# TRANSENERGY

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*Geological Survey of Slovenia*

*(material prepared by all partners)*




**Budapest, 28.11.2013**

# Index

- Settings
- Aims
- Stakeholders
- Organization of work
- Results
- Good practice
- Bad practice
- Vision

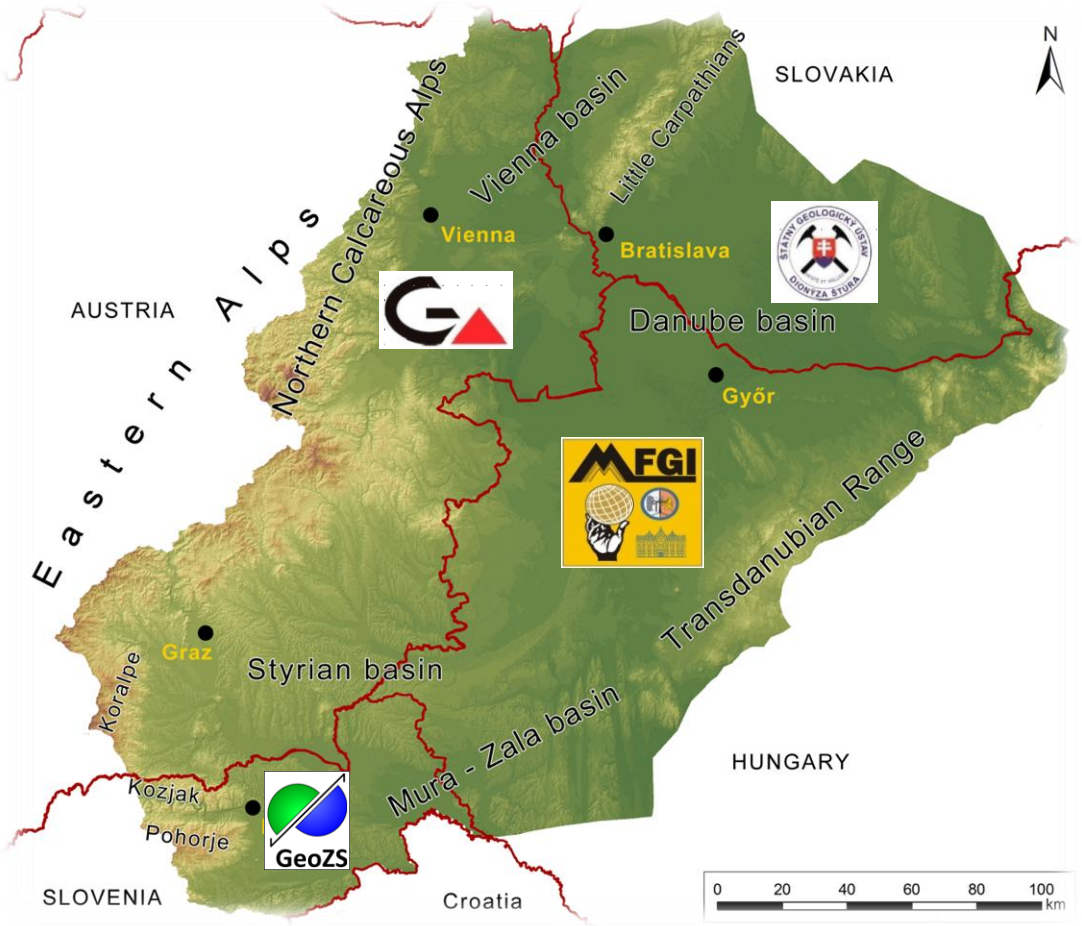
# Project TRANSENERGY

Transboundary geothermal energy resources of Slovenia, Austria, Hungary and Slovakia

Duration: 1.4.2010 - 31.3.2013
**- 30.9.2013**
(42 months)

Budget: 2,855,090.92 €

CEU Program Priority 3:
Using our environment responsiby




This project is implemented through the CENTRAL EUROPE Programme co-financed by the ERDF.

# Aims of TRANSENERGY

**Promote and enhance**

**sustainable geothermal development**

- Non-tecnical barriers, WFD
- Management → scientific issues
- Reliable resource assessment
- Harmonized management
- Sustainable use of resources

# Stakeholders

| Group | Needs | Scale |
|---|---|---|
| **Decision makers: national ministries, authorities, governmental bodies) EU level (DG Energy, DR Regio, ICPDR)** | - current utilization schemes and its impacts,<br>- limits of an enhanced use of geothermal resources and its forecasted impacts<br>- thematic expert summaries supporting policy documents | **macro-regional** |
| **Project developers and new investors** | - geothermal potential<br>- targeted reservoir properties<br>- prospective and ‘‘free‘‘ areas<br>- regulatory and financial environment<br>- short and easy licensing procedures | **regional/national** |
| **Users** | - quality and quantity state of aquifers<br>- competitive use algorithms<br>- exploitation experience | **reservoir** |

