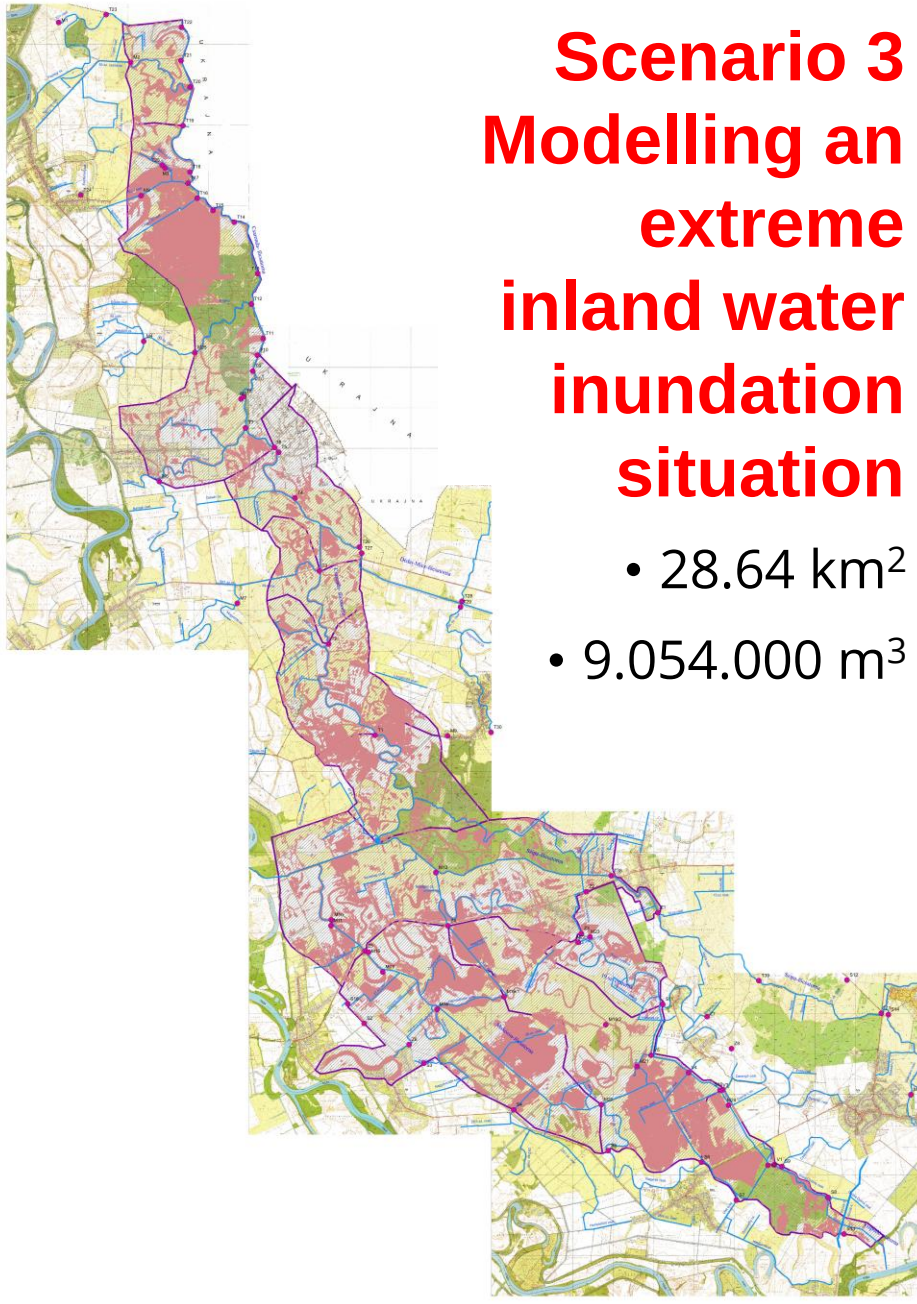
- 9.18 km²
- 8.884.000 m³



WWF 'More space for water and life' Vízpótlás a Beregben III. Ütem

Scenario 3
Modelling an extreme inland water inundation situation

