Deep untapped geothermal potential in the Danube Strategy Region

Annamária Nádor
Geological and Geophysical Institute of Hungary

Danube Region: a heterogenous macro-region

The EU Strategy for the Danube Region (EUSDR) is a macro-regional strategy of the European Union, endorsed by the European Council in June 2011;

Driving force ⇨ the one-size-fits-all approach is not working in an EU of 27 Member States and 271 regions;

The Strategy was jointly developed by the European Commission, the Danube Region countries and stakeholders in order to jointly address common challenges;

- **9 EU + 5 non-EU countries**
- **More than 100 million inhabitants**
- **One-fifth of EU's total area**
- **Significant regional disparities**

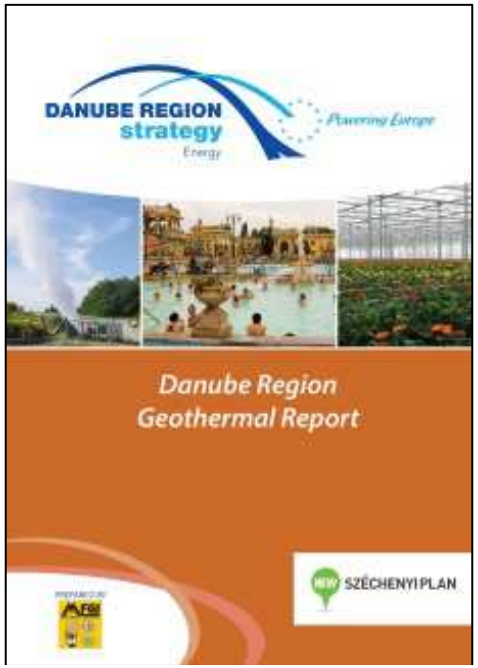
Connecting the Region through sustainable energy

THE FOUR PILLARS

Connecting the Region			Protecting the Environment			Building Prosperity			Strengthening the Region	
Mobility and multimodality	Sustainable energy	Culture and tourism, People to People	Water quality	Environmental risks	Biodiversity, landscapes, air and soil quality	Knowledge society	Competitive-ness	People and skills	Institutional capacity and cooperation	Security

11 priority areas, coordinated by a priority area coordinator

Coordinated by Hungary and the Czech Republic



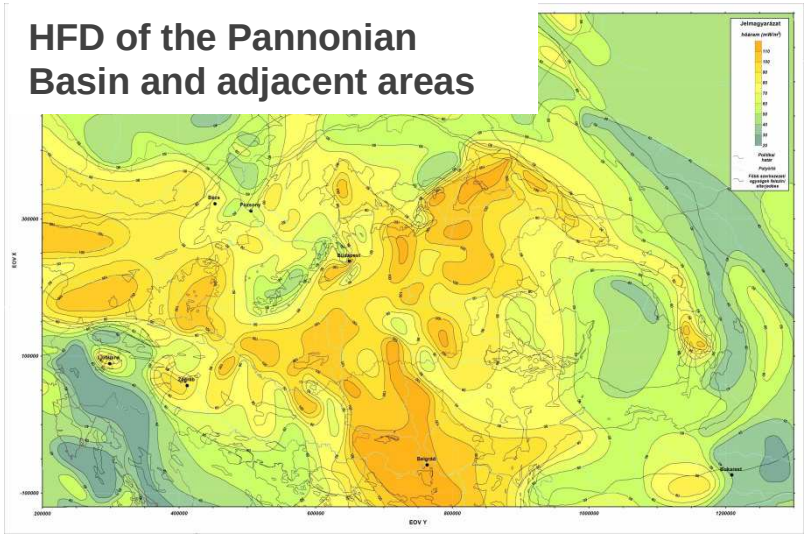
Danube Region Geothermal Concept (2014)

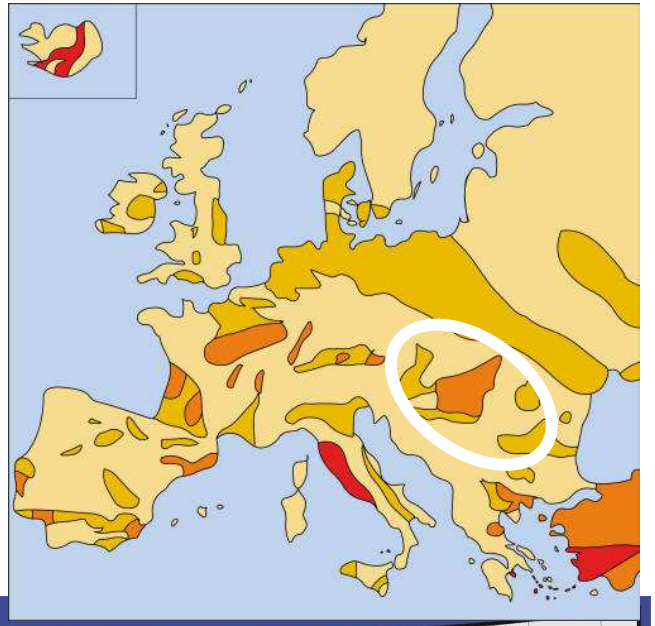
Providing systematic and harmonized information about the geothermal potential, utilization, regulatory frameworks, financial supporting schemes, data policies in 11 DRD countries

