Hydrogeology in the Carpathian Basin

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EFG Hydrogeology Workshop

European water policy: challenges for Hydrogeologists

Brussels, 22-23 November 2013

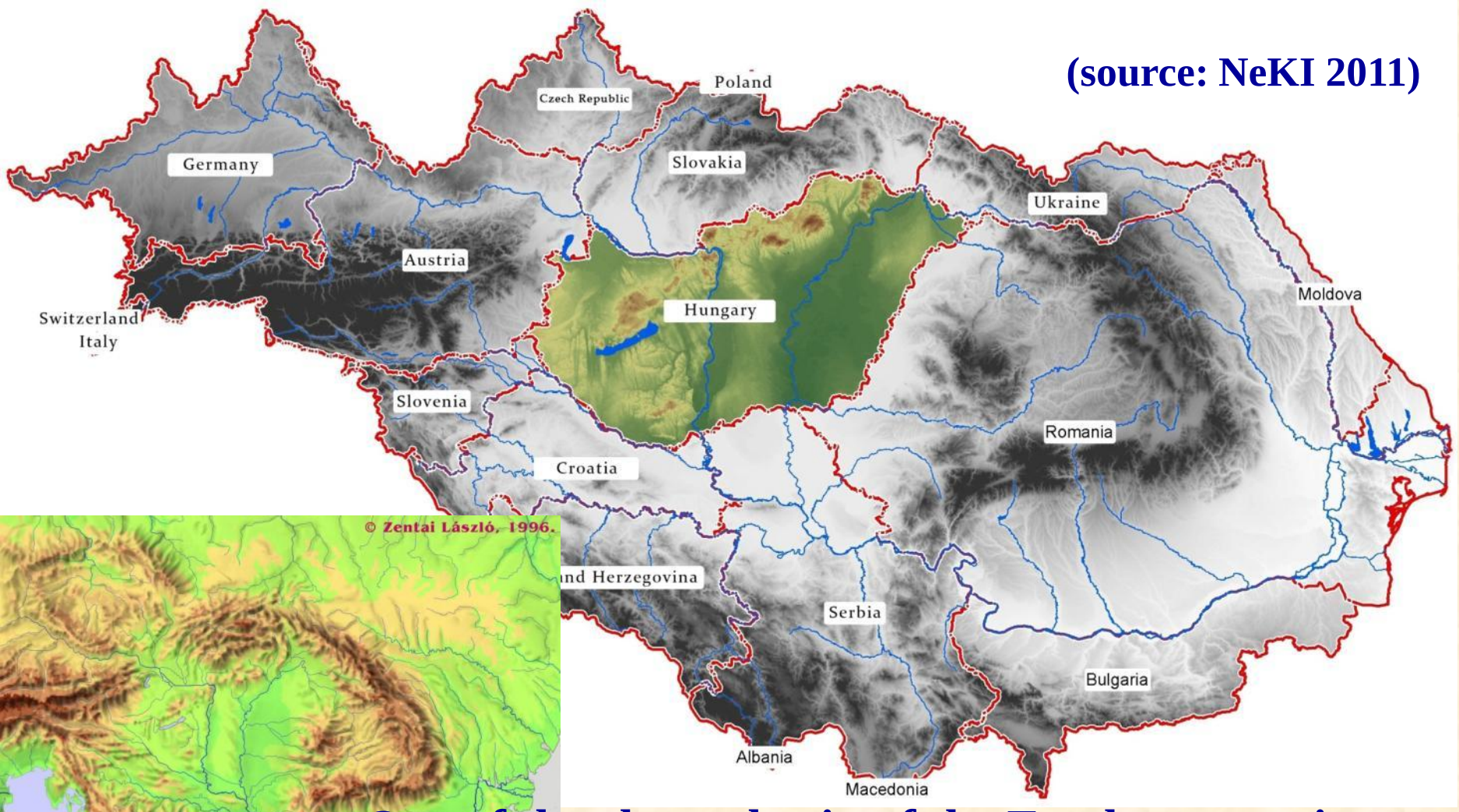
Outline

- Facts and specialties concerning hydrogeology in the Carpathian Basin

- Implementation of the Water Framework and Groundwater Protection Directives. Challenges and experience

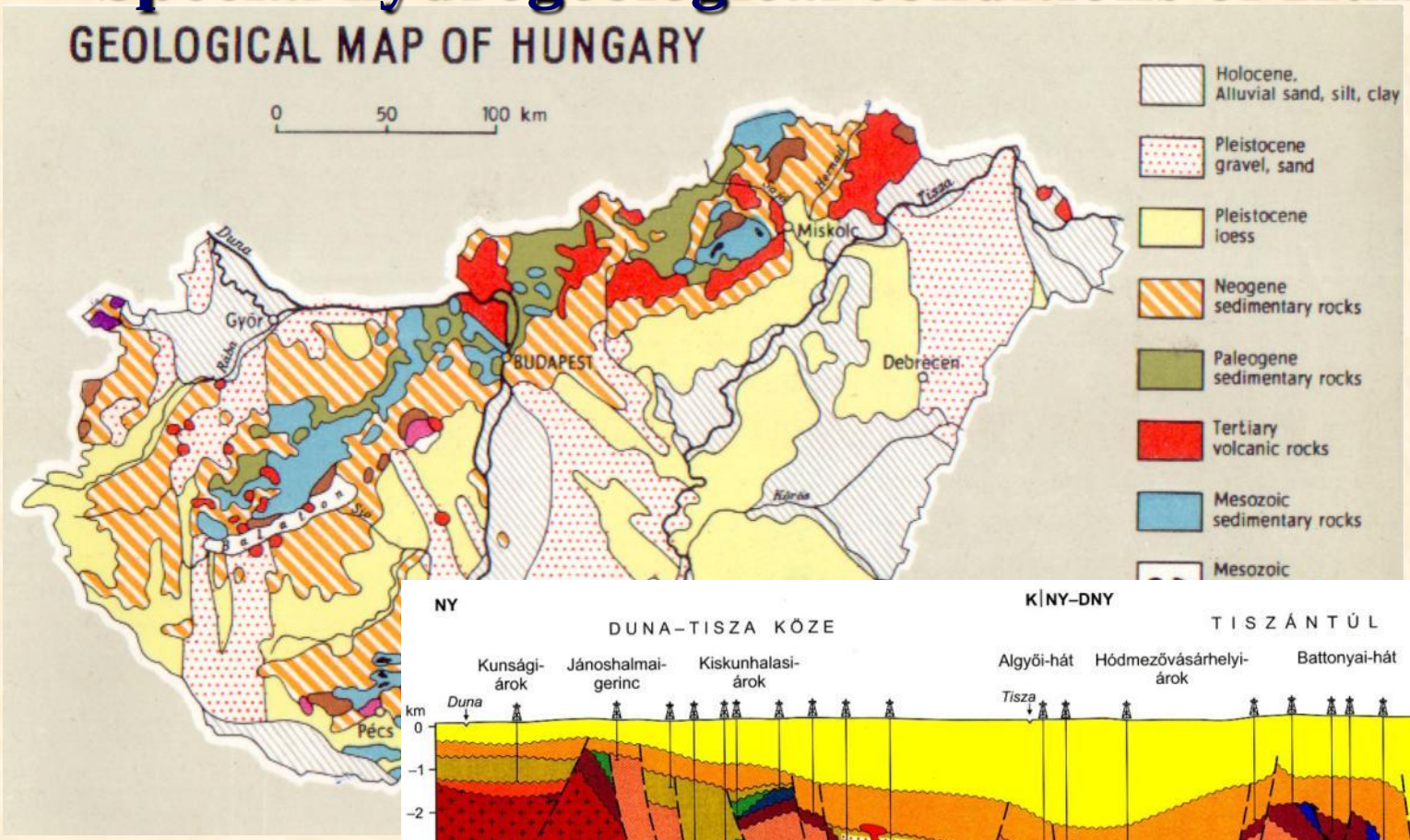
- Conclusions

Special hydrogeological conditions inside the Carpathian Basin belonging to the Danube watershed



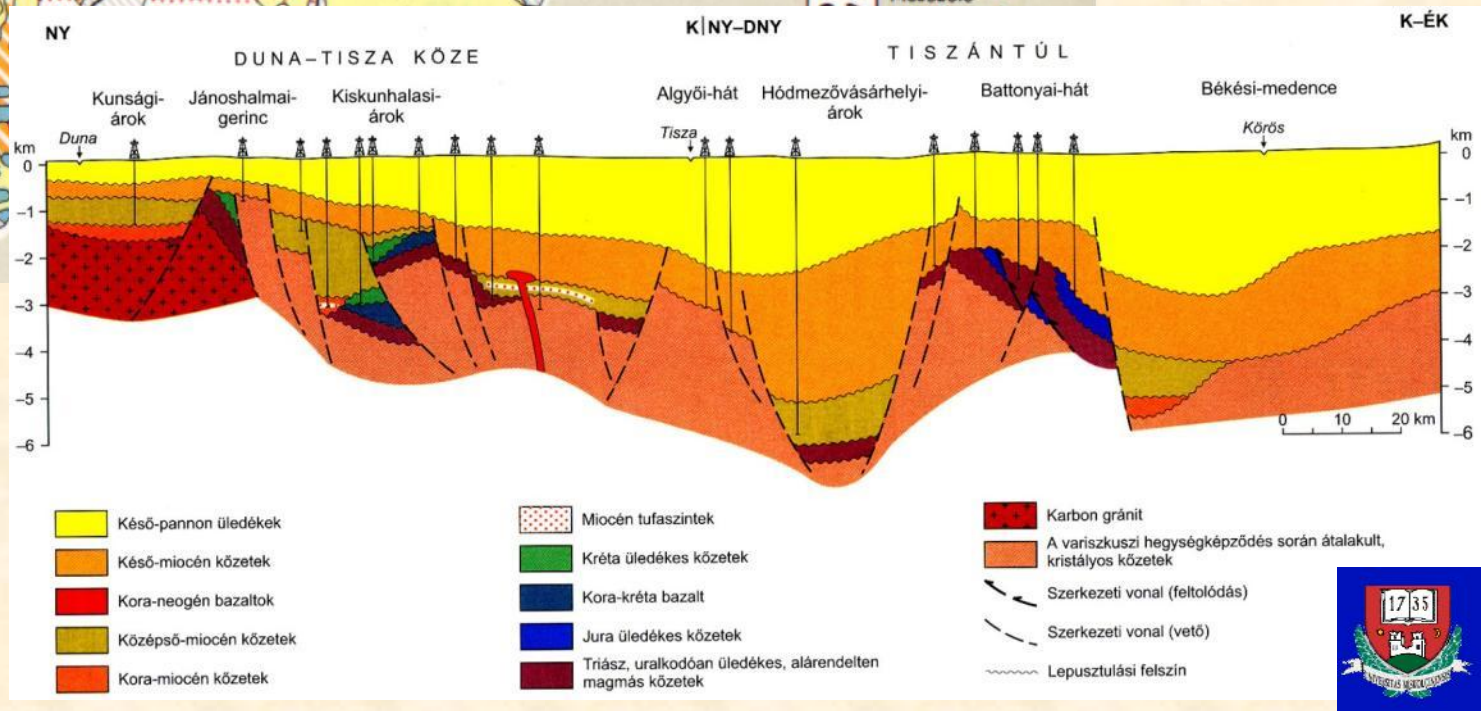
One of the closest basin of the Earth concerning the surface and subsurface water accounts