## Web-based decision supporting tool

# Organization of work

WP1 Project management

WP2 Communication

WP3 Utilization aspects

WP4 Transnational data management

WP5 Cross-border geoscientific models

WP6 Implementation tools for transboundary geothermal resource management

# Communication and dissemination

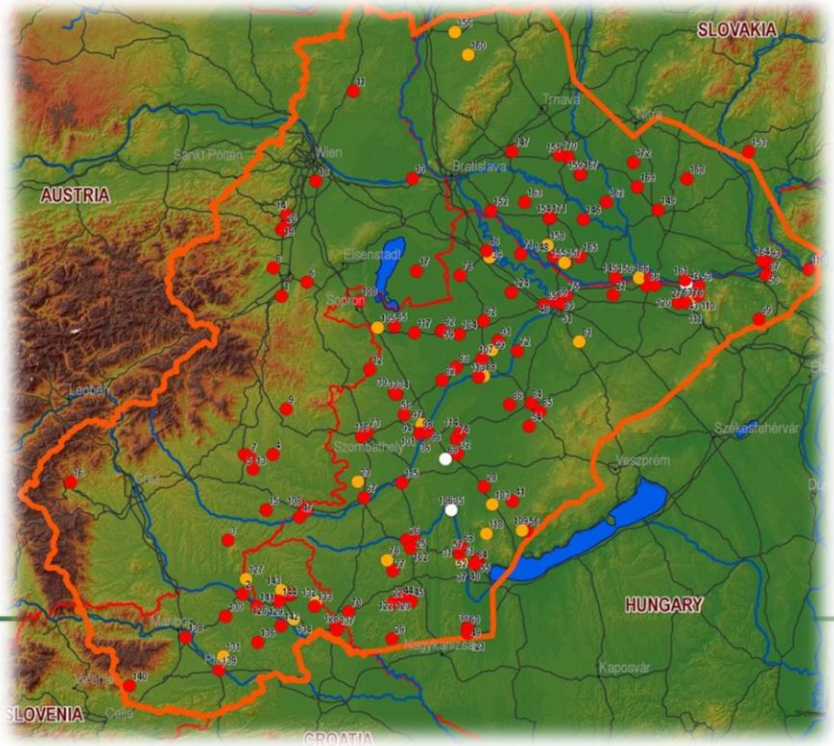
- Website – interactive web portal
- Leaflets
- Summary reports
- **Strategy paper**
- Two national events
- Final conference in June 2013
- Field trip guides

***Visualization of subsurface to non-geologists***

# Utilization aspects

- Authorities survey (Database of 40 geothermal authorities)
- Overview of EU, national and regional legislation
- Methodology for joint/**harmonized** groundwater management
- Utilization overview (Database: 3 levels, ~213 users, ~290 formations, ~401 wells)

http://akvamarin.geo-zs.si/users/




Country: Slovenia

Users: Benedikt Municipality

**ORGANIZATION INFORMATION:**

| | |
|---|---|
| Commercial name | Občina Benedikt |
| Country | Slovenia |
| Location | Benedikt |
| Level | local |
| Organization (Original) | Občina Benedikt |
| Organization (English) | Benedikt Municipality |
| Web address | Click to view |
| Address | Čolnikov trg 5 |
| Postcode | 2234 |
| Post name | Benedikt |
| Telephone | +386 (0)2 703 6080 |
| Fax | +386 (0)2 703 6081 |
| Organization group | |
| Comment | |
| Google Maps | Click to view |

**PRODUCED WATER MANAGEMENT:**

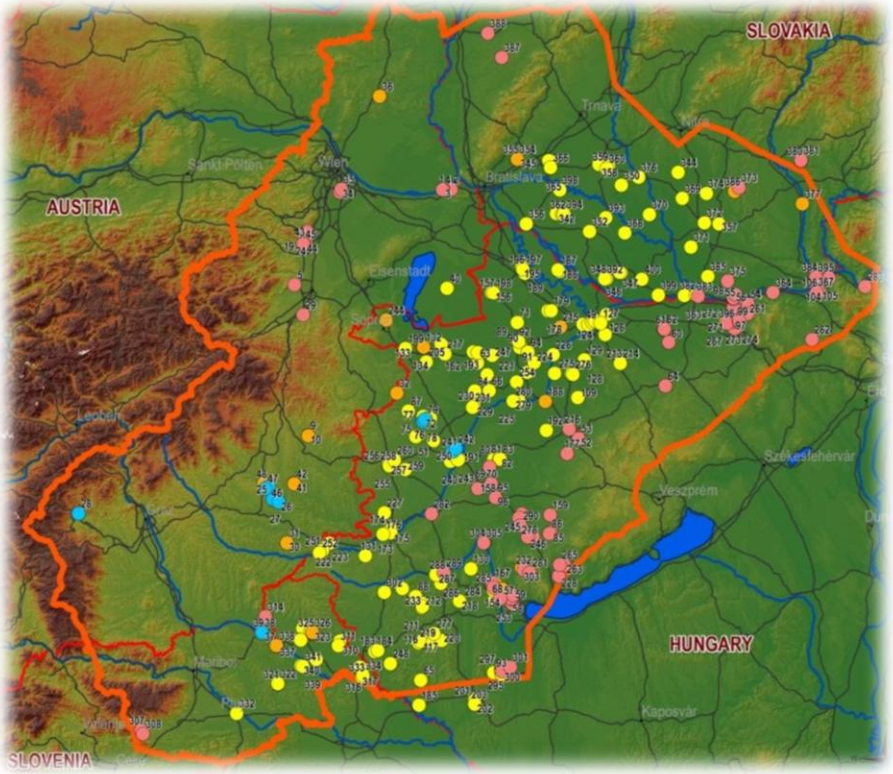
| | |
|---|---|
| User status | active production |
| Water use | district heating (other than heat pumps) |
| Water sources | Be-2/04 |
| MIN. water temp. (°C) | |
| MAX. water temp. (°C) | 72,00 |

**WASTE WATER MONITORING:**

| | |
|---|---|
| Quantitative monitoring | no monitoring |
| Chemical monitoring | occasional point measurement |
| Temperature monitoring | occasional point measurement |
| Waste water temp. (°C) | 45,00 |
| Waste water treatment | no treatment |
| Place of water release | meteoric channel, Drvanja stream |
| Comment | m3/year estimated through pipe diameter and days of operation, waste water temp measured befoe discharched to cooling pool |