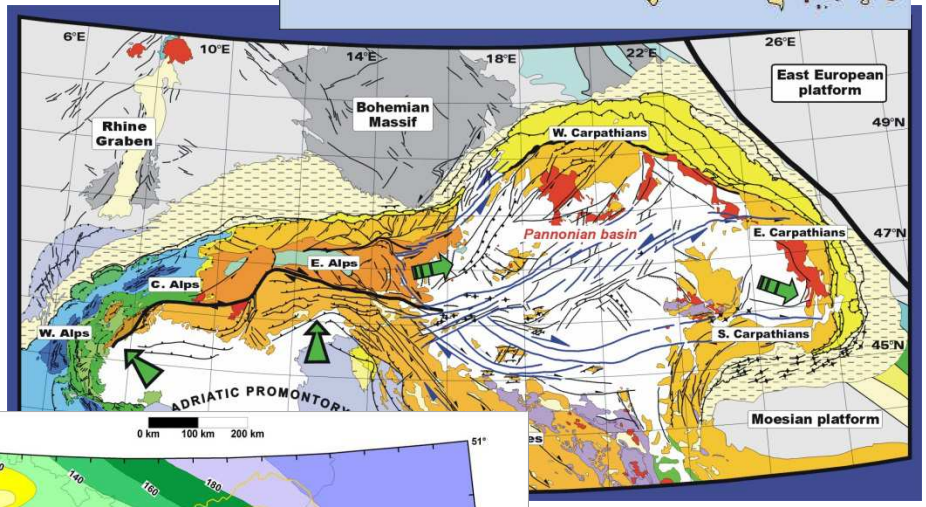
Available at:
http://groupspaces.com/Energy2/item/657526

The deep geothermal potential of the Danube Region is very good

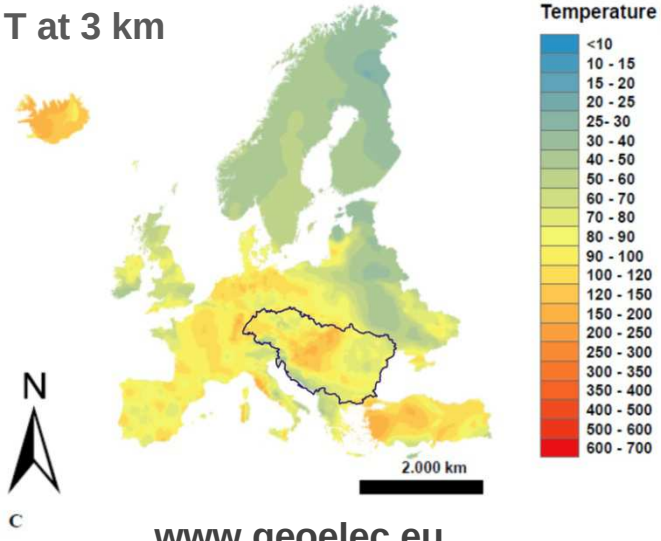
HFD of the Pannonian Basin and adjacent areas







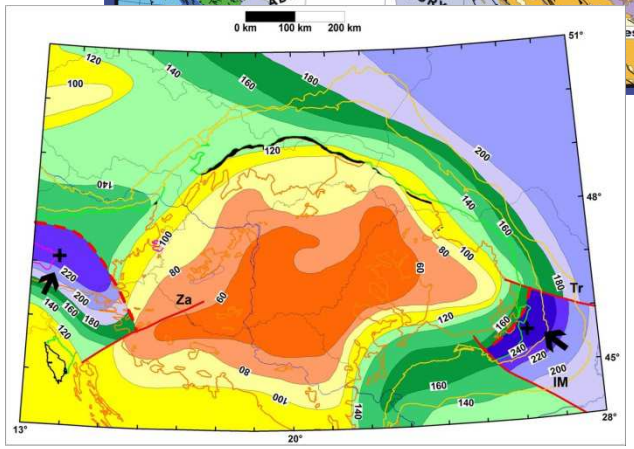
T at 3 km



Temperature (°C)

- <10
- 10 - 15
- 15 - 20
- 20 - 25
- 25- 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100
- 100 - 120
- 120 - 150
- 150 - 200
- 200 - 250
- 250 - 300
- 300 - 350
- 350 - 400
- 400 - 500
- 500 - 600
- 600 - 700