Special hydrogeological conditions of Hungary



Complex geology

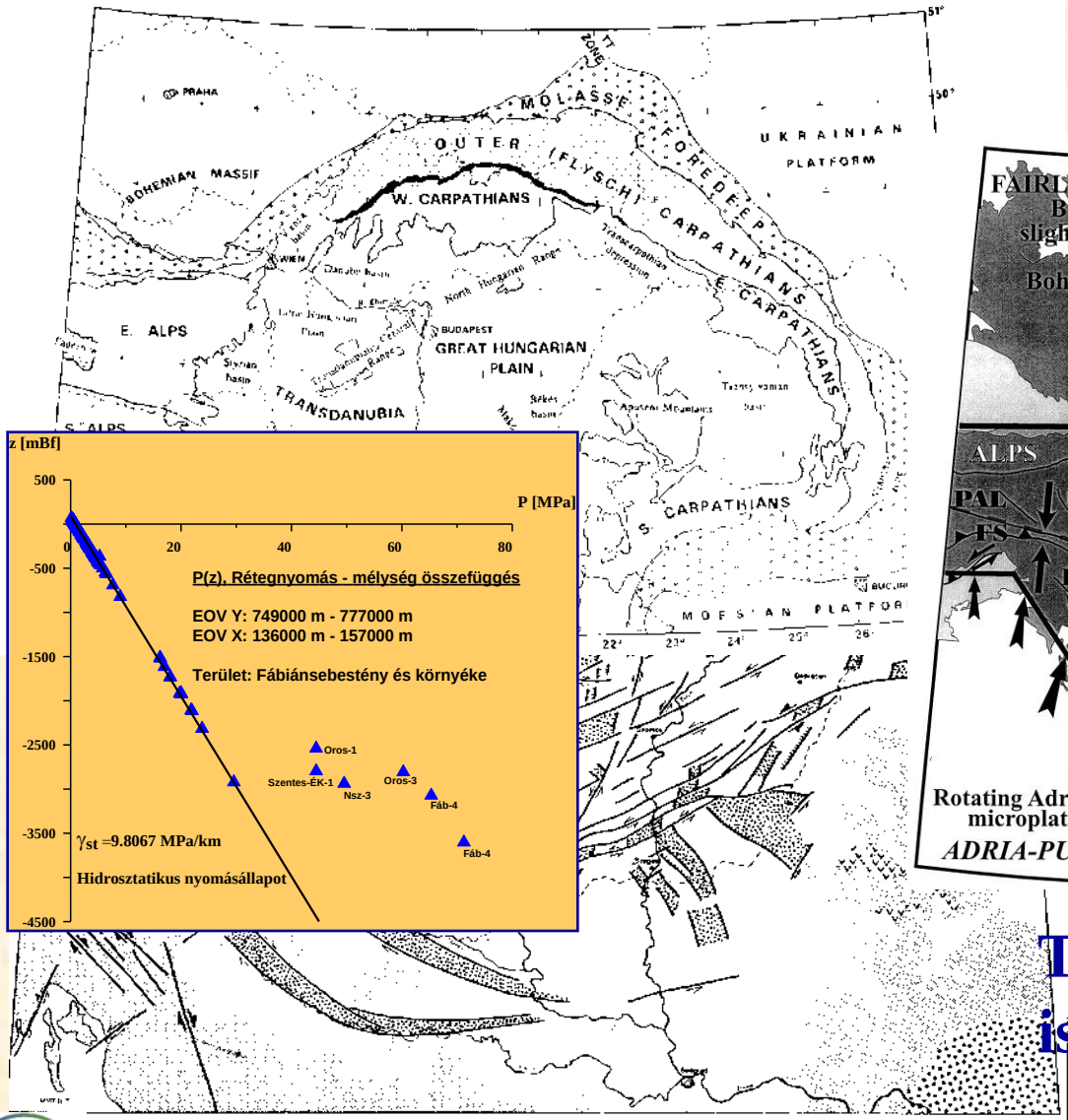
Pre-Neogene basement relief

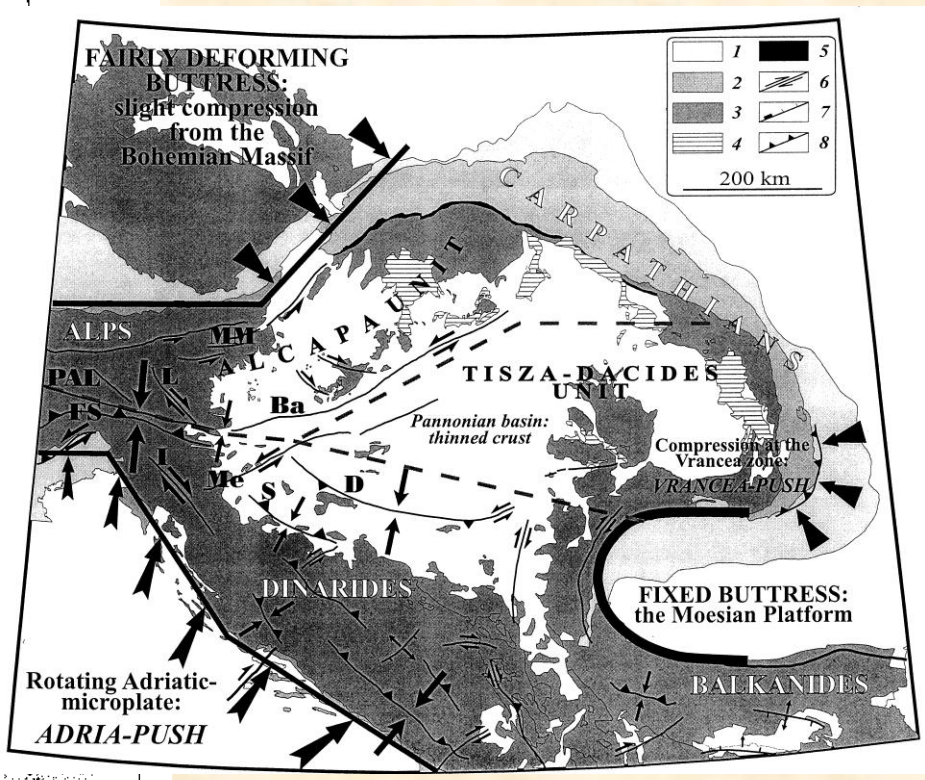


Haas (2001)

Special hydrogeological conditions of Hungary

(Bada et al. 1999)

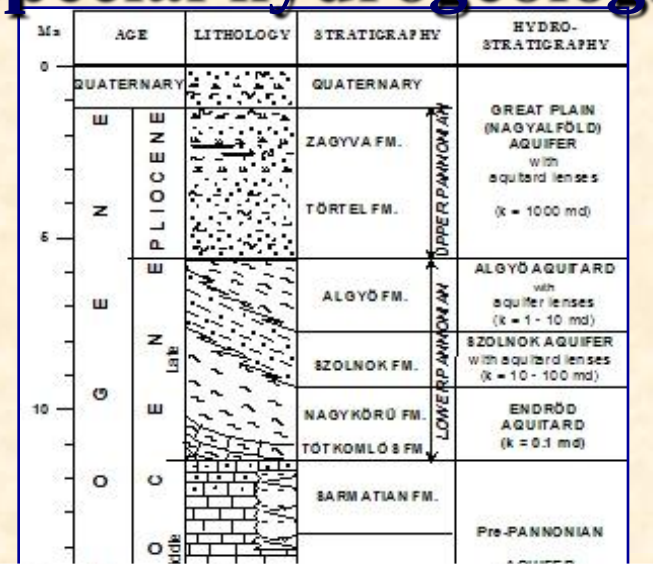




The Carpathian Basin is under tectonic compression

Over-pressured aquifers

Special hydrogeological conditions of the Great Plain

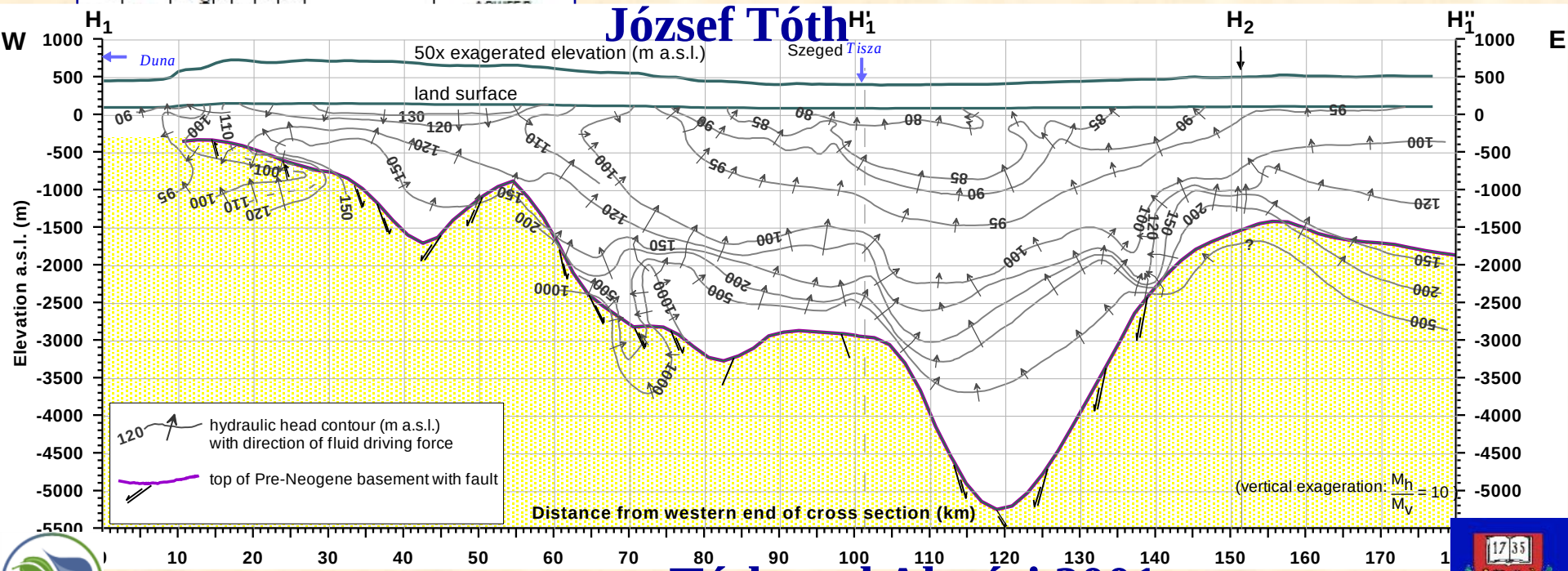


-Deep over-pressured flow systems originated from the Pre-Neogene basement

-Superimposed, shallower, gravity-driven flow system

„Unique natural groundwater laboratory”

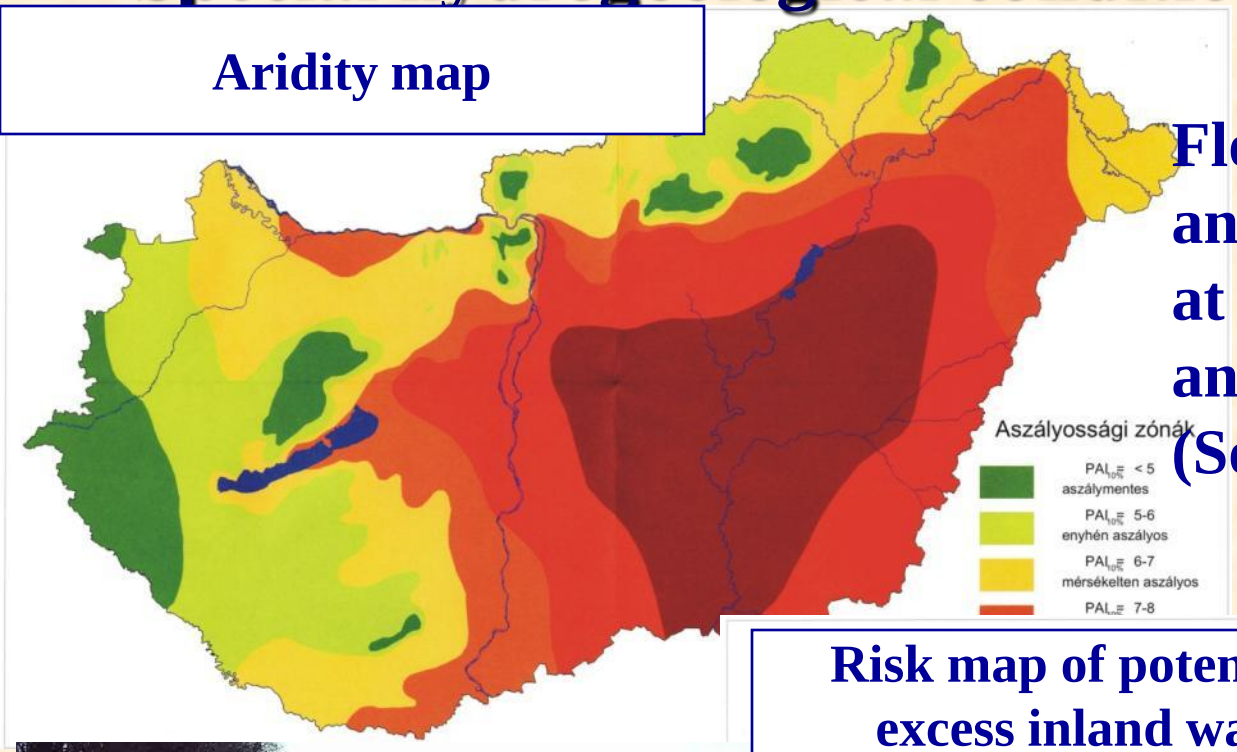
József Tóth



Tóth and Almási 2001

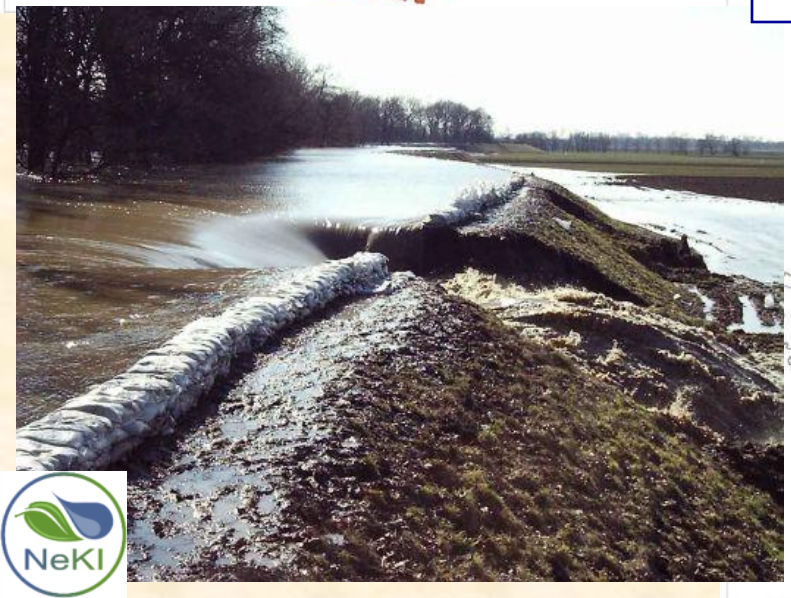
Special hydrogeological conditions of Hungary