# Exploited reservoirs

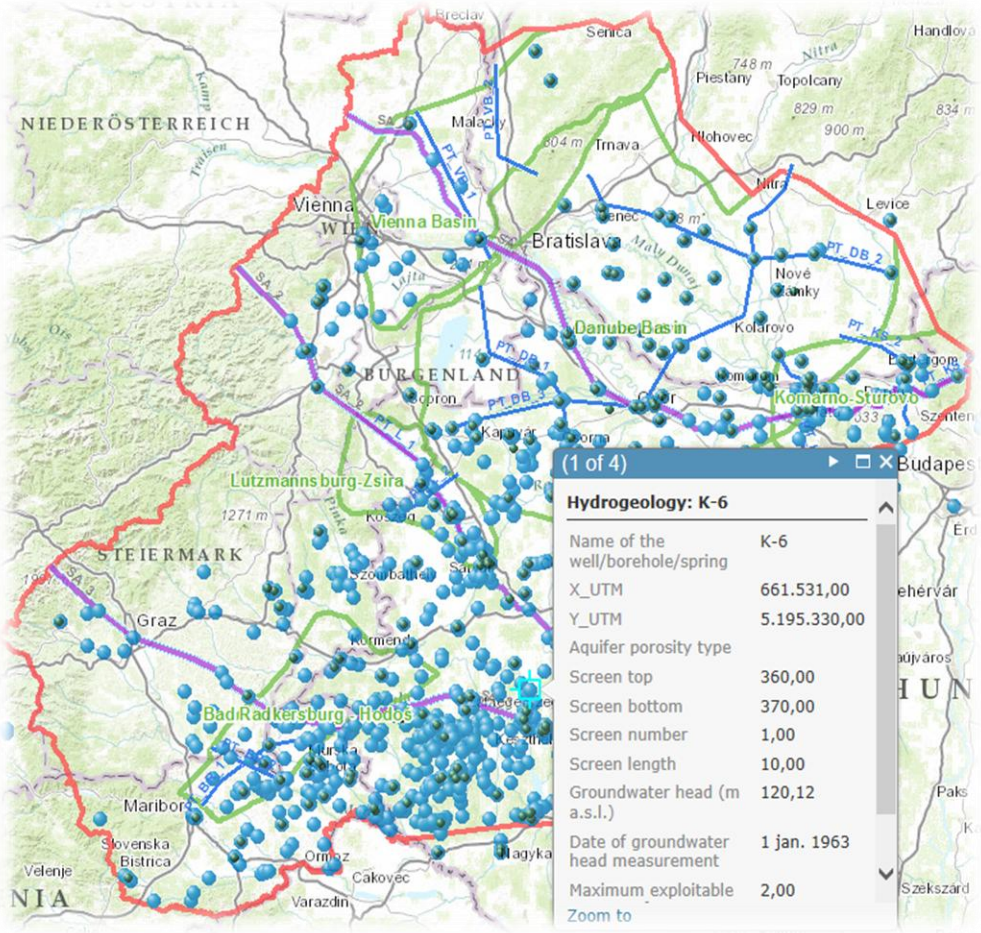
- $T_{thermal\ water}$ > 20 C
- Utilization / Monitoring / Waste water management / Future potential
- 148 active users with 307 active wells
- Low-temperature low energetic use
- Indications on overexploitation




| Main geothermal reservoirs | Paleo-Mesozoic fractured, karstified basement rocks | Miocene porous and carbonate reservoirs | Mio-Pliocene multi-layered sandstones, shales |
|---|---|---|---|
| Depth (top) | >2-3000 m | basement highs | 600-1500 m |
| Temperature | >100-150 C | 50-150 C | 50-100 C |
| Active wells | ~100 | ~30 | ~170 |
| Abstraction | 19.9 mio $m^3$/year | 1.3 mio $m^3$/year | 11.4 mio $m^3$/year |