www.geoelec.eu



Thickness of the lithosphere in the Pannonian Basin

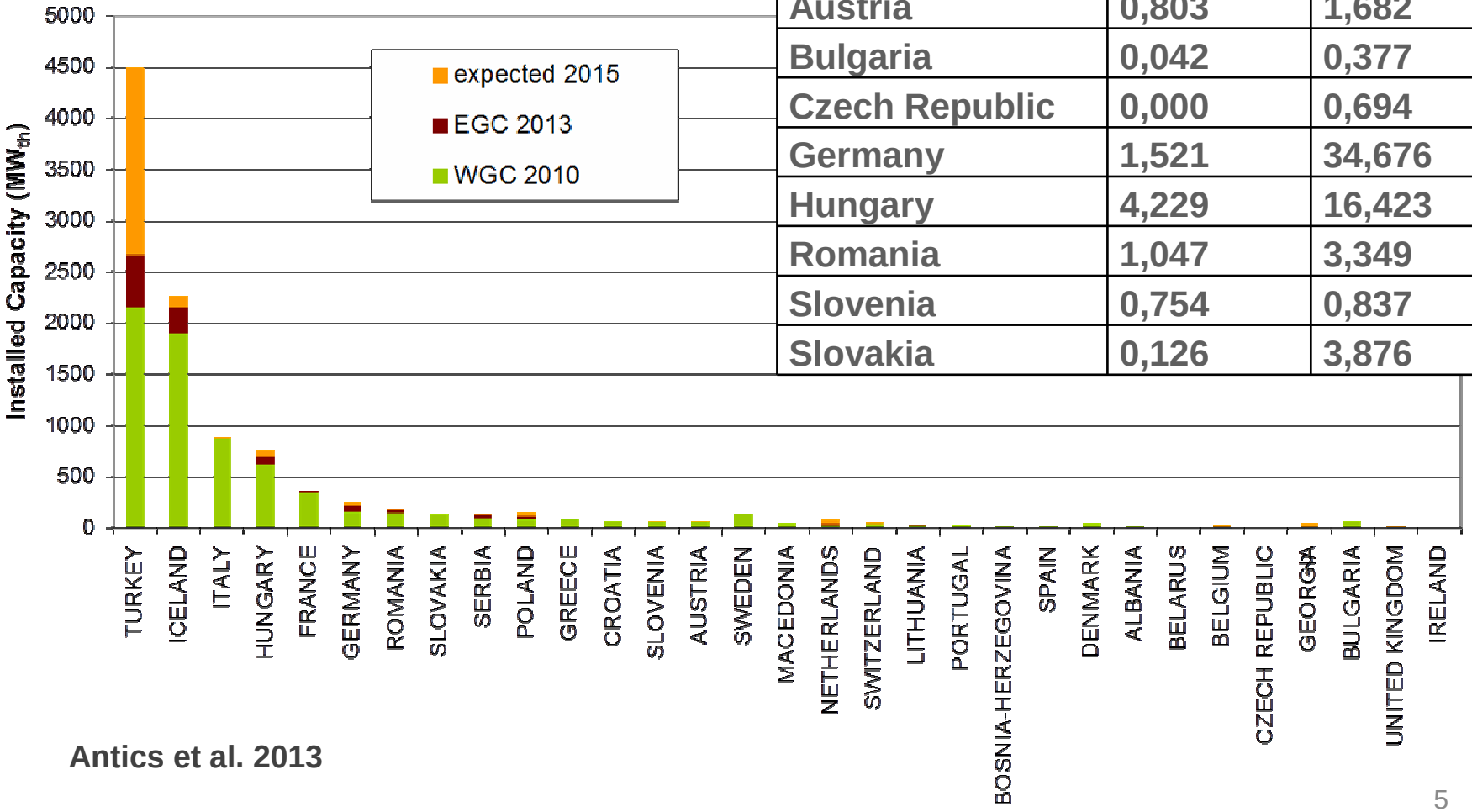
Utilization of geothermal energy in the DRS countries

	Geothermal power plants		Geothermal district heating plants		Geothermal heat in agriculture and industry		Geothermal heat in balneology and other	
	Installed capacity (MW_e)	Production (GWh_e/y)	Installed capacity (MW_t)	Production (GWh_t/y)	Installed capacity (MW_t)	Production (GWh_t/y)	Installed capacity (MW_t)	Production (GWh_t/y)
Austria	1,85	2,2	117,6	158,9	2	4,6	2,4	20,6
Bosnia and Herzegovina	0	0	0	0	1,6	11,25	19,94	59,36
Bulgaria	0	0	1,83	8,03	1,65	7,67	82,3	586,08
Croatia	0	0	36,66	NA	NA	NA	77,24	NA
Czech Republic	0	0	6,56	25	0	0	2,12	NA
Germany *	4,11	18,83	157,25	331,17	0	0	48	380
Hungary	0	0	132,97	339,65	250,14	825,066	312,37	1648,743
Romania	0,05	0,4	106,63	148,34	8	50	10	12
Serbia	0	0	53,646	231,254	16,955	82,881	55,595	258,41
Slovakia	0	0	27,5	NA	29,5	NA	73,6	NA
Slovenia	0	0	3,72	6,27	13,96	31,61	45,48	126,42

Based on EGC 2013 country update reports

- Geothermal power production hardly exists (HR, AT)
- GeoDH production is significant in HU, RO and SRB, less in AT, HR and SK
- Geothermal in agriculture is outstanding in HU, also important in SRB, SK and SI
- Balneology is predominant

Forecasted growth and NREAP targets



	Geothermal energy in NREAP (PJ)	
Country	2010	2020
Austria	0,803	1,682
Bulgaria	0,042	0,377
Czech Republic	0,000	0,694
Germany	1,521	34,676
Hungary	4,229	16,423
Romania	1,047	3,349
Slovenia	0,754	0,837
Slovakia	0,126	3,876