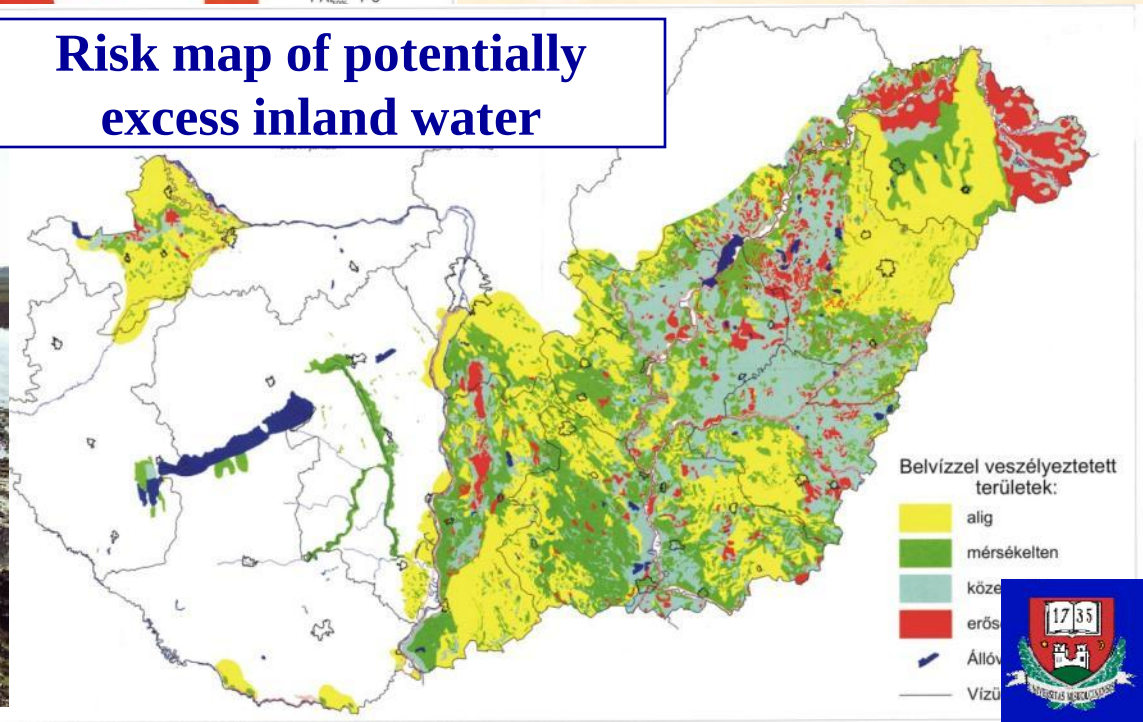
Aridity map



Floods, excess inland water and draught can occur at the same place and same time!!!
(Source: NeKI)

Risk map of potentially excess inland water



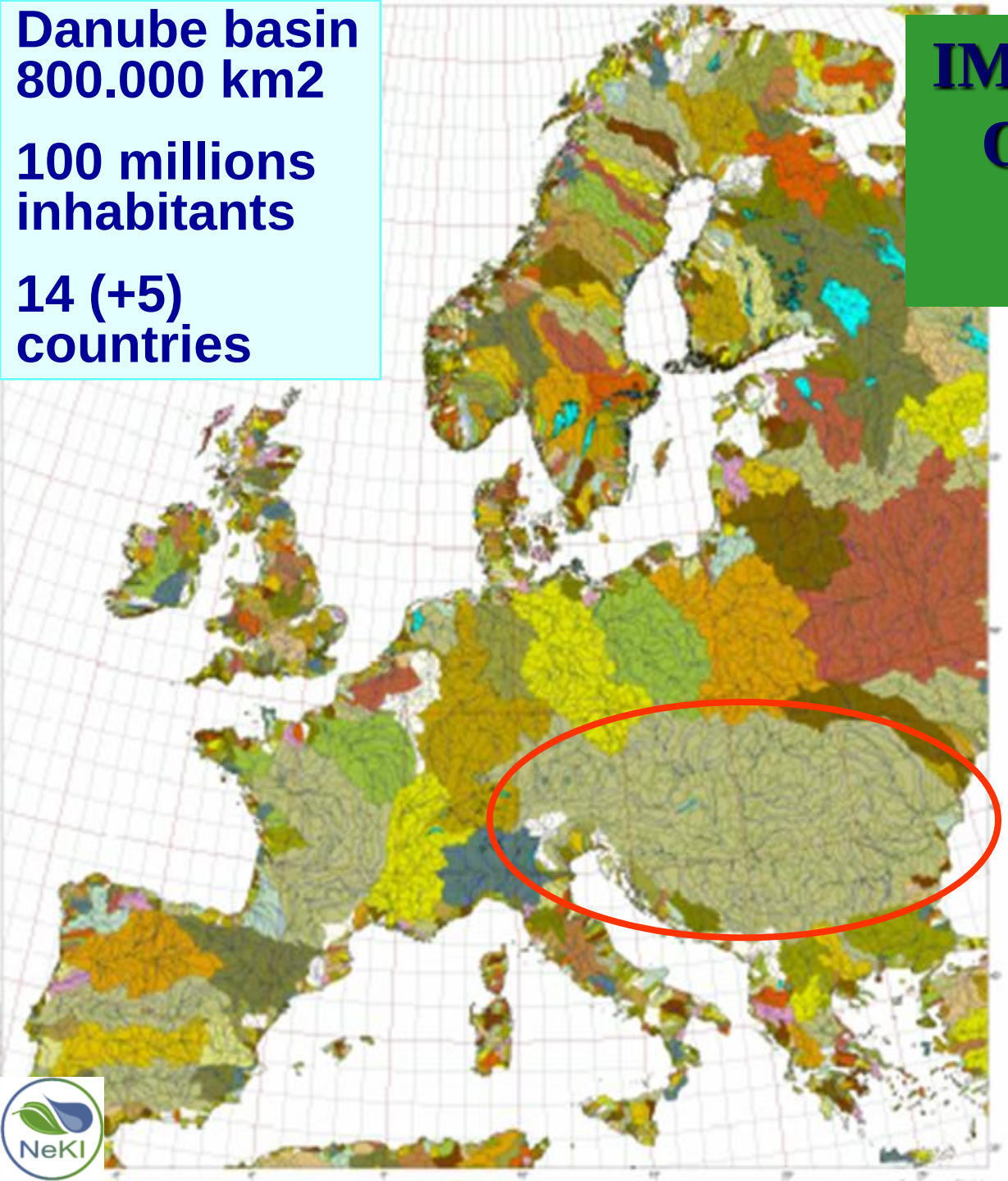


IMPLEMENTATION OF THE EU WFD

Danube basin
800.000 km2

100 millions inhabitants

14 (+5) countries



-Wide range of water bodies

-Fulfilment of environmental goals

-River basin planning for good status of waters

Trans-boundary aquifers in Europe

Source: UNECE

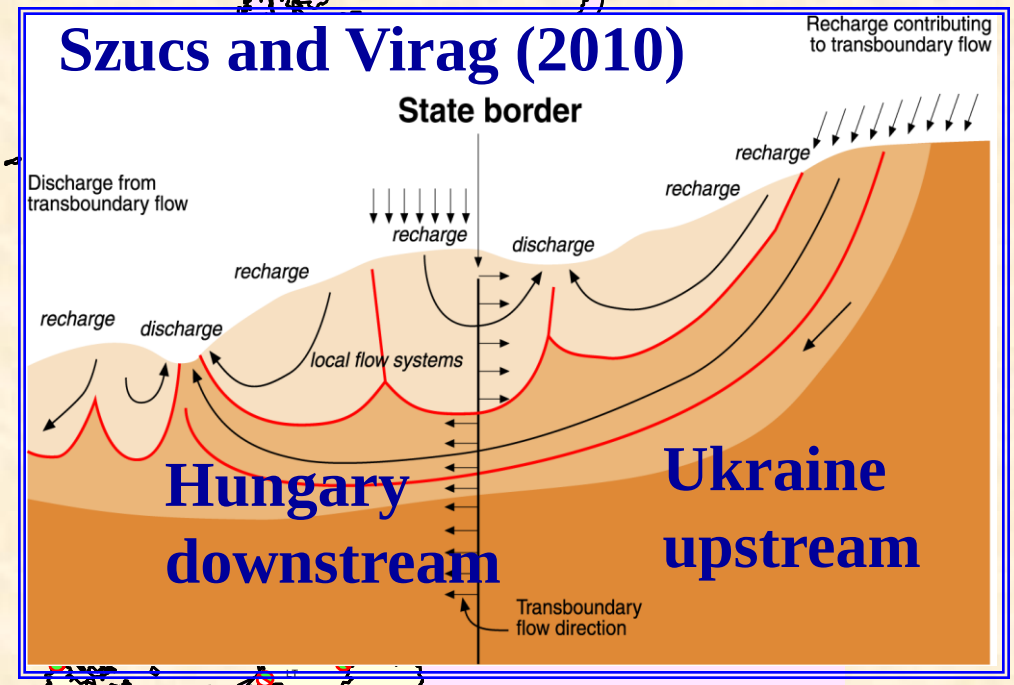
Hungary (Source: NeKI)

Groundwater bodies: 185

Transboundary: 40

Legend :