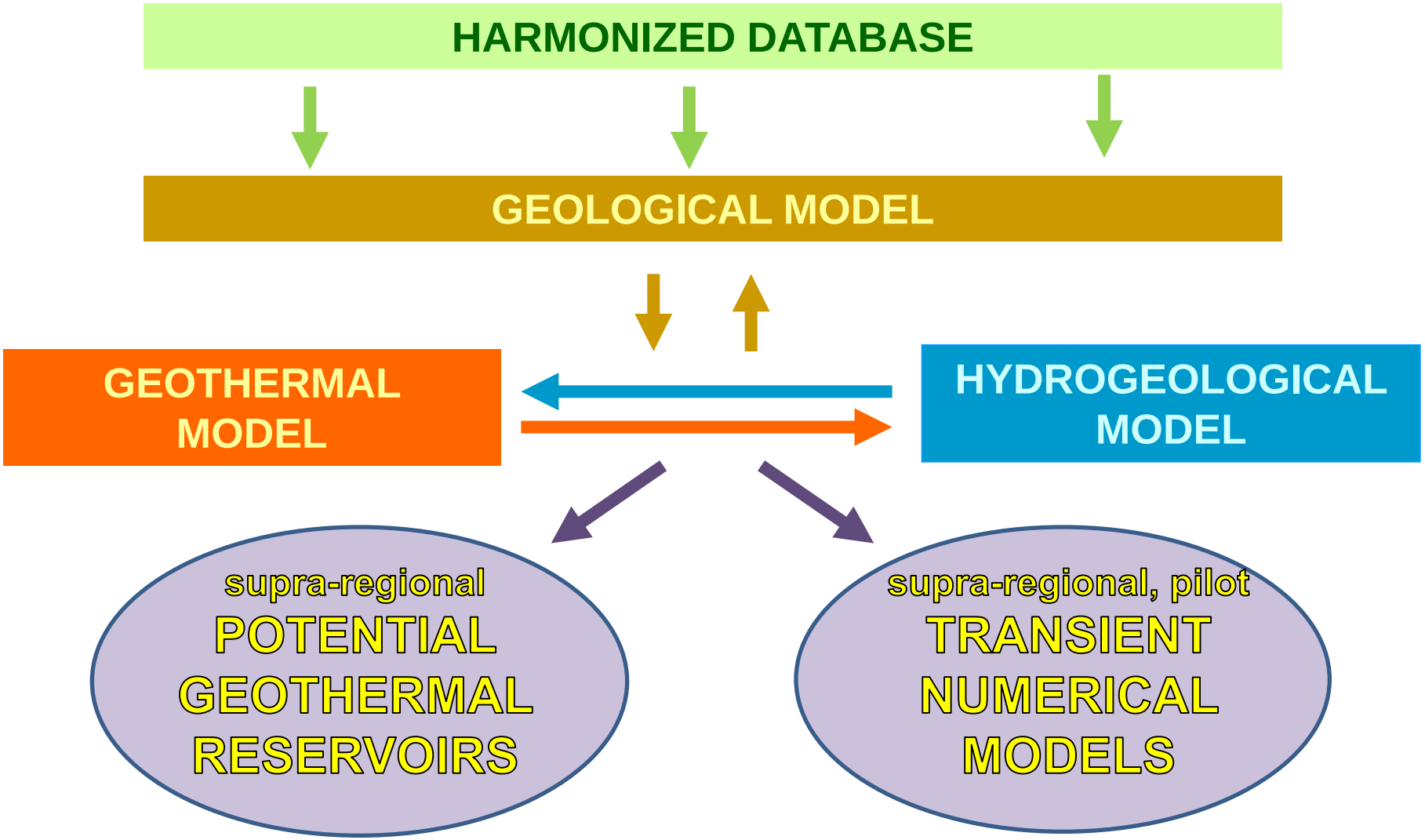
# Transnational data management

- General
- Utilization
- Technical
- Geology
- Hydrogeological
- Geothermal
- Geophysics
- Basic chemistry
- Trace elements
- Isotops and noble gases
- Organic compound