Antics et al. 2013

EUDSR initiative „DanReGeotherm" – rationale and goals

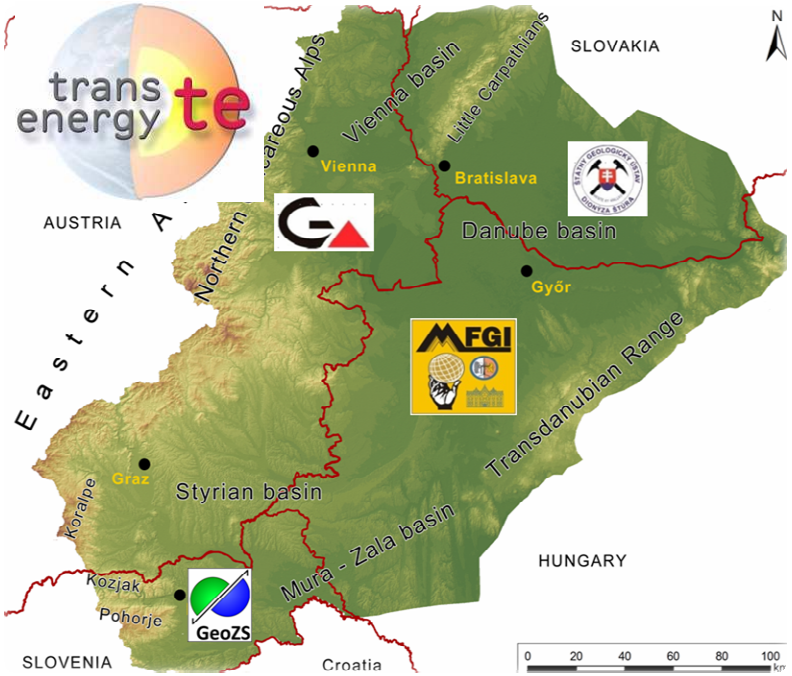
- ✓ **Raise the awareness on the untapped deep geothermal energy potential of the DSR**
- ✓ **Provide scientifically based information on the available resources, current utilizations and technical and non-technical barriers → attrack investors to the region**
- ✓ **Policy recommendations (national, trans-national and EU) for the enhanced utilization of geothermal energy**
- ✓ **Preparation of the non-EU members for the adaption and implementation of relevant EU directives (WFD, RES, INSPIRE)**

A meeting with 40 participants from 10 DSR countries was held on November 28, 2013 in Budapest to elaborate project concepts

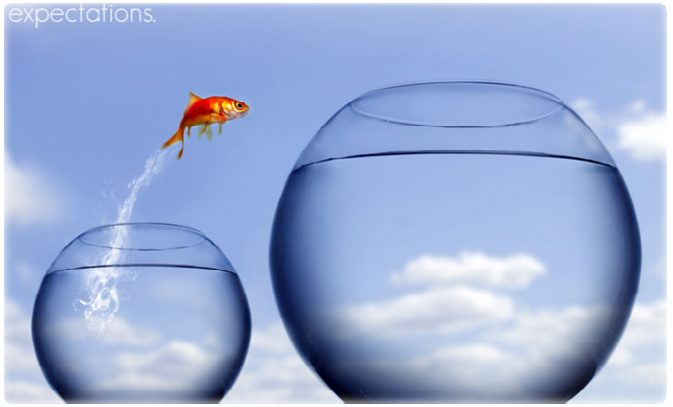
DanReGeotherm concept

„seed" TRANSNERGY project: Transboundary geothermal energy resources of Slovenia, Austria, Hungary and Slovakia

http://transenergy-eu.geologie.ac.at



successful cooperation established among 4 countries in the HARMONISED evaluation of hydrogeothermal resources



Expand cooperation based on lessons learnt

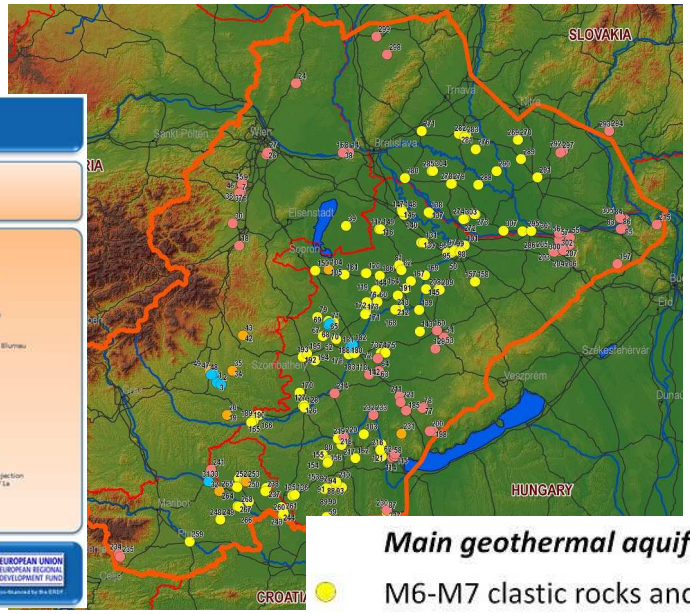
Main planned activities (1) Overview and database of current utilizations + web applications