- responded to inventory
- transboundary aquifers
- transboundary aquifers



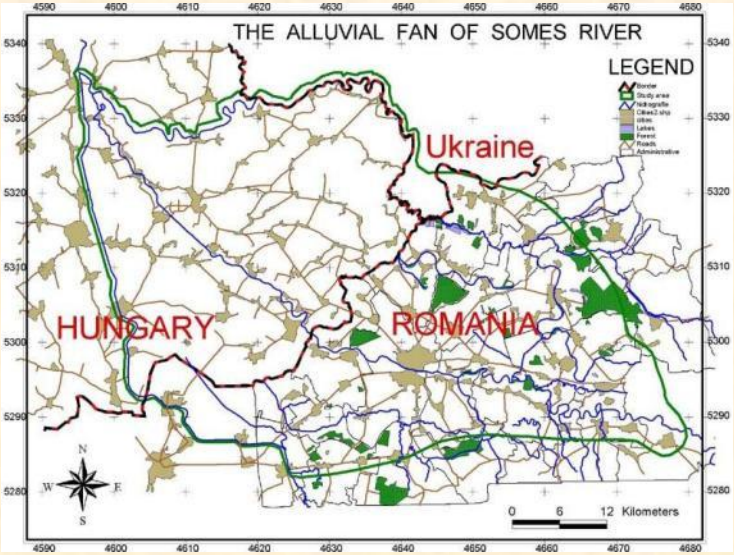
Hungary

The largest specific number concerning internationally shared aquifers in Europe

Special hydrogeological conditions of Hungary

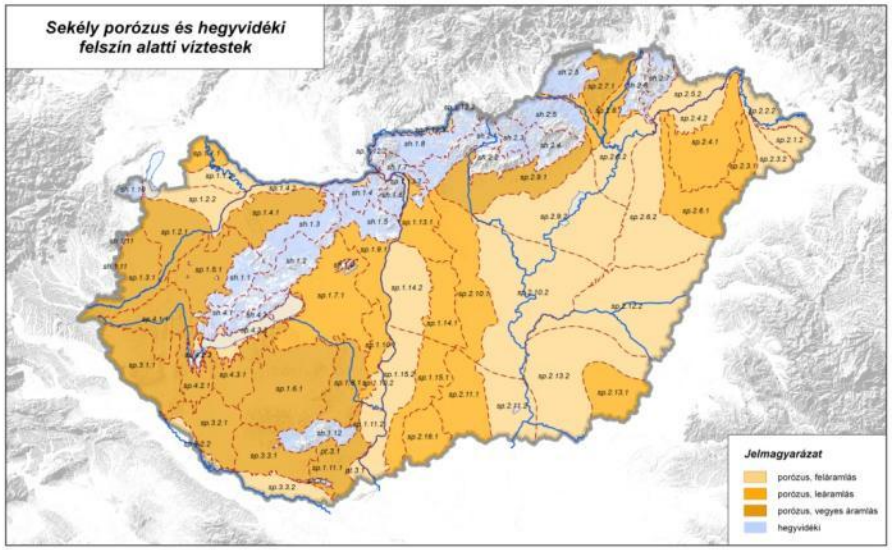
Shared waters shared responsibility (not only for GW)

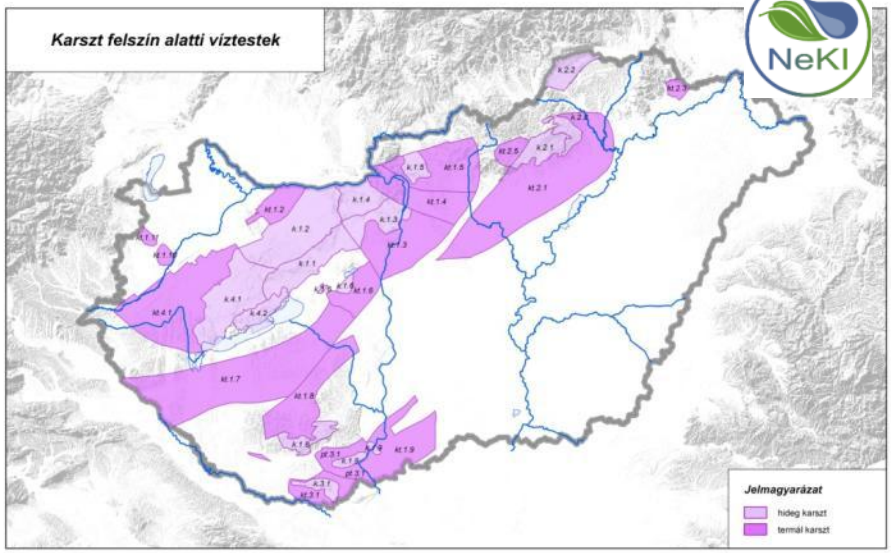
- exchange of information (promoted by
- joint problem diagnosis
- joint decisions on transboundary measures
- working together in coordination of common interested measures

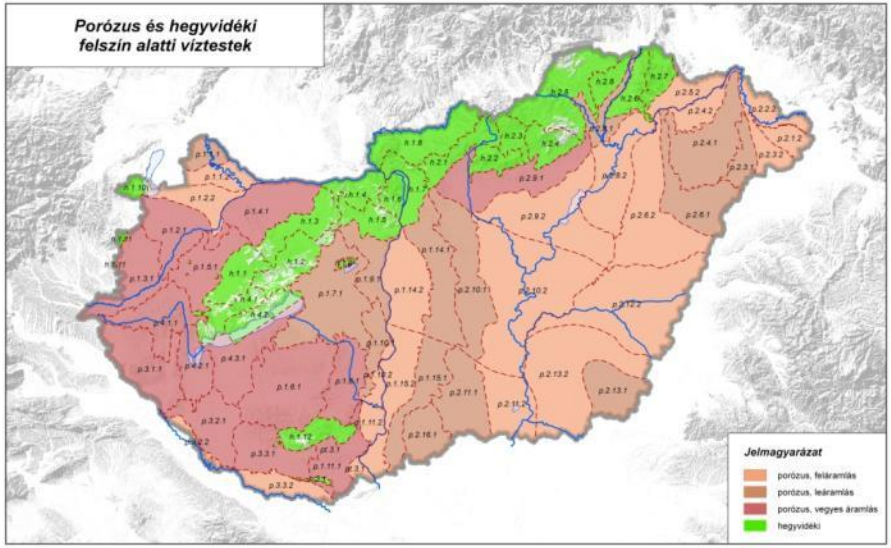


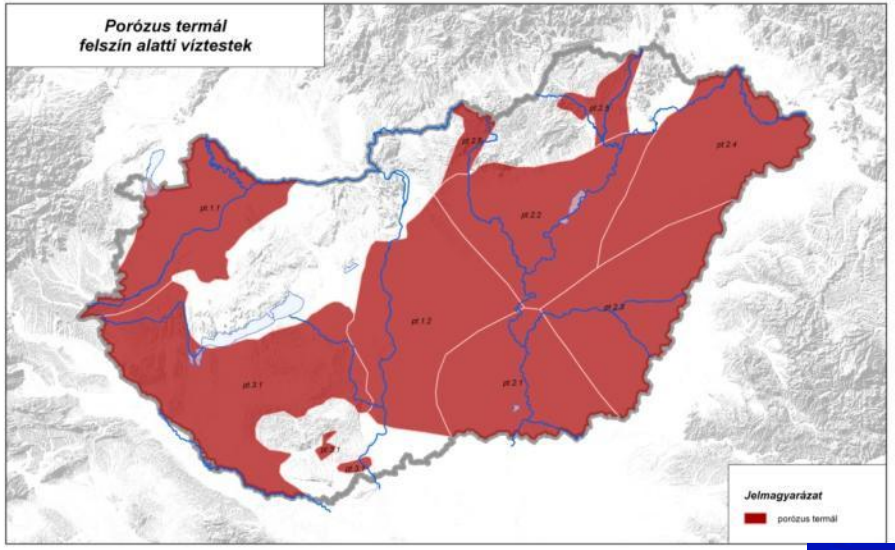
Groundwater bodies in Hungary by WFD

Hegyi Róbert, Tahy Ágnes, Tóth Tünde - Vízügyi és Környezetvédelmi Központi Igazgatóság