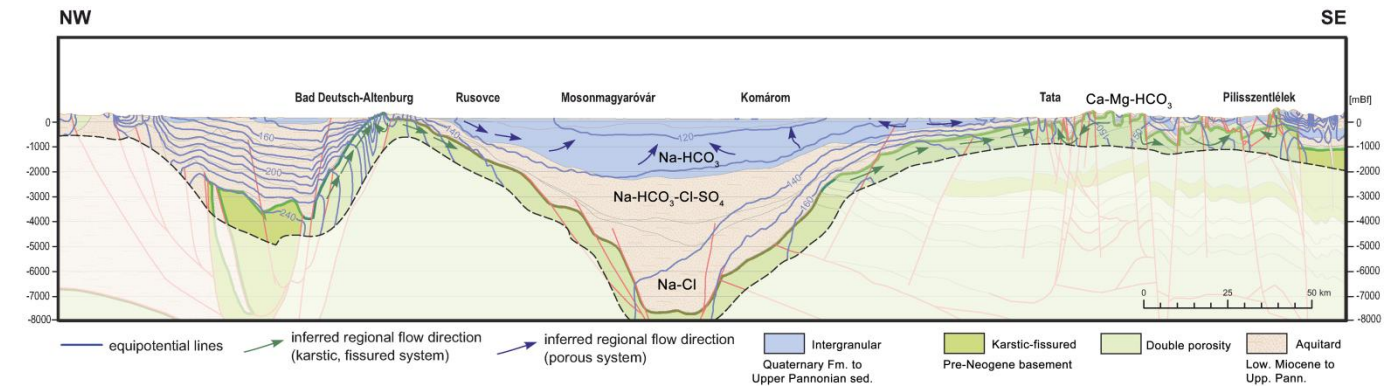


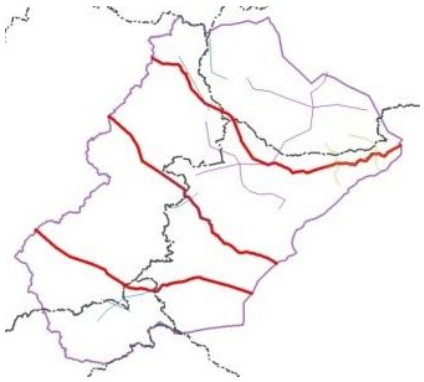

- 5-lingual database
- Other results in English

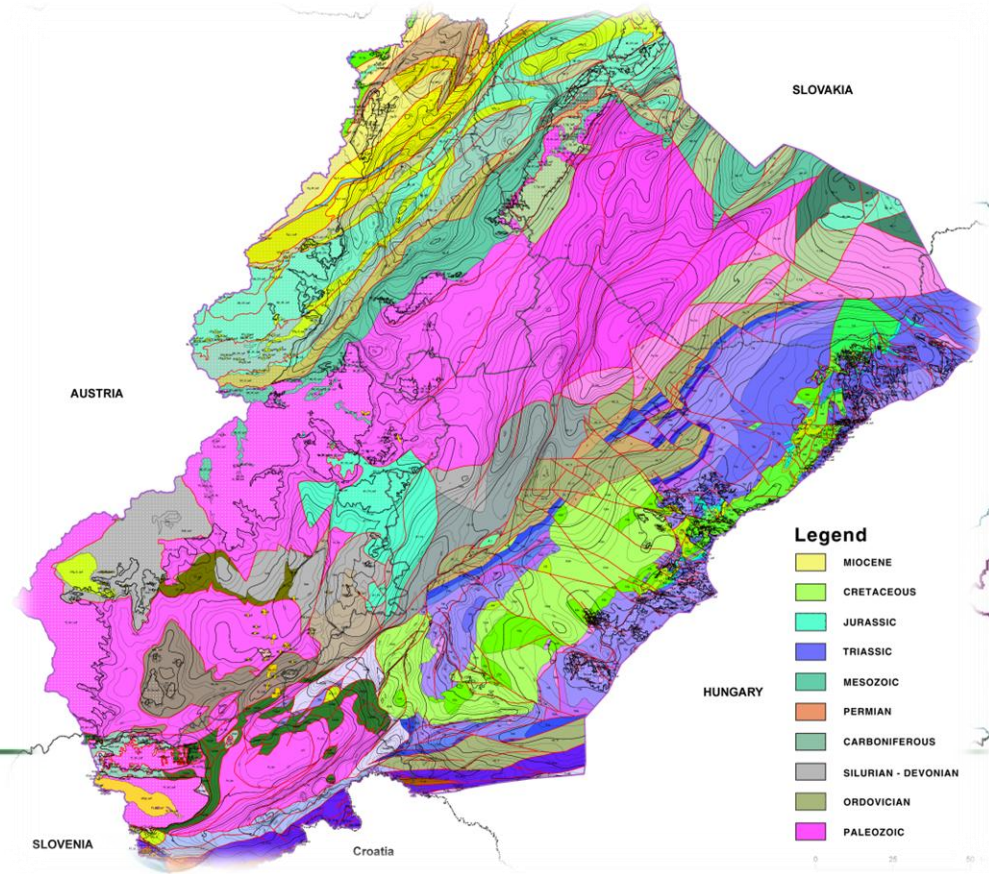
# Cross-border geoscientific models

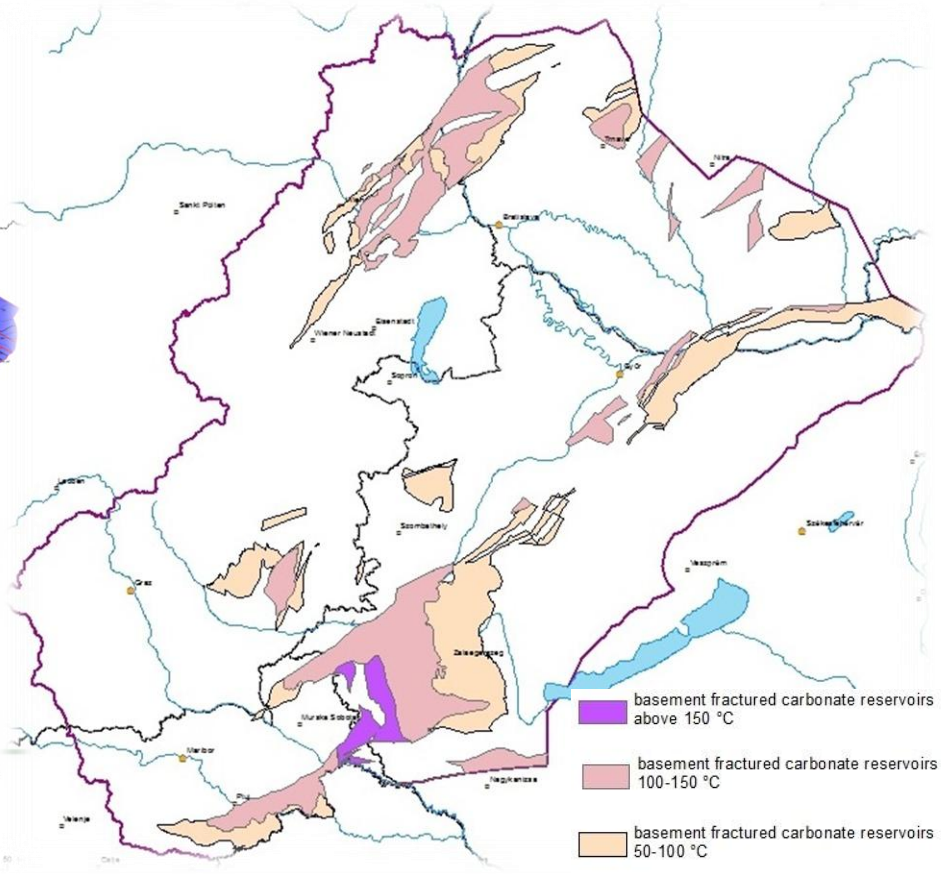


# 2D geoscientific models



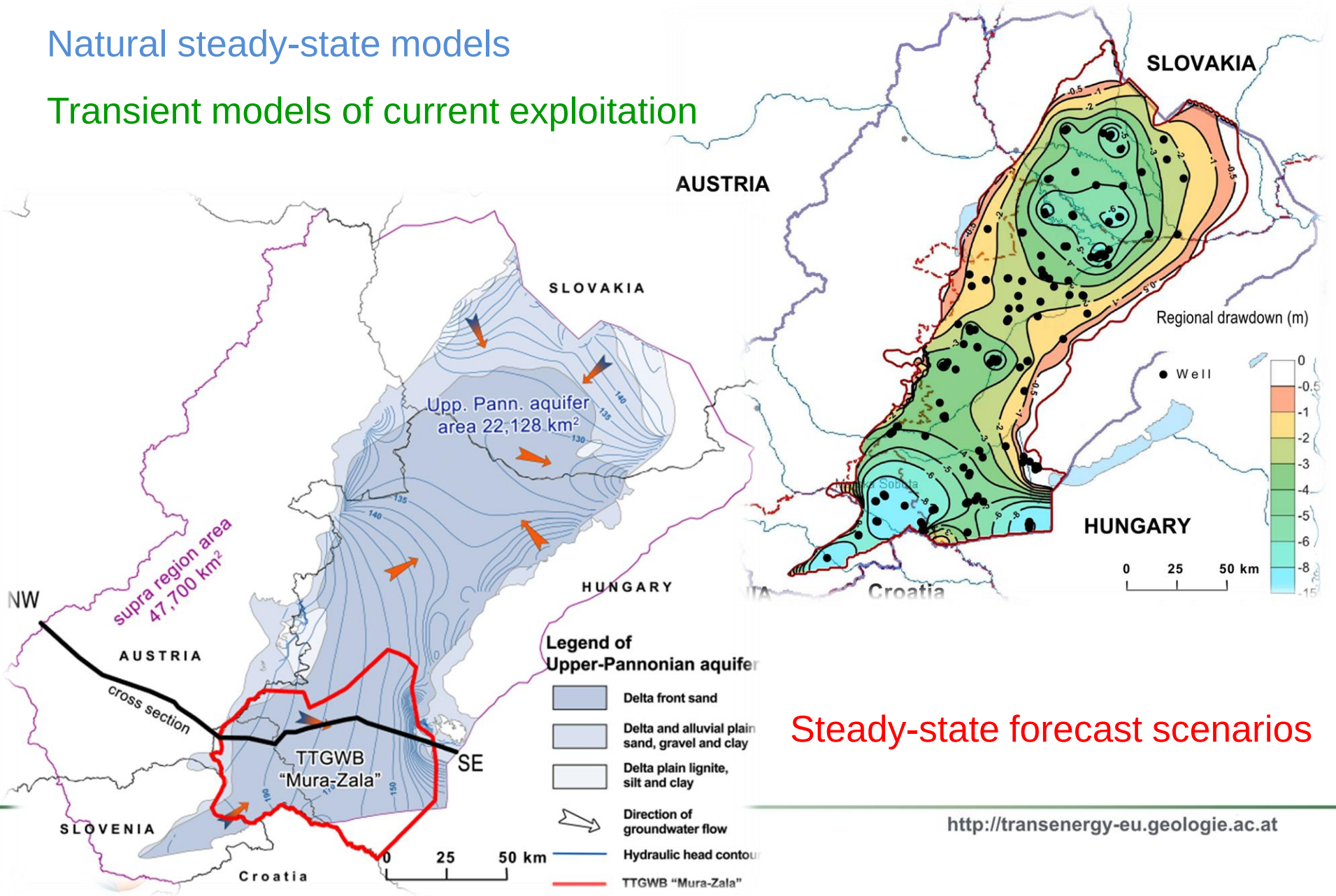