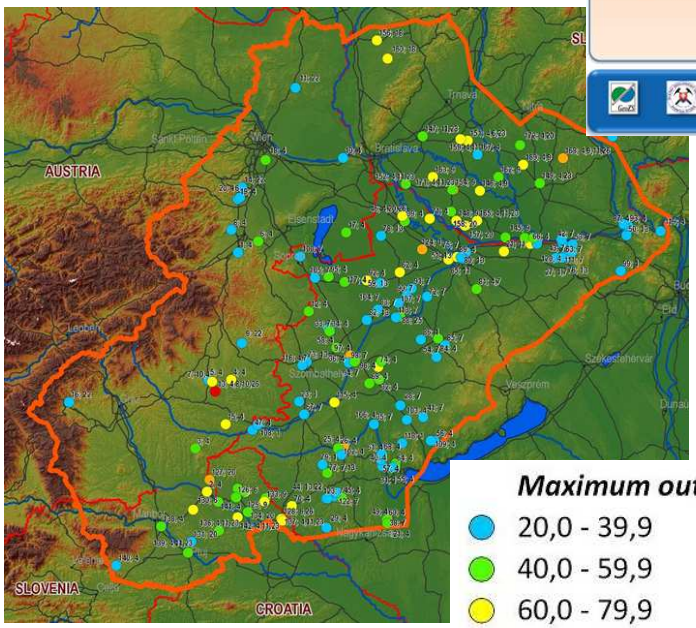
Database: 3 levels

~213 users

~290 formations

~401 wells





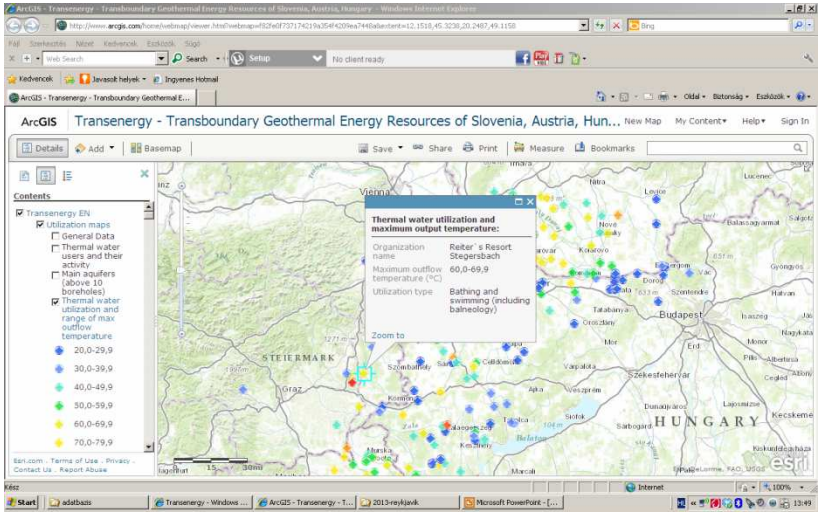
Main geothermal aquifer

- M6-M7 clastic rocks and sediments
- M4-M5 clastic rocks and sediments
- MZ carbonate rocks
- PZ carbonate rocks

trans energy te

Maximum outflow temperature (°C)

- 20,0 - 39,9
- 40,0 - 59,9
- 60,0 - 79,9
- 80,0 - 99,9
- 100,0 - 110,0

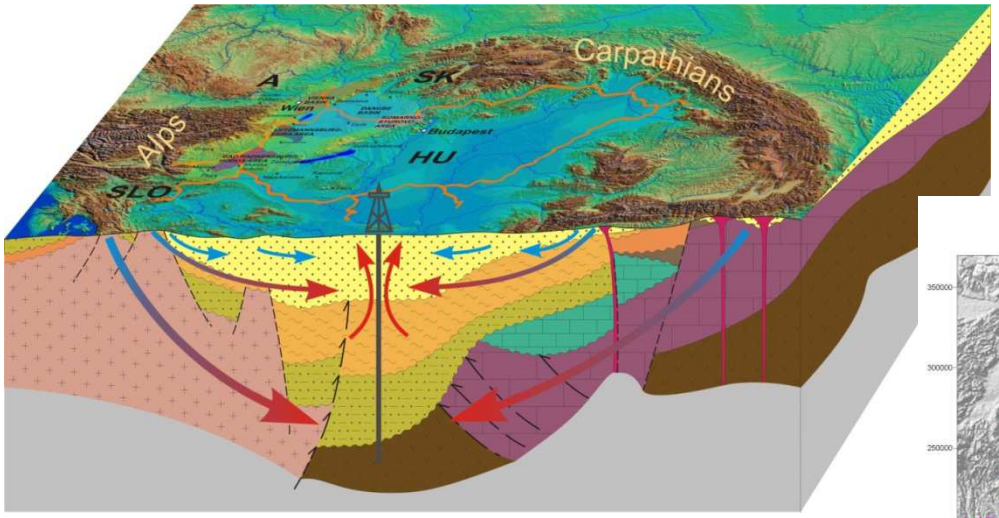


http://transenergy-eu.geologie.ac.at

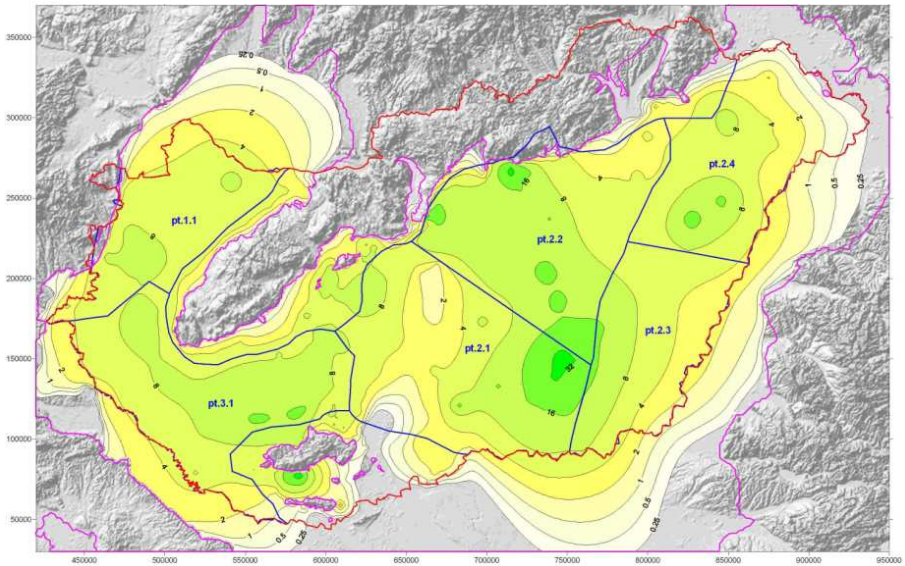
Main planned activities (2) Transboundary issues