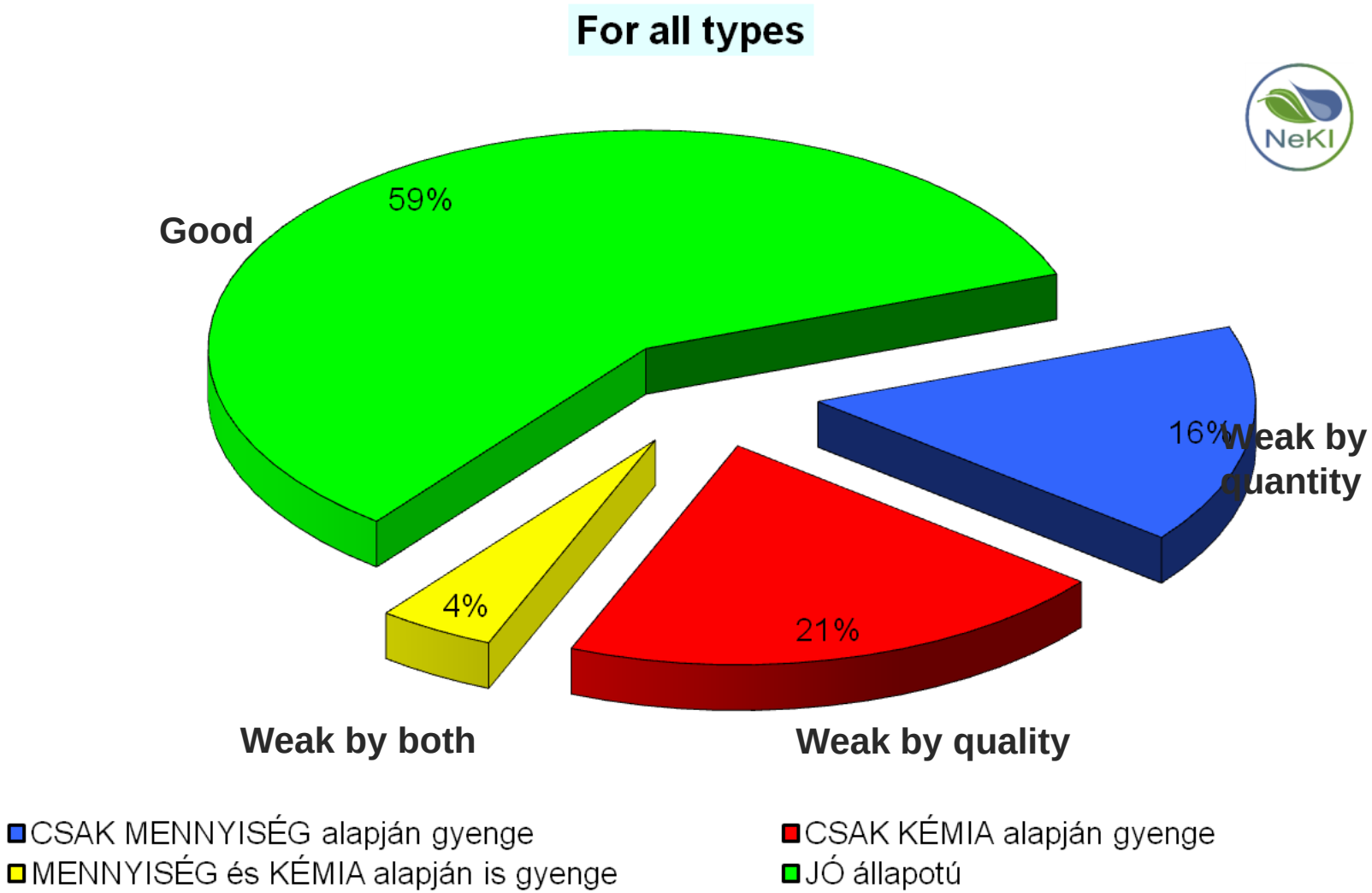




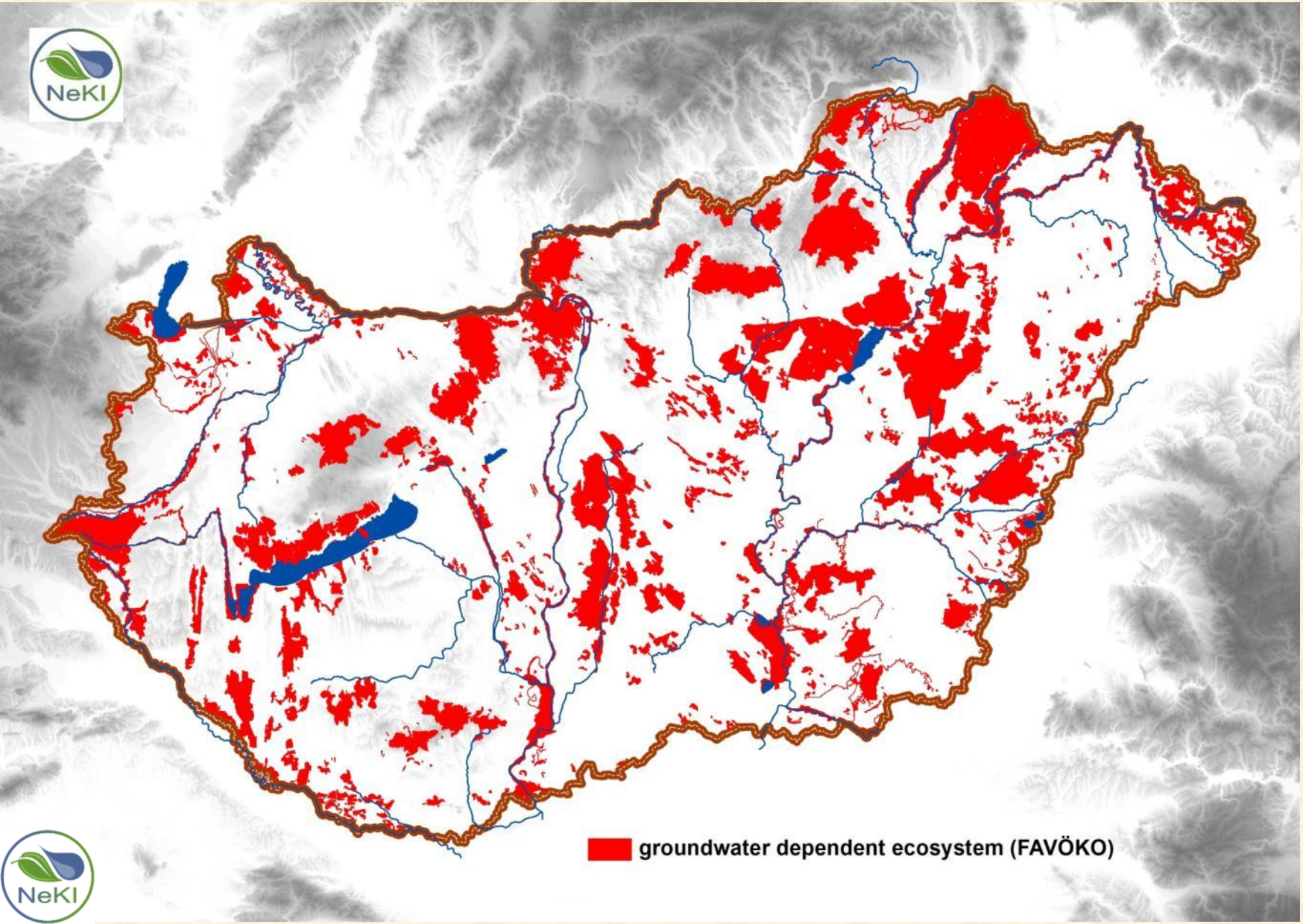




Status assessment of HU groundwater bodies



Groundwater for ecosystems by WFD



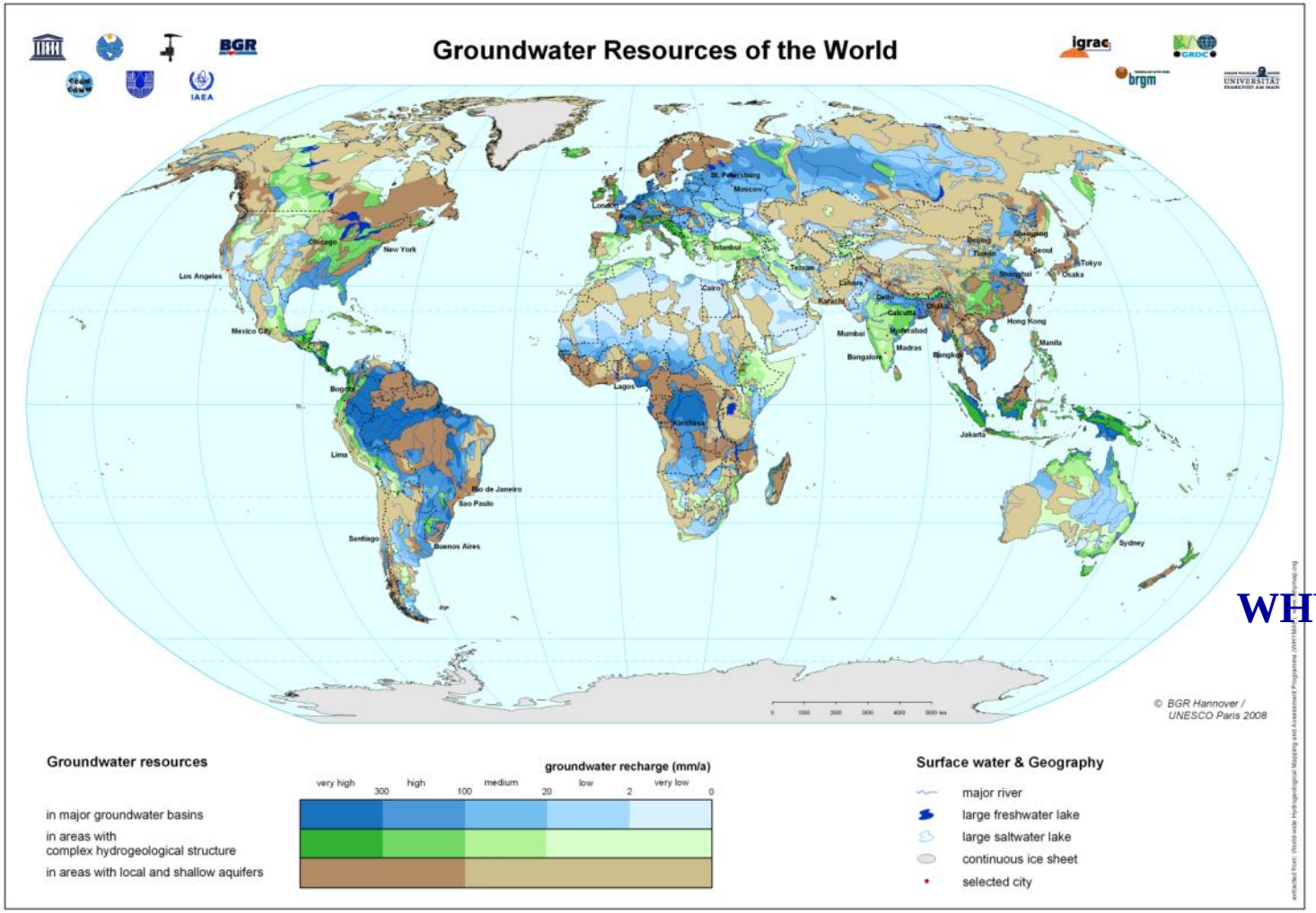
The role of groundwater resources in drinking water supply

Percentage of drinking water supply covered by groundwater resources:

World **more than 50 %,**

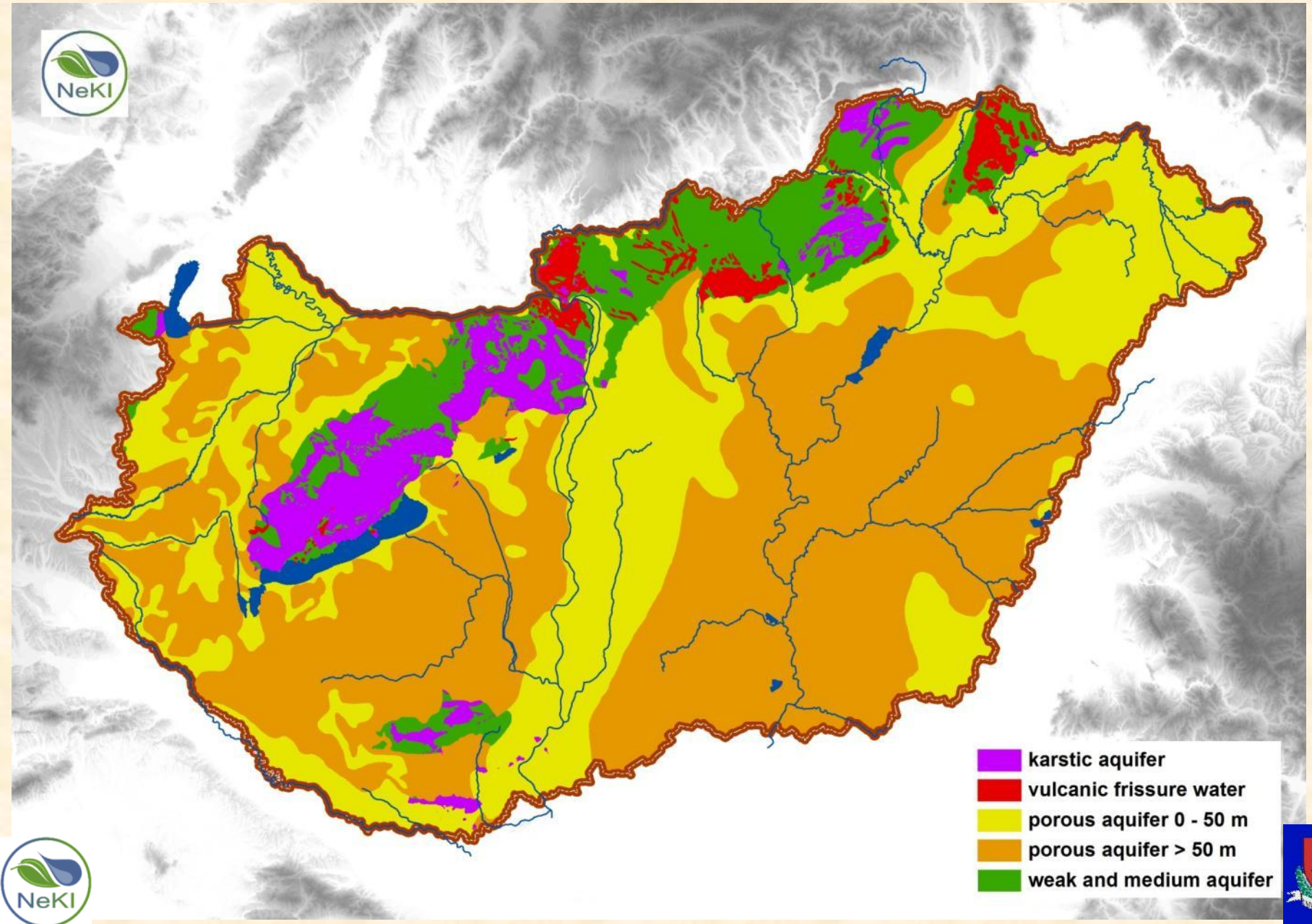
Europe **more than 75 %,**

Hungary **more than 95%. (around 700 million m3/year)**

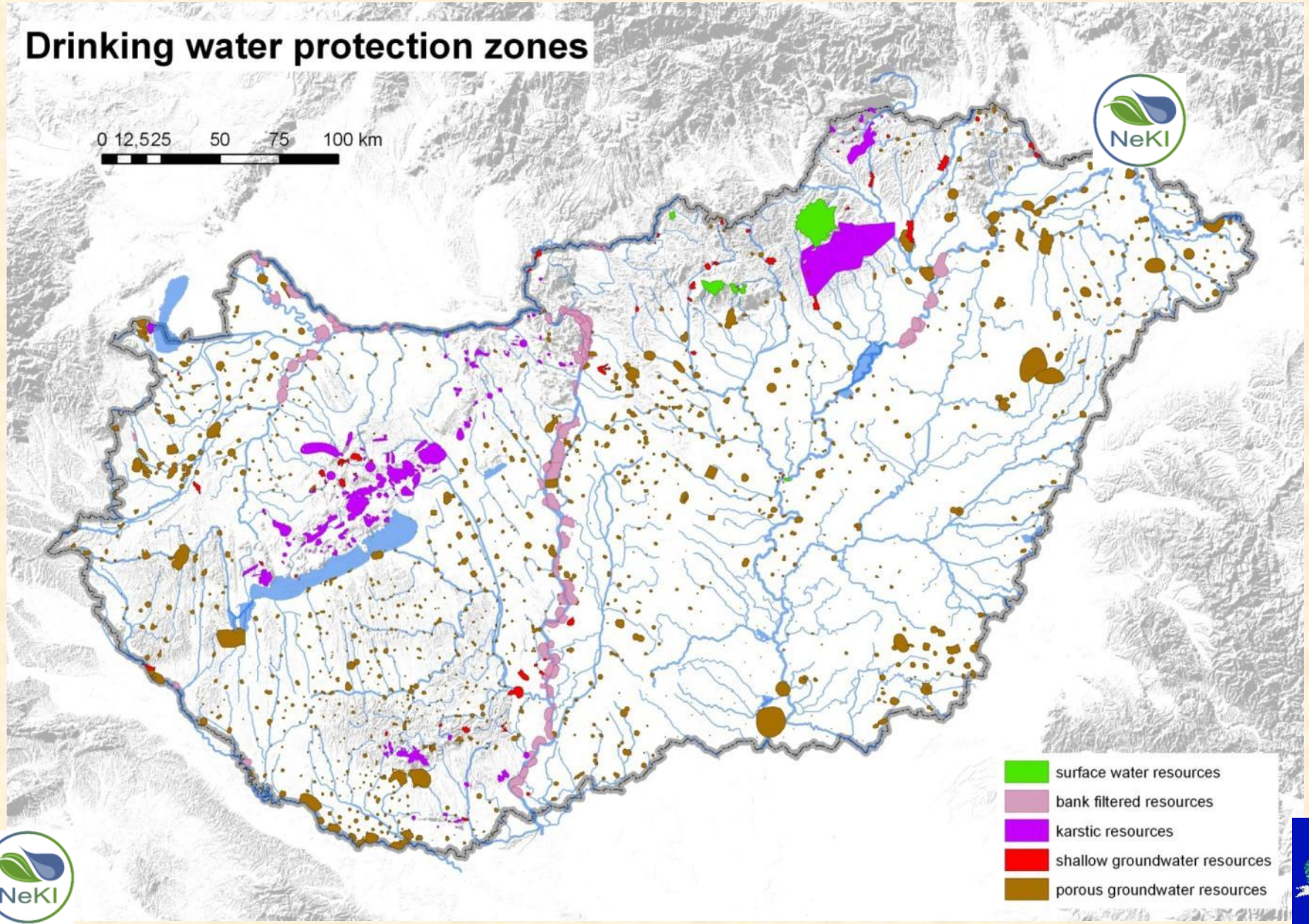


WHYMAP, 2008

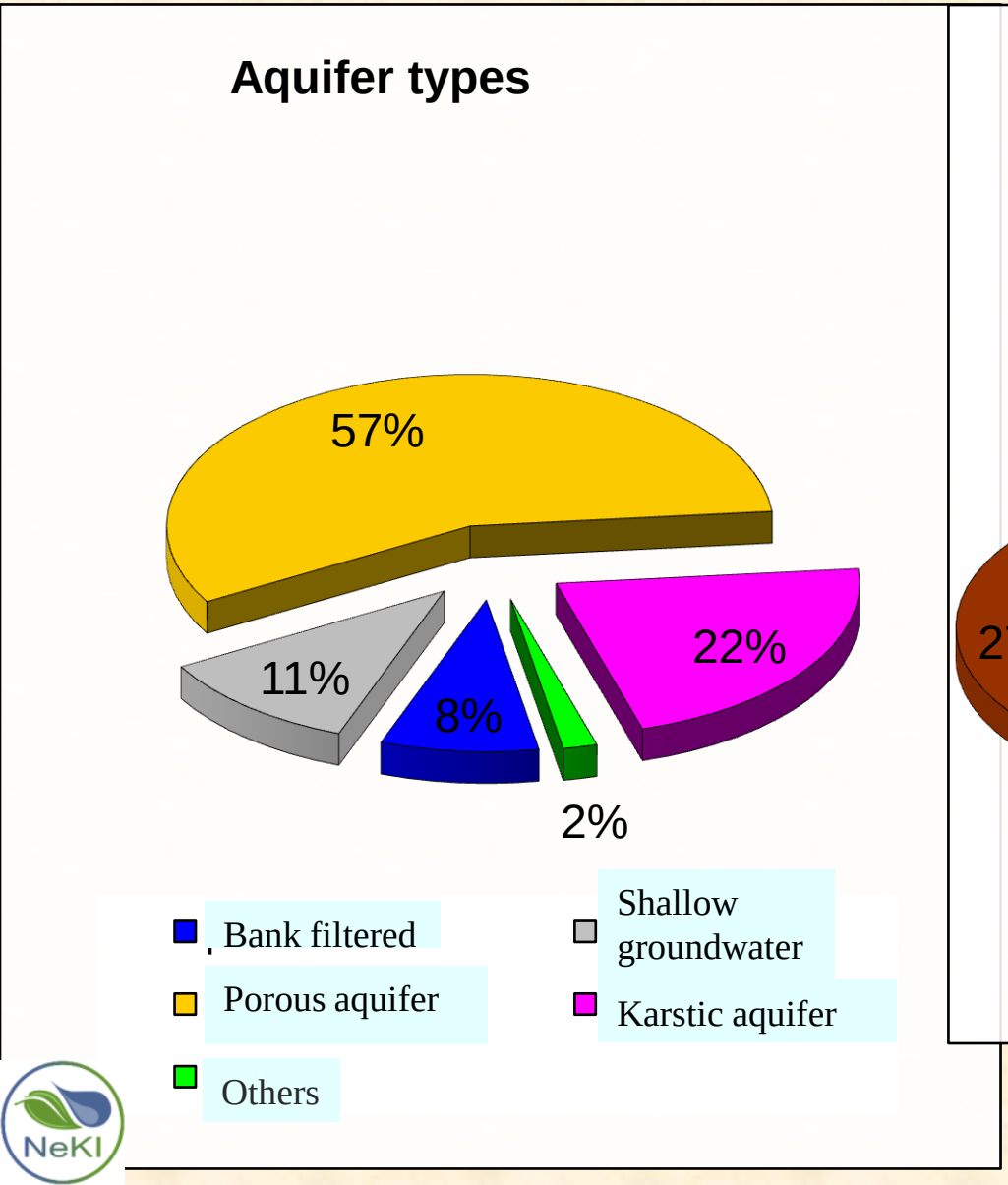
Aquifers for drinking water supply in Hungary