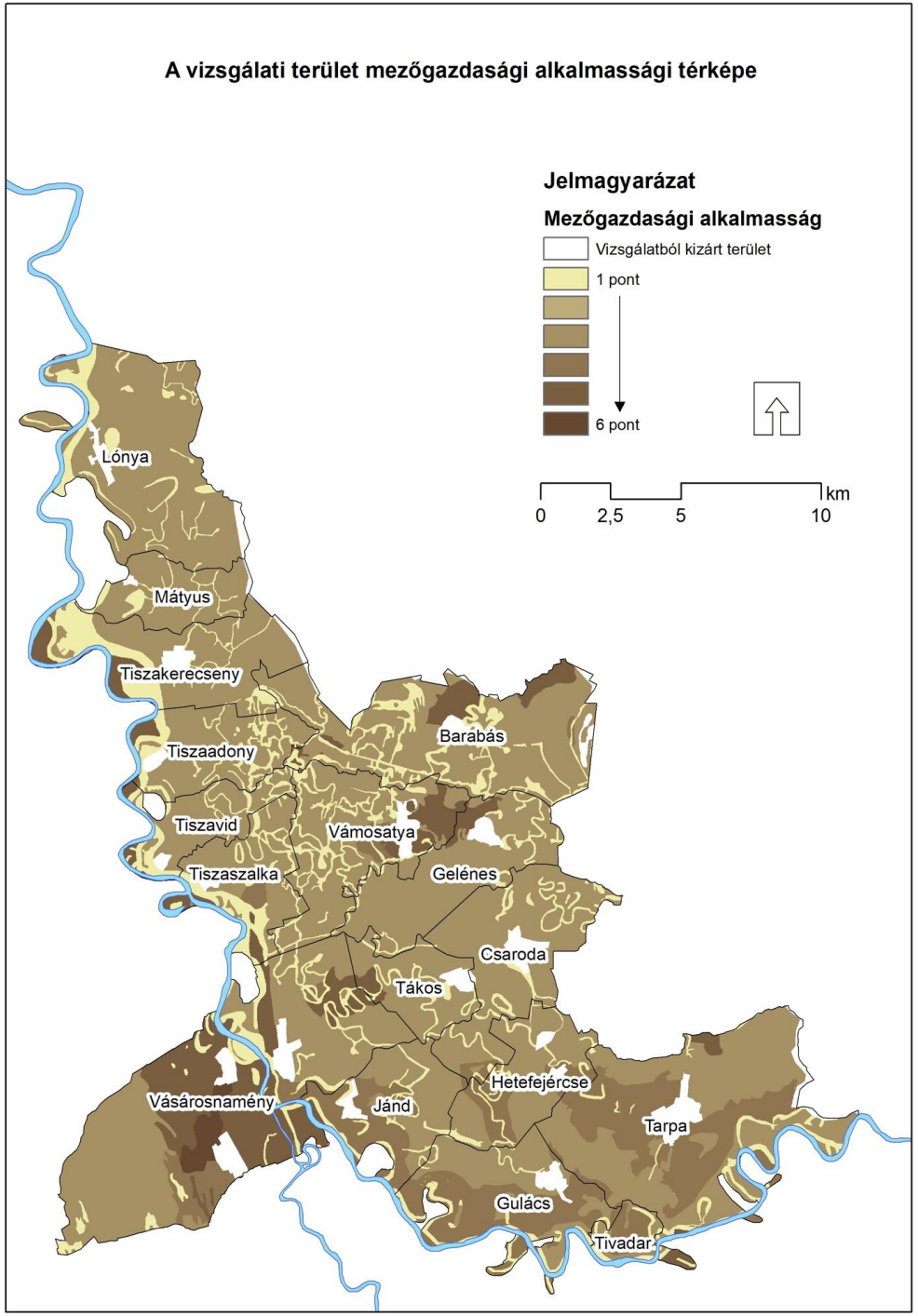
- 28.64 km²
- 9.054.000 m³

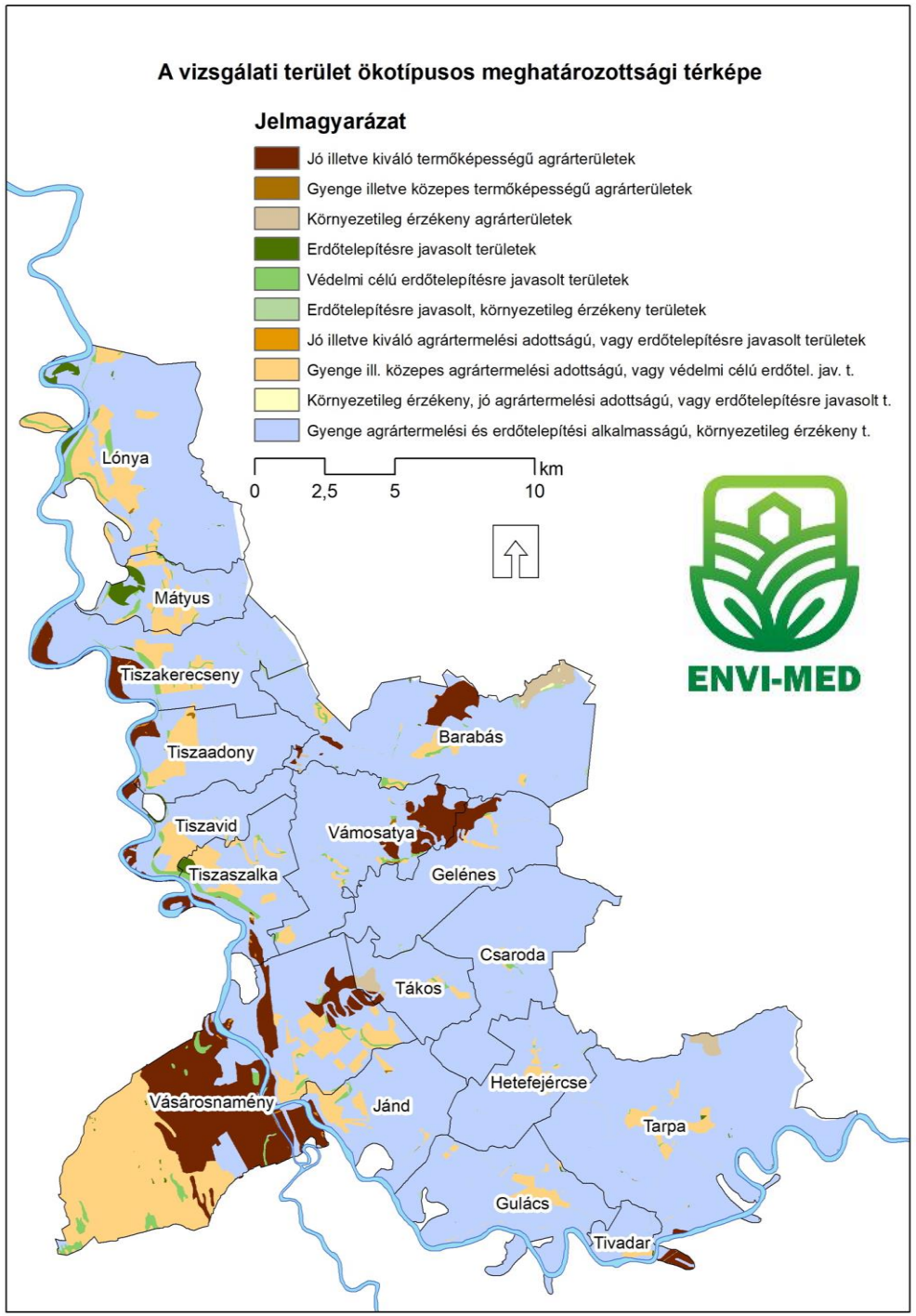


Inundation scenarios in the Bereg

Analyses, fora for land use change

- Analysis of land use
- Social, economic situation
- Elaboration of proposed land use alternatives
- CAP subsidies
- Building new value chains





Bereg Area: the change has started