HSA PLAYS: exploitation of geothermal energy = abstraction of thermal groundwater

Regional geothermal aquifers do not stop at state borders: majority of the users exploit the same reservoirs in the transboundary regions without harmonized management strategies → potential unfavorable effects in the neighbouring countries



Depressions in the Upper Pannonian intergranular aquifer caused by thermal water abstraction



Tóth 2005

Main planned activities (3) Integrated hydrogeothermal models at selected transboundary pilot areas

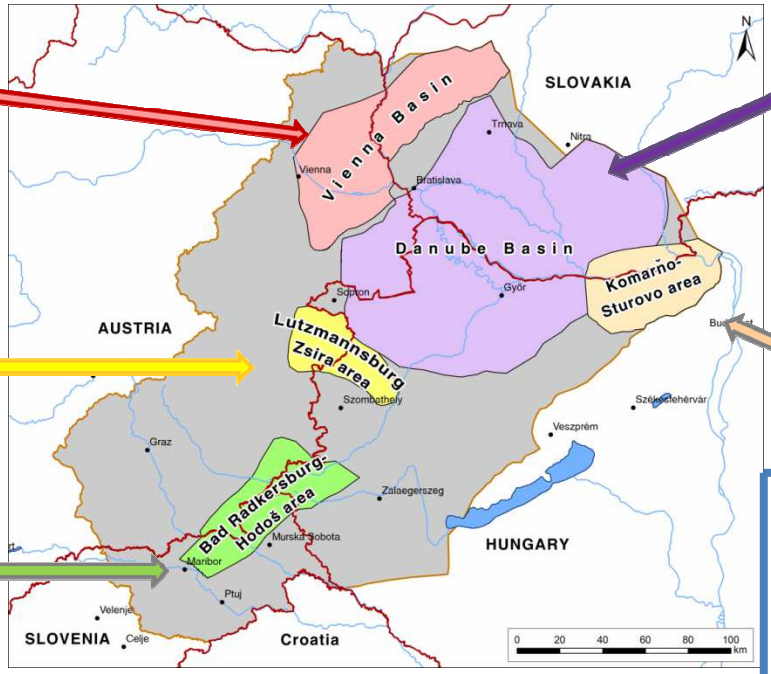
New exploitation of geothermal resources

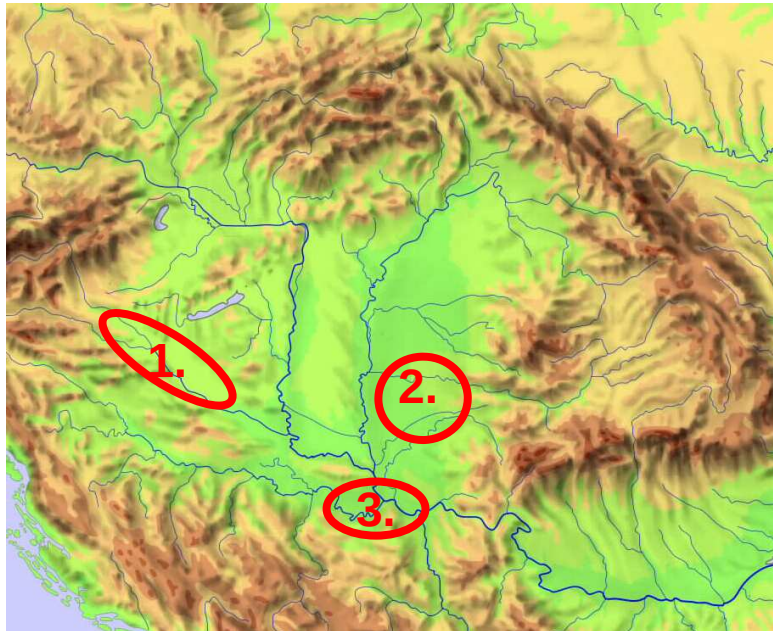
Availability of thermal water

Overexploitation of geothermal aquifers

Effects of past mining activity on thermal karst water system

Interference between users and geothermal doublets





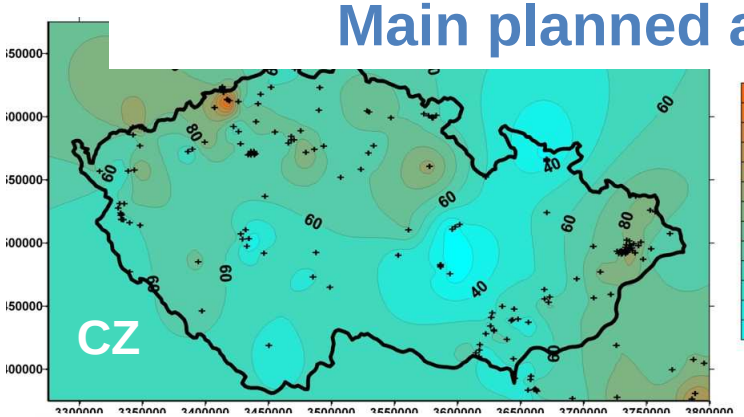
New areas in DanReGeotherm:

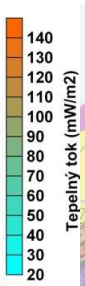
1.Drava basin (SLO-HR-HU),

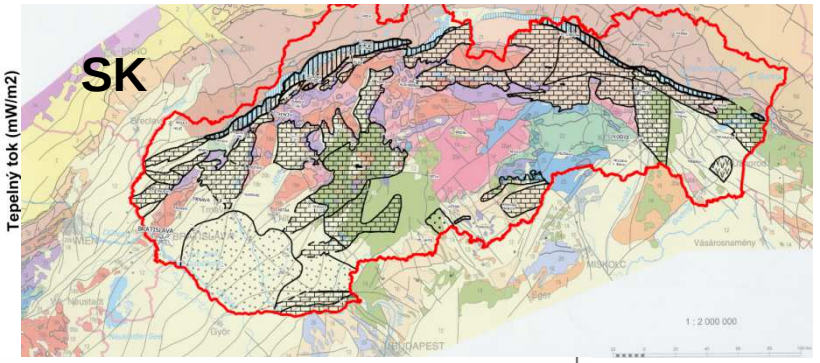
2.SE-Pannonian basin (RO-SRB-HU)

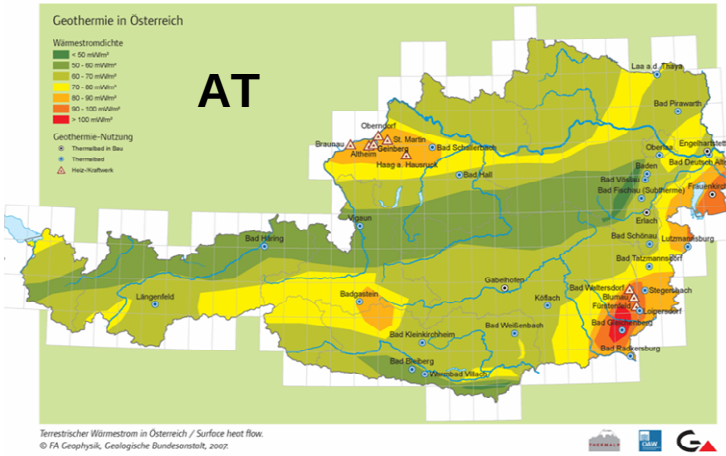
3.Ophiolite Belt and adjoining paleo-mesozic carbonates (BH-SRB)

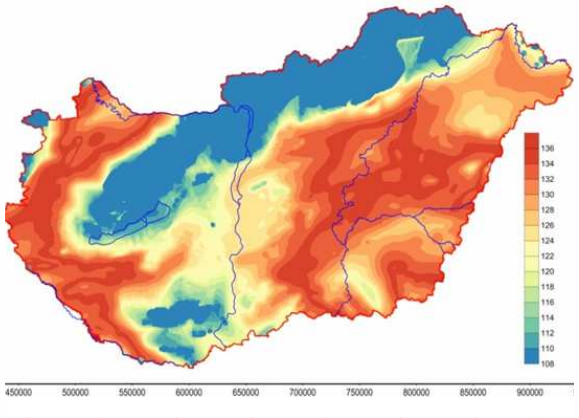
Main planned activities (4): Data harmonization