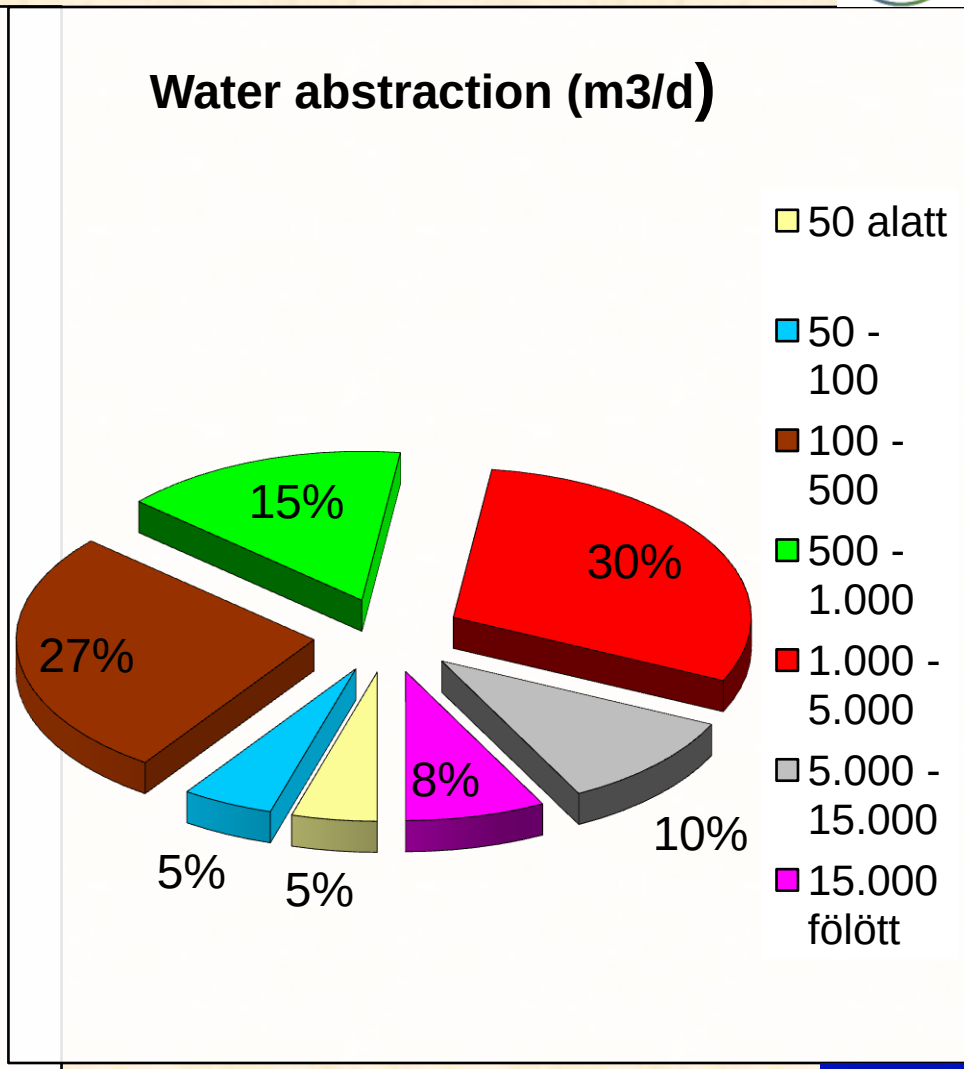


Program for vulnerable drinking water resources

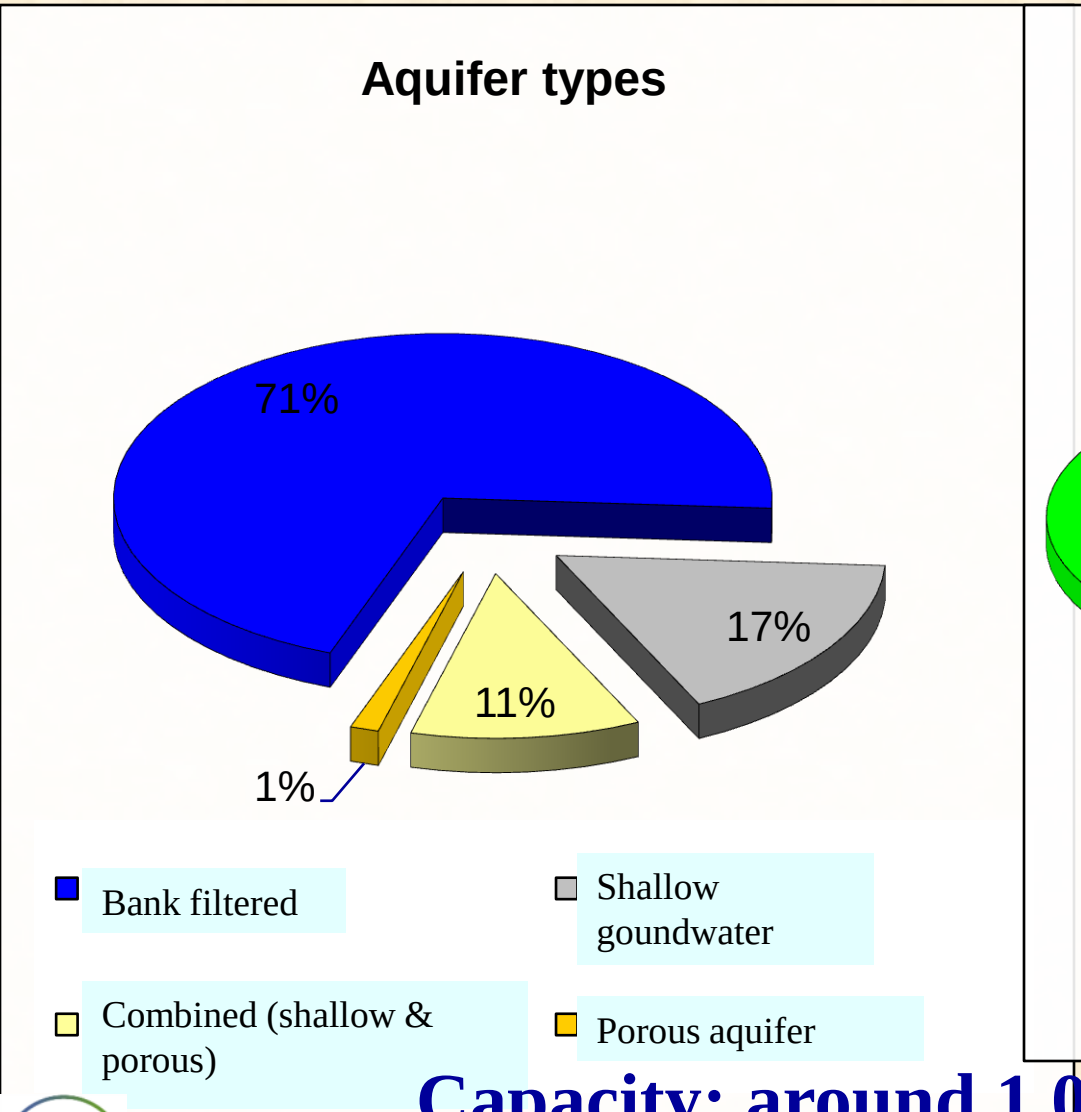


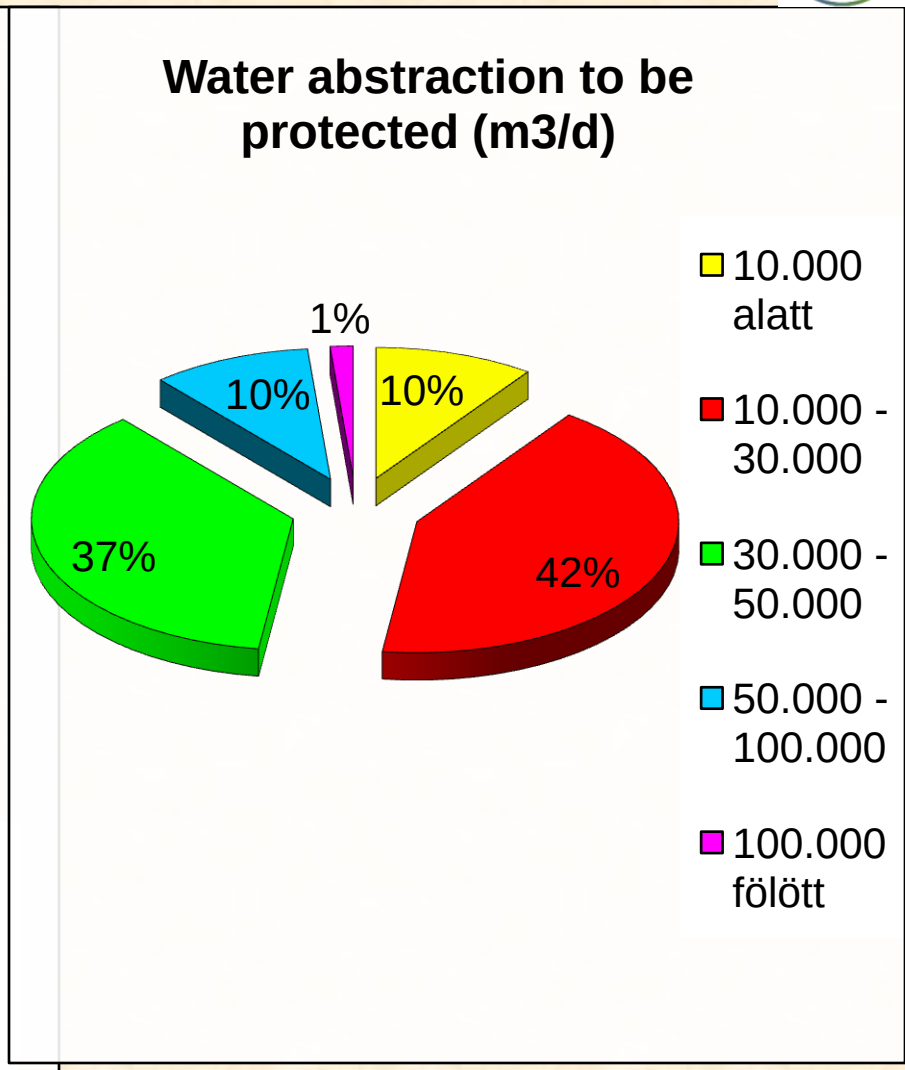
Waterworks operated from vulnerable groundwater resources





Vulnerable aquifers for prospective drinking water reserve

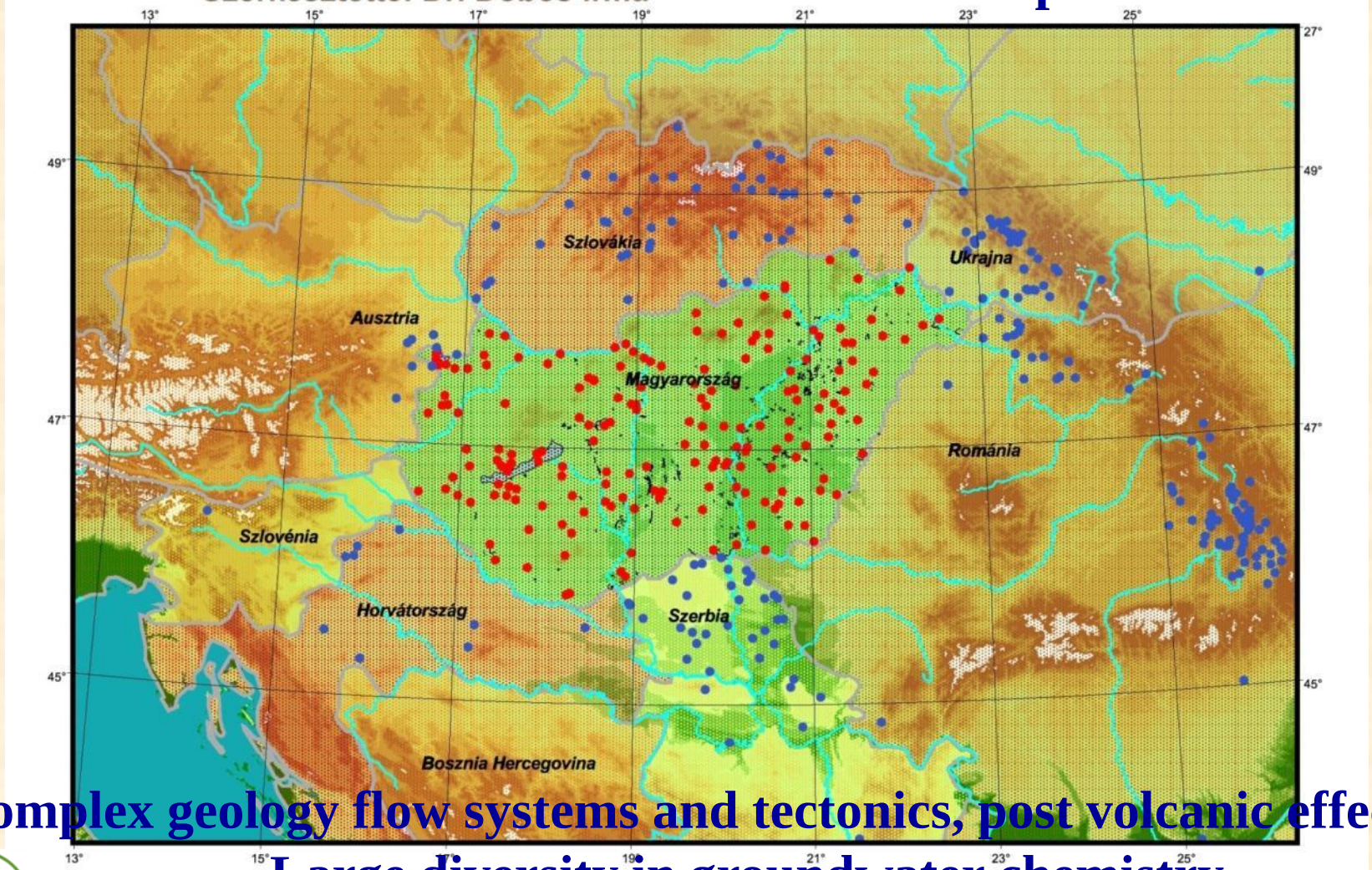




Capacity: around 1 000 000 m3/day

The importance of mineral, medicinal and thermal water resources

Favorable natural conditions in the whole Carpathian Basin.