# 3D geoscientific models

Natural steady-state models

Transient models of current exploitation




Steady-state forecast scenarios

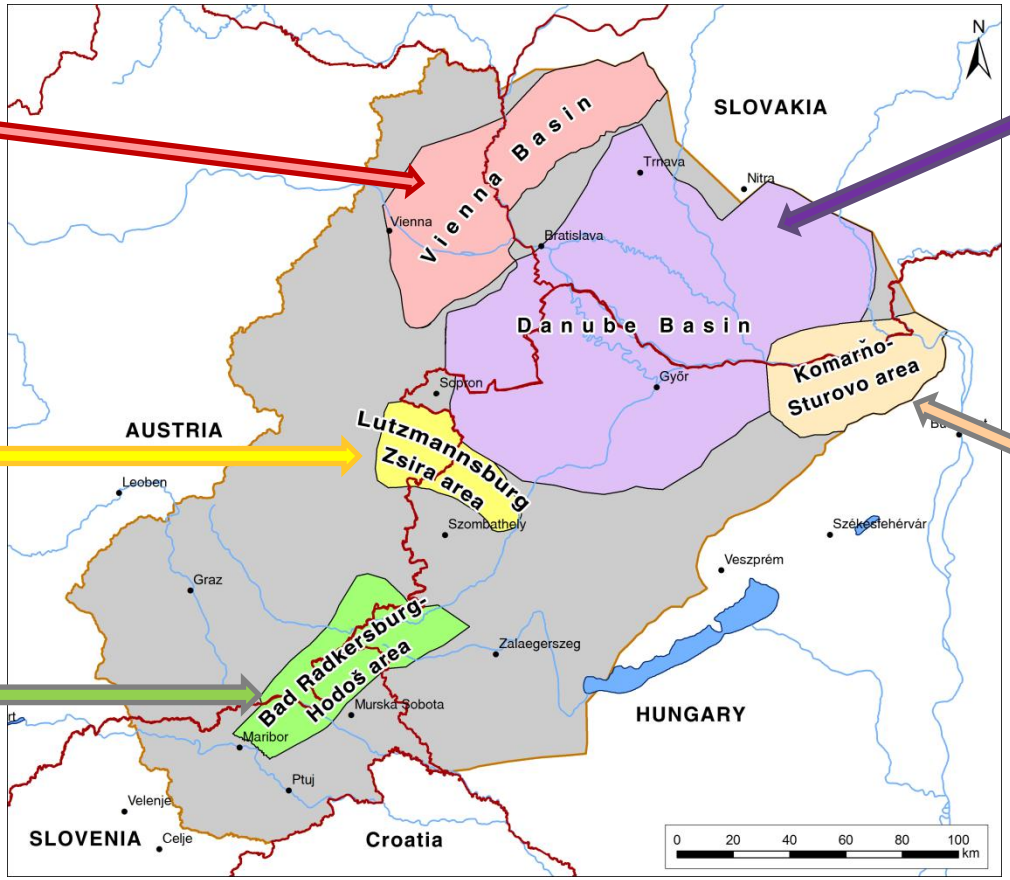
# Pilot area models

- Impact assessment addressing special utilization issues
- Coupled groundwater flow and heat transfer