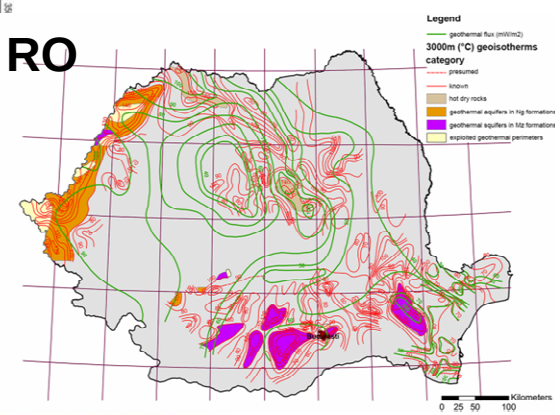


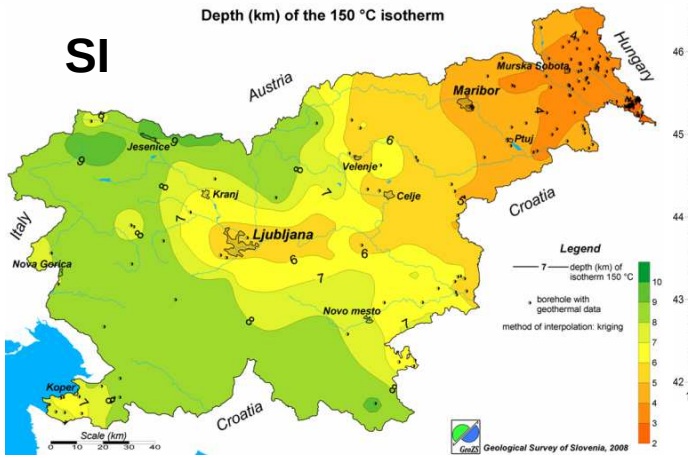


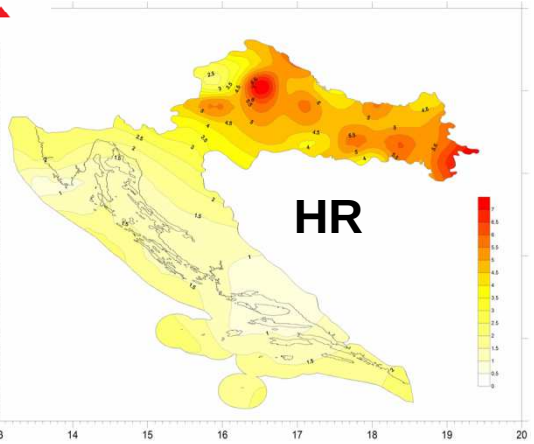


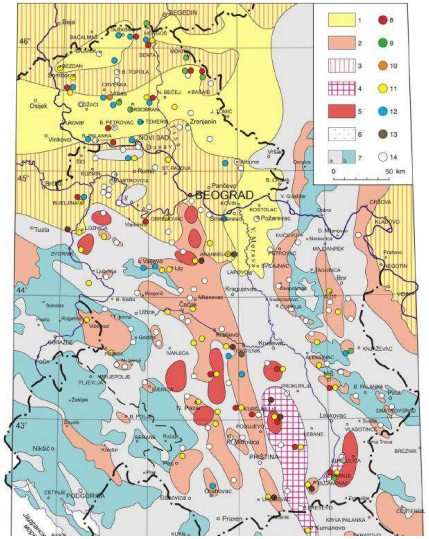






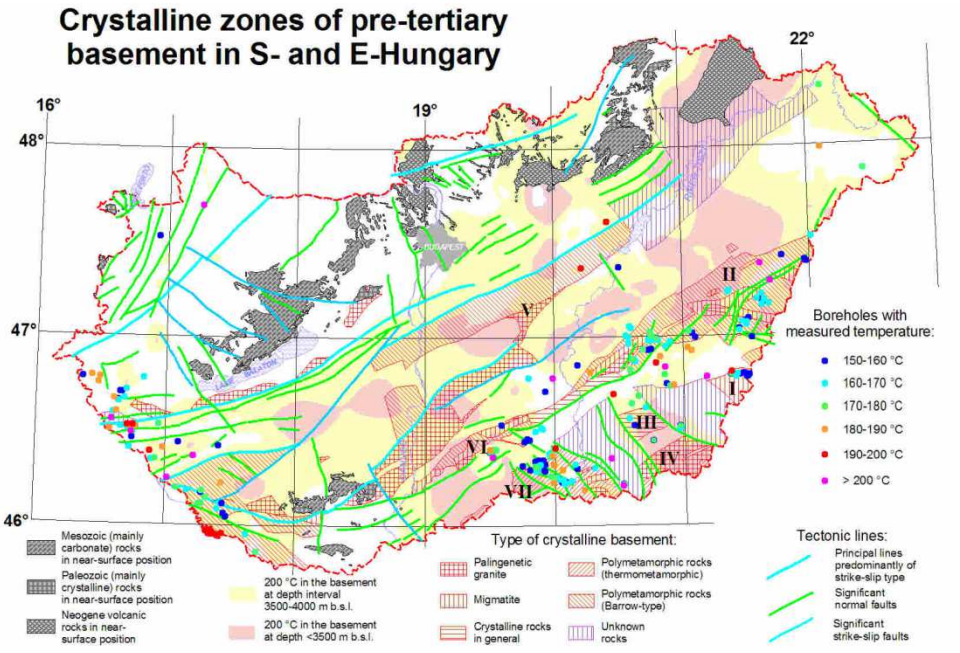






Main planned activities (5): Technical barriers and emerging technologies

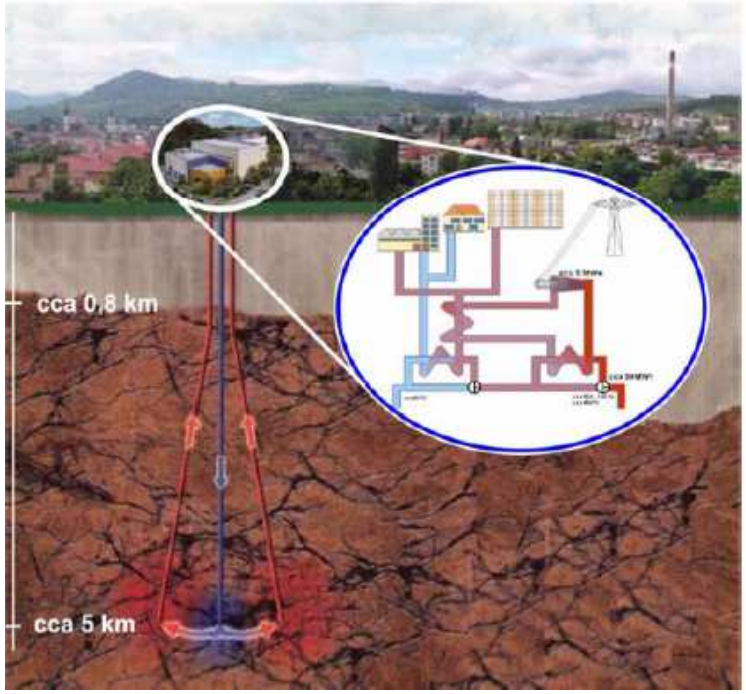
Environmental constrains of EGS (fraccing, induced seismicity, interactions with groundwaters)



Dövényi et al. 2005

Hungary won a NER-300 tender in 2013 for an EGS pilot

Litomerice HDR project (CZ)



SUMMARY

- ✓ **The DSR countries have significant untapped deep geothermal potentials**
- ✓ **In the current utilization schemes balneology is predominant, direct heat is subordinate, power production hardly exists, although all countries have ambitios plans for an enhanced use (also NREAP obligations)**
- ✓ **„DanReGeotherm" project concept has been evolved since 2013 and plans to:**

  provide scientifically based information on the available resources, current utilizations and technical and non-technical barriers → attrack investors to the region

- ✓ **Project consortium established, planned submission in 2015 autumn (Danube Transnational Program)**
- ✓ **START fund granted to HU, SRB, HR, RO, BH, CZ (data models)**

Thank you for your attention!

nador.annamaria@mfgi.hu
tel: +36-30-924-6823