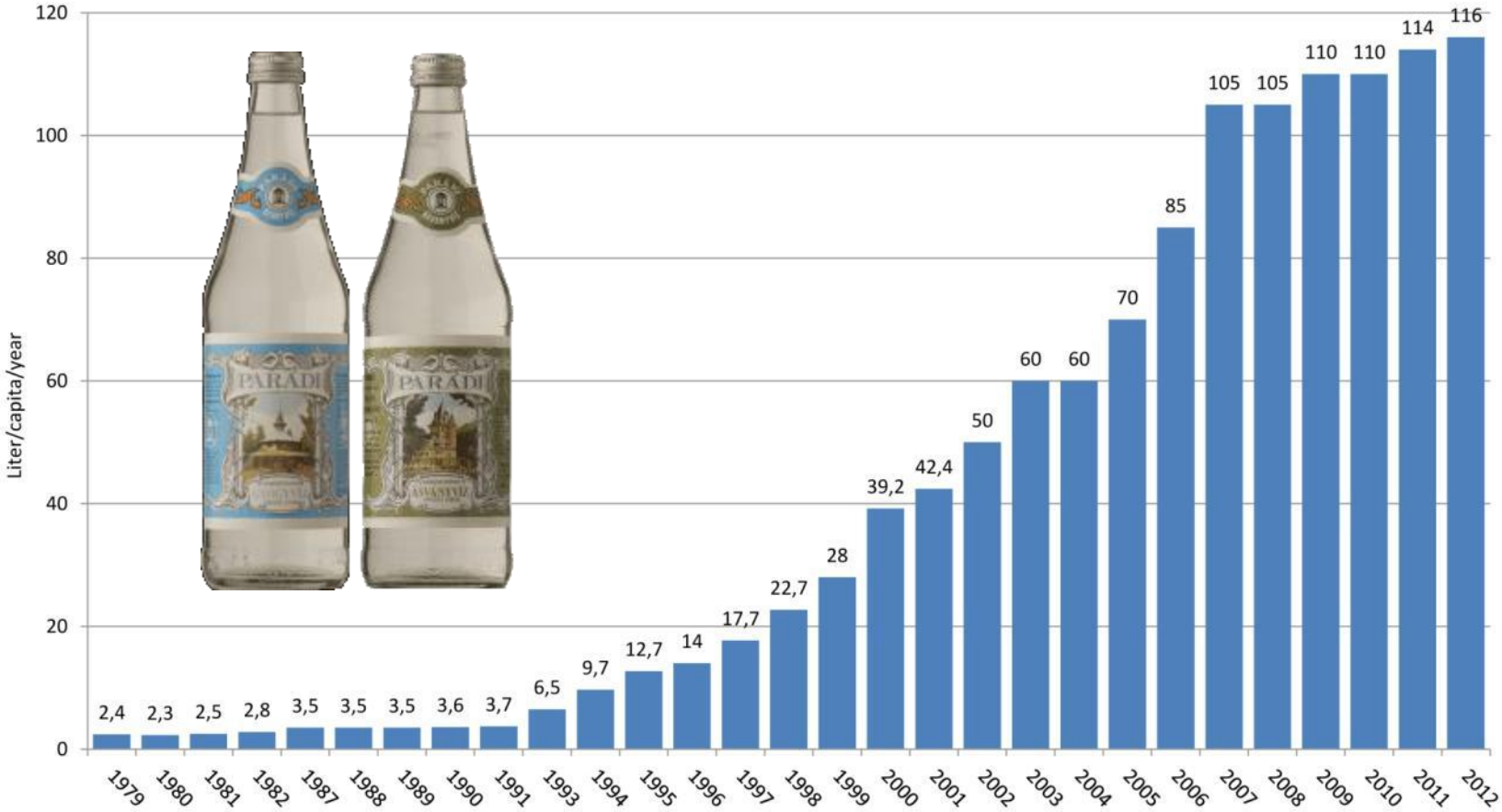


Complex geology flow systems and tectonics, post volcanic effects

Large diversity in groundwater chemistry

The importance of mineral, medicinal and thermal water resources

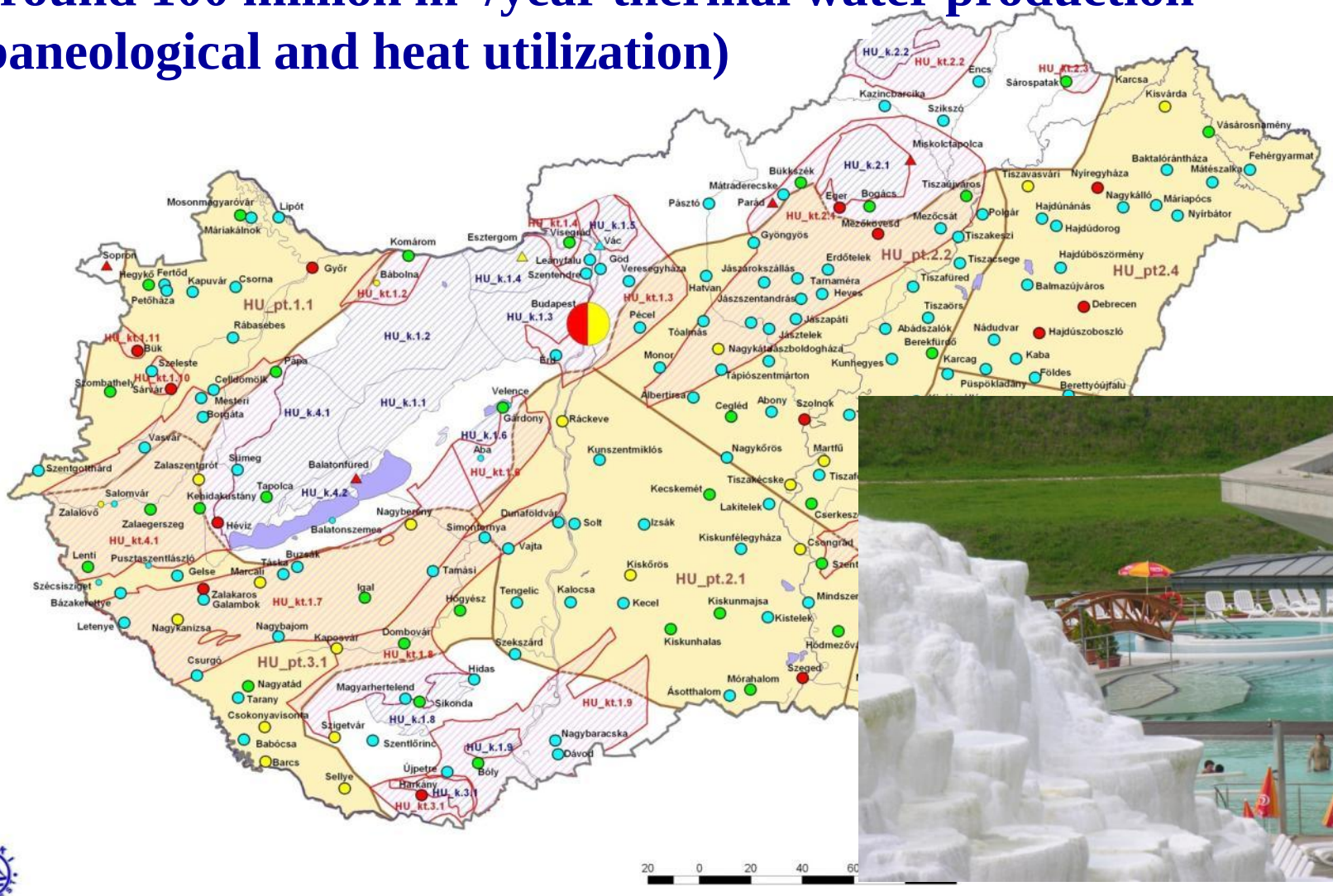
Increasing national trend in mineral water consumption



OGYFI – 195 different registered mineral waters, and 220 acknowledged medicinal water sources .

The importance of mineral, medicinal and thermal water resources

Around 100 million m^3 /year thermal water production (baneological and heat utilization)

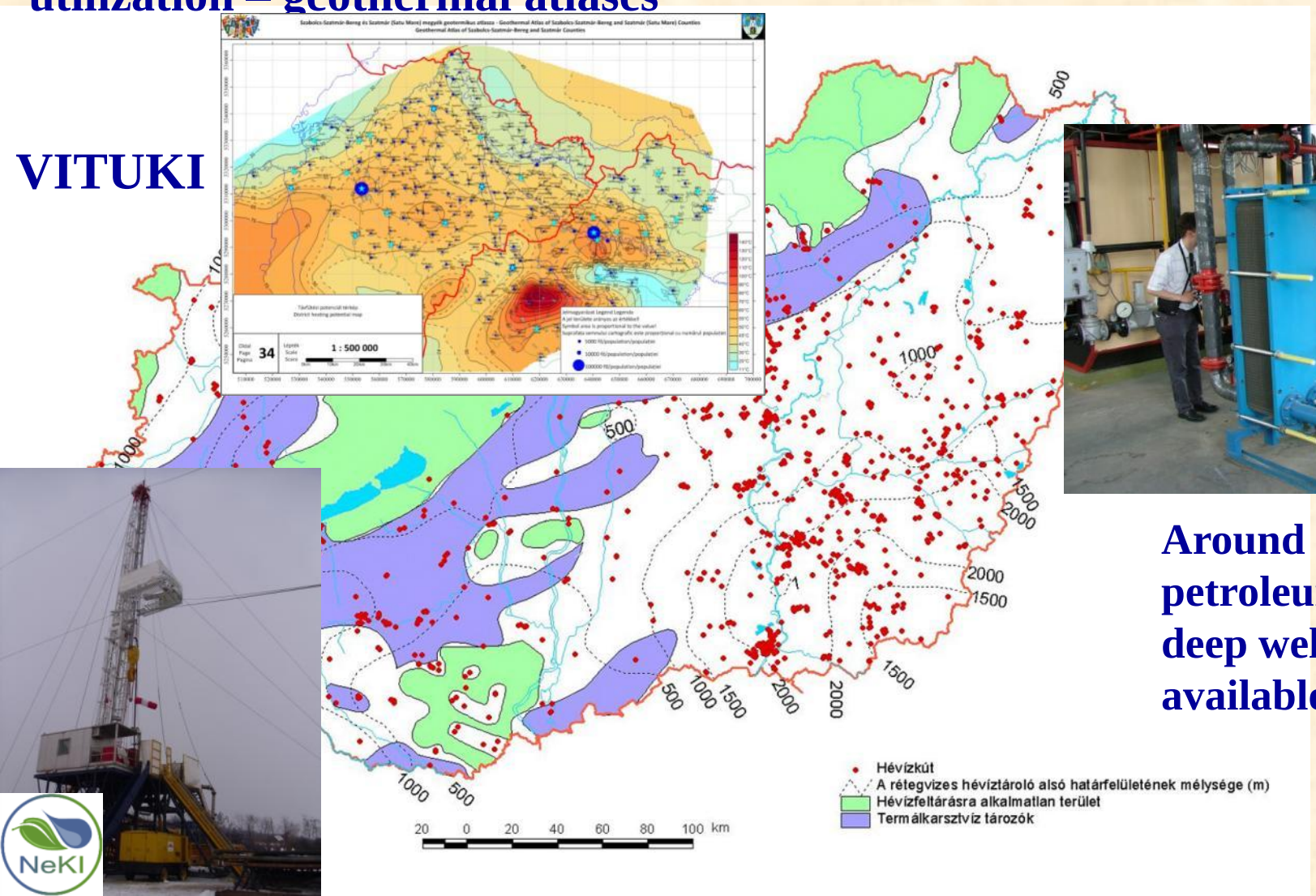


Budapest – 2nd place, Best Spa Vacation in Europe, TripAdvisor, 2009

The importance of mineral, medicinal and thermal water resources

80% of the total area of Hungary is suitable for thermal water production (Mádlné Szőnyi Judit 2006) - increasing geothermal energy utilization – geothermal atlases

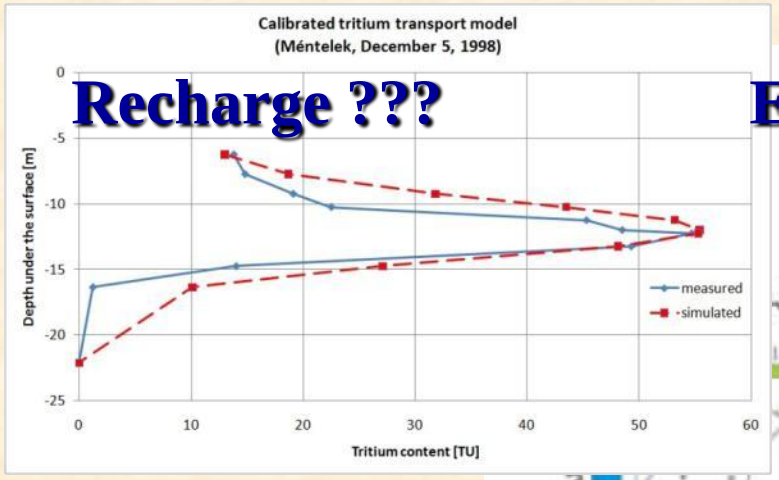
VITUKI



Around 3000 petroleum industry deep wells are available

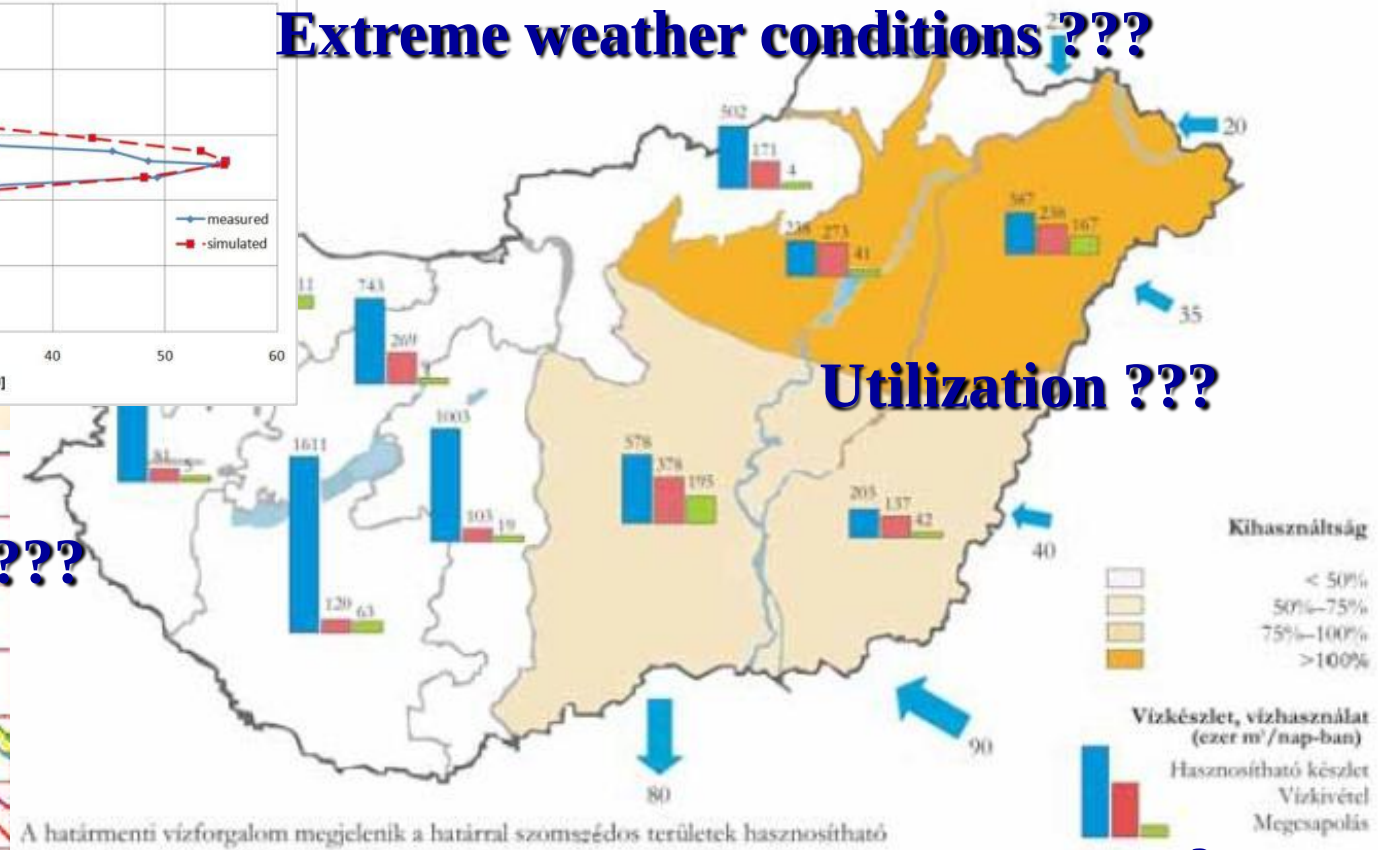
The importance of groundwater resources

Available groundwater resources (Somlyódy 2011)



Recharge ???

Extreme weather conditions ???



Utilization ???

Sustainability ???

Available GW resources.: 2.5 km^3/year

Drinking, mineral, medicinal and thermal water resources can not be handled independently.

Conclusions

• Groundwater resources play significant role in Hungary as well as in the whole Carpathian Bain. Many specialties. Main source of drinking water supply

• The increasing utilization of mineral, medicinal and thermal water resources is important national interest. National Development Plan

• Realization of integrated groundwater management. The importance of transboundary collaboration concerning surface and groundwater resources

• Many tasks and challenges for hydrogeologists inside the Carpathian basin. 1/3 of groundwater bodies in Hungary are not in good condition

Faculty of Earth Science and Engineering founded in 1735

Műszaki Földtudományi Kar
1735
Miskolci Egyetem

Thank you for your attention