New exploitation of geothermal resources

Overexploitation of geothermal aquifers

Interference between users and geothermal doublets




Availability of thermal water

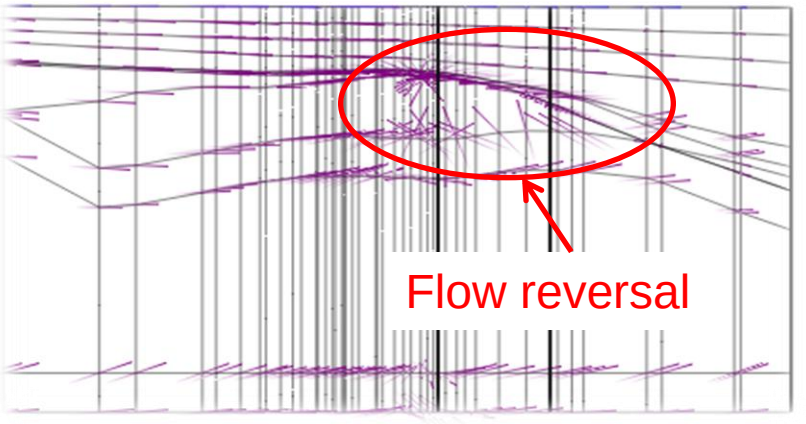
Effects of past mining activity on thermal karst water system

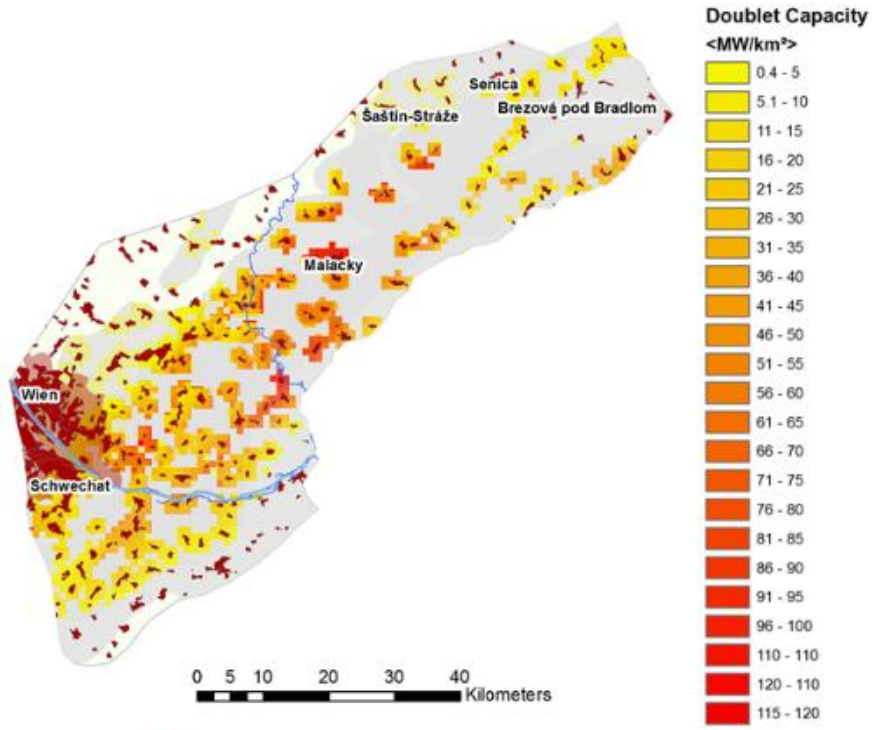
# Pilot area models

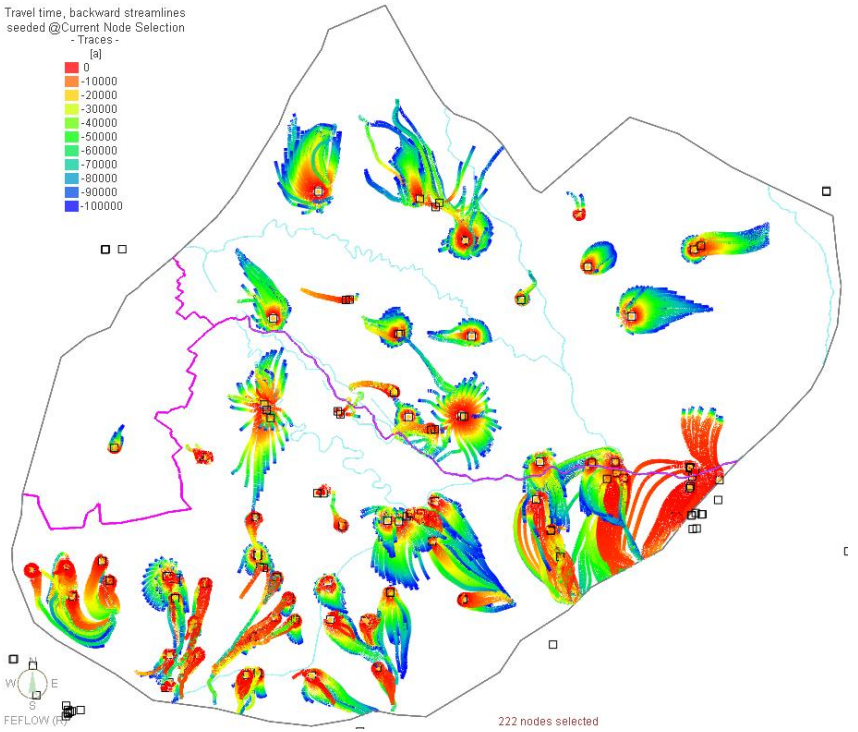
- Sustainable scenarios (state, reinjection)
- Guidelines on transboundary monitoring network

- ***Pilot areas section on website***

  ***→ short summaries***



# Implementation tool for transboundary geothermal resource management

- 5-lingual interactive information web-portal
- Web-maps: supra-regional and pilot scale
- Databases with contact information
- ~1700 wells, 50% public data
- List of legal and economic deficiencies
- Assessment of demonstration sites in HU and SK

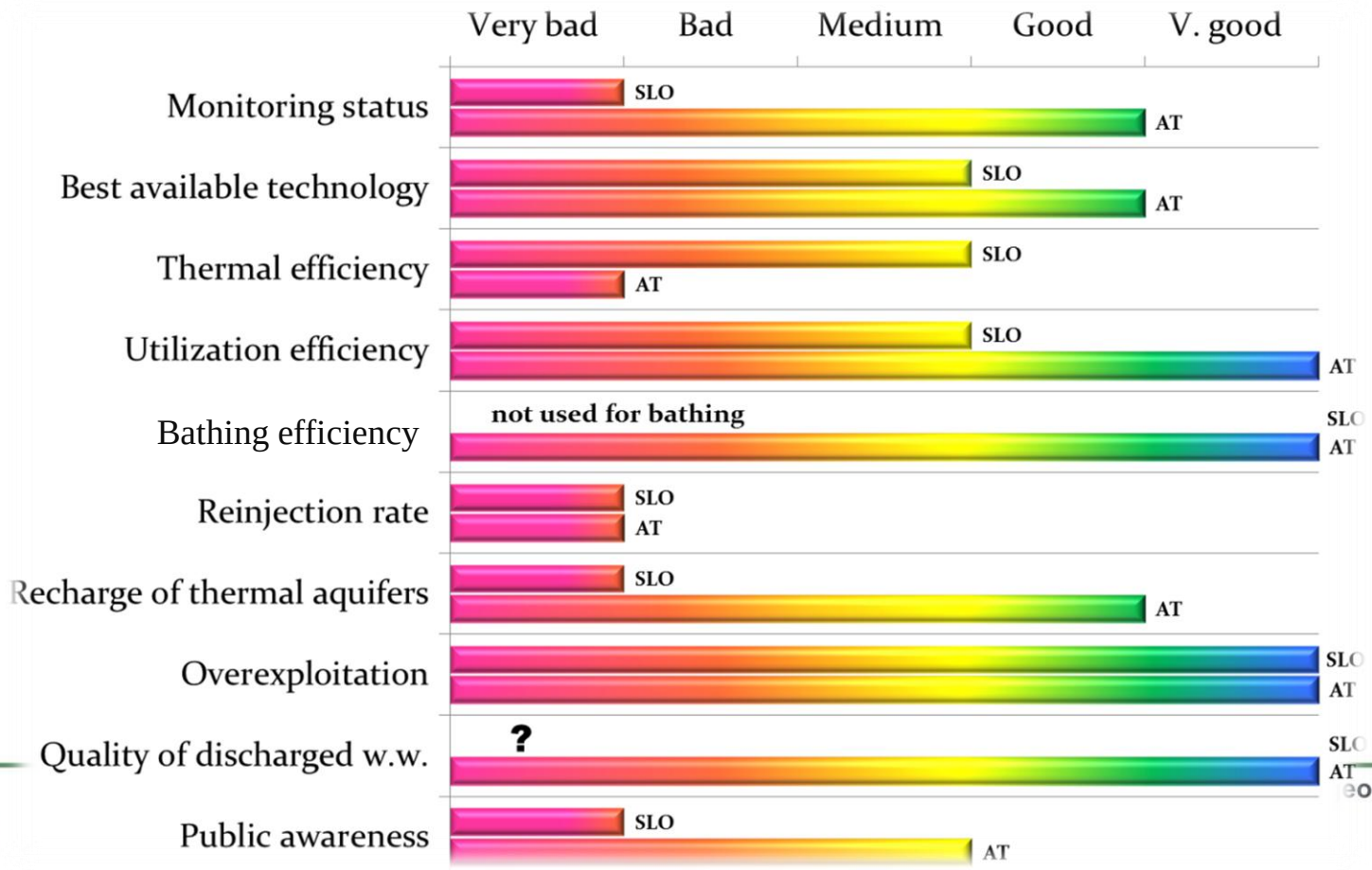
www.kleefeldoncomics.com

## Strategic paper

**on sustainable cross-border use of hydrogeothermal resources**

# Management (benchmarking)

- Bad Radkersburg-Hodoš (AT-SI)
- Danube basin (HU-SK)
- Komarno-Sturovo (HU-SK)
- Lutzmannsburg-Zsira (AT-HU)
- Mura-Zala basin (SI-HU)



# Good and poor practice

- Strong partners cooperation
- Field measurements
- Joint trainings

- Sequential tasks not fulfilled in time
- No time for scientific papers
- Very few abstracts in reports

- External Evaluation Board
- Annual national events
- Field trips for stakeholders

- Server is poorly organized (ver X)
- Publicity/confidentiality of data
- Updating of the database

# VISION

- Physical models (visualization)
- Transboundary monitoring

- Updating users status
- Regional benchmarking
- Guidelines for permits for users

- Competitive use of geo-potentials
- Guidelines on reinjection
- Shallow geothermal (heat pumps)

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Rudolf Berka
Stefan Hoyer
Thomas Hofmann

- Reliable independent assessment of hydrogeothermal resources
- Sustainable use of thermal water and heat
- Recommendations on harmonized management of thermal aquifers
- Non-tecnical barriers for enhanced development of deep geothermal sector
- GEOZS Most complete national databases, Expertise to provide impartial assessments
- Org: Identify stakeholders → understand their needs → „translate”policy related / manegement questions to scientific ones; Find the best way to provide appropriate answers: integrated geoscientific models; Feed the models with uniform (harmonized) data input

razpokan kraški vodonosnik 100% reinjekcija, dvojni dublet

- Geotermalna elektrarna *(Csömödér; 2,7 km, 30 kg/s, 150 C; 2 MWe, 7,5 MWth, €2.45 mio letno, amortizacija 8,3 let)*
- Daljinsko ogrevanje *(Ostrove; 2,2 km, 50 kg/s, 91 C; 6 MWth, €1.36 mio letno, amortizacija 9,1 